

SECTION **BR**

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When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

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

PRECAUTIONS AND PREPARATION

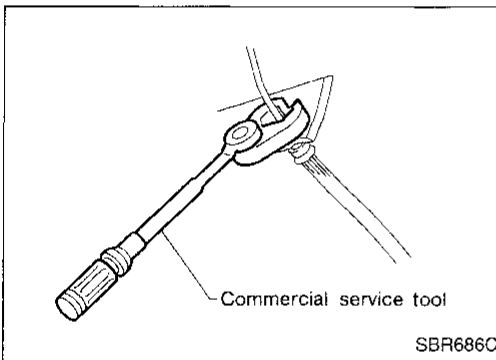
Precautions

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

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



BRAKE SYSTEM

- Use brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- To clean master cylinder parts, disc brake caliper parts or wheel cylinder parts, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.
- Use flare nut wrench when removing and installing brake tubes.
- Always torque brake lines when installing.

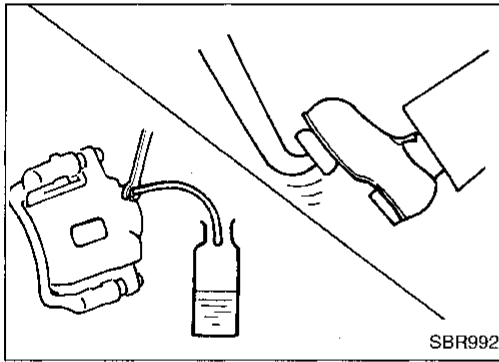
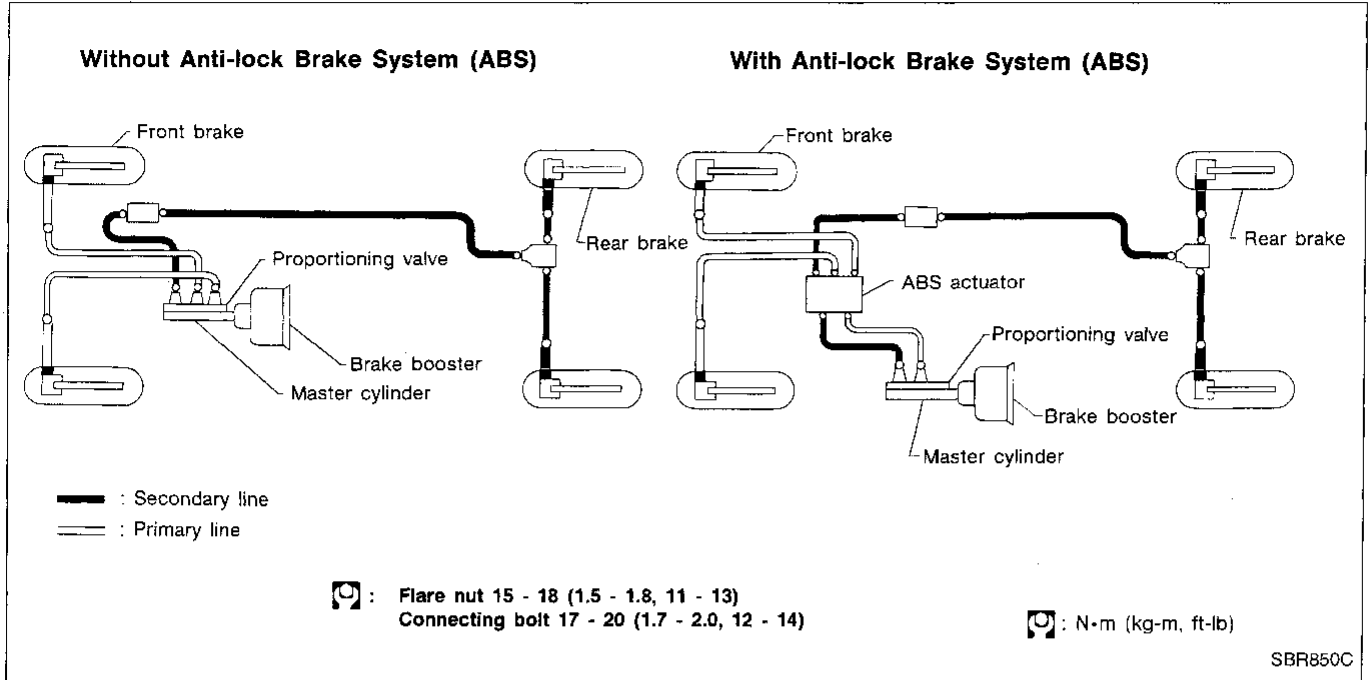
WARNING:

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

Commercial Service Tools

Tool name	Description
<ol style="list-style-type: none"> 1 Flare nut crows foot 2 Torque wrench 	<p>NT360</p> <p>a: 10 mm (0.39 in)</p> <p>Removing and installing each brake piping</p>
Brake fluid pressure gauge	<p>NT151</p> <p>Measuring brake fluid pressure</p>

Brake Hydraulic Line



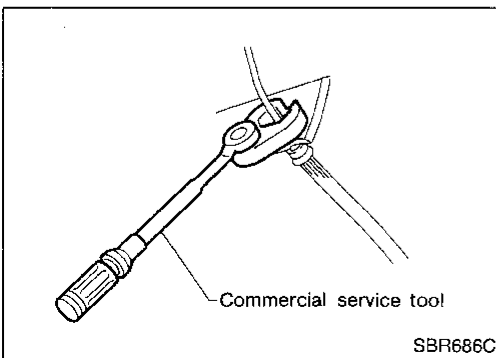
REMOVAL

CAUTION:

- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
 - All hoses must be free from excessive bending, twisting and pulling.
1. Connect vinyl tube to air bleeder valve.
 2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
 3. Remove flare nut connecting brake tube and hose, then withdraw lock spring.
 4. Cover openings to prevent entrance of dirt whenever disconnecting brake line.

INSPECTION

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

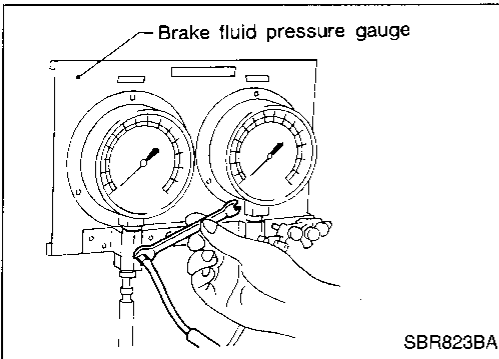
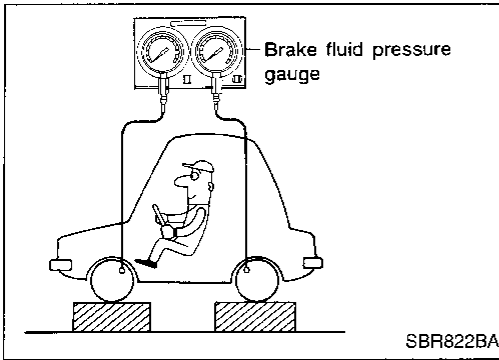


INSTALLATION

CAUTION:

- Refill with new brake fluid "DOT 3".
 - Never reuse drained brake fluid.
1. Tighten all flare nuts and connecting bolts.
 - Flare nut:
 - ☐: 15 - 18 N·m (1.5 - 1.8 kg·m, 11 - 13 ft·lb)
 - Connecting bolt:
 - ☐: 17 - 20 N·m (1.7 - 2.0 kg·m, 12 - 14 ft·lb)
 2. Refill until new brake fluid comes out of each air bleeder valve.
 3. Bleed air. Refer to "Bleeding Brake System", BR-6.

BRAKE HYDRAULIC LINE/CONTROL VALVE



Proportioning Valve

INSPECTION

CAUTION:

- Carefully monitor brake fluid level at master cylinder.
 - Use new brake fluid "DOT 3".
 - Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.
 - Depress pedal slowly when raising front brake pressure.
 - Check rear brake pressure 2 seconds after front brake pressure reaches specified value.
 - For models with ABS, disconnect harness connectors from ABS actuator relay box before checking.
1. Connect Tool to air bleeders of front and rear brakes on either LH and RH side.
 2. Bleed air from the Tool.
 3. Check fluid pressure by depressing brake pedal.

Unit: kPa (kg/cm², psi)

Applied pressure (Front brake)	5,884 (60, 853)
Output pressure (Rear brake)	3,629 - 4,021 (37 - 41, 526 - 583)

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

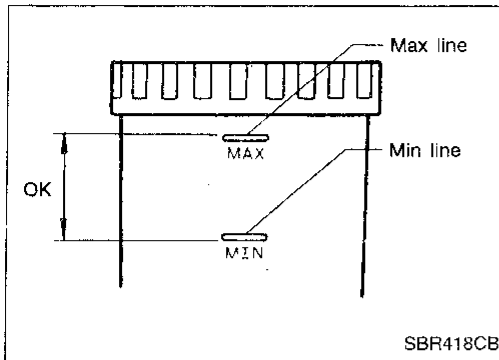
4. Bleed air after disconnecting the Tool. Refer to "Bleeding Brake System", BR-6.

REMOVAL AND INSTALLATION (Built-in type)

Always replace together with master cylinder as an assembly.

- Refer to "MASTER CYLINDER", BR-8.

CHECK AND ADJUSTMENT



Checking Brake Fluid Level

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

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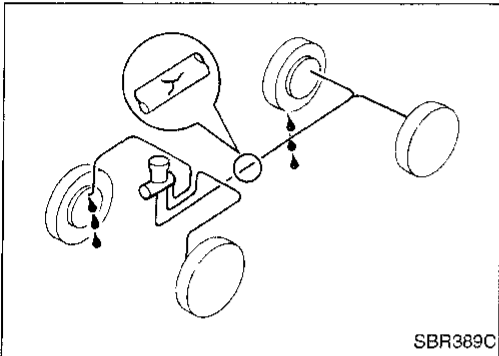
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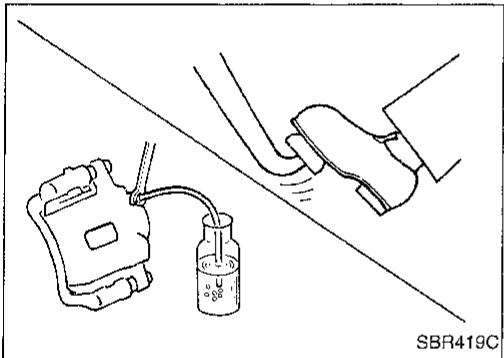


Checking Brake Line

CAUTION:

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

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

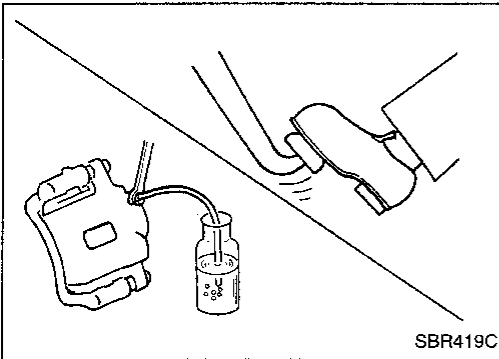
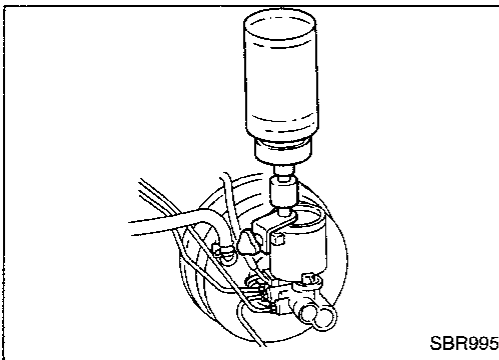


Changing Brake Fluid

CAUTION:

- Refill with new brake fluid "DOT 3".
- Always keep fluid level higher than minimum line on reservoir tank.
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.

1. Clean inside of reservoir tank, and refill with new brake fluid.
2. Connect a vinyl tube to each air bleeder valve.
3. Drain brake fluid from each air bleeder valve by depressing brake pedal.
4. Refill until brake fluid comes out of each air bleeder valve. Use same procedure as in bleeding hydraulic system to refill brake fluid. Refer to "Bleeding Brake System", BR-6.



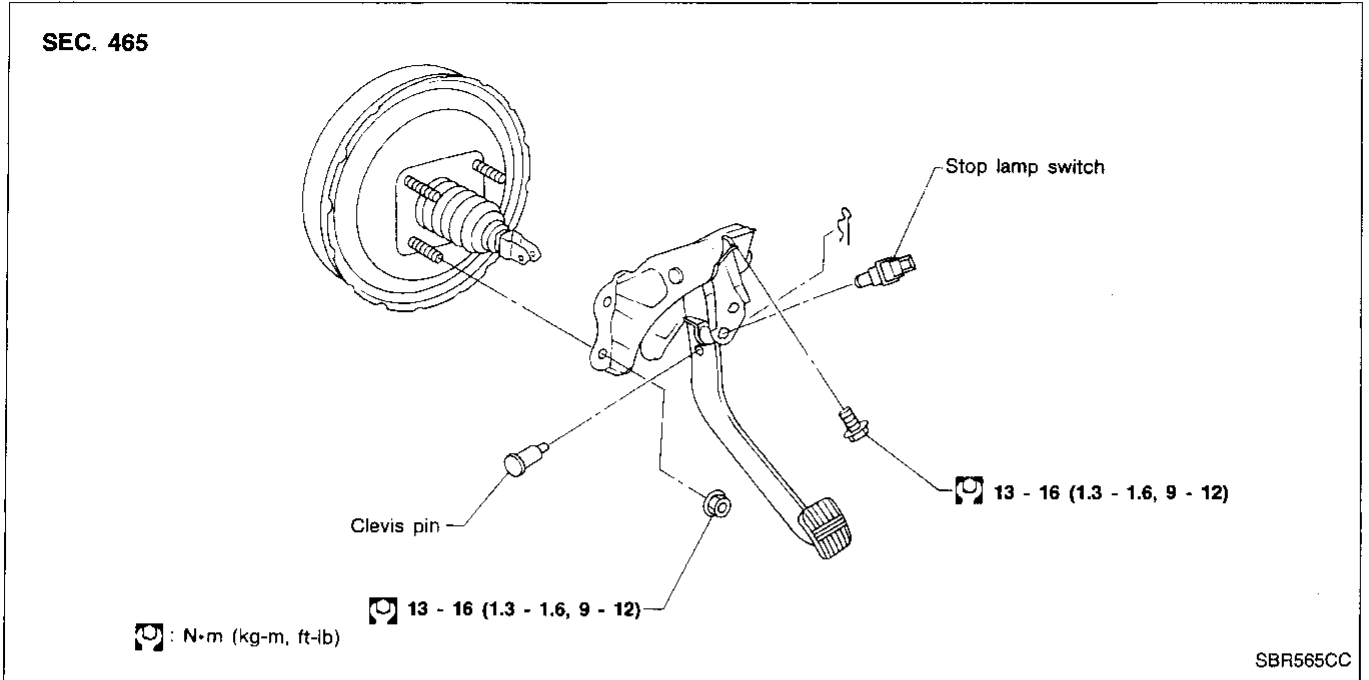
Bleeding Brake System

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-10.
 - Fill reservoir with new brake fluid "DOT 3". Make sure it is full at all times while bleeding air out of system.
 - Place a container under master cylinder to avoid spillage of brake fluid.
 - For models with ABS, turn ignition switch OFF and disconnect ABS actuator connectors or battery ground cable.
 - Bleed air in the following order.
Right rear brake → Left rear brake →
Right front brake → Left 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)

BRAKE PEDAL AND BRACKET

Removal and Installation



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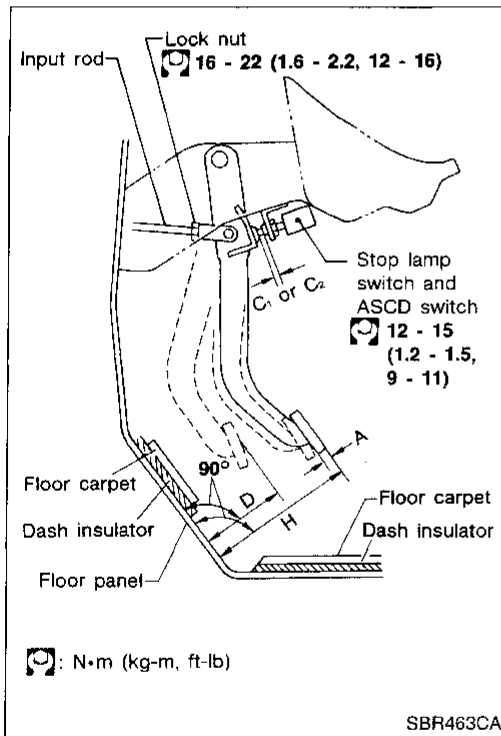
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Inspection

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. Adjust if necessary.

H: Free height
Refer to SDS (BR-69).

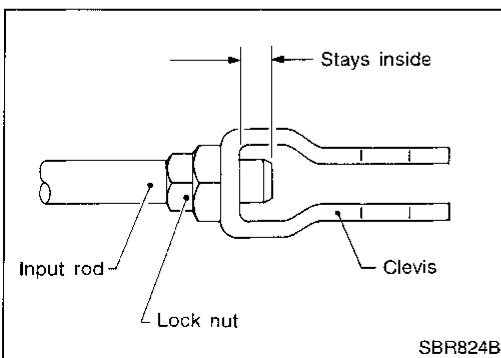
D: Depressed height
Refer to SDS (BR-69).

Under force of 490 N (50 kg, 110 lb) with engine running

C₁, C₂: Clearance between pedal stopper and threaded end of stop lamp switch and ASCD switch

0.3 - 1.0 mm (0.012 - 0.039 in)

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



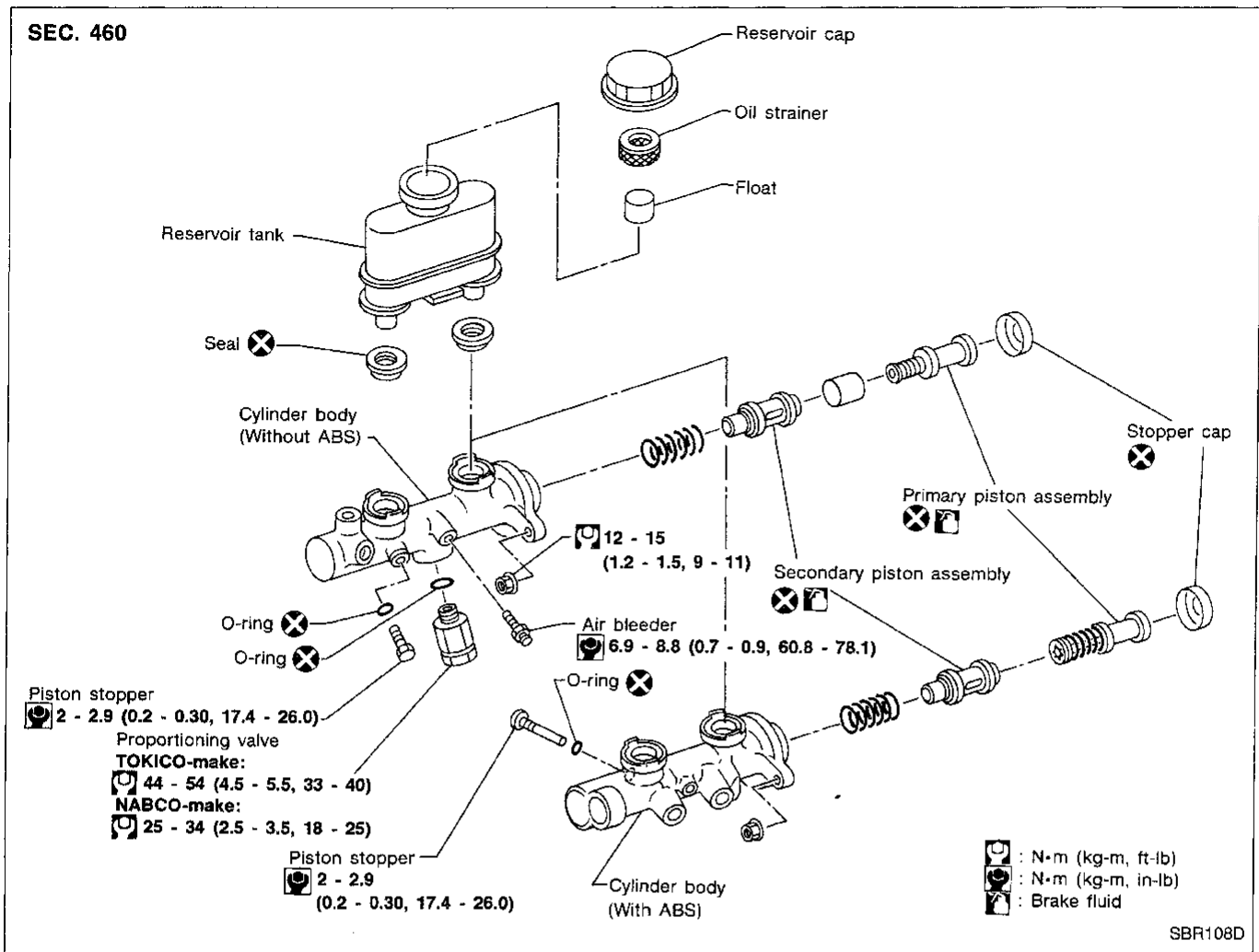
1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.
2. Check pedal free play.

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

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

MASTER CYLINDER

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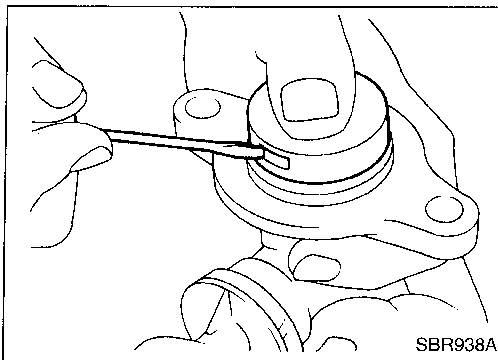
Removal

CAUTION:

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

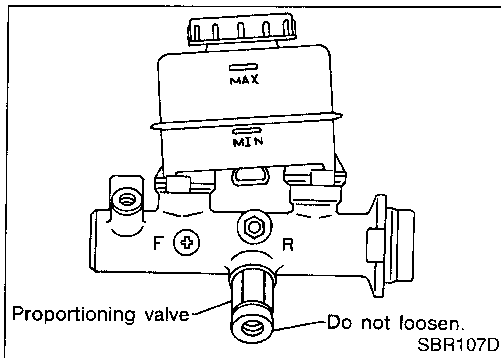
1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
3. Remove brake pipe flare nuts.
4. Remove master cylinder mounting nuts.

MASTER CYLINDER



Disassembly

1. Bend claws of stopper cap outward.



Models without ABS:

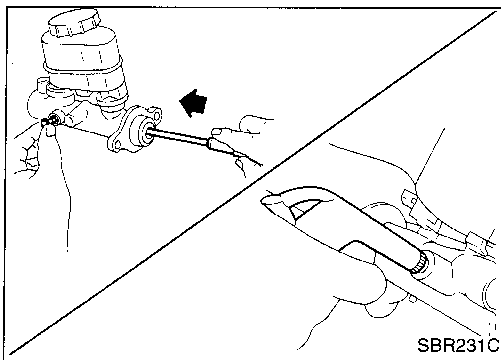
2.
 - a. Remove proportioning valve.
 - b. Remove piston stopper while piston is pushed into cylinder.

CAUTION:

Do not loosen valve tip when removing proportioning valve.

Models with ABS:

- Remove piston stopper while piston is pushed into cylinder.



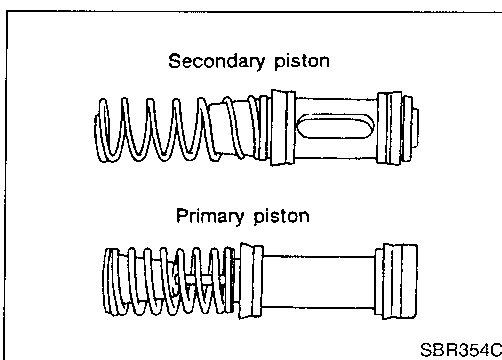
3. Remove piston assemblies.

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

4. Draw out reservoir tank.

Inspection

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



Assembly

1. Insert secondary piston assembly. Then insert primary piston assembly.
 - Pay attention to direction of piston cups in figure at left. Also, insert pistons squarely to avoid scratches on cylinder bore.
 - Pay attention to alignment of secondary piston slit with valve stopper mounting hole of cylinder body (For models with ABS only).

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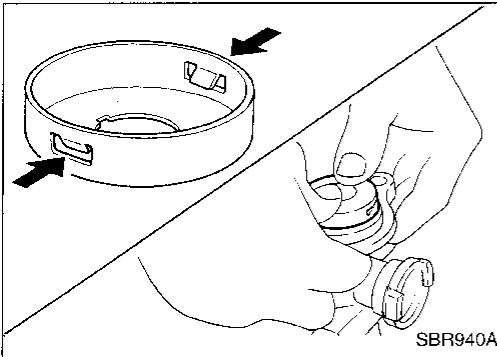
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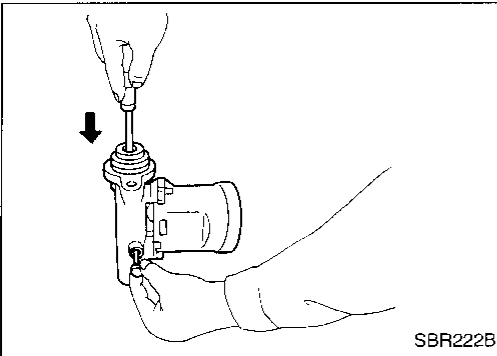
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MASTER CYLINDER

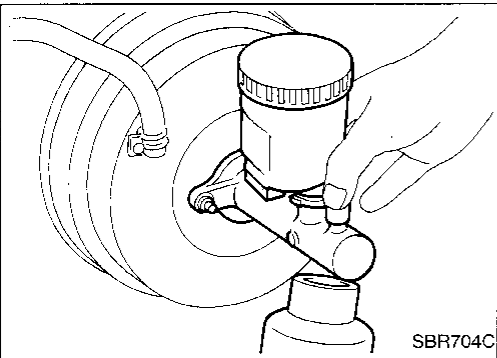
Assembly (Cont'd)



2. Install stopper cap.
Before installing stopper cap, ensure that claws are bent inward.
3. Push reservoir tank seals into cylinder body.
4. Push reservoir tank into cylinder body.



5. Install valve stopper while piston is pushed into cylinder.



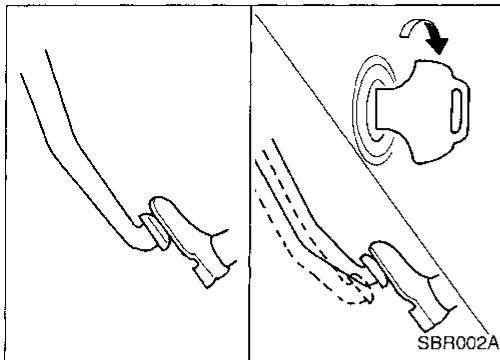
Installation

CAUTION:

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

1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Torque mounting nuts.
Ⓜ: 12 - 15 N·m (1.2 - 1.5 kg-m, 9 - 11 ft-lb)
3. Fill up reservoir tank with new brake fluid.
4. Plug all ports on master cylinder with fingers to prevent air suction while releasing brake pedal.
5. Have driver depress brake pedal slowly several times until no air comes out of master cylinder.
6. Fit brake lines to master cylinder.
7. Tighten flare nuts.
Ⓜ: 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
8. Bleed air from brake system. Refer to "Bleeding Brake System", BR-6.

BRAKE BOOSTER/VACUUM HOSE



Brake Booster

ON-VEHICLE SERVICE

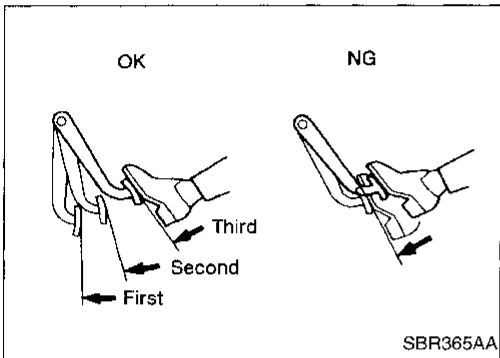
Operating check

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

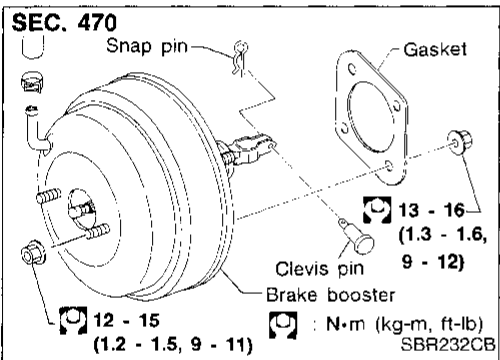
Airtight check

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

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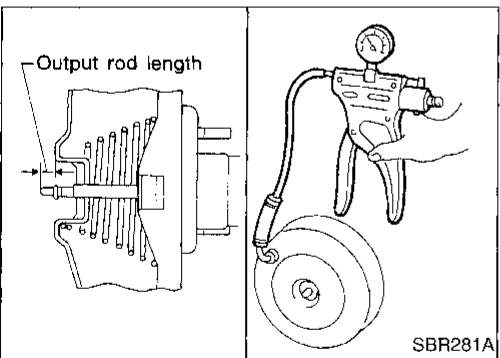


REMOVAL

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.

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INSPECTION

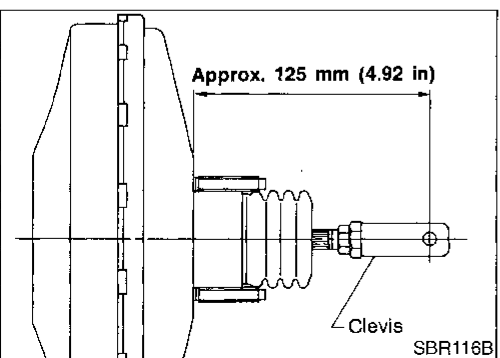
Output rod length check

1. Apply vacuum of -66.7 kPa (-500 mmHg , -19.69 inHg) to brake booster with a hand vacuum pump.
2. Check output rod length.

Specified length:

10.275 - 10.525 mm (0.4045 - 0.4144 in)

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INSTALLATION

CAUTION:

- Be careful not to deform or bend brake pipes during installation of booster.
- Replace clevis pin if damaged.
- Refill with new brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Take care not to damage brake booster mounting bolt thread when installing. Due to the narrow angle of installation, the threads can be damaged by the dash panel.

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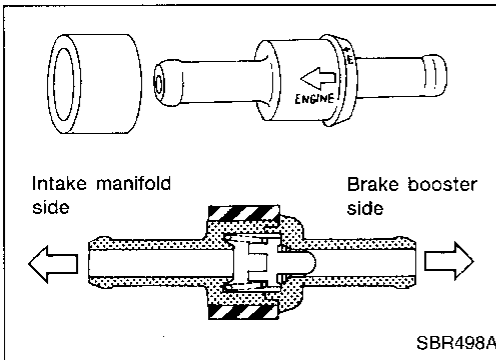
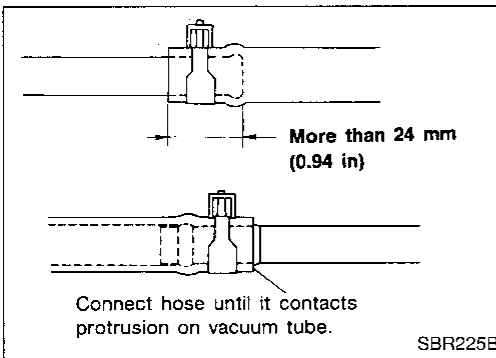
BRAKE BOOSTER/VACUUM HOSE

Brake Booster (Cont'd)

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

Specification: 13 - 16 N·m (1.3 - 1.6 kg·m, 9 - 12 ft·lb)

5. Install master cylinder. Refer to "Installation" in "MASTER CYLINDER", BR-10.
6. Bleed air. Refer to "Bleeding Brake System", BR-6.



Vacuum Hose

REMOVAL AND INSTALLATION

CAUTION:

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

- Do not apply any oil or lubricants to vacuum hose and check valve.
- Insert vacuum tube into vacuum hose as shown.
- Install check valve, paying attention to its direction.

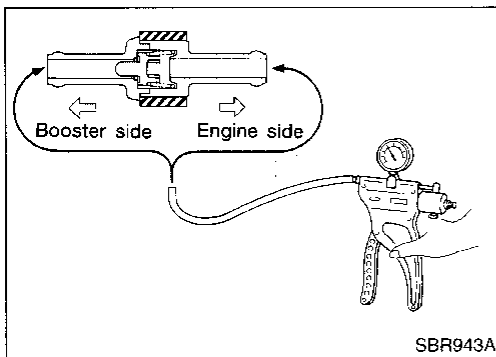
INSPECTION

Hoses and connectors

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

FRONT DISC BRAKE

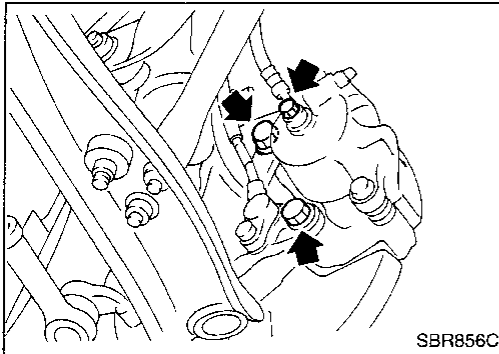
Removal

WARNING:

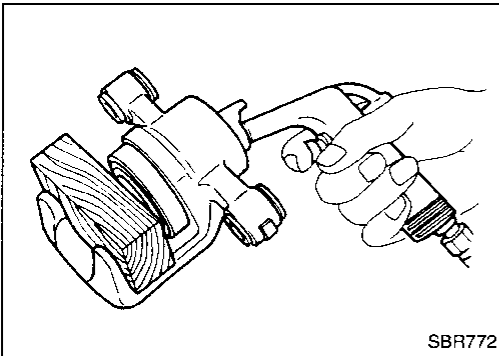
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

CAUTION:

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



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



Disassembly

WARNING:

Do not place your fingers in front of piston.

CAUTION:

Do not scratch or score cylinder wall.

1. Push out piston with piston boot 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 objects. 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:

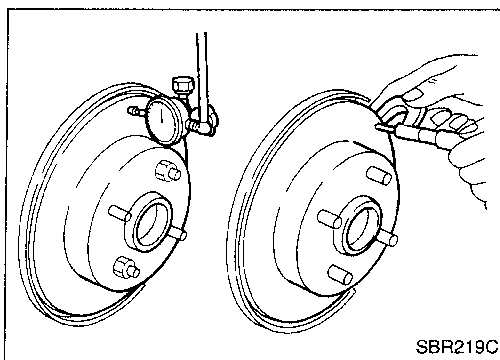
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

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

FRONT DISC BRAKE



Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.

RUNOUT

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

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

Maximum runout:

0.07 mm (0.0028 in)

3. If the runout is out of specification, find minimum runout position as follows:
 - a. Remove nuts and rotor from wheel hub.
 - b. Shift the rotor one hole and secure rotor to wheel hub with nuts.
 - c. Measure runout.
 - d. Repeat steps a. to c. so that minimum runout position can be found.
4. If the runout is still out of specification, turn rotor with on-car brake lathe (“MAD, DL-8700”, “AMMCO 700 and 705” or equivalent).

THICKNESS

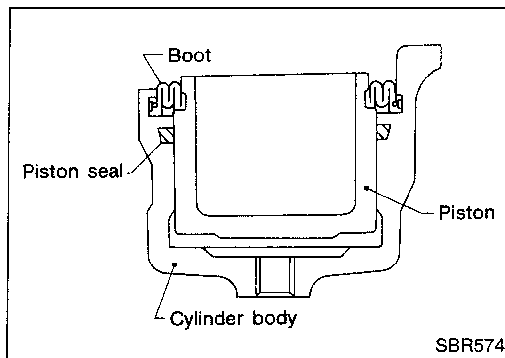
Thickness variation (At least 8 positions):

Maximum 0.01 mm (0.0004 in)

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

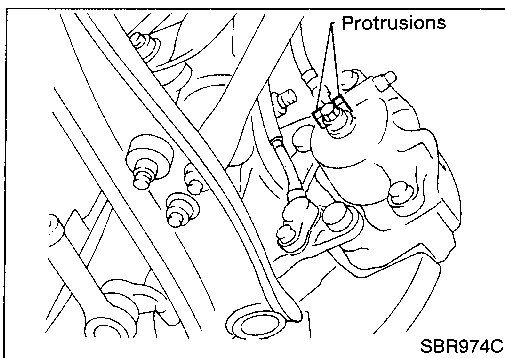
Rotor repair limit:

18.0 mm (0.709 in)



Assembly

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



Installation

CAUTION:

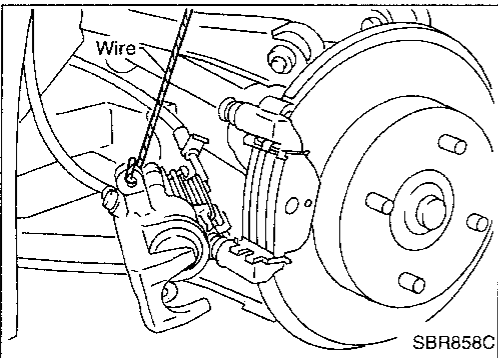
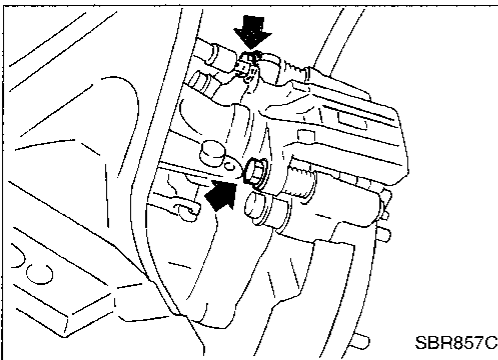
- Refill with new brake fluid “DOT 3”.
- Never reuse drained brake fluid.

1. Install brake hose to caliper securely.

Fit brake hose between the caliper protrusions.

2. Install all parts and secure all bolts.
3. Bleed air. Refer to “Bleeding Brake System”, BR-6.

REAR DISC BRAKE



Pad Replacement

WARNING:

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

CAUTION:

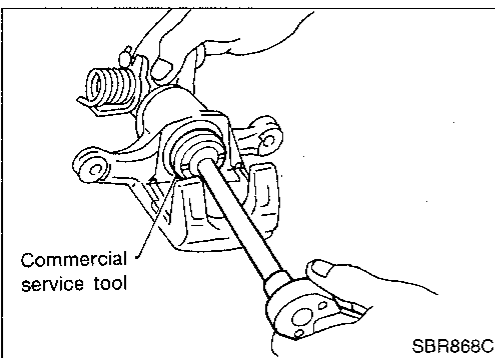
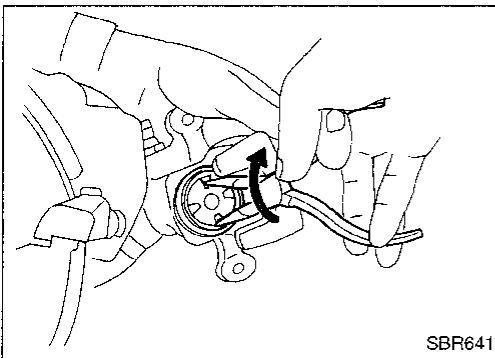
- When cylinder body is open, do not depress brake pedal, otherwise piston will pop out.
 - Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.
 - If shims are rusted or show peeling of rubber coat, replace them with new shims.
 - It is not necessary to 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.
 - Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.
1. Remove master cylinder reservoir cap.
 2. Release parking brake.
 3. Remove brake cable mounting bolts from the rear suspension.
 4. Remove pin bolts.
 5. Remove cylinder body. Then remove pad retainers, and inner and outer shims.

Standard pad thickness:

9.5 mm (0.374 in)

Pad wear limit:

2.0 mm (0.079 in)

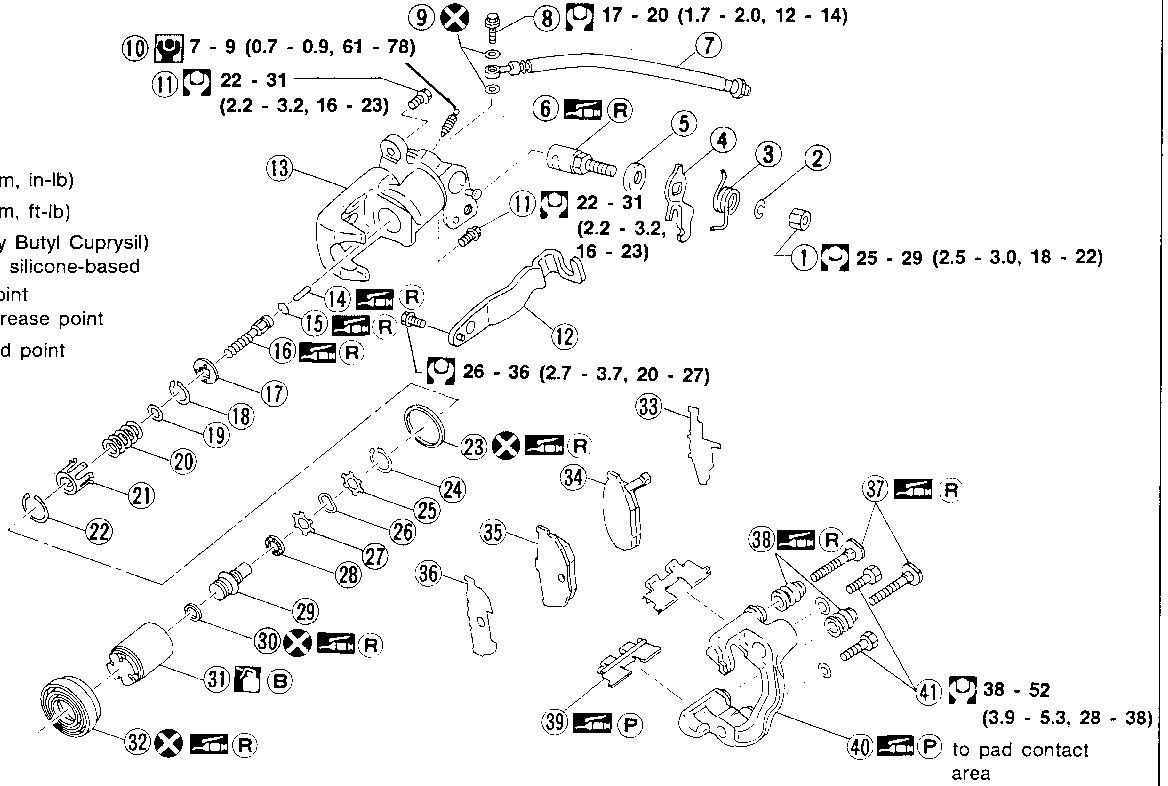


6. When installing new pads, push piston into cylinder body by gently turning piston clockwise, as shown.

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

REAR DISC BRAKE

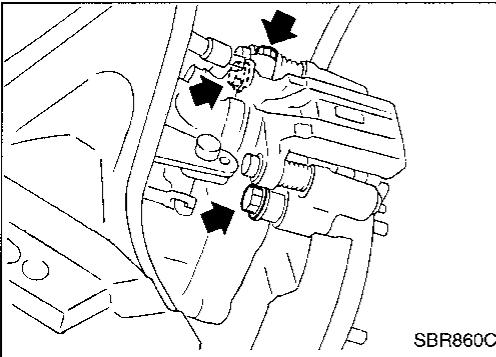
SEC. 441



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- | | | |
|--------------------------|----------------|-----------------------------|
| ① Nut | ⑮ O-ring | ⑳ Adjusting nut |
| ② Washer | ⑯ Push rod | ㉑ Cup |
| ③ Return spring | ⑰ Key plate | ㉒ Piston |
| ④ Parking brake lever | ⑱ Ring C | ㉓ Dust seal |
| ⑤ Cam boot | ⑲ Seat | ㉔ Inner shim |
| ⑥ Cam | ⑳ Spring | ㉕ Inner pad |
| ⑦ Brake hose | ㉑ Spring cover | ㉖ Outer pad |
| ⑧ Connecting bolt | ㉒ Ring B | ㉗ Outer shim |
| ⑨ Copper washer | ㉓ Piston seal | ㉘ Pin |
| ⑩ Bleed screw | ㉔ Ring A | ㉙ Pin boot |
| ⑪ Pin bolt | ㉕ Spacer | ㉚ Pad retainer |
| ⑫ Cable mounting bracket | ㉖ Wave washer | ㉛ Torque member |
| ⑬ Cylinder | ㉗ Spacer | ㉜ Torque member fixing bolt |
| ⑭ Strut | ㉘ Ball bearing | |

REAR DISC BRAKE



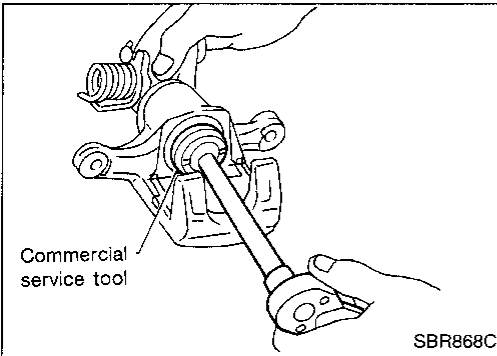
Removal

WARNING:

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

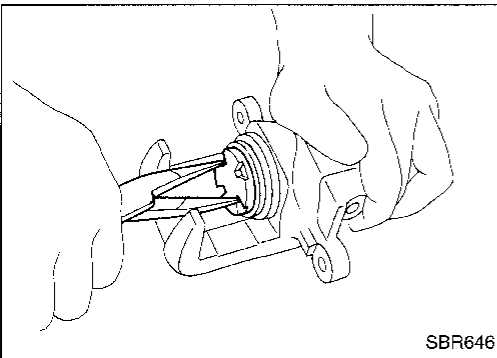
1. Remove brake cable mounting bracket bolt and lock spring.
2. Remove torque member fixing bolts and connecting bolt.

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.

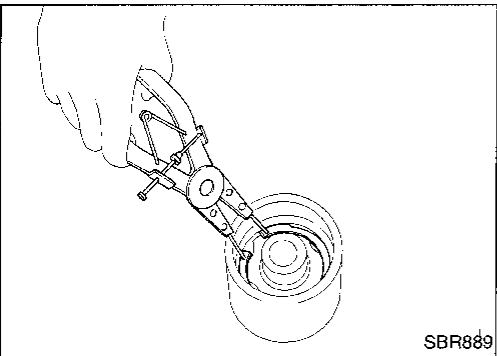


Disassembly

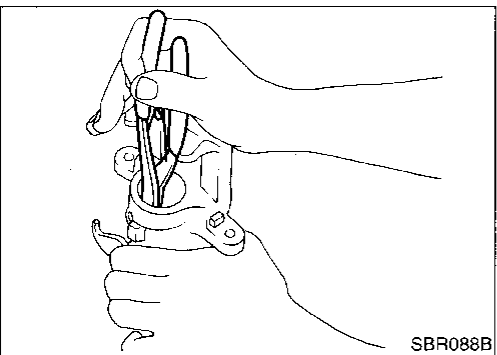
1. Remove piston by turning it counterclockwise with suitable commercial service tool or long nose pliers.



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



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

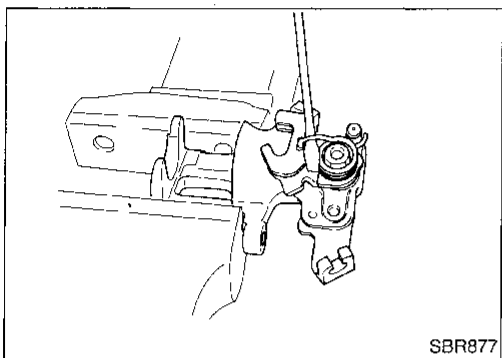
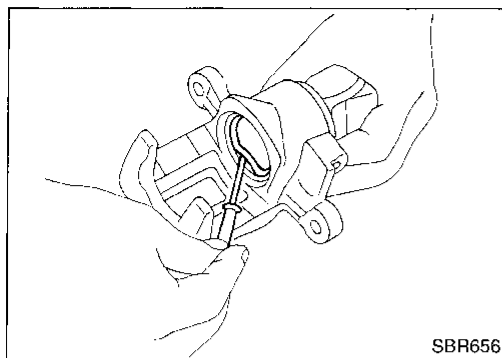


REAR DISC BRAKE

Disassembly (Cont'd)

c. Remove piston seal.

Be careful not to damage cylinder body.



4. Remove return spring, cable mounting bracket and parking brake lever.

Inspection — Caliper

CAUTION:

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

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign 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.

PIN AND PIN BOOT

Check for wear, cracks or other damage.

Replace if any of the above conditions are observed.

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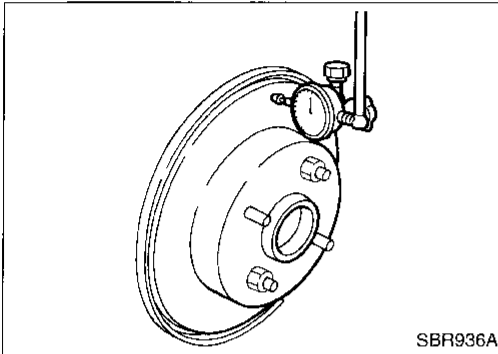
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REAR DISC BRAKE

Inspection — Rotor

RUBBING SURFACE

Check rotor for roughness, cracks or chips.



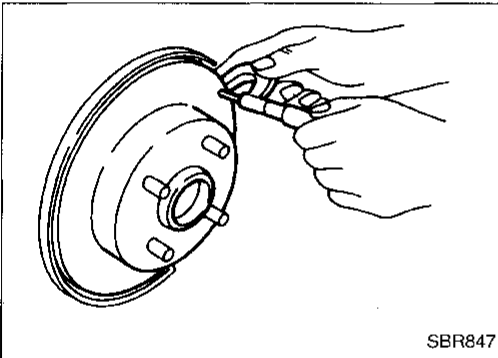
RUNOUT

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

Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to RA section (“Rear Wheel Bearing”, “ON-VEHICLE SERVICE”).

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

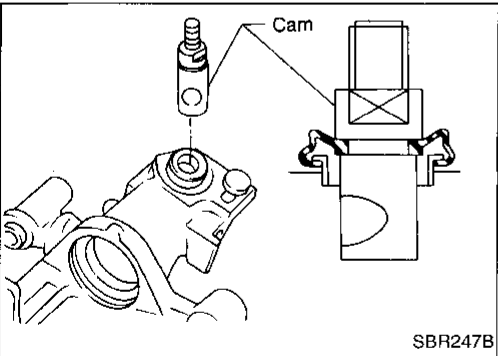
**Maximum runout:
0.07 mm (0.0028 in)**



THICKNESS

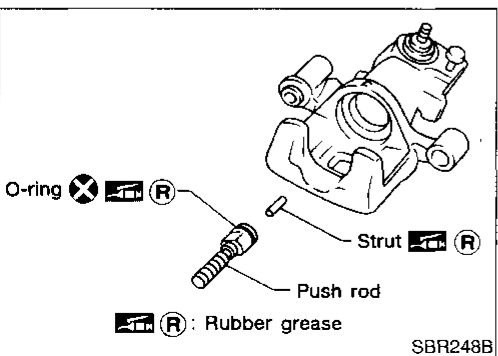
**Rotor repair limit:
Standard thickness
9 mm (0.35 in)
Minimum thickness
8 mm (0.31 in)
Thickness variation (At least 8 positions)
Maximum 0.02 mm (0.0008 in)**

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



Assembly

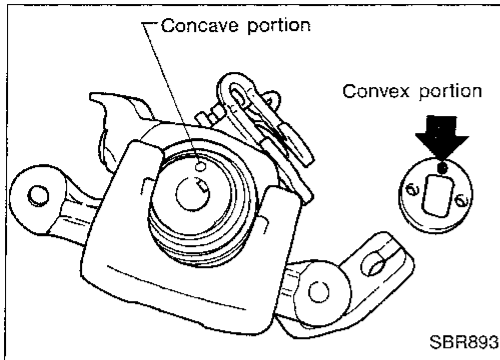
1. Insert cam with depression facing towards open end of cylinder.



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

REAR DISC BRAKE

Assembly (Cont'd)

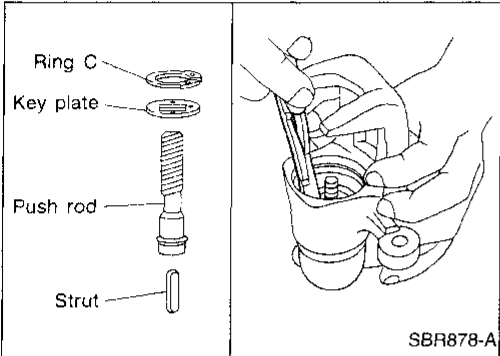


3. Match protrusion on key plate with depression in cylinder.

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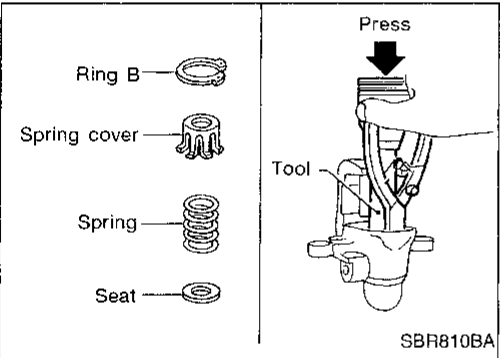
4. Install ring C with a suitable tool.

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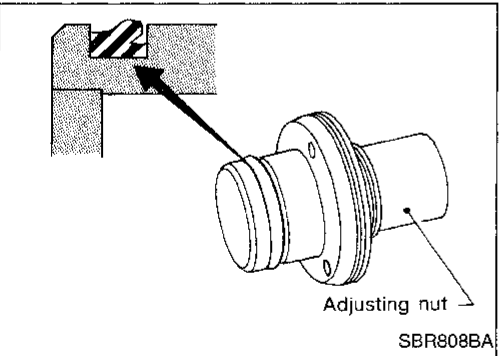
5. Install seat, spring, spring cover and ring B while depressing with suitable tool.

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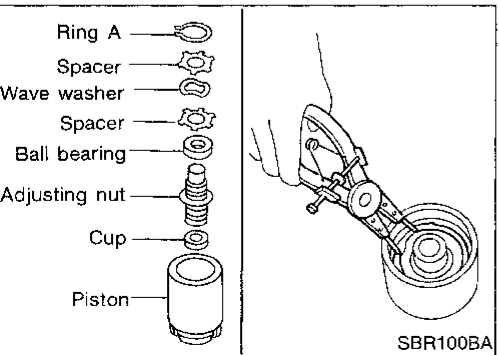
6. Install adjusting nut in the specified direction.

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7. Install cup, adjusting nut, bearing, spacers, washer and ring A with a suitable tool.

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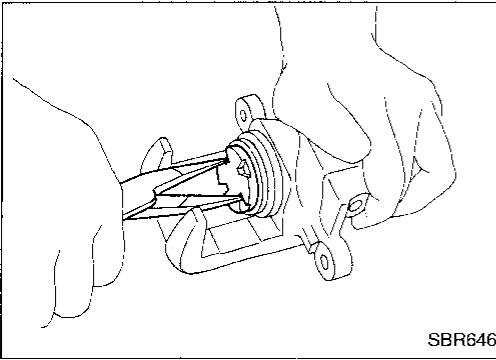
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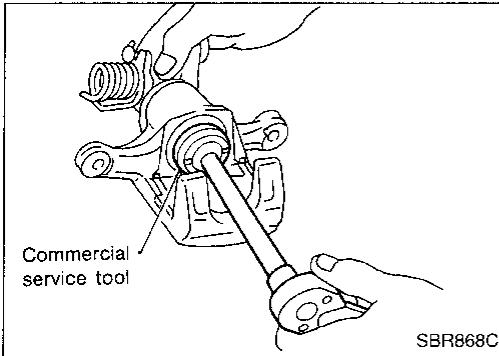
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REAR DISC BRAKE

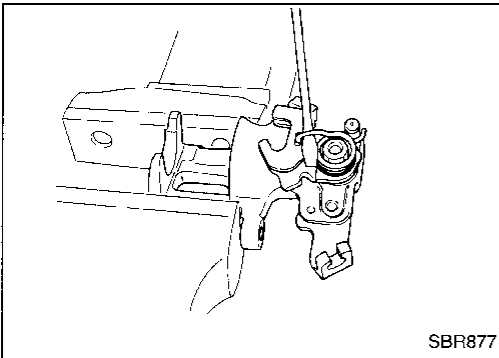
Assembly (Cont'd)



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



10. Fit parking brake lever, return spring and cable mounting bracket.



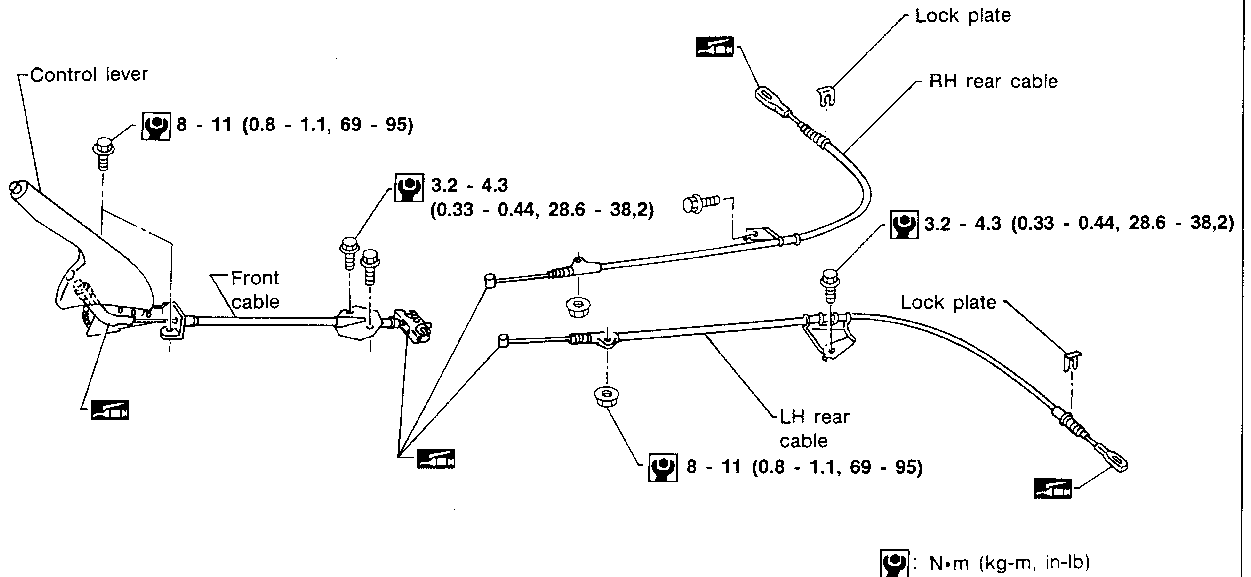
Installation

CAUTION:

- Refill with new brake fluid "DOT 3".
 - Never reuse drained brake fluid.
1. Install caliper assembly.
 2. Install brake hose to caliper securely.
 3. Install all parts and secure all bolts.
 4. Bleed air. Refer to "Bleeding Brake System", BR-6.

PARKING BRAKE CONTROL

SEC. 443

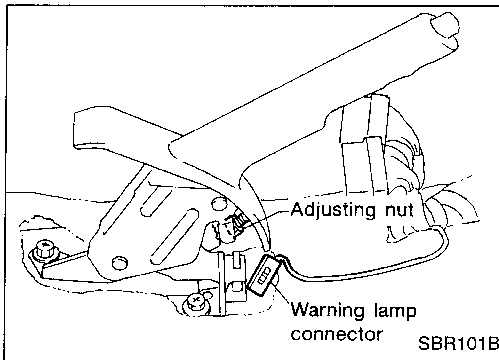


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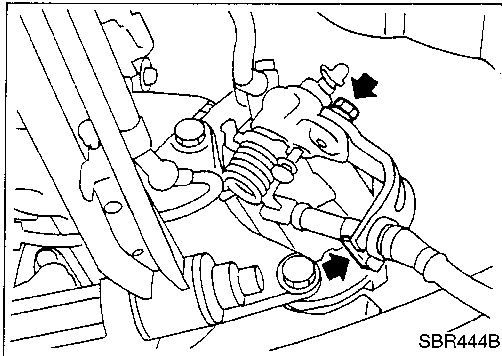
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Removal and Installation

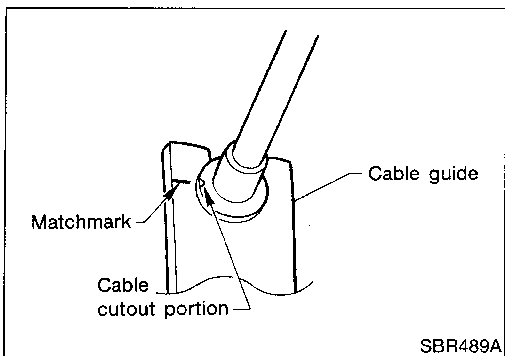
1. To remove parking brake cable, first remove center console.
2. Disconnect warning lamp connector.
3. Remove bolts, slacken off and remove adjusting nut.



4. Remove lock plate, then disconnect cable from caliper.



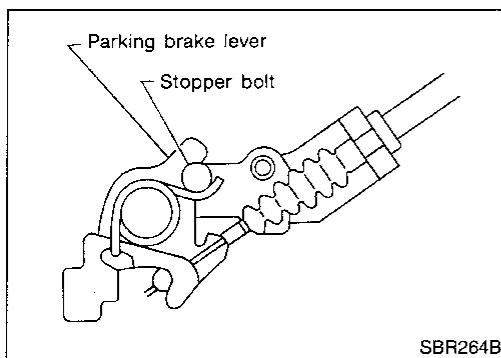
- When installing parking brake cable at rear caliper, make sure to align matchmark on cable guide.



PARKING BRAKE CONTROL

Inspection

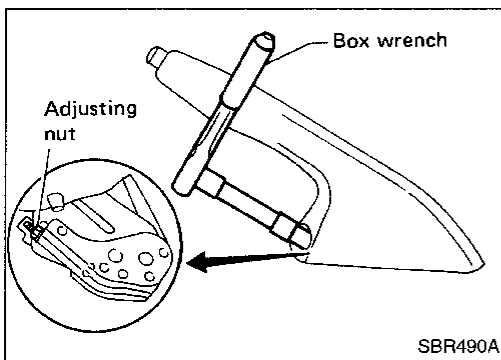
1. Check control lever for wear or other damage. Replace if necessary.
2. Check wires for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Replace if necessary.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.



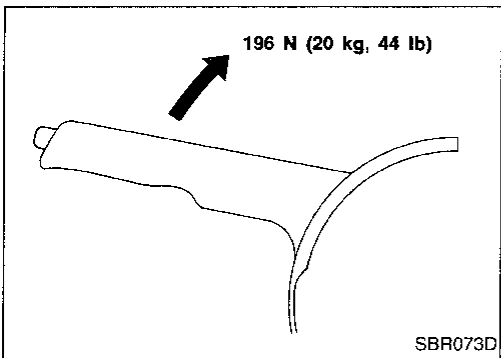
Adjustment

Pay attention to the following points after adjustment.

- There is no drag when control lever is being released.
- Parking brake lever returns to stopper bolt when control lever for rear disc brake is released.



1. Adjust clearance between pad and rotor as follows.
 - a. Release parking brake lever and loosen adjusting nut.
 - b. Depress brake pedal fully at least 10 times with engine running.
2. Pull control lever 4 - 5 notches. Then adjust control lever by turning adjusting nut.



3. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
Number of notches: 7 - 9

4. Bend warning lamp switchplate 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 or less**

ANTI-LOCK BRAKE SYSTEM

Purpose

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

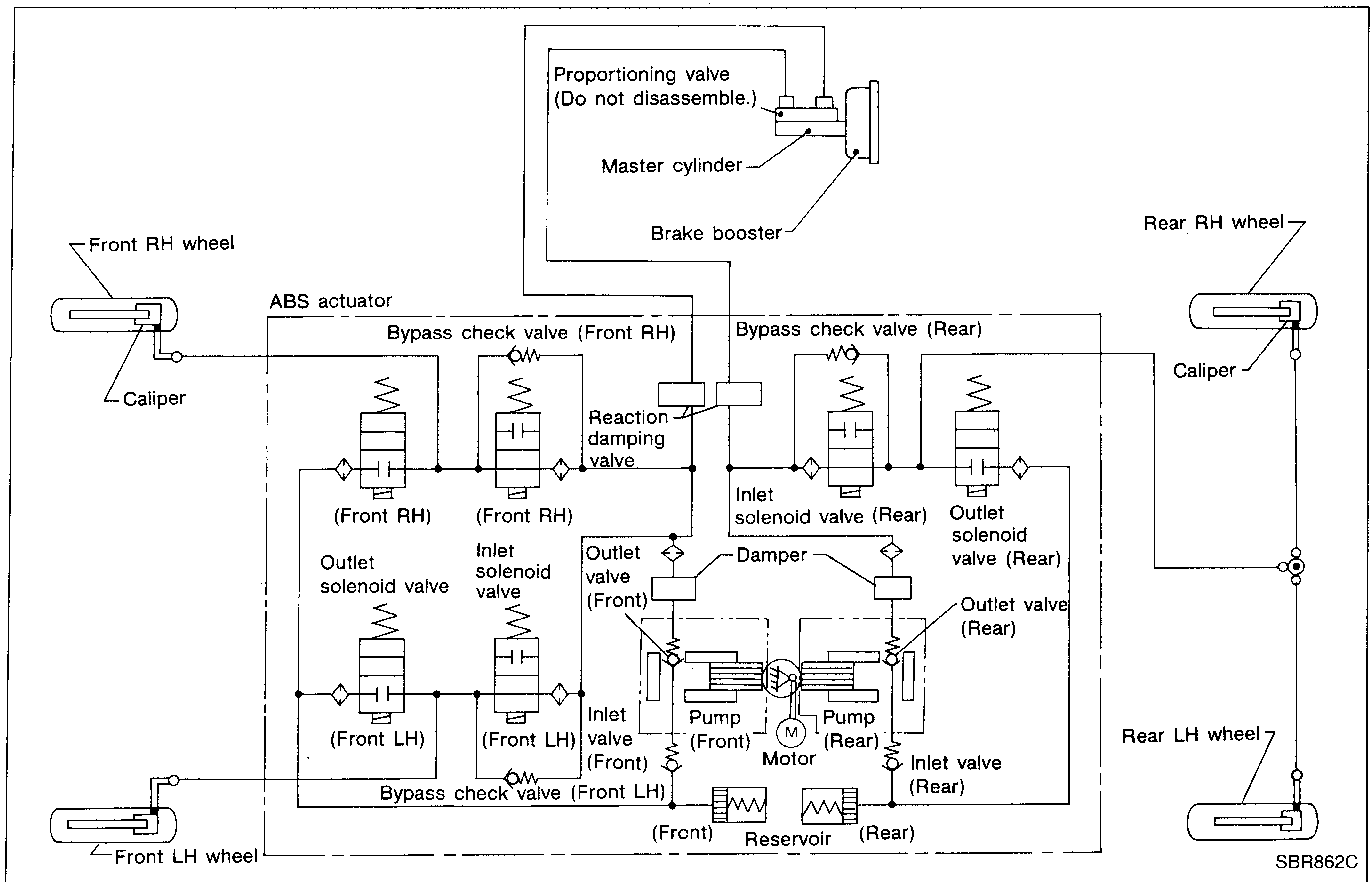
The ABS:

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

Operation

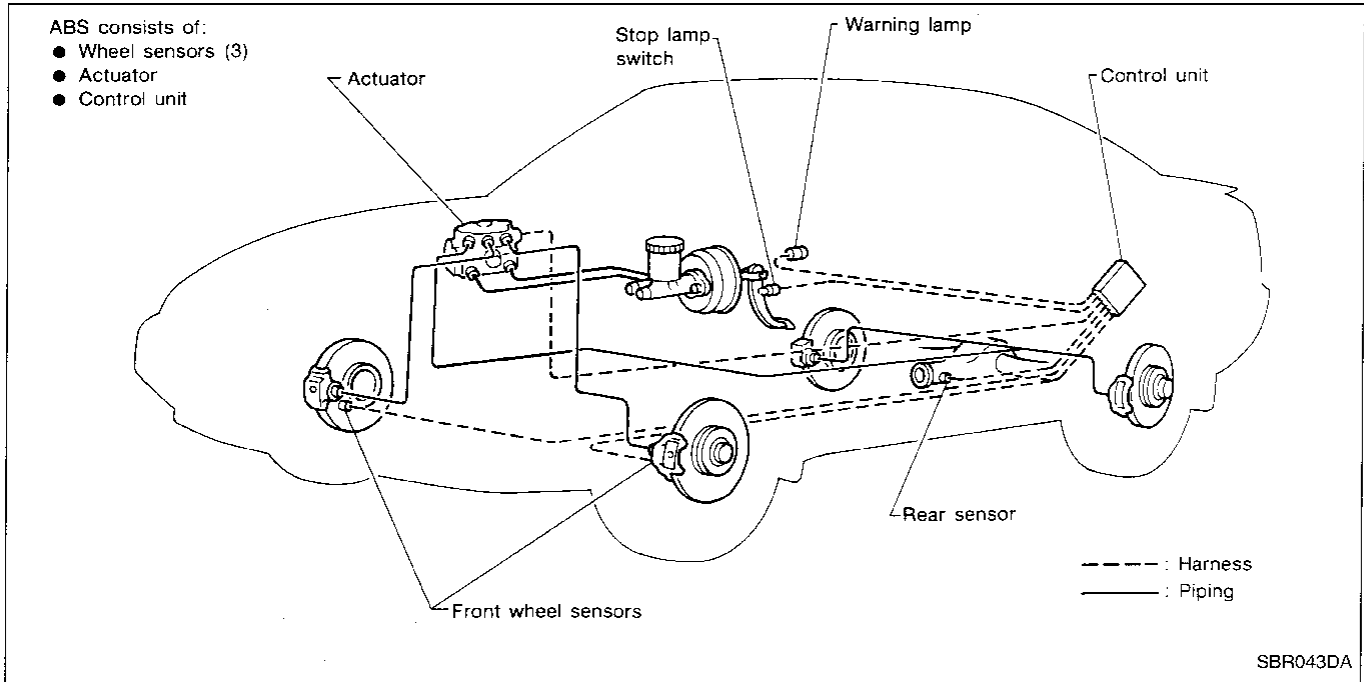
- The ABS will not operate at speeds below 5 to 10 km/h (3 to 6 MPH) to completely stop the vehicle. (The speeds will vary according to road conditions.)
- The ABS has self-test capabilities. A mechanical noise may be heard as the ABS performs a self-test the first time the vehicle reaches 10 km/h (6 MPH). This is a normal part of the self-test feature. If a malfunction is found during this check, the anti-lock warning light will come on.
- During ABS operation, a mechanical noise may be heard. This is a normal condition.

ABS Hydraulic Circuit



ANTI-LOCK BRAKE SYSTEM

System Components



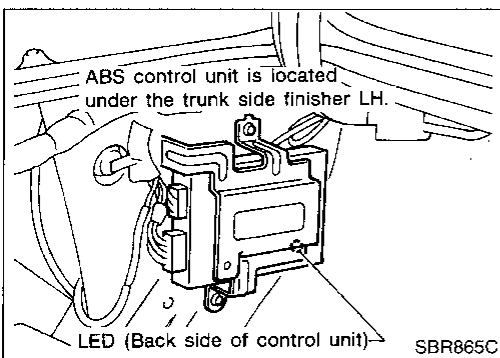
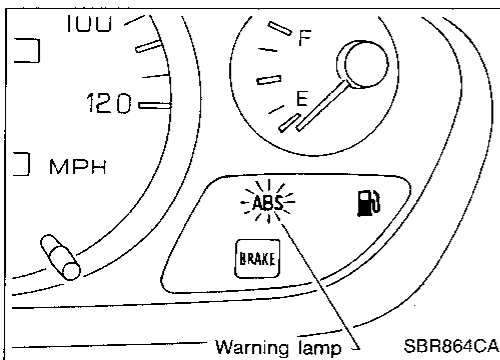
System Description

SENSOR

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

CONTROL UNIT

The control unit computes the wheel rotating speed by the signal current sent from the sensor. Then it supplies a DC current to the actuator solenoid valve. It also controls ON-OFF operation of the valve relay and 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.



ANTI-LOCK BRAKE SYSTEM

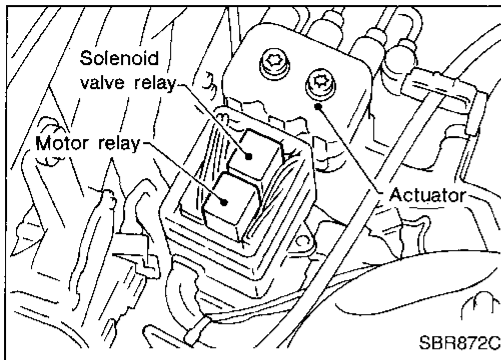
System Description (Cont'd)

ACTUATOR

The actuator contains:

- An electric motor and pump
- Two relays
- Six solenoid valves, each inlet and outlet for
 - LH front
 - RH front
 - LH and RH rear

These components control the hydraulic circuit. The ABS control unit directs the actuator to increase, hold or decrease hydraulic pressure to all or individual wheels.



ABS actuator operation

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

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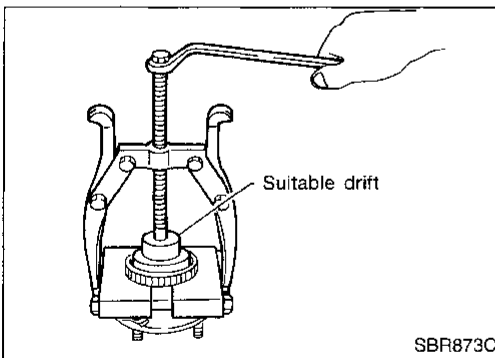
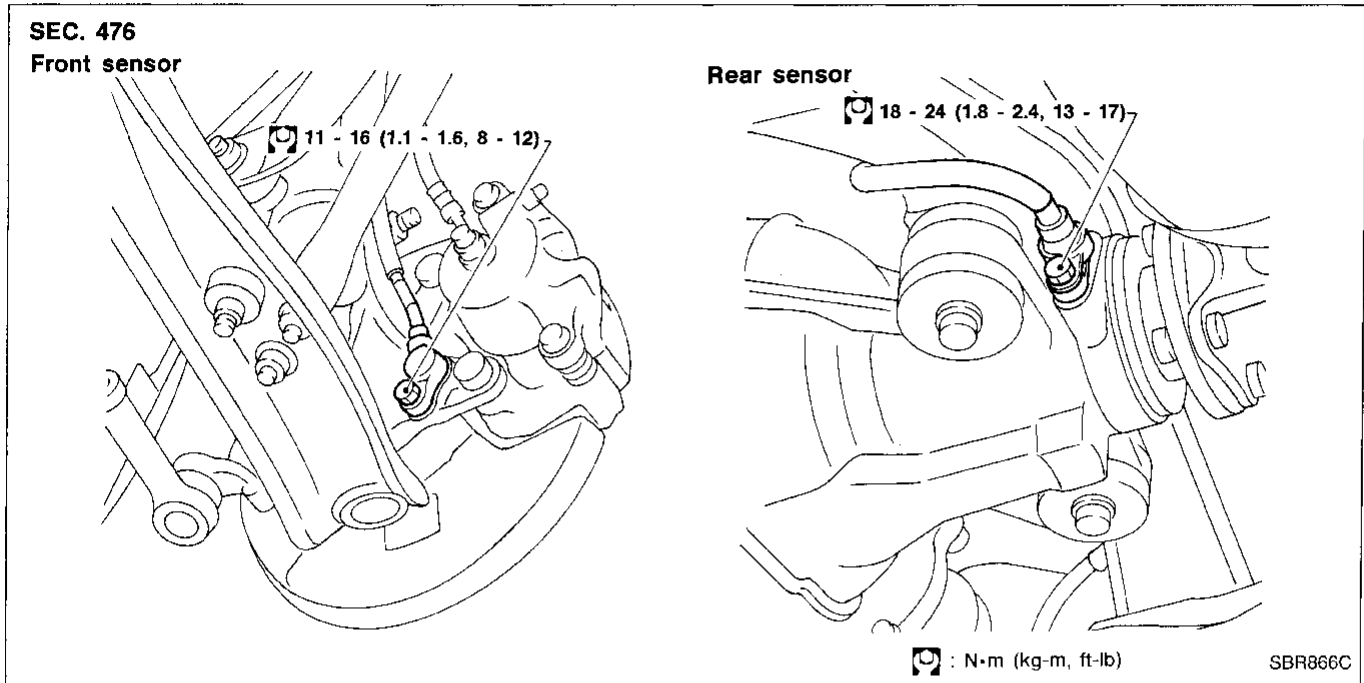
ANTI-LOCK BRAKE SYSTEM

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.

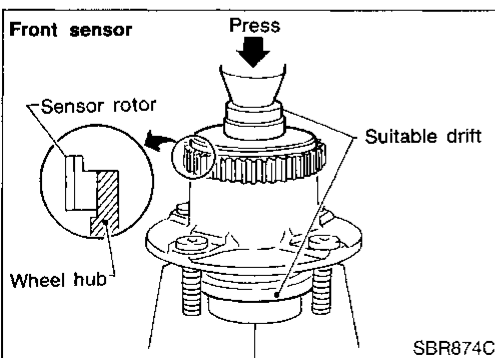
WHEEL SENSORS



SENSOR ROTOR

Removal

1. Remove the front wheel hub or final drive companion flange. Refer to FA section ("FRONT AXLE") and PD section.
2. Remove the sensor rotor using suitable puller, drift and bearing replacer.



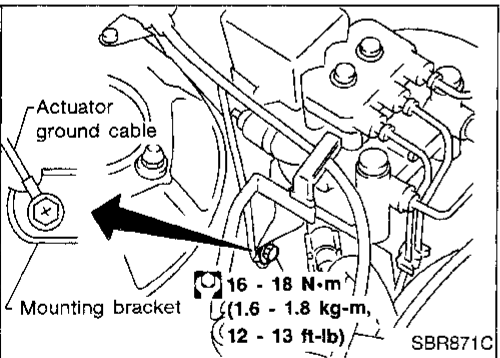
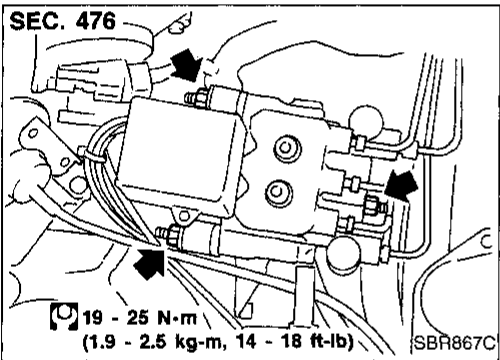
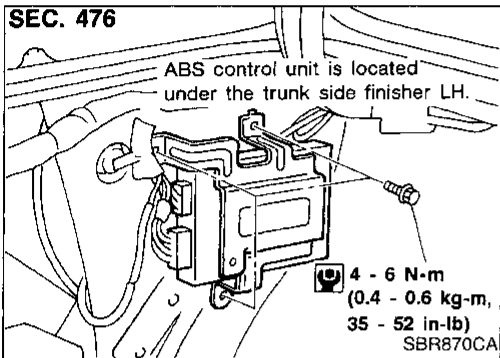
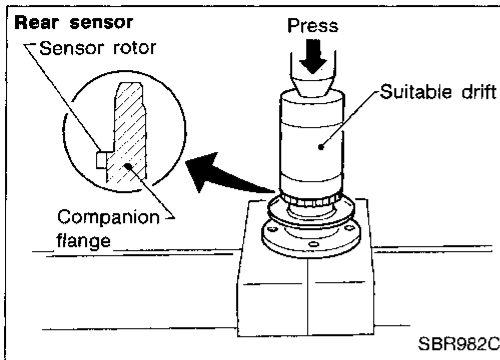
Installation

Install the sensor rotor using suitable drift and press.

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

ANTI-LOCK BRAKE SYSTEM

Removal and Installation (Cont'd)



CONTROL UNIT

Location: Under trunk side finisher LH.

ACTUATOR

Removal

1. Disconnect battery cable.
2. Drain brake fluid. Refer to "Changing Brake Fluid", BR-5.
3. Apply different colored paint to each pipe connector and actuator to prevent incorrect connection.
4. Disconnect connector, brake pipes and remove fixing nuts and actuator ground cable.

Installation

CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to "Bleeding Brake System", BR-6.

1. Tighten actuator ground cable.
Place ground cable at a notch of mounting bracket.
2. Connect brake pipes temporarily.
3. Tighten fixing nuts.
4. Tighten brake pipes.
5. Fix actuator harness clip on the mounting bracket.
6. Connect connector and battery cable.

ACTUATOR RELAYS

1. Disconnect battery cable.
2. Remove actuator relay cover.
3. Pull out relays.

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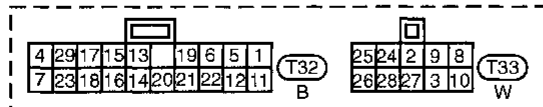
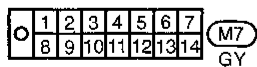
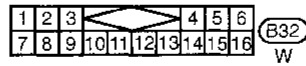
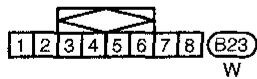
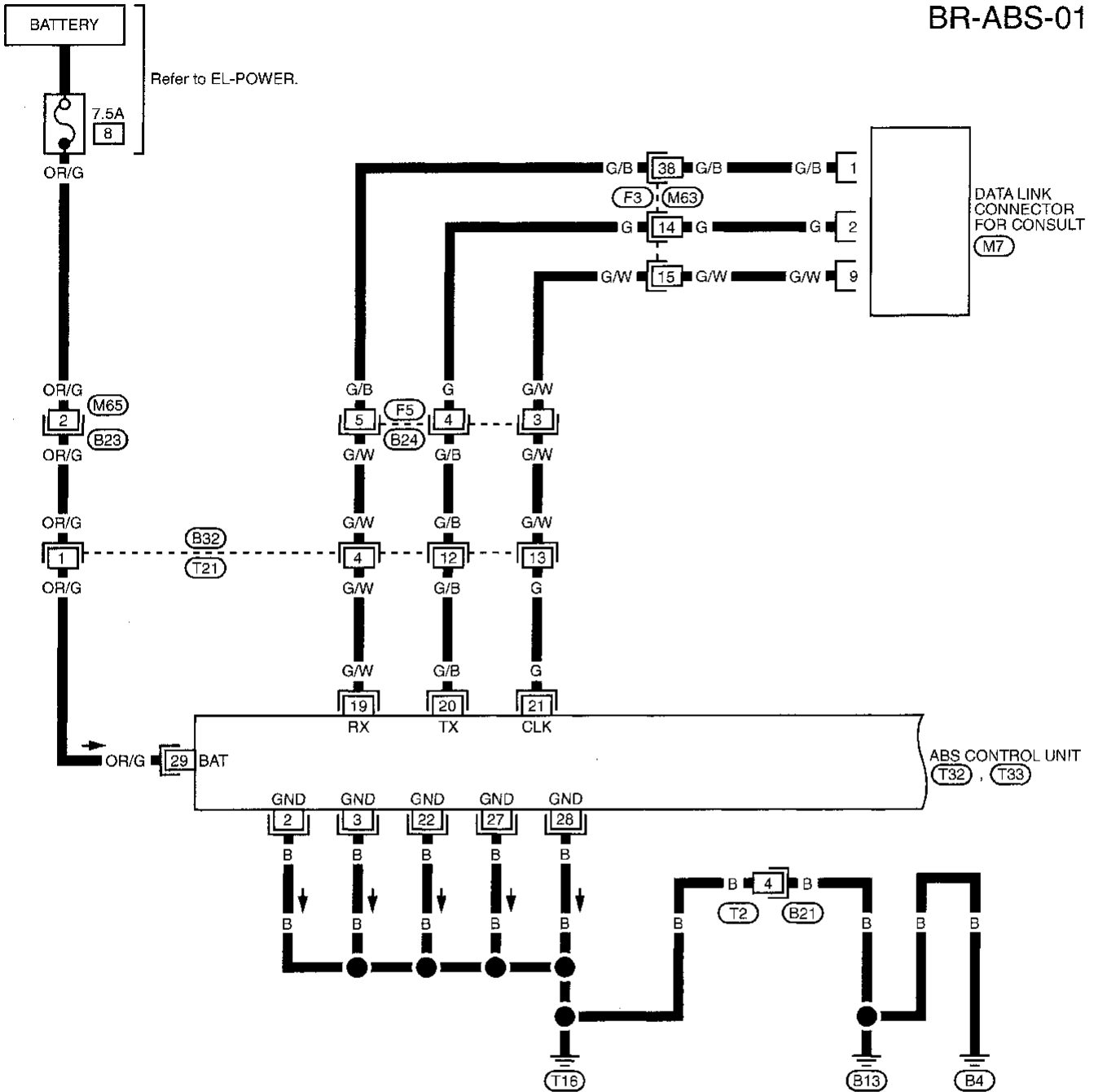
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ANTI-LOCK BRAKE SYSTEM

Wiring Diagram — ABS —

BR-ABS-01

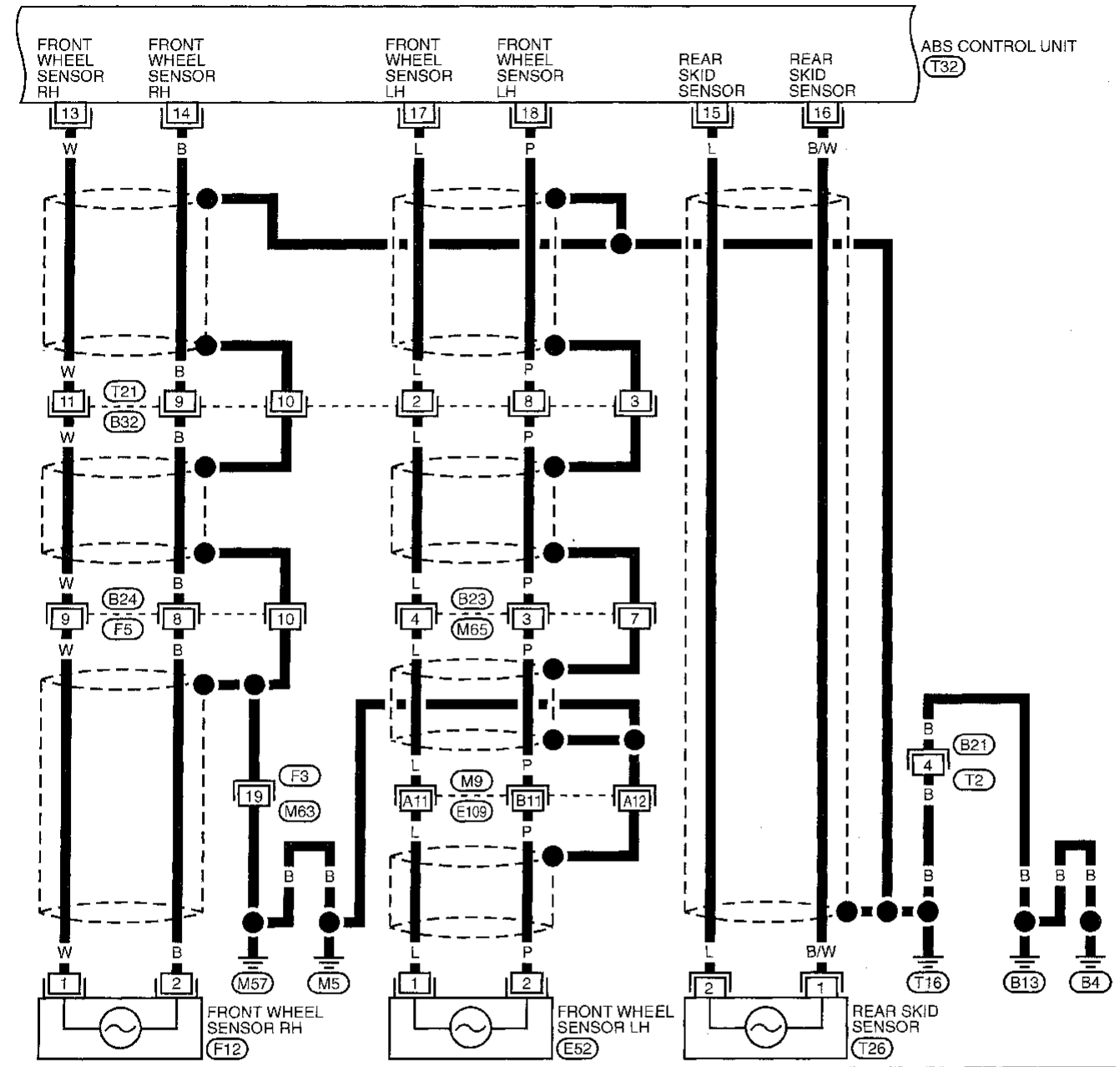


Refer to last page (Foldout page).
(F3), (M63)

ANTI-LOCK BRAKE SYSTEM

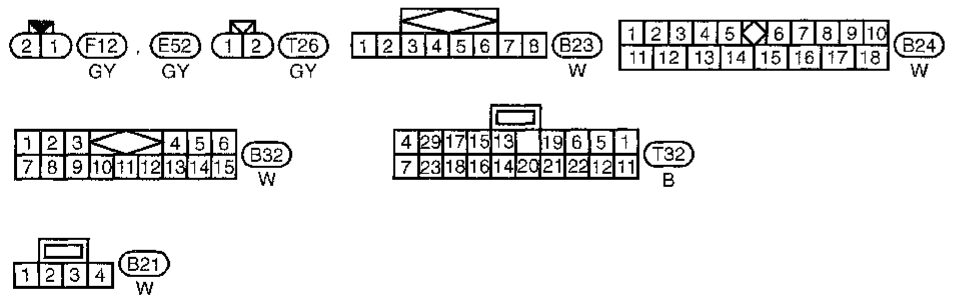
Wiring Diagram — ABS — (Cont'd)

BR-ABS-02



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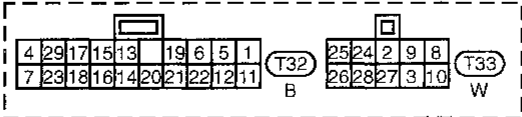
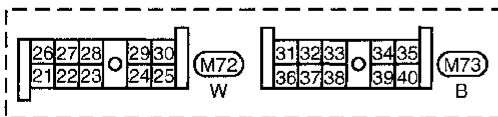
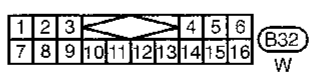
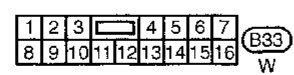
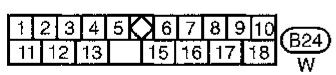
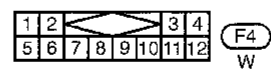
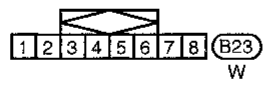
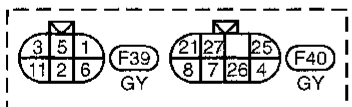
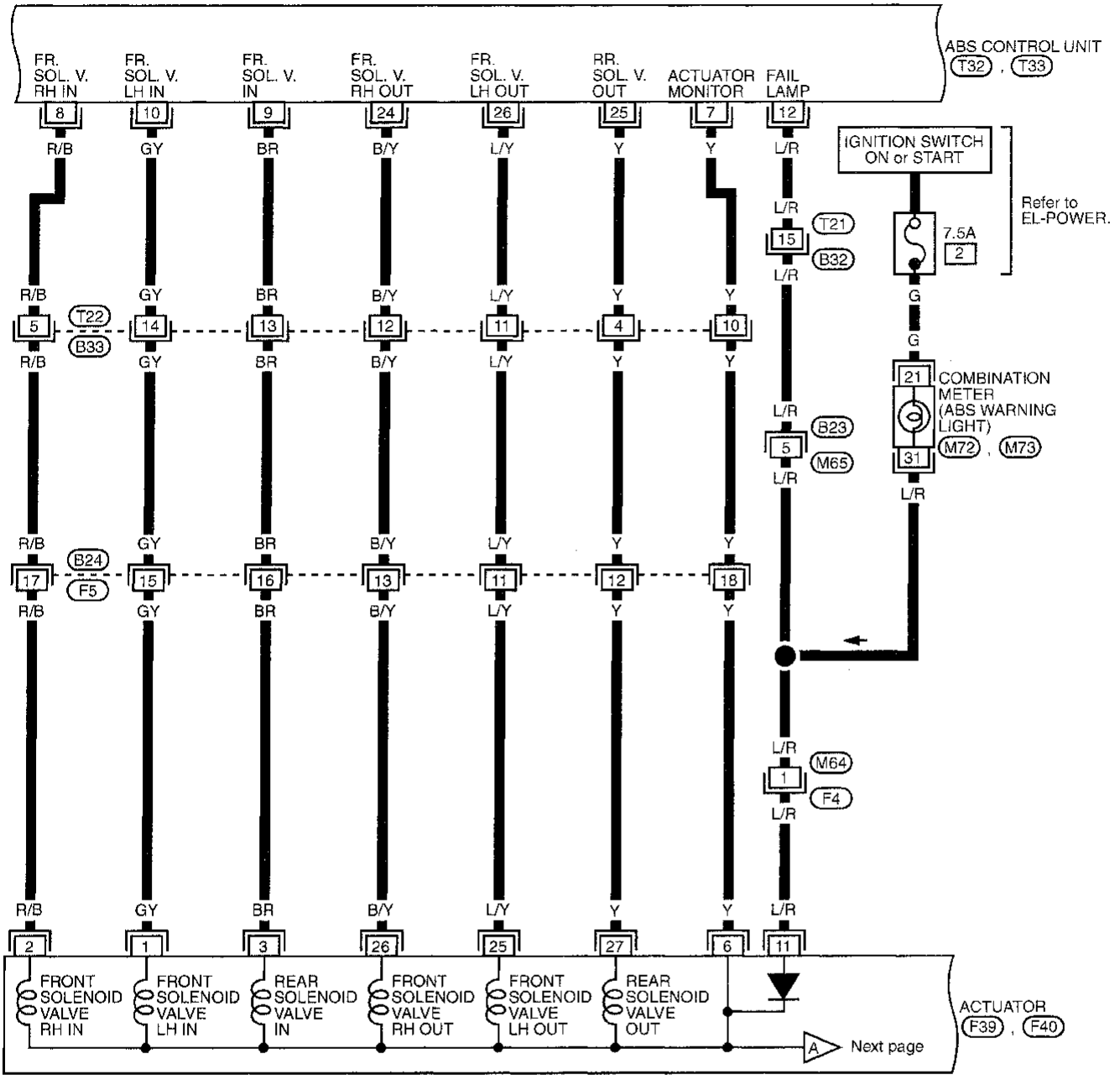
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ANTI-LOCK BRAKE SYSTEM

Wiring Diagram — ABS — (Cont'd)

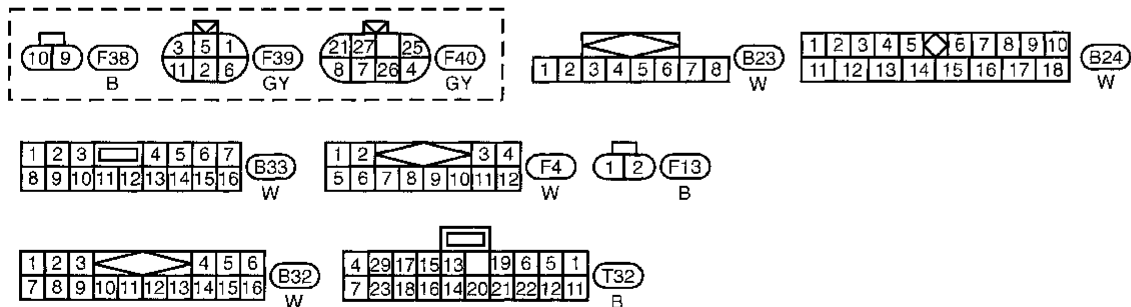
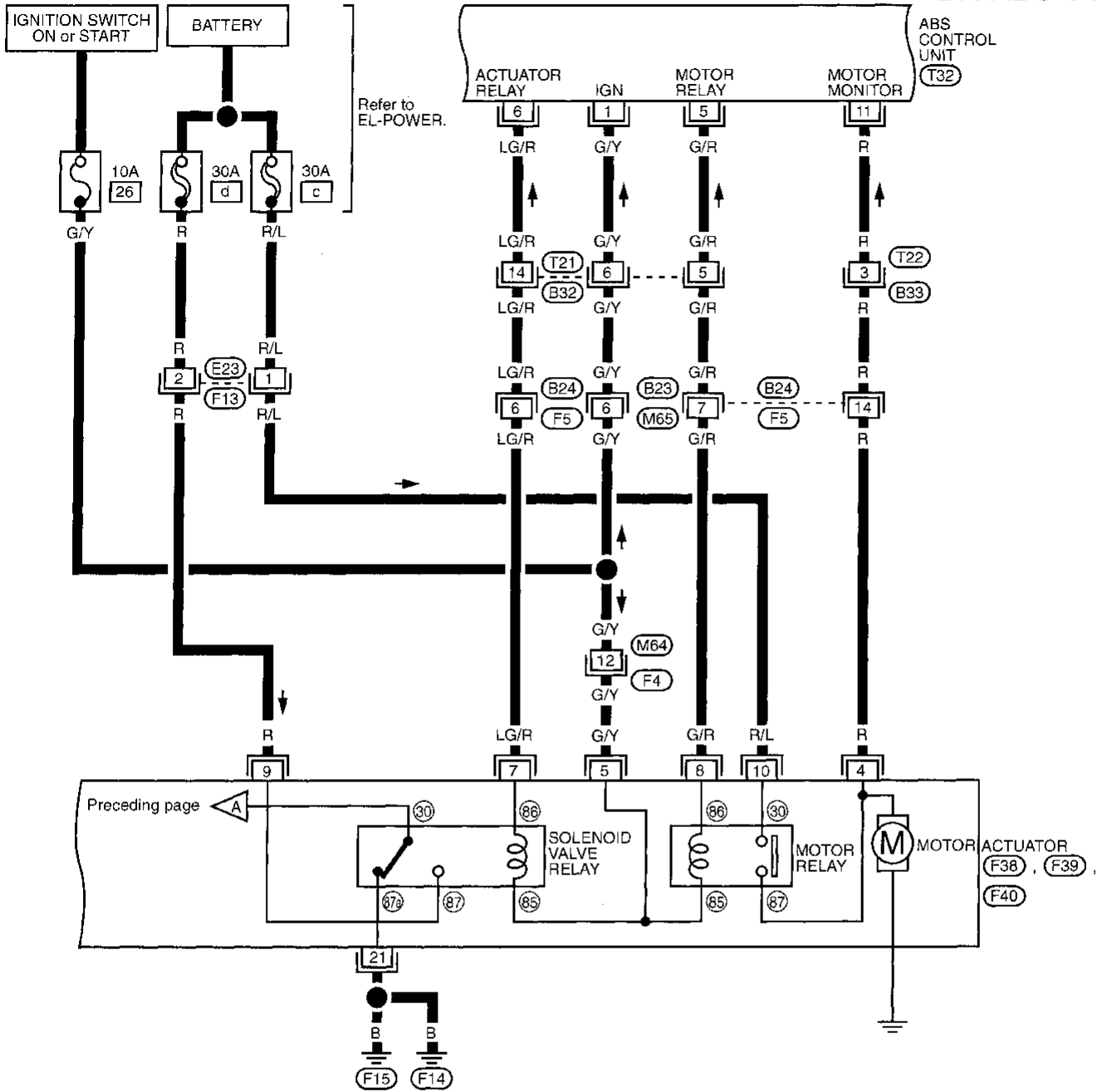
BR-ABS-03



ANTI-LOCK BRAKE SYSTEM

Wiring Diagram — ABS — (Cont'd)

BR-ABS-04

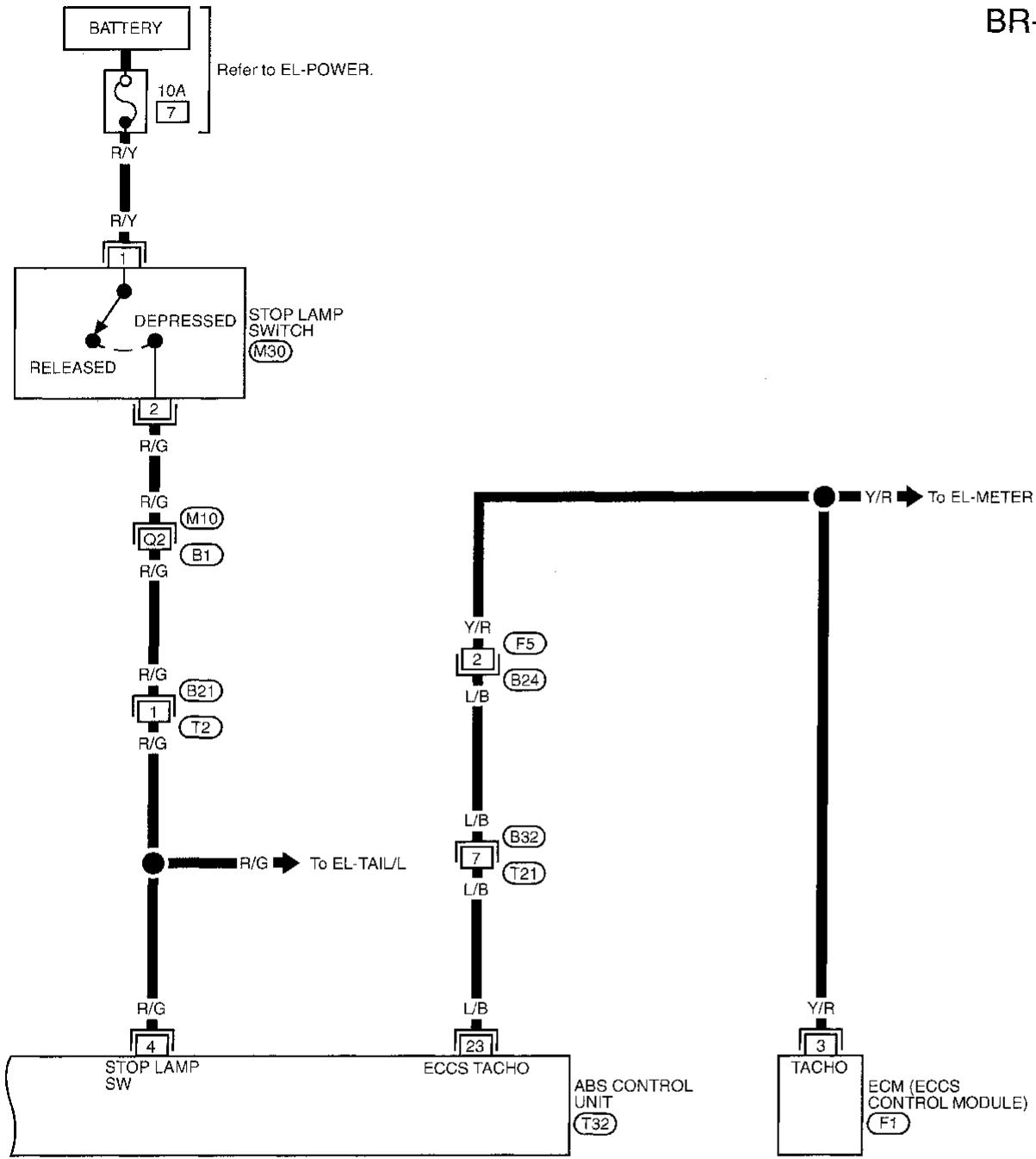


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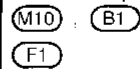
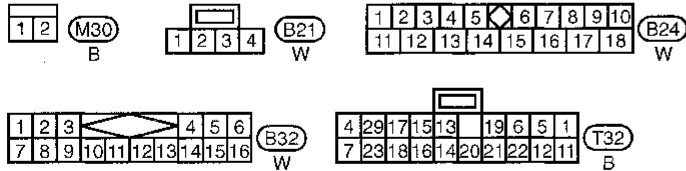
ANTI-LOCK BRAKE SYSTEM

Wiring Diagram — ABS — (Cont'd)

BR-ABS-05

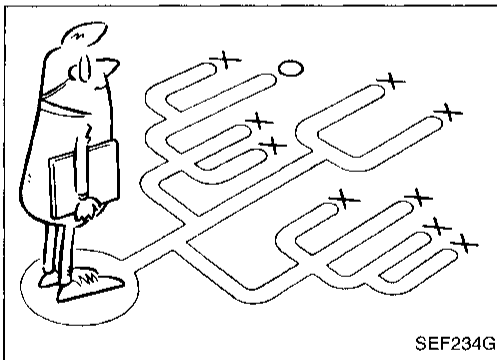
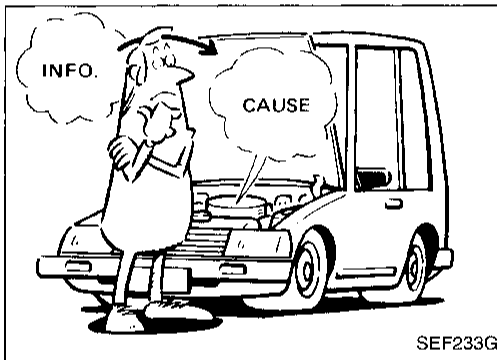


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How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

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

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

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

Before undertaking actual checks, take 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.

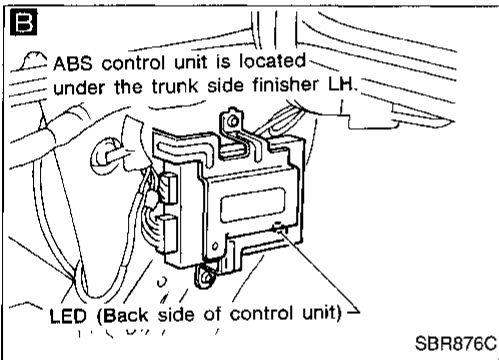
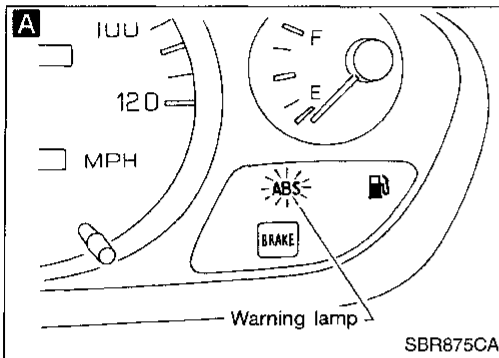
Self-diagnosis

FUNCTION

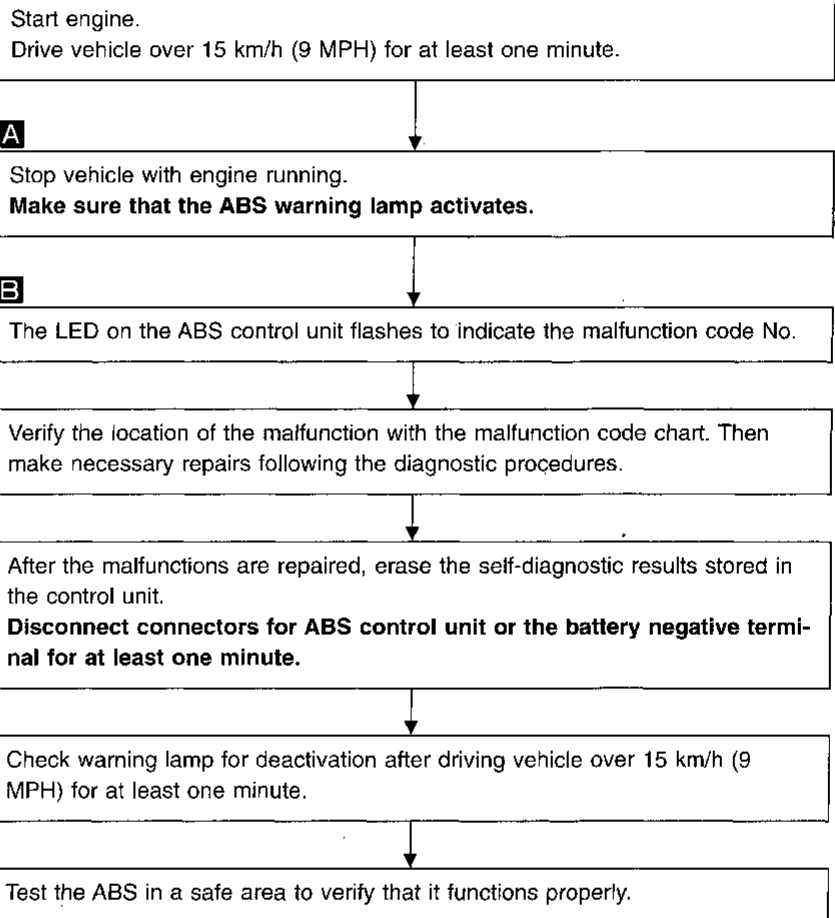
- When a problem occurs in the ABS, the warning lamp on the instrument panel comes on.
- A maximum of three malfunctions are stored in the memory of the ABS control unit.

Erase the self-diagnosis results stored in the control unit after malfunctions are repaired (See next page).

- The self-diagnosis results are identified by CONSULT or LED on the control unit.



SELF-DIAGNOSIS PROCEDURE

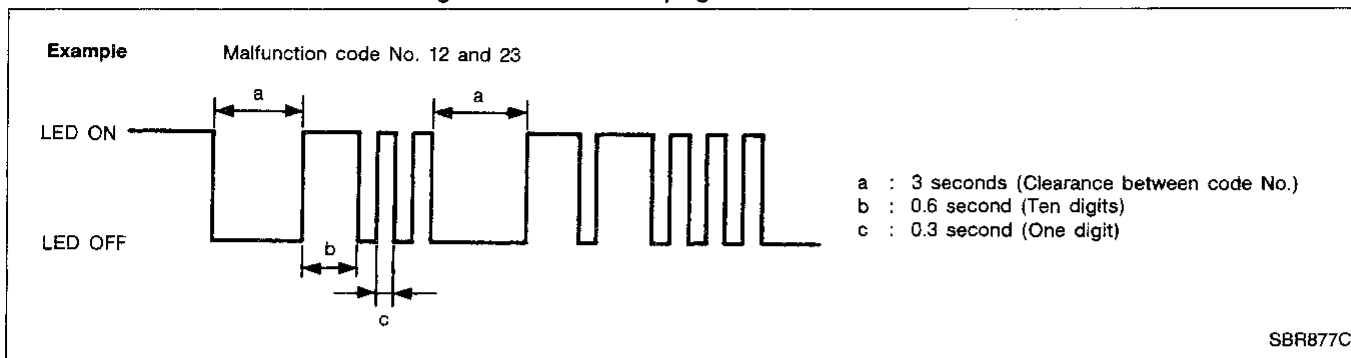


TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

HOW TO READ SELF-DIAGNOSTIC RESULTS (Malfunction codes)

- Determine the code No. by counting the number of times the LED flashes on and off.
- The malfunction code chart is given on the next page.



HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)

- Disconnect ABS control unit connectors or battery negative terminal for at least one minute.
- When using CONSULT, touch "ERASE" on the CONSULT screen with self-diagnostic results mode.

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TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

MALFUNCTION CODE/SYMPTOM CHART

Code No. (No. of LED flashes)	Malfunctioning part and circuit	Diagnostic procedure
01	Front right sensor (open-circuit)	4
02	Front left sensor (open-circuit)	4
03	Rear sensor (open-circuit)	4
05	Front right sensor (short-circuit)	4
06	Front left sensor (short-circuit)	4
07	Rear sensor (short-circuit)	4
11	Actuator front right inlet solenoid valve (open-circuit)	3
12	Actuator front left inlet solenoid valve (open-circuit)	3
13	Actuator rear inlet solenoid valve (open-circuit)	3
15	Actuator front right outlet solenoid valve (open-circuit)	3
16	Actuator front left outlet solenoid valve (open-circuit)	3
17	Actuator rear outlet solenoid valve (open-circuit)	3
21	Actuator front right inlet solenoid valve (short-circuit)	3
22	Actuator front left inlet solenoid valve (short-circuit)	3
23	Actuator rear inlet solenoid valve (short-circuit)	3
25	Actuator front right outlet solenoid valve (short-circuit)	3
26	Actuator front left outlet solenoid valve (short-circuit)	3
27	Actuator rear outlet solenoid valve (short-circuit)	3
41	Solenoid valve relay circuit (unable to turn off)	6
42	Solenoid valve relay circuit (unable to turn on)	6
43	Actuator motor or motor relay (unable to turn off)	5
44	Actuator motor or motor relay (unable to turn on)	5
47	Power supply (High voltage)	7
48	Power supply (Low voltage)	7
45, 46, 77 LED deactivation or continuous activation	Control unit Ground circuit	2
Warning lamp does not come on when ignition switch is turned on	Fuse, warning lamp bulb or warning light circuit Control unit power supply circuit	1
Pedal vibration and noise	—	9
Long stopping distance	—	10
Unexpected pedal action	—	11
ABS does not work	—	12
ABS works frequently	—	13

TROUBLE DIAGNOSES

CONSULT

CONSULT APPLICATION TO ABS

ITEM	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST	
Front right wheel sensor	X	X	—	GI
Front left wheel sensor	X	X	—	MA
Rear wheel sensor	X	X	—	
Stop lamp switch	—	X	—	EM
Engine revolution signal	—	X	—	
Front right inlet solenoid valve	X	X	X	LC
Front right outlet solenoid valve	X	X	X	
Front left inlet solenoid valve	X	X	X	EC
Front left outlet solenoid valve	X	X	X	
Rear inlet solenoid valve	X	X	X	FE
Rear outlet solenoid valve	X	X	X	
Actuator solenoid valve relay	X	X	—	
Actuator motor relay (ABS MOTOR is shown on the Data Monitor screen.)	X	X	X	CL
ABS warning lamp	—	X	—	MT
Battery voltage (SENSOR VOLT is shown on the Data Monitor screen.)	X	X	—	AT

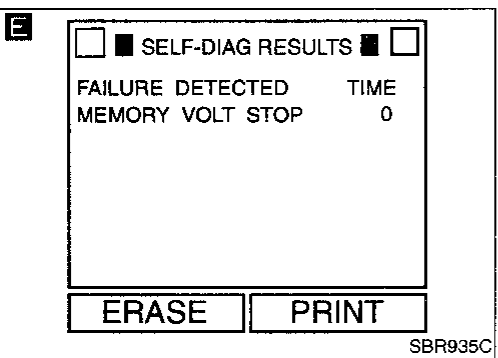
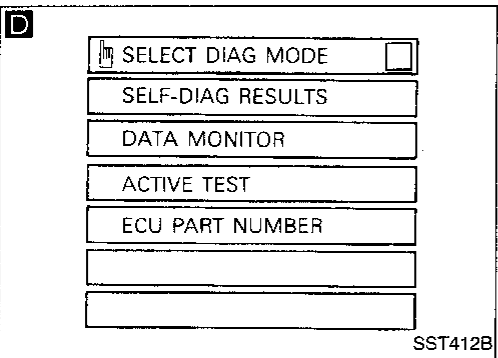
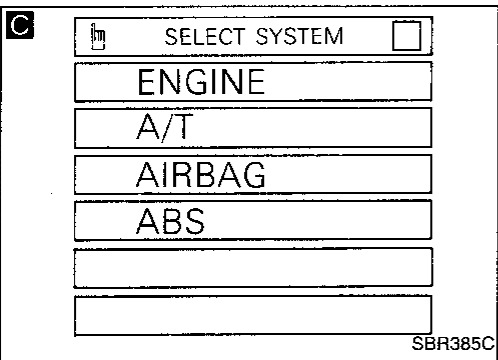
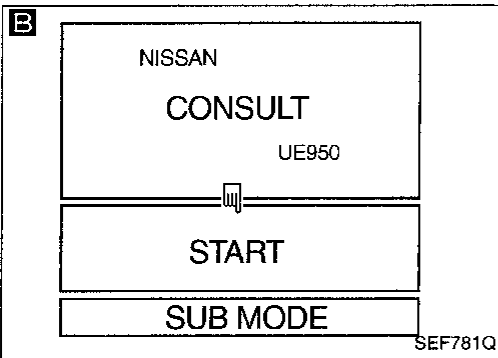
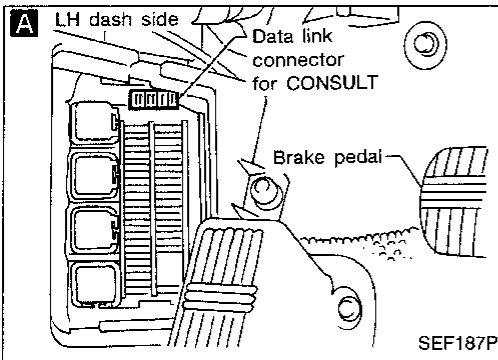
X: Applicable.

—: Not applicable.

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CONSULT Inspection Procedure

SELF-DIAGNOSIS PROCEDURE



A

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

- 1) Start engine.
- 2) Drive vehicle over 15 km/h (9 MPH) for at least one minute.

B 1) Stop vehicle with engine running and touch "START" on CONSULT screen.

C 2) Touch "ABS".

D 3) Touch "SELF-DIAG RESULTS".

- The screen shows the detected malfunction and the times of ignition switch ON and OFF after it occurred.

Make the necessary repairs following the diagnostic procedures.

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

Check warning lamp for deactivation after driving vehicle over 15 km/h (9 MPH) for at least one minute.

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

TROUBLE DIAGNOSES

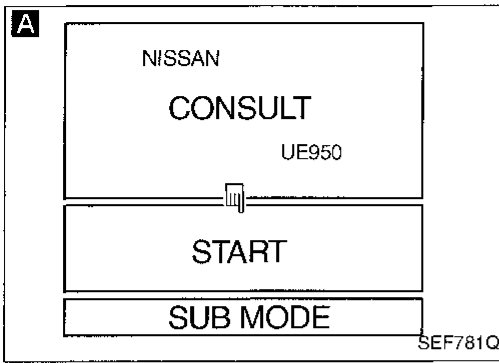
CONSULT Inspection Procedure (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

Diagnostic item	Diagnostic item is detected when ...	Diagnostic procedure	
FR RH SENSOR [OPEN]	<ul style="list-style-type: none"> • Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.) 	4	GI
FR LH SENSOR [OPEN]	<ul style="list-style-type: none"> • Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.) 	4	MA
REAR SENSOR [OPEN]	<ul style="list-style-type: none"> • Circuit for rear sensor is open. (An abnormally high input voltage is entered.) 	4	EM
FR RH SENSOR [SHORT]	<ul style="list-style-type: none"> • Circuit for front right wheel sensor is shorted. (An abnormally low input voltage is entered.) 	4	LC
FR LH SENSOR [SHORT]	<ul style="list-style-type: none"> • Circuit for front left wheel sensor is shorted. (An abnormally low input voltage is entered.) 	4	EC
REAR SENSOR [SHORT]	<ul style="list-style-type: none"> • Circuit for rear sensor is shorted. (An abnormally low input voltage is entered.) 	4	FE
FR RH IN ABS SOL [OPEN]	<ul style="list-style-type: none"> • Circuit for front right inlet solenoid valve is open. (An abnormally low output voltage is entered.) 	3	CL
FR LH IN ABS SOL [OPEN]	<ul style="list-style-type: none"> • Circuit for front left inlet solenoid valve is open. (An abnormally low output voltage is entered.) 	3	MT
RR IN ABS SOL [OPEN]	<ul style="list-style-type: none"> • Circuit for rear inlet solenoid valve is open. (An abnormally low output voltage is entered.) 	3	AT
FR RH IN ABS SOL [SHORT]	<ul style="list-style-type: none"> • Circuit for front right inlet solenoid valve is shorted. (An abnormally high output voltage is entered.) 	3	PD
FR LH IN ABS SOL [SHORT]	<ul style="list-style-type: none"> • Circuit for front left inlet solenoid valve is shorted. (An abnormally high output voltage is entered.) 	3	FA
RR IN ABS SOL [SHORT]	<ul style="list-style-type: none"> • Circuit for rear inlet solenoid valve is shorted. (An abnormally high output voltage is entered.) 	3	RA
FR RH OUT ABS SOL [OPEN]	<ul style="list-style-type: none"> • Circuit for front right outlet solenoid valve is open. (An abnormally low output voltage is entered.) 	3	BR
FR LH OUT ABS SOL [OPEN]	<ul style="list-style-type: none"> • Circuit for front left outlet solenoid valve is open. (An abnormally low output voltage is entered.) 	3	ST
RR OUT ABS SOL [OPEN]	<ul style="list-style-type: none"> • Circuit for rear outlet solenoid valve is open. (An abnormally low output voltage is entered.) 	3	RS
FR RH OUT ABS SOL [SHORT]	<ul style="list-style-type: none"> • Circuit for front right outlet solenoid valve is shorted. (An abnormally high output voltage is entered.) 	3	BT
FR LH OUT ABS SOL [SHORT]	<ul style="list-style-type: none"> • Circuit for front left outlet solenoid valve is shorted. (An abnormally high output voltage is entered.) 	3	HA
RR OUT ABS SOL [SHORT]	<ul style="list-style-type: none"> • Circuit for rear outlet solenoid valve is shorted. (An abnormally high output voltage is entered.) 	3	EL
ABS ACTUATOR RELAY [ON FAILURE]	<ul style="list-style-type: none"> • Actuator solenoid valve relay is ON, even control unit sends off signal. 	6	BR
ABS ACTUATOR RELAY [OFF FAILURE]	<ul style="list-style-type: none"> • Actuator solenoid valve relay is OFF, even control unit sends on signal. 	6	ST
ABS MOTOR [ON FAILURE]	<ul style="list-style-type: none"> • Actuator motor is running, even control unit sends off signal. 	5	RS
ABS MOTOR [OFF FAILURE]	<ul style="list-style-type: none"> • Actuator motor is not running, even control unit sends on signal. 	5	BT
BATTERY VOLT [VB-HIGH]	<ul style="list-style-type: none"> • Power source voltage supplied to ABS control unit is abnormally high. 	7	HA
BATTERY VOLT [VB-LOW]	<ul style="list-style-type: none"> • Power source voltage supplied to ABS control unit is abnormally low. 	7	EL
CONTROL UNIT	<ul style="list-style-type: none"> • Function of calculation in ABS control unit has failed. 	2	HA
MEMORY VOLT STOP	<ul style="list-style-type: none"> • Connectors for ABS control unit or battery terminals are disconnected. 	8	EL

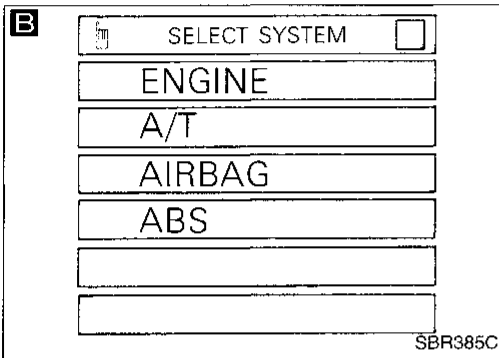
TROUBLE DIAGNOSES

CONSULT Inspection Procedure (Cont'd) DATA MONITOR PROCEDURE

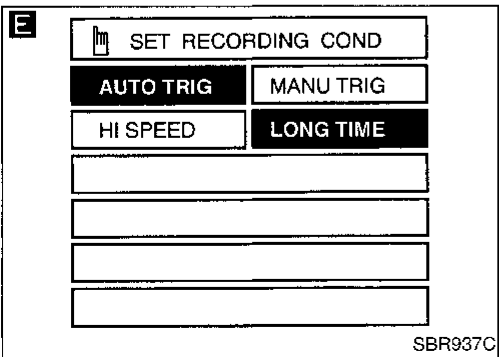
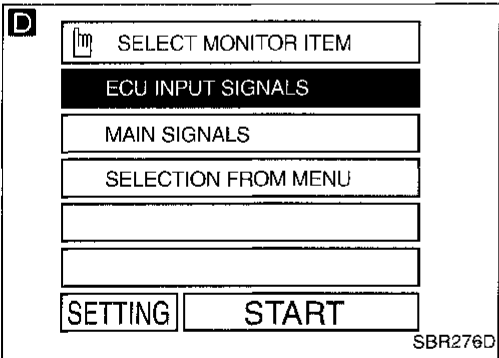
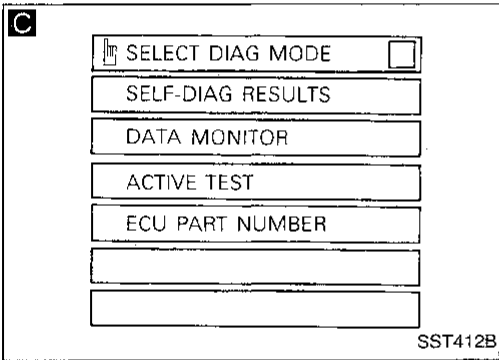


- 1) Turn ignition switch OFF.
- 2) Connect CONSULT to Data Link Connector for CONSULT.
- 3) Turn ignition switch ON.

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



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



TROUBLE DIAGNOSES

CONSULT Inspection Procedure (Cont'd)

ACTIVE TEST PROCEDURE

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

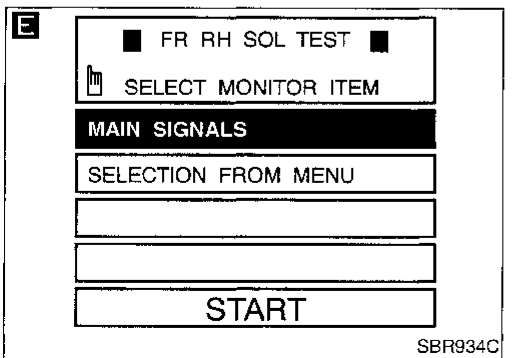
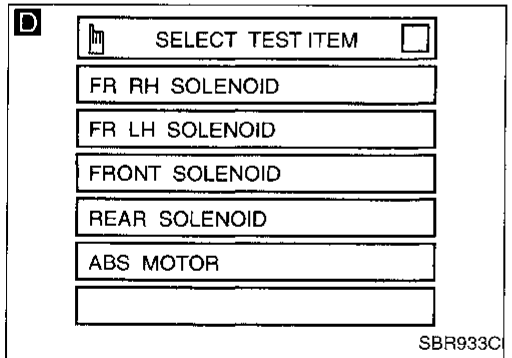
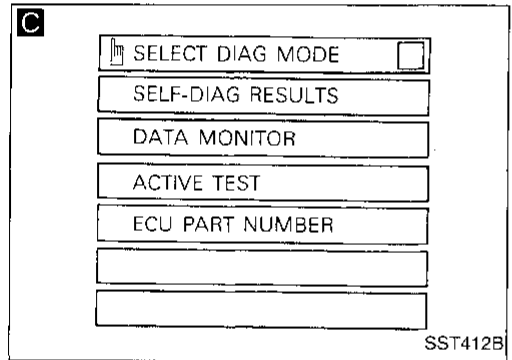
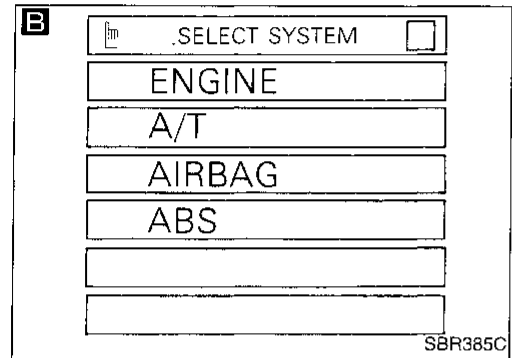
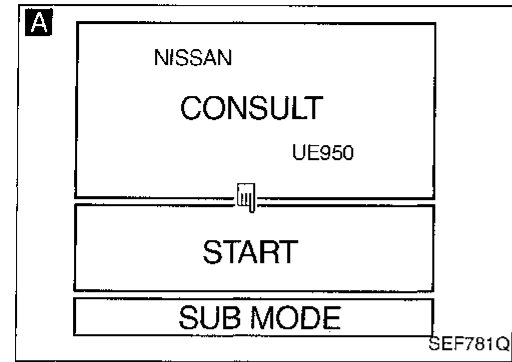
- 1) Turn ignition switch OFF.
- 2) Connect CONSULT to Data Link Connector for CONSULT.
- 3) Start engine.

- 1) Touch "START" on CONSULT screen.
- 2) Touch "ABS".
- 3) Touch "ACTIVE TEST".

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

Carry out the active test by touching screen key.

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TROUBLE DIAGNOSES

CONSULT Inspection Procedure (Cont'd)

DATA MONITOR MODE

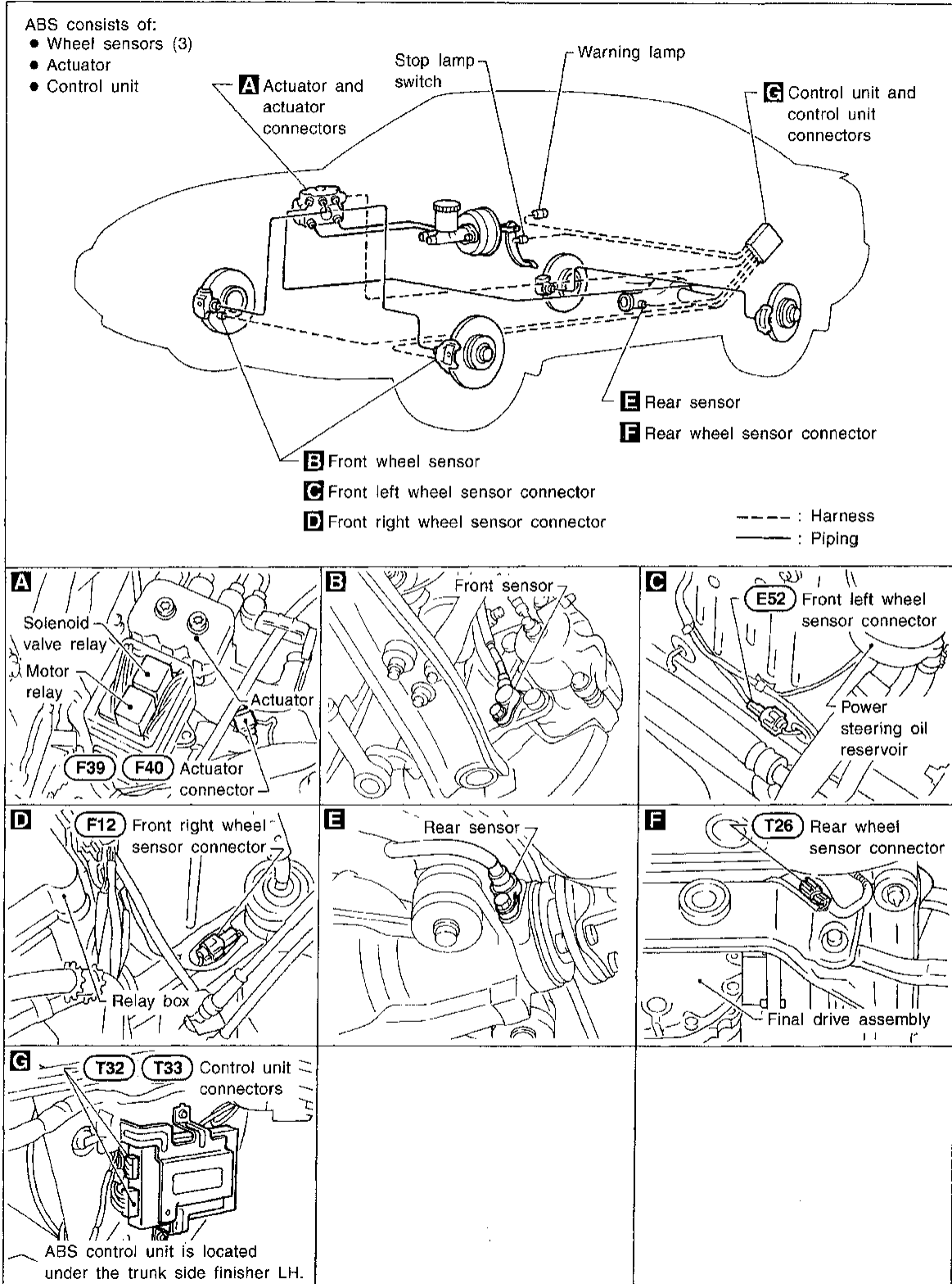
MONITOR ITEM	CONDITION	SPECIFICATION
FR RH SENSOR FR LH SENSOR REAR SENSOR	Drive vehicle. (Each wheel is rotating.)	Wheel speed signal (Almost the same speed as speedometer.)
STOP LAMP SW	Brake is depressed.	Depress the pedal: ON Release the pedal: OFF
ENG RPM SIGNAL	Engine is running.	Engine stops: STOP Engine is running: RUN
FR RH IN SOL FR RH OUT SOL FR LH IN SOL FR LH OUT SOL REAR IN SOL REAR OUT SOL	1. Drive vehicle at speeds over 15 km/h (9 MPH) for at least one minute. 2. Engine is running.	Operating conditions for each solenoid valve are indicated. ABS is not operating: OFF
MOTOR RLY		ABS is not operating: OFF ABS is operating: ON
ACTUATOR RLY		Ignition switch ON (Engine stops): OFF Engine running: ON
WARNING LAMP	Ignition switch is ON or engine is running.	ABS warning lamp is turned on: ON ABS warning lamp is turned off: OFF
SENSOR VOLT		Power supply voltage for control unit

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT												
FR RH SOLENOID FR LH SOLENOID FRONT SOLENOID REAR SOLENOID	Engine is running.	Brake fluid pressure control operation <table style="margin-left: 40px;"> <tr> <td></td> <td>IN SOL</td> <td>OUT SOL</td> </tr> <tr> <td>UP (Increase):</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>KEEP (Hold):</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>DOWN (Decrease):</td> <td>ON</td> <td>ON</td> </tr> </table>		IN SOL	OUT SOL	UP (Increase):	OFF	OFF	KEEP (Hold):	ON	OFF	DOWN (Decrease):	ON	ON
	IN SOL	OUT SOL												
UP (Increase):	OFF	OFF												
KEEP (Hold):	ON	OFF												
DOWN (Decrease):	ON	ON												
ABS MOTOR		ABS actuator motor ON: Motor runs OFF: Motor stops												

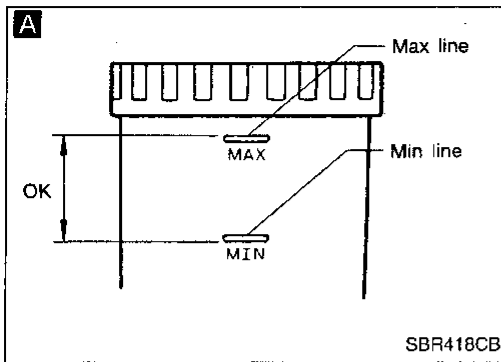
TROUBLE DIAGNOSES

Component Parts and Harness Connector Location

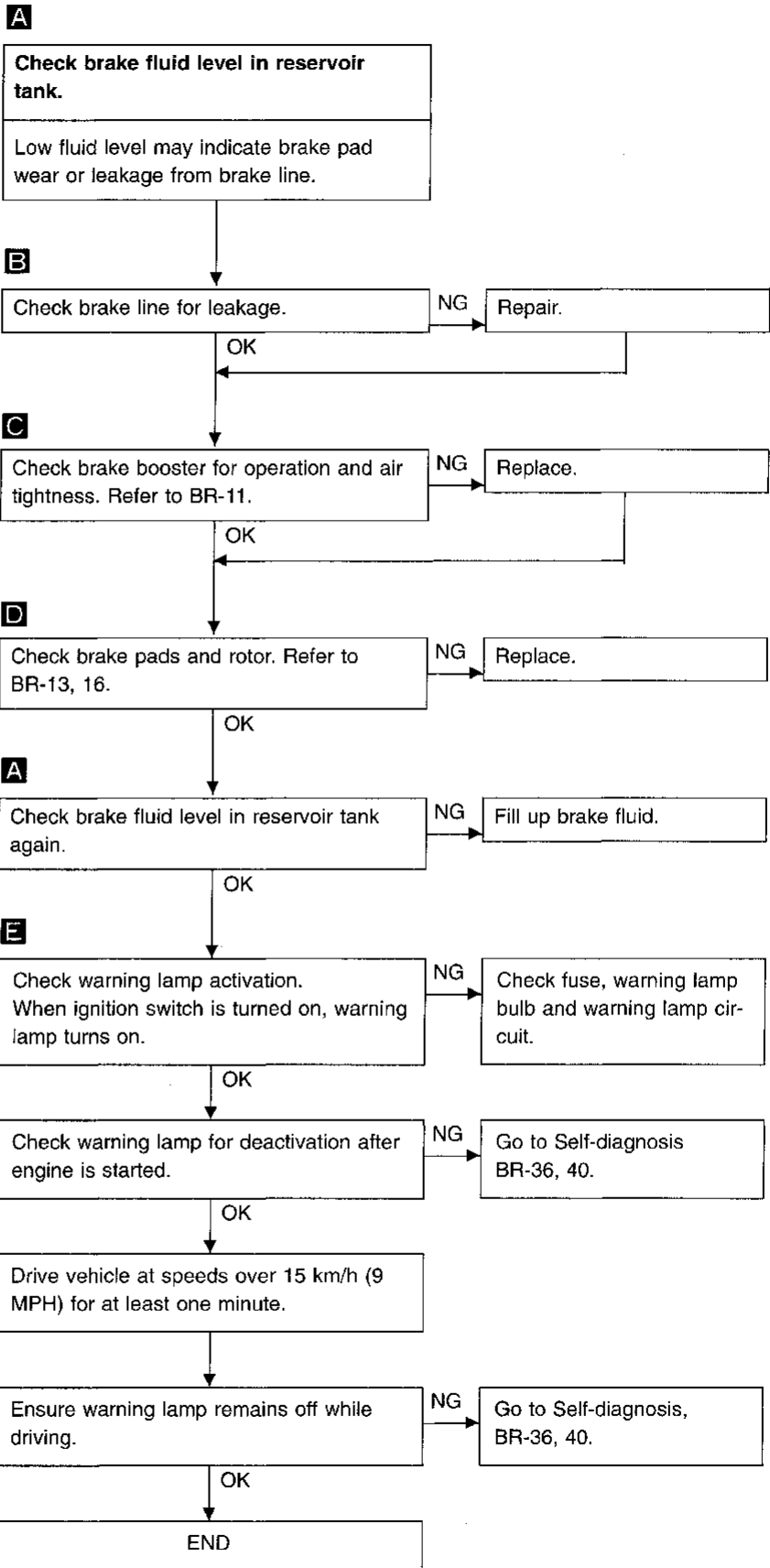
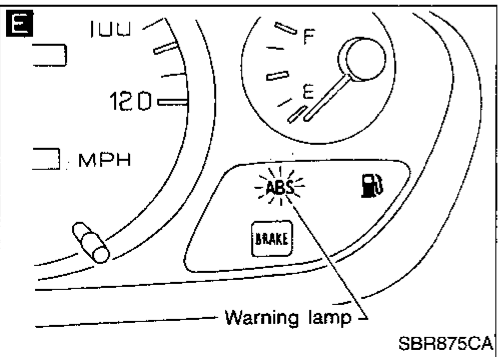
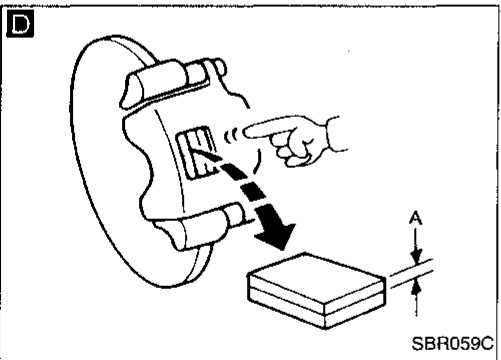
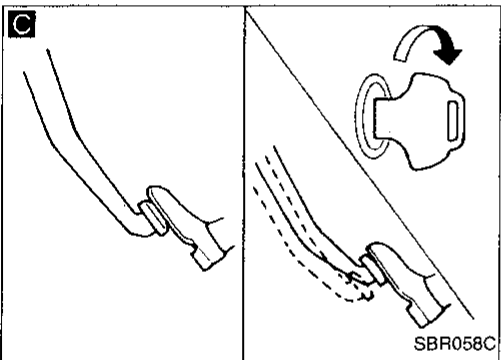
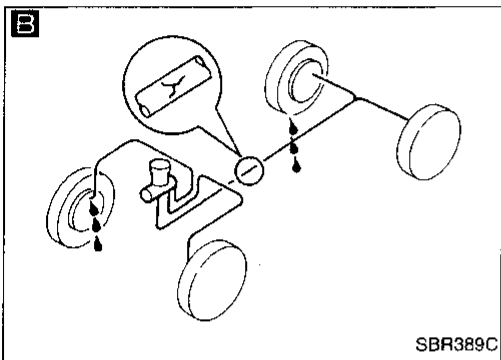


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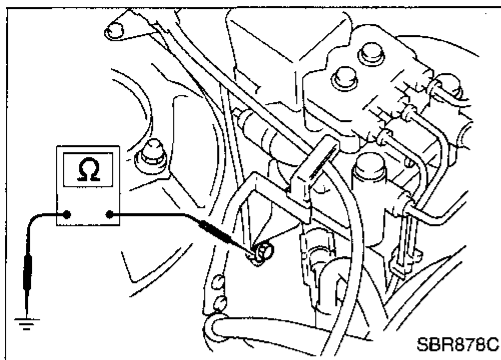
TROUBLE DIAGNOSES



Preliminary Check



TROUBLE DIAGNOSES



Ground Circuit Check

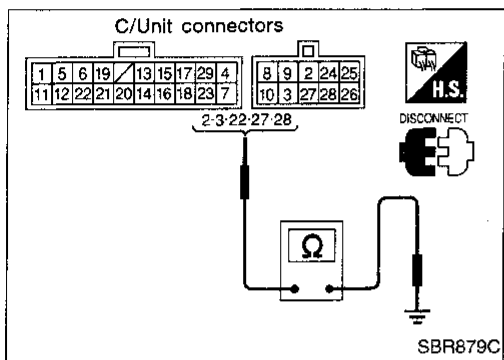
ACTUATOR MOTOR GROUND

- Check resistance between actuator motor ground terminal and body ground.
Resistance: approximately 0Ω

GI

MA

EM



CONTROL UNIT GROUND

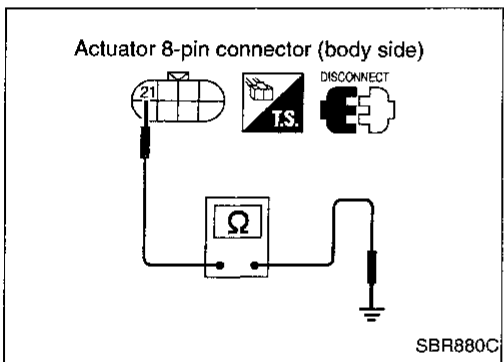
- Check resistance between control unit connector terminals and ground.
Resistance: approximately 0Ω

LC

EC

FE

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ACTUATOR GROUND

- Check resistance between actuator harness 8-pin connector (body side) terminal ⑳ and ground.
Resistance: approximately 0Ω

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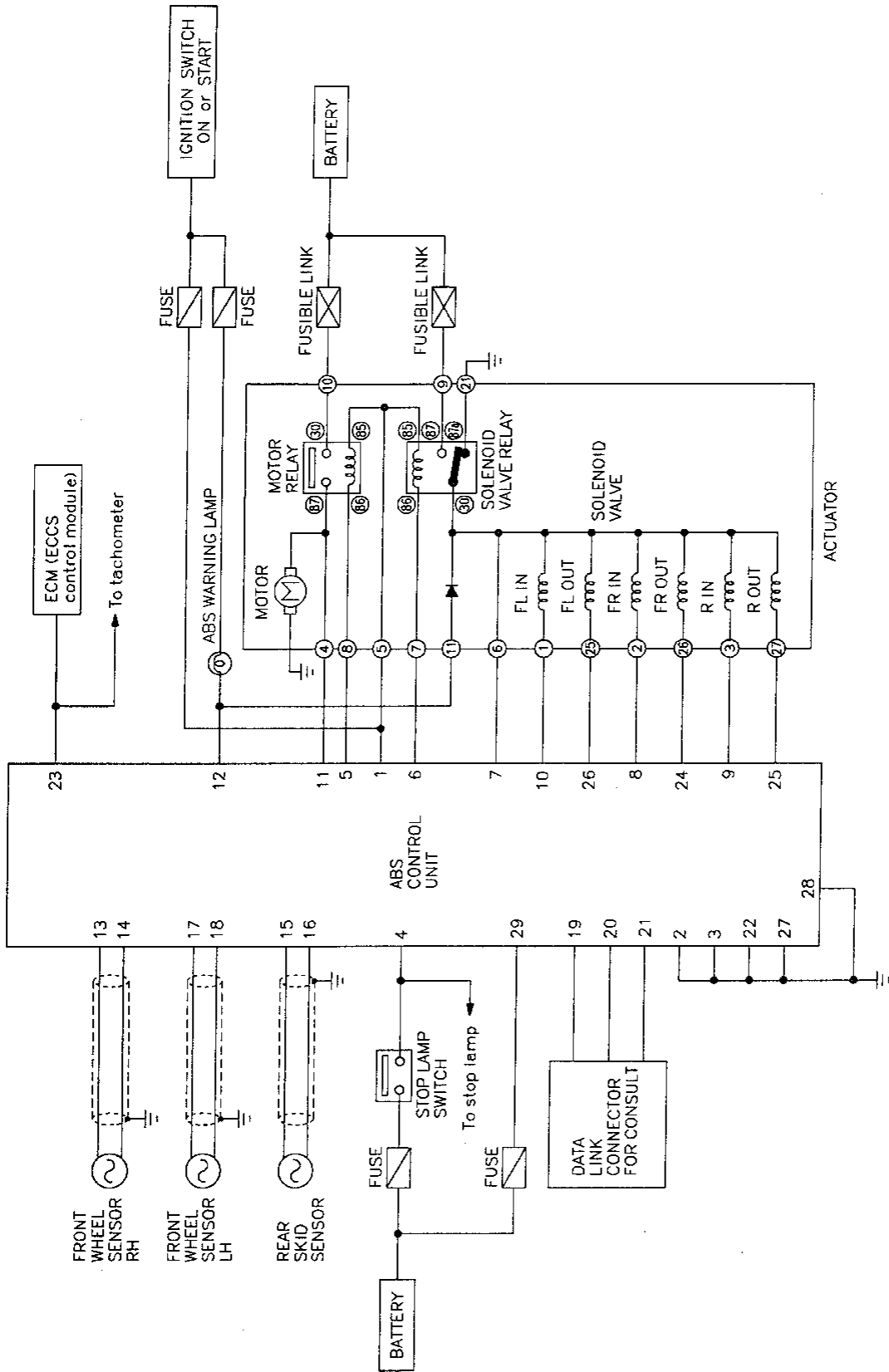
BT

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Circuit Diagram for Quick Pinpoint Check



Diagnostic Procedure 1 (Not self-diagnostic item)

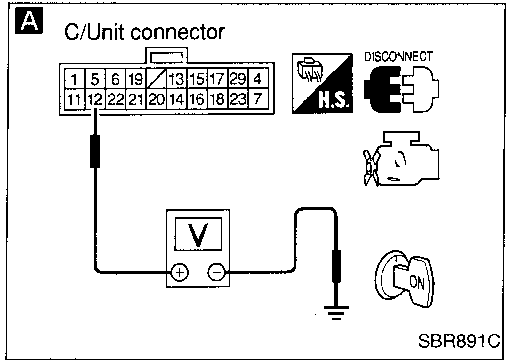
Warning lamp does not come on when ignition switch is turned on.

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WARNING LAMP CIRCUIT CHECK

Check 7.5A fuse ② for warning lamp.
For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Replace fuse.



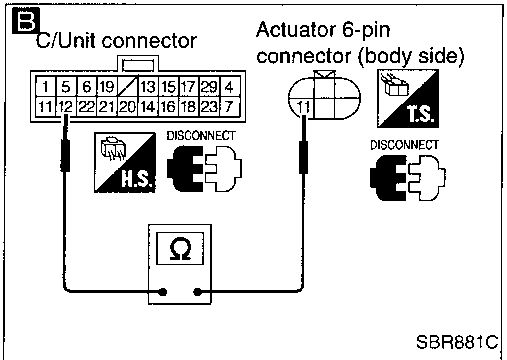
A

1. Install 7.5A fuse.
2. Disconnect connectors from control unit and actuator.
3. Check voltage between control unit connector terminal ⑫ and ground after turning ignition switch "ON".
Battery voltage should exist after turning ignition switch "ON".

OK → Replace bulb.

NG → Check warning lamp bulb.

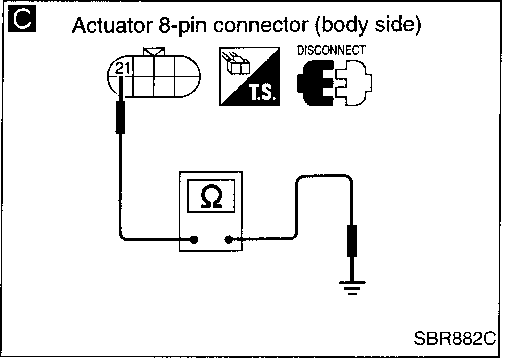
OK → Repair harness and connectors between battery and control unit connector terminal ⑫ (including combination meter).



B

1. Turn ignition switch "OFF".
Disconnect actuator 6-pin connector.
2. Check continuity between control unit connector terminal ⑫ and actuator 6-pin connector (body side) terminal ⑪.
Continuity should exist.

NG → Repair harness and connectors between warning lamp (combination meter) and actuator 6-pin connector (body side) terminal ⑪.



C

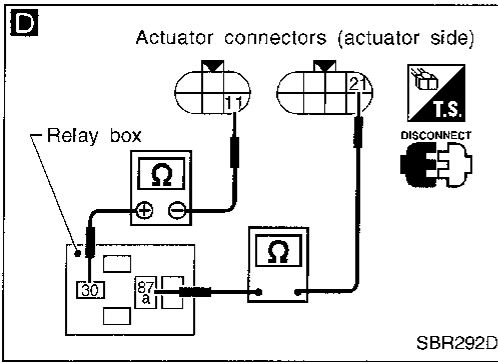
1. Disconnect actuator 8-pin connector.
2. Check continuity between actuator harness 8-pin connector (body side) terminal ⑳ and body ground.
Continuity should exist.

NG → Repair harness and connectors.

OK → **A**
(Go to next page.)

TROUBLE DIAGNOSES

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



D

1. Disconnect solenoid valve relay.
2. Check continuity between actuator connector (actuator side) terminals and solenoid valve relay box terminals.

Actuator	Relay box
11 ⊖	30 ⊕
21	87a

Continuity should exist.
Note: Pay attention to tester polarity*.

NG

Replace actuator assembly.

OK

CHECK SOLENOID VALVE RELAY.

Refer to SOLENOID VALVE RELAY in Electrical Components Inspection, BR-68.

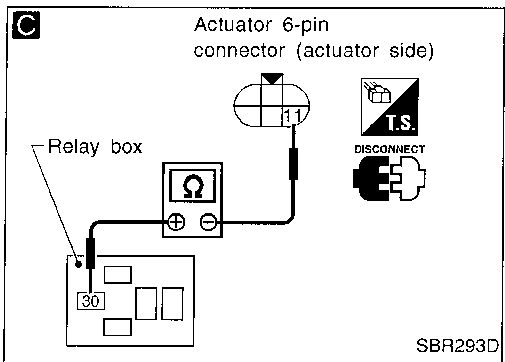
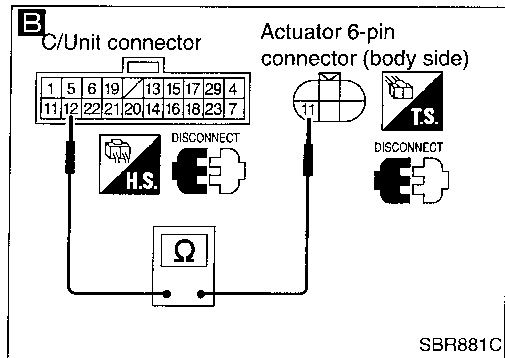
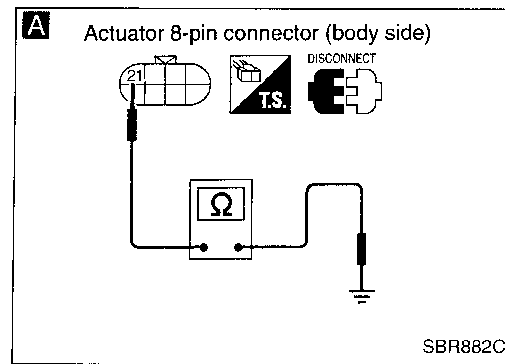
NG

Replace solenoid valve relay.

OK

Go to **D** in Diagnostic Procedure 2.

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



Diagnostic Procedure 2

CONTROL UNIT OR GROUND CIRCUIT

(Malfunction code No. 45, 46, 77, LED deactivation or continuous activation)

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

No → Inspection end

Yes → SOLENOID VALVE RELAY CHECK

SOLENOID VALVE RELAY CHECK

Refer to SOLENOID VALVE RELAY in Electrical Components Inspection, BR-68.

NG → Replace solenoid valve relay.

OK → SOLENOID VALVE RELAY GROUND CIRCUIT

A SOLENOID VALVE RELAY GROUND CIRCUIT

1. Disconnect actuator 8-pin connector.
2. Check continuity between actuator 8-pin connector (body side) terminal ②① and body ground.
Continuity should exist.

NG → Repair harness and connectors.

OK → SOLENOID VALVE RELAY GROUND CIRCUIT

B

1. Disconnect control unit connectors and actuator 6-pin connector.
2. Check continuity between control unit connector terminal ⑫ and actuator 6-pin connector (body side) terminal ⑪.
Continuity should exist.

NG → Repair harness and connectors.

OK → SOLENOID VALVE RELAY GROUND CIRCUIT

C

Check continuity between actuator 6-pin connector (actuator side) terminal ⑪ and solenoid valve relay box terminal ③①.

Actuator	Relay box	Continuity
11 ⊖	30 ⊕	Yes
11 ⊕	30 ⊖	No

Note: Pay attention to tester polarity*.

NG → Replace actuator assembly.

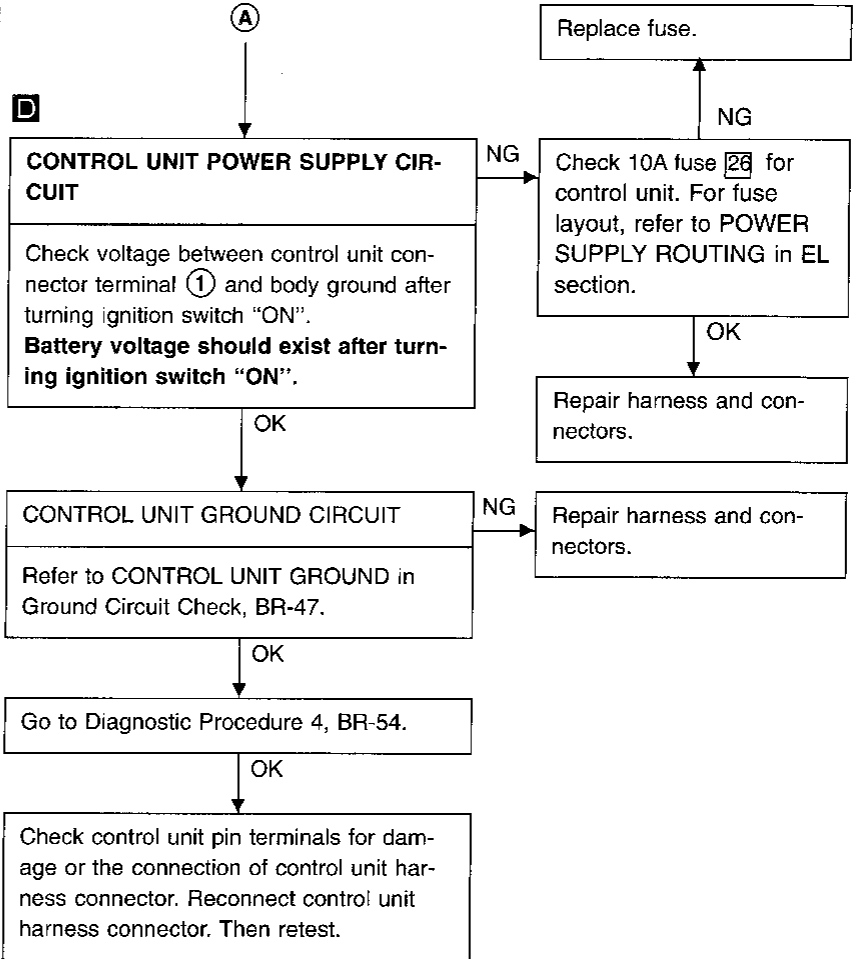
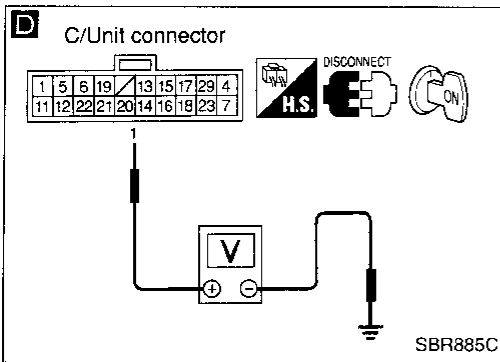
OK → (Go to next page.)

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

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TROUBLE DIAGNOSES

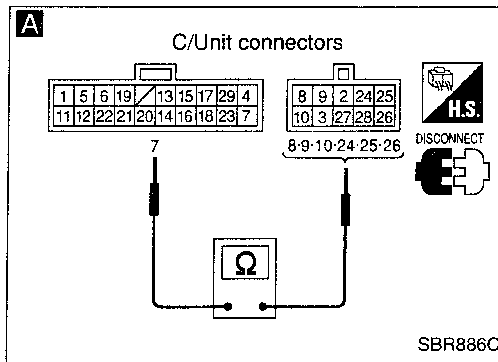
Diagnostic Procedure 2 (Cont'd)



Diagnostic Procedure 3

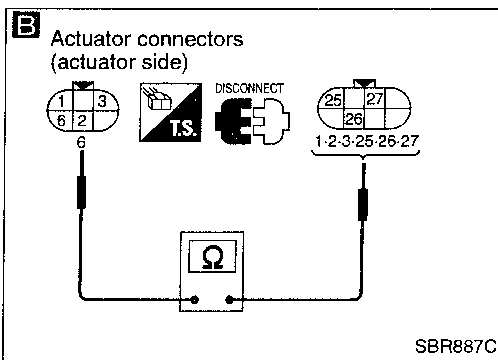
ACTUATOR SOLENOID VALVE

(Malfunction code No. 11 - 13, 15 - 17, 21 - 23, 25 - 27)



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

No → Inspection end



A

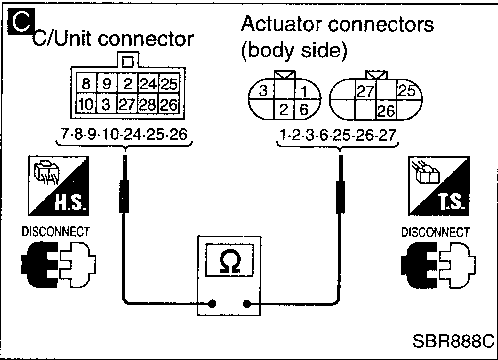
ACTUATOR SOLENOID VALVE CHECK

1. Disconnect control unit connectors.
2. Check resistance between control unit connector terminals.

Code No. (LED flashes.)	Terminals
11, 21	(7) - (8)
12, 22	(7) - (10)
13, 23	(7) - (9)
15, 25	(7) - (24)
16, 26	(7) - (26)
17, 27	(7) - (25)

Resistance: 3.7 - 8.0Ω

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



NG →

1. Disconnect actuator connectors.
2. Check resistance between actuator connector (actuator side) terminals.

Code No. (LED flashes.)	Terminals
11, 21	(6) - (2)
12, 22	(6) - (1)
13, 23	(6) - (3)
15, 25	(6) - (26)
16, 26	(6) - (25)
17, 27	(6) - (27)

Resistance: 3.7 - 8.0Ω

NG → Replace actuator.

OK →

- C**
- Check continuity between control unit connector terminals and actuator connector (body side) terminals.

Code No. (LED flashes.)	Control unit	Actuator
11, 21	(8)	(2)
12, 22	(10)	(1)
13, 23	(9)	(3)
15, 25	(24)	(26)
16, 26	(26)	(25)
17, 27	(25)	(27)
42	(7)	(6)

Continuity should exist.

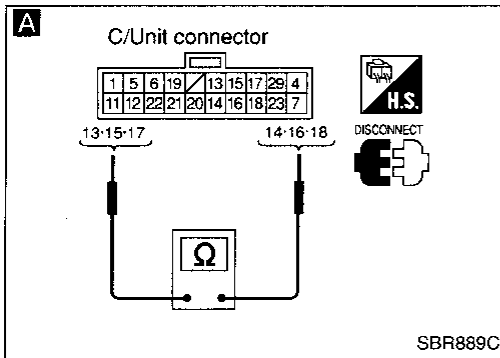
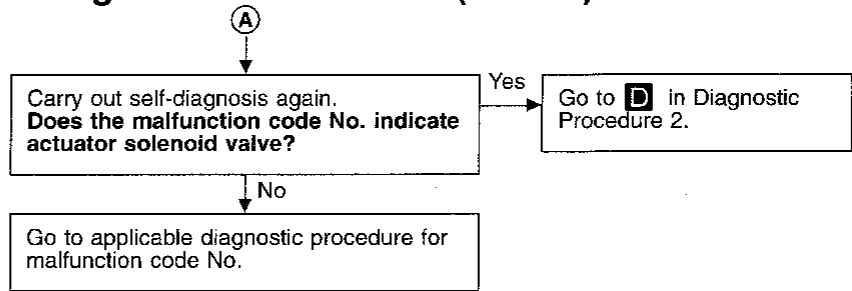
NG → Repair harness and connector.

OK
↓
A
(Go to next page.)

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TROUBLE DIAGNOSES

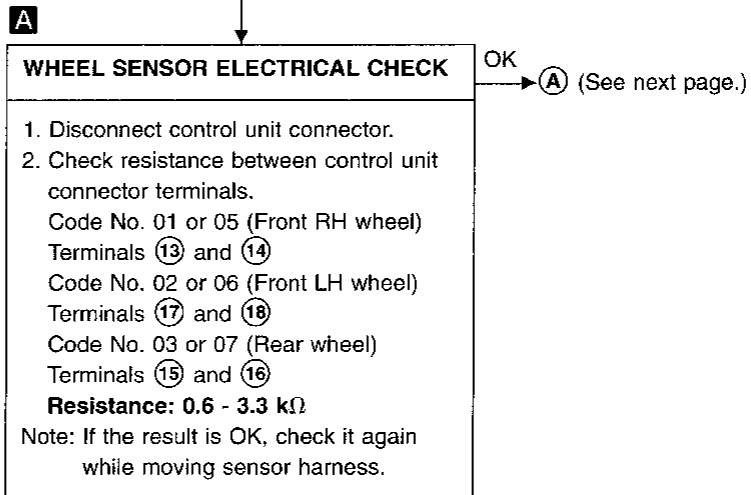
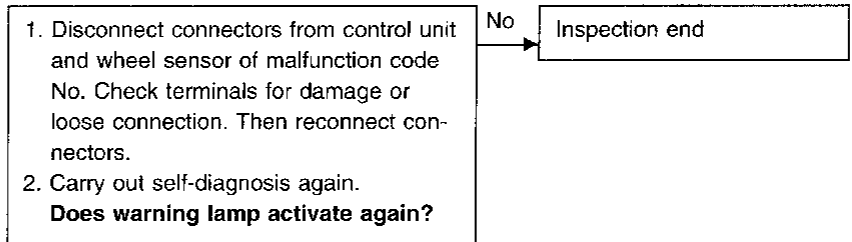
Diagnostic Procedure 3 (Cont'd)



Diagnostic Procedure 4

WHEEL SENSOR OR ROTOR

(Malfunction code No. 01 - 03, 05 - 07)

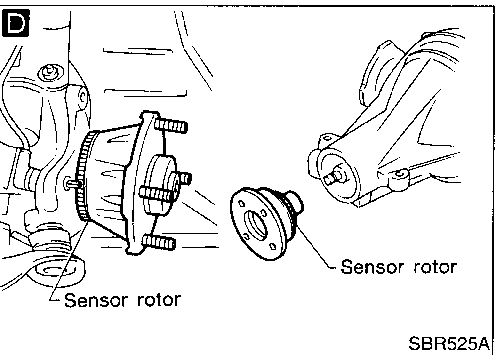
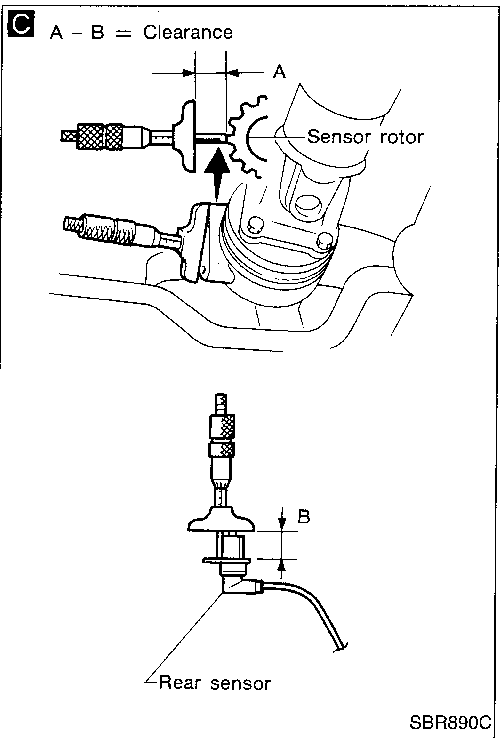
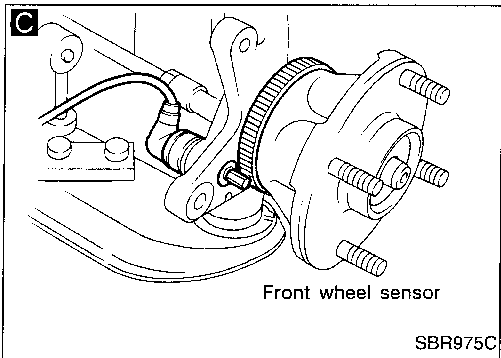
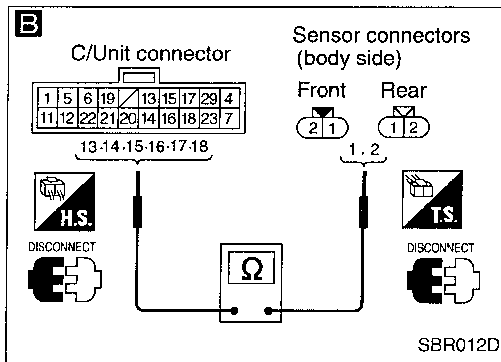


NG
↓
Ⓑ
(Go to next page.)

Note: Wheel position should be distinguished by code No. (LED flashes).

TROUBLE DIAGNOSES

Diagnostic Procedure 4 (Cont'd)



B

1. Disconnect wheel sensor connector.
2. Check continuity between control unit connector terminals and wheel sensor connector (body side) terminals.

Code No. (LED flashes.)	Control unit	Wheel sensor
01, 05 (Front RH)	13	1
	14	2
02, 06 (Front LH)	17	1
	18	2
03, 07 (Rear)	15	2
	16	1

Continuity should exist.

NG

Note

Repair harness and connectors between control unit connector and wheel sensor connector.

C Note

WHEEL SENSOR MECHANICAL CHECK

Check for any foreign materials and clearance between sensor and rotor.

Clearance:

Front

Make sure the sensor is installed of minimum clearance.

Rear

0.31 - 0.82 mm (0.0122 - 0.0323 in)

OK

D Note

Check sensor rotor for teeth damage.

OK

Carry out self-diagnosis again.

Does the malfunction code No. (LED flashes) indicate wheel sensor?

No

Go to applicable diagnostic procedure for malfunction code No. (LED flashes).

Note: Wheel position should be distinguished by code No. (LED flashes).

OK Note

CHECK WHEEL SENSOR.

Refer to WHEEL SENSOR in Electrical Components Inspection, BR-68.

NG Note

Clean sensor fixing portion, reinstall or replace sensor.

NG Note

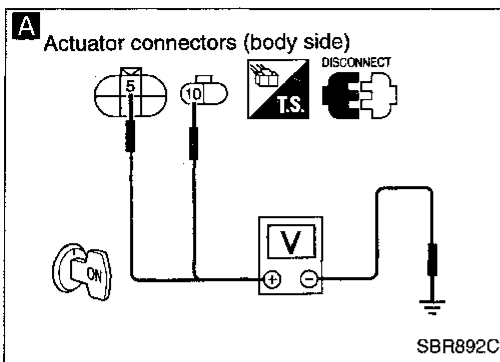
Replace sensor rotor.

Yes

Go to **D** in Diagnostic Procedure 2.

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Diagnostic Procedure 5 MOTOR RELAY OR MOTOR (Malfunction code No. 43, 44)

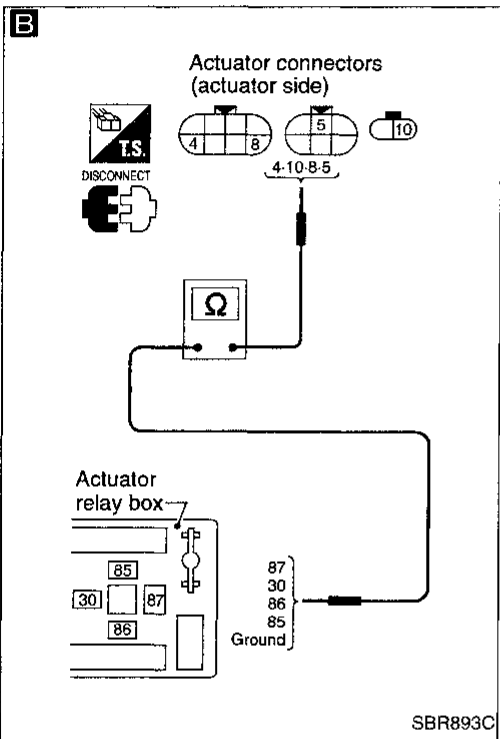


MOTOR POWER SUPPLY CIRCUIT

Check 30A fusible link **d** and 10A fuse **26** for actuator. For fusible link and fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → **B** (Skip page.)

OK



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

No → Inspection end

Yes

A

1. Disconnect actuator connectors.
2. Check voltage between connector (body side) terminals and ground.

Terminals	Ignition switch
⑤ - ground	ON position
⑩ - ground	—

Battery voltage should exist.

NG → Repair harness and connectors between battery and actuator connector (body side) terminals.

OK

B

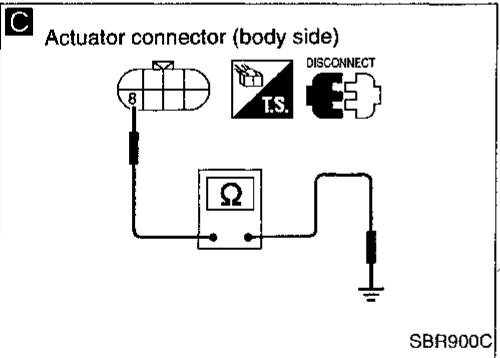
MOTOR RELAY CIRCUIT

1. Remove motor relay.
2. Disconnect actuator connectors.
3. Check continuity between actuator connector (actuator side) terminals and relay connector terminals or body ground.

Actuator connector	Relay connector	Continuity
④	⑧⑦	Yes
⑩	③①	Yes
⑧	⑥⑥	Yes
⑤	⑤⑤	Yes
④	Ground	No

NG → Replace actuator assembly.

OK



C

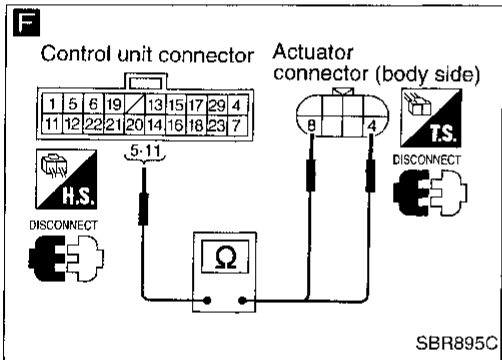
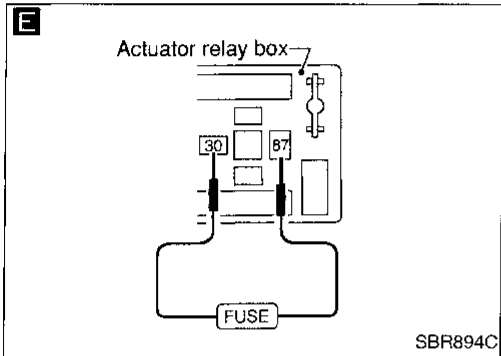
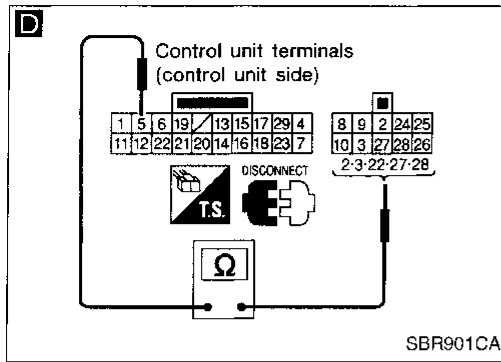
Check continuity between actuator connector (body side) terminal **8** and ground.
Continuity should not exist.

OK → **A** (Go to next page.)

NG
→ **A**

TROUBLE DIAGNOSES

Diagnostic Procedure 5 (Cont'd)



A

D

1. Disconnect control unit connectors.
2. Check continuity between control unit terminals (control unit side) ⑤ and ②, ③, ②②, ②⑦, ②⑧.

Continuity should not exist.

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

OK → Repair harness and connectors.

E

MOTOR CHECK

1. Connect actuator connectors.
2. Connect suitable wire between relay connector terminals ⑧⑦ and ③⑦.

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

NG → Check actuator motor ground. Refer to BR-47.

OK → Replace actuator assembly.

NG → Repair harness and terminals.

MOTOR RELAY CHECK

Refer to MOTOR RELAY in Electrical Components Inspection, BR-68.

NG → Replace motor relay.

OK →

F

CIRCUIT CHECK

1. Disconnect control unit connector.
2. Check continuity between control unit connector terminals and actuator connector (body side) terminals.

Control unit	Actuator
⑤	⑧
①①	④

Continuity should exist.

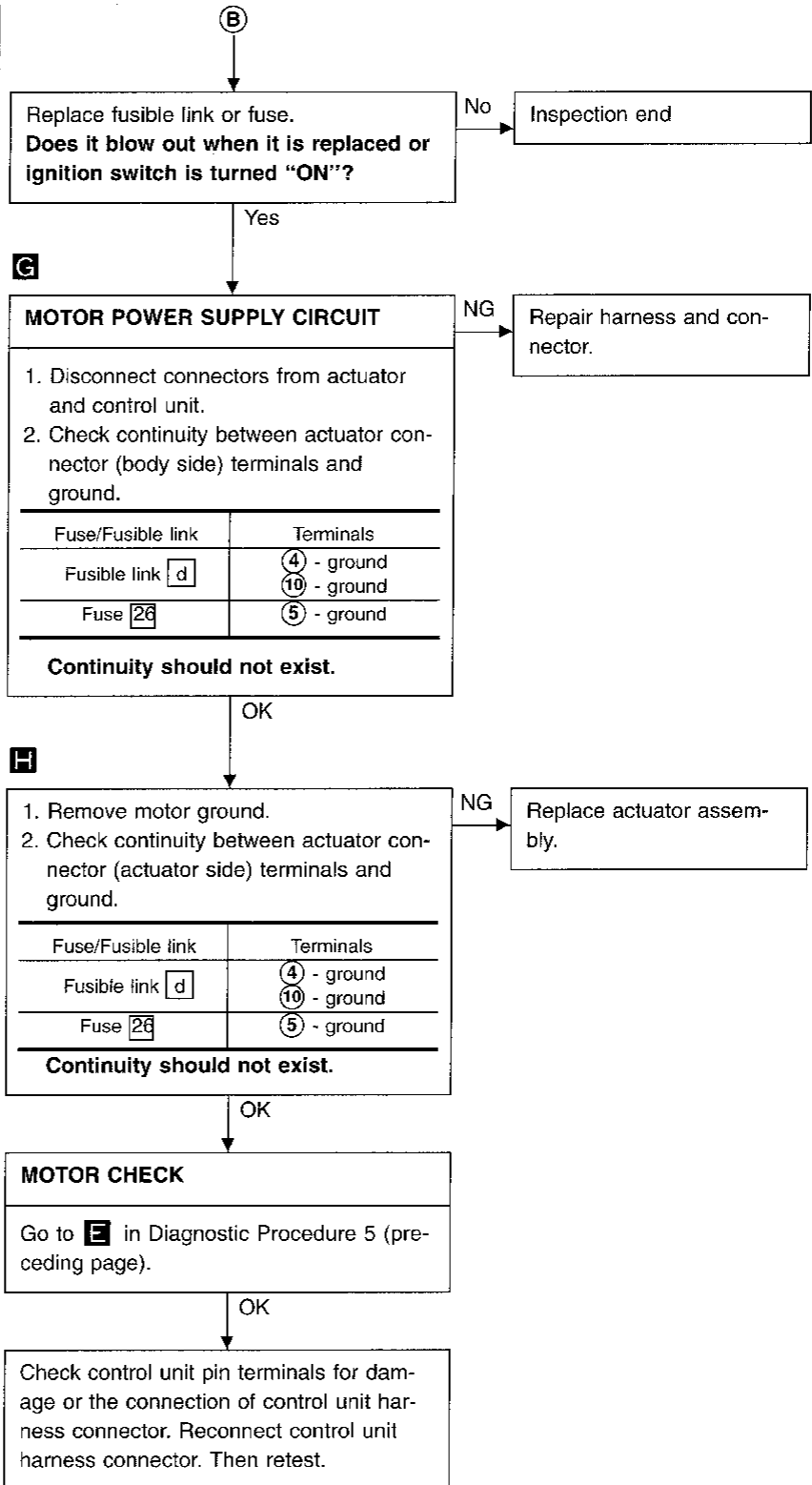
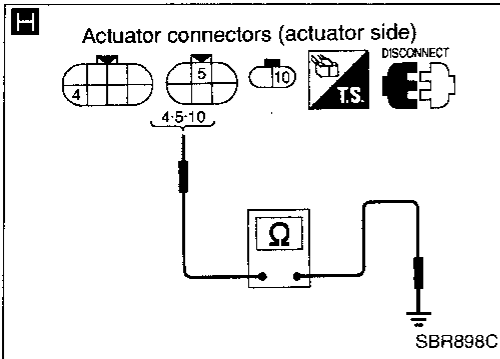
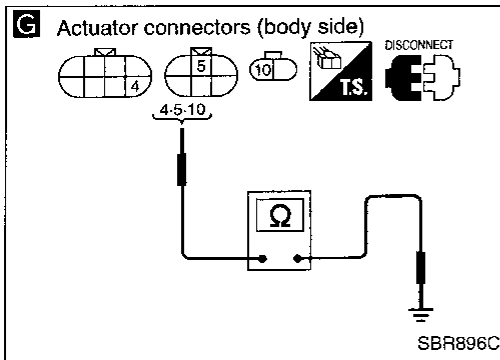
NG → Repair harness and connectors.

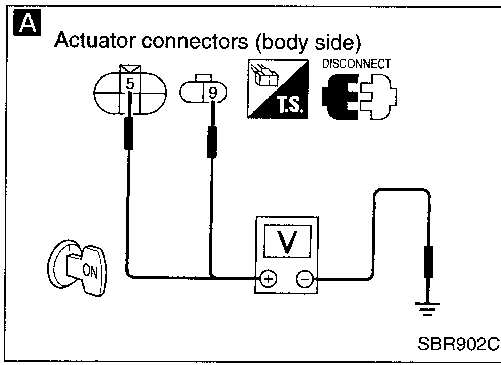
OK → Go to **D** in Diagnostic Procedure 2.

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TROUBLE DIAGNOSES

Diagnostic Procedure 5 (Cont'd)





Diagnostic Procedure 6 SOLENOID VALVE RELAY (Malfunction code No. 41, 42)

SOLENOID VALVE POWER SUPPLY CHECK

Check 30A fusible link **C** and 10A fuse **26** for actuator. For fusible link and fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → **B** (See next page.)

OK

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

No → Inspection end

Yes

A

SOLENOID VALVE POWER SUPPLY CHECK

1. Disconnect connectors from actuator.
2. Check voltage between actuator 2-pin connector (body side) terminals and ground.

Terminals	Ignition switch
(5) - ground	ON position
(9) - ground	—

Battery voltage should exist.

NG → Repair harness and connector.

OK

SOLENOID VALVE RELAY CHECK

Refer to SOLENOID VALVE RELAY in Electrical Components Inspection, BR-68.

NG → Replace solenoid valve relay.

OK

B

SOLENOID VALVE RELAY CIRCUIT CHECK

Check continuity between relay terminals and actuator connector (actuator side) terminals.

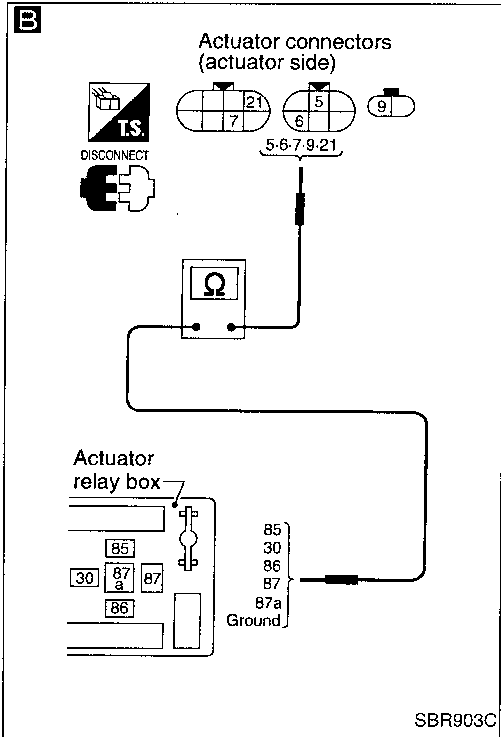
Relay terminals	Connector terminals	Continuity
(30)	(6)	Yes
(87)	(9)	Yes
(87a)	(21)	Yes
(86)	(7)	Yes
(85)	(5)	Yes
Ground	(7)	No

NG → Replace actuator.

OK

A

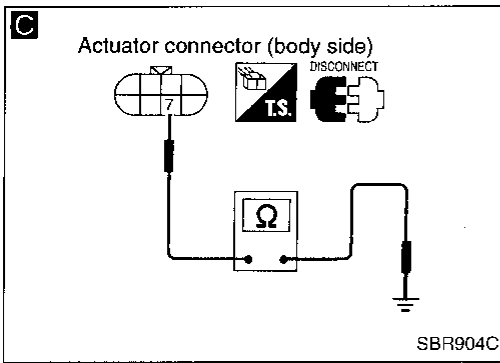
(Go to next page.)



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TROUBLE DIAGNOSES

Diagnostic Procedure 6 (Cont'd)



C Check continuity between actuator connector (body side) terminal (7) and ground.
Continuity should not exist.

OK → **C** (See below.)

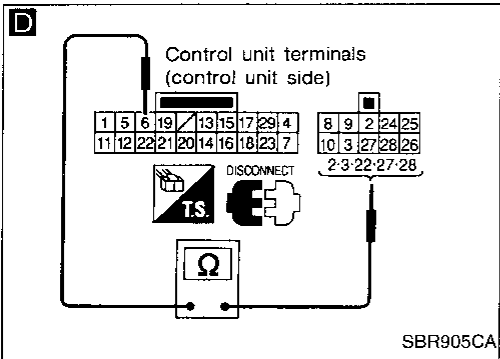
NG

D 1. Disconnect control unit connectors.
2. Check continuity between control unit terminals (control unit side) (6) and (2), (3), (22), (27), (28).
Continuity should not exist.

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

OK

Repair harness and connectors.



C

E **CIRCUIT CHECK**
1. Disconnect control unit connector.
2. Check continuity between control unit connector terminals and actuator connector (body side) terminals.

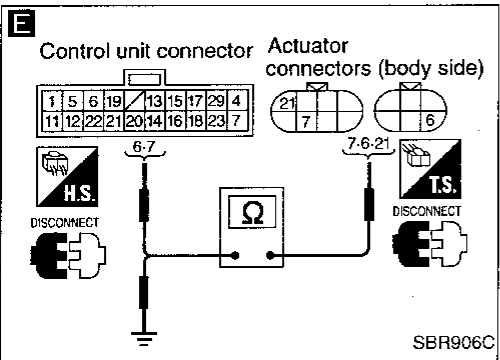
NG → Repair harness and connectors.

Control unit	Actuator
(6)	(7)
(7)	(6)
Ground	(2)

Continuity should exist.

OK

Go to **D** in Diagnostic Procedure 2.



B

Replace fusible link or fuse.
Does it blow out when it is replaced or ignition switch is turned "ON"?

No → Inspection end

Yes

F **ACTUATOR POWER SUPPLY CIRCUIT**
1. Disconnect connectors from actuator and control unit.
2. Check continuity between actuator connector (body side) terminals and ground.

NG → Repair harness and connector.

Fuse/Fusible link	Terminals
Fusible link (c)	(6) - ground (9) - ground
Fuse (26)	(5) - ground

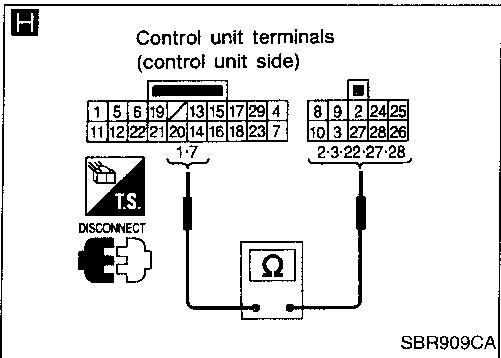
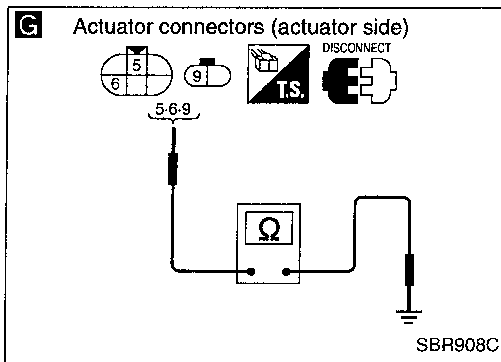
Continuity should not exist.

OK

D
(Go to next page.)

TROUBLE DIAGNOSES

Diagnostic Procedure 6 (Cont'd)



D

G Check continuity between actuator connector (actuator side) terminals and ground.

Fuse/Fusible link	Terminals
Fusible link c	⑥ - ground ⑨ - ground
Fuse 26	⑤ - ground

Continuity should not exist.

NG → Replace actuator assembly.

OK →

H Check continuity between control unit terminals (control unit side).

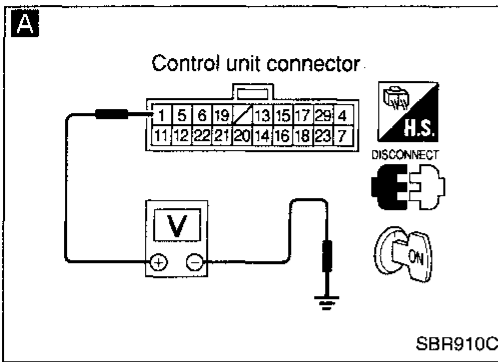
Fuse/Fusible link	Terminals
Fusible link c	⑦ - ②, ③, ②②, ②⑦, ②⑧
Fuse 26	① - ②, ③, ②②, ②⑦, ②⑧

Continuity should not exist.

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

OK → Replace actuator assembly.

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Diagnostic Procedure 7

POWER SUPPLY

(Malfunction code No. 47, 48)

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

No → Inspection end

Yes

A

CONTROL UNIT POWER SUPPLY

1. Disconnect control unit connectors.
2. Check voltage between connector terminal ① and ground when ignition switch is turned ON.
Battery voltage should exist.

NG → Check harness and connectors between battery and control unit connector terminal ①, 10A fuse ② or battery. For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

OK

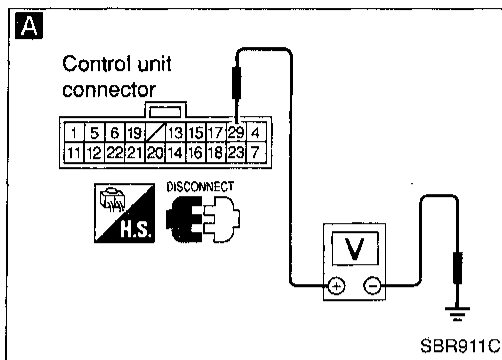
CONTROL UNIT GROUND CIRCUIT

Refer to CONTROL UNIT GROUND in Ground Circuit Check, BR-47.

NG → Repair harness and connectors.

OK

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



Diagnostic Procedure 8

MEMORY VOLT STOP

1. Disconnect control unit connectors. Check terminals for damage or loose connection. Then reconnect connectors.
 2. Turn ignition switch ON and OFF more than two times.
 3. Carry out self-diagnosis again.
- Does warning lamp activate again?**

No → Inspection end

Yes

A

CONTROL UNIT POWER SUPPLY

1. Disconnect control unit connectors.
2. Check voltage between connector terminal (29) and ground.

Battery voltage should exist.

NG → Check harness and connectors between battery and control unit connector terminal (29) or 7.5A fuse (8). For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

OK

CONTROL UNIT GROUND CIRCUIT

Refer to CONTROL UNIT GROUND in Ground Circuit Check, BR-47.

NG → Repair harness and connectors.

OK

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

Note: MEMORY VOLT STOP is always indicated after disconnecting control unit connector.

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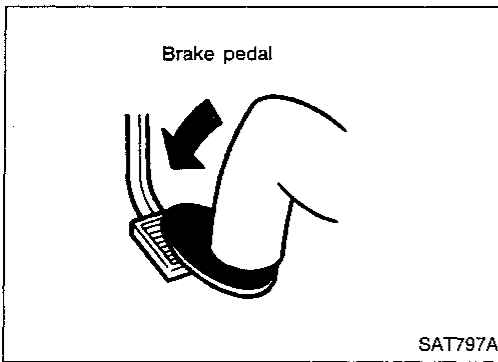
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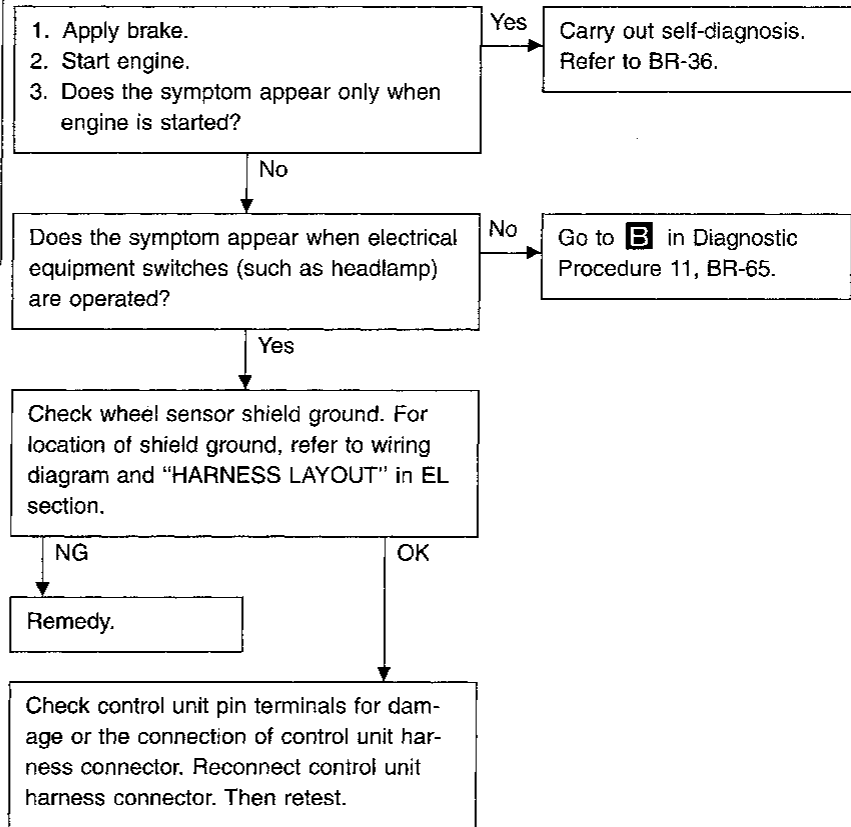
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TROUBLE DIAGNOSES



Diagnostic Procedure 9

SYMPTOM: Pedal vibration and noise

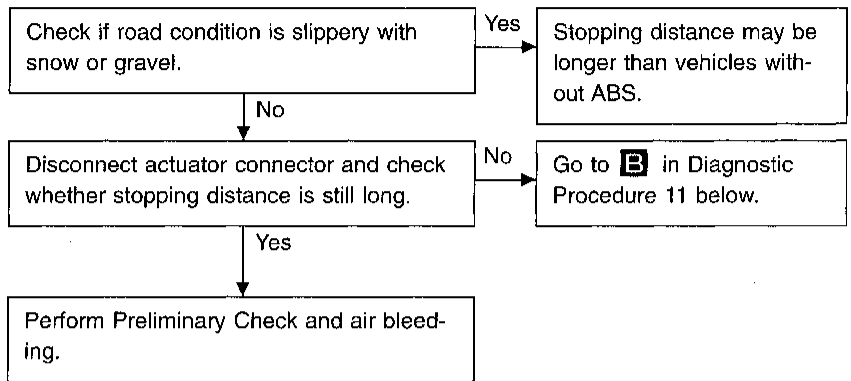


Note: ABS may operate and cause vibration under any of the following conditions.

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

Diagnostic Procedure 10

SYMPTOM: Long stopping distance



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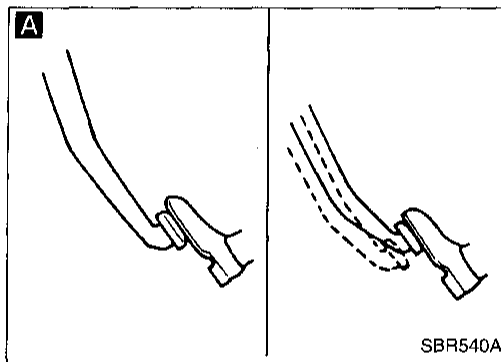
RS

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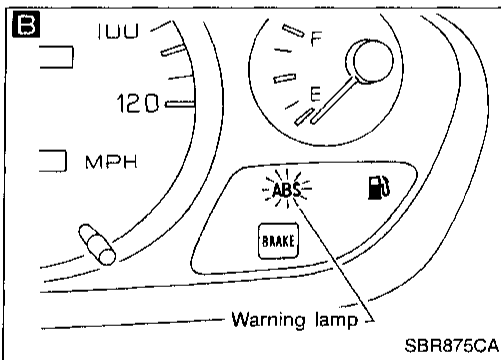
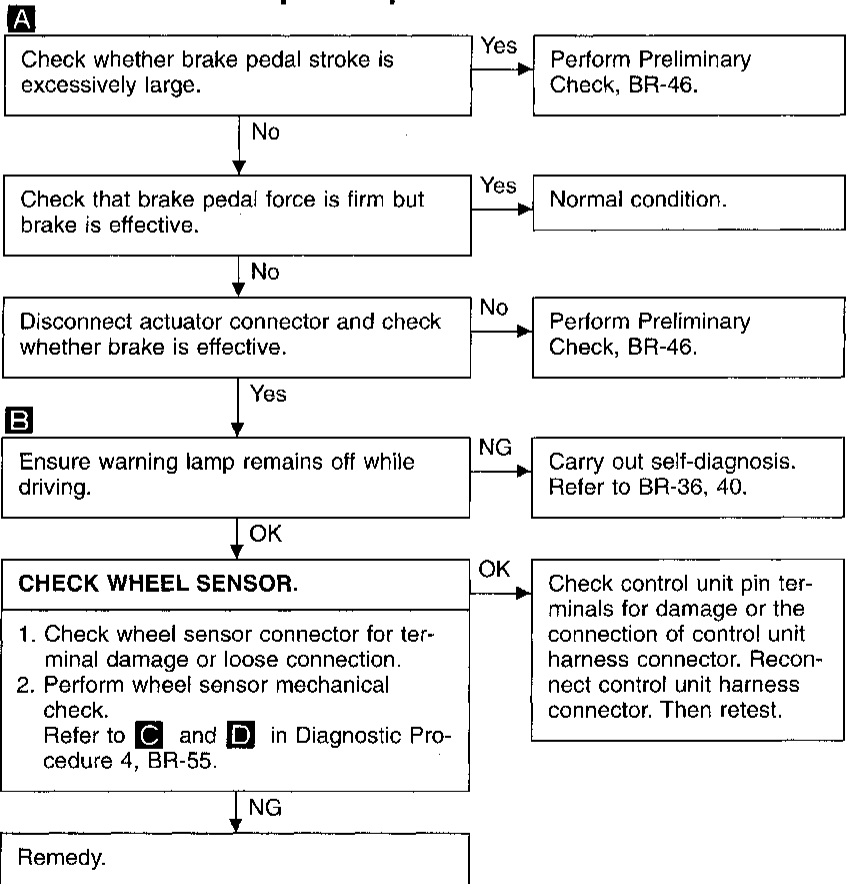
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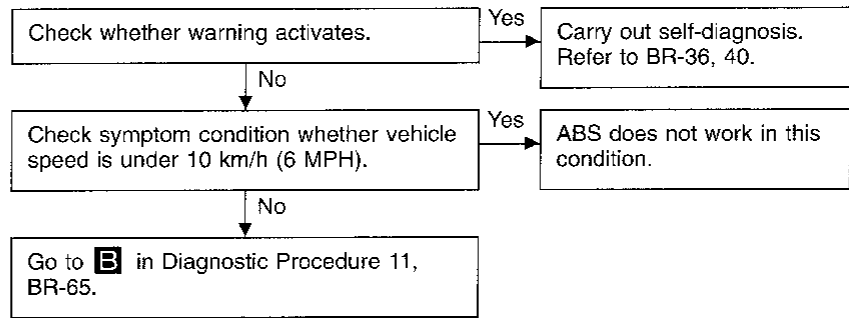
Diagnostic Procedure 11

SYMPTOM: Unexpected pedal action



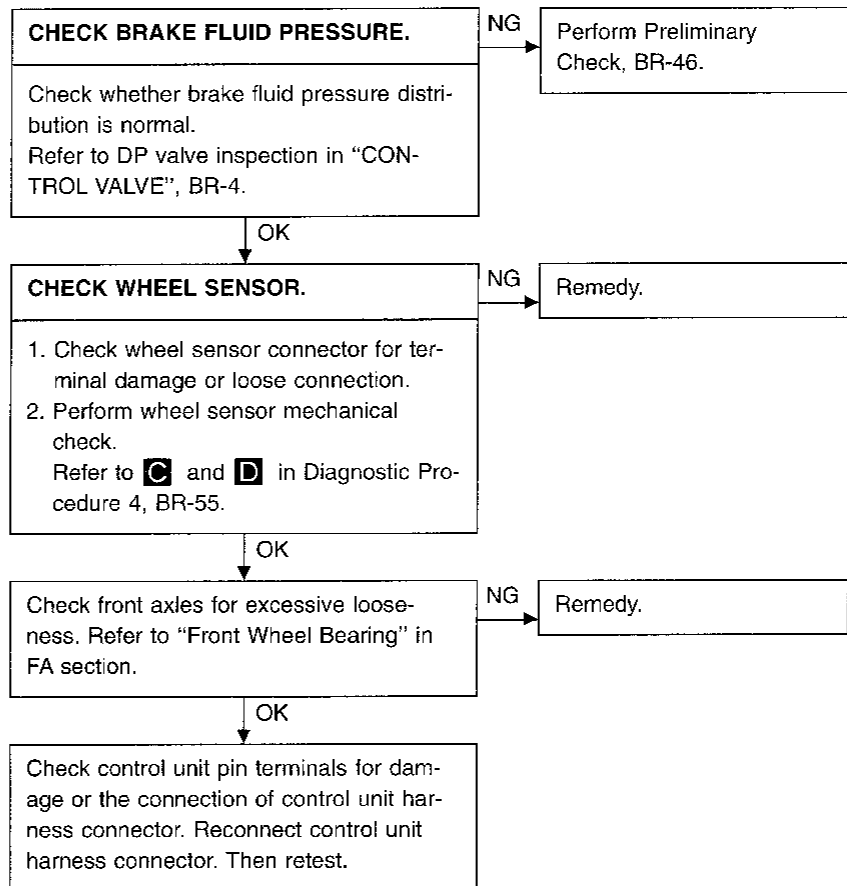
Diagnostic Procedure 12

SYMPTOM: ABS does not work.

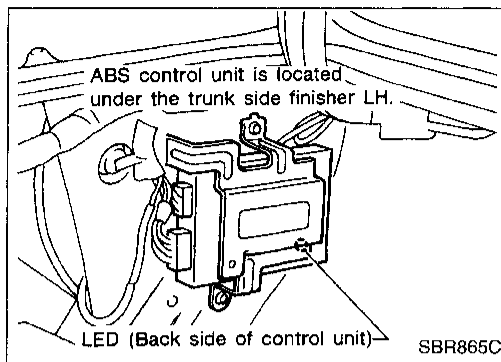


Diagnostic Procedure 13

SYMPTOM: ABS works frequently.



TROUBLE DIAGNOSES



Electrical Components Inspection

ABS CONTROL UNIT

- Check that voltage between ABS control unit terminals is within the following reference value.

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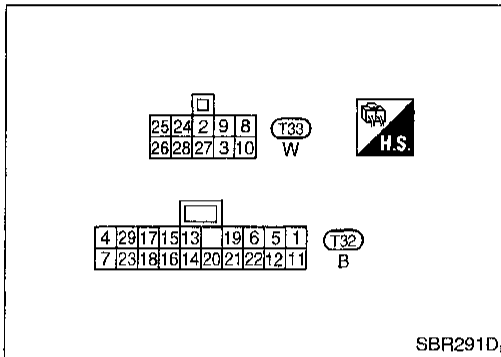
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- Pin connector terminal layout.

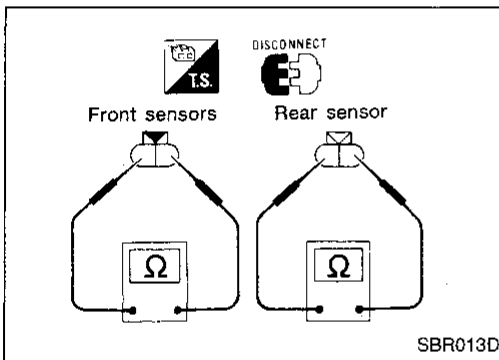
ABS control unit terminals and reference value

TERMINAL NO.		ITEM	CONDITION	DATA (Reference value)
+	-			
1		Power source	Ignition switch "ON"	Battery voltage
4		Stop lamp switch signal	Brake pedal depressed	Approx. 12V
			Brake pedal released	Less than 2V
5		Motor monitor	ABS actuator motor operating (Perform "ACTIVE TEST" mode with CONSULT.)	Less than 2V
			ABS actuator motor not operating	Approx. 12V
6		Actuator monitor	ABS actuator relay operating (Engine is running.)	Less than 2V
			ABS actuator relay not operating (Ignition switch "ON")	Approx. 12V
7	Ground	Actuator monitor	ABS actuator relay operating (Engine is running.)	Approx. 12V
			ABS actuator relay not operating (Ignition switch "ON")	Approx. 0V
8		Front solenoid valve RH IN	ABS actuator operating (Perform "ACTIVE TEST" mode with CONSULT.) Ignition switch turned "ON"	Approx. 0V
9		Rear solenoid valve IN		
10		Front solenoid valve LH IN	ABS actuator not operating (Engine is running with vehicle stopped.)	Approx. 12V
11		Motor monitor	ABS actuator motor operating (Perform "ACTIVE TEST" mode with CONSULT.)	Approx. 12V
			ABS actuator motor not operating	Approx. 0V
12		ABS warning lamp	ABS warning lamp "ON"	Approx. 0V
			ABS warning lamp "OFF"	Approx. 12V

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

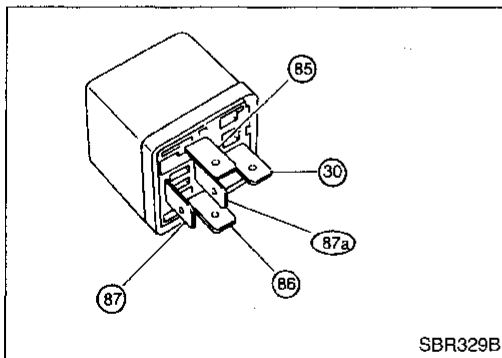
TERMINAL NO.		ITEM	CONDITION	DATA (Reference value)
+	-			
13	14	Front wheel sensor RH	Wheel is rotating	Approx. 0.1 - 0.2V
15	16	Rear wheel sensor		
17	18	Front wheel sensor LH		
23	Ground	Engine speed signal	Engine running at idle speed	Approx. 1.0V
			Engine running at 2,500 rpm	Approx. 3.1 - 3.3V
24		Front solenoid valve RH OUT	ABS actuator operating (Perform "ACTIVE TEST" mode with CONSULT.) Ignition switch "ON"	Approx. 0V
25		Rear solenoid valve OUT		
26		Front solenoid valve LH OUT	ABS actuator not operating (Engine is running with vehicle stopped.)	Approx. 12V
29	Power source	—	Battery voltage	



WHEEL SENSOR

Check resistance for each sensor.

Resistance: 0.6 - 3.3 kΩ



ACTUATOR MOTOR RELAY AND SOLENOID VALVE RELAY

	Solenoid valve relay	Actuator motor relay solenoid valve relay
Condition	Continuity existence between terminals (30) and (87a)	Continuity existence between terminals (30) and (87)
Battery voltage not applied between terminals (85) and (86).	Yes	No
Battery voltage applied between terminals (85) and (86).	No	Yes

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

Front brake		
Brake model		CL22VF disc brake
Cylinder bore diameter mm (in)		54.0 (2.126)
Pad mm (in) Length x width x thickness		112.8 x 44.8 x 10.0 (4.44 x 1.764 x 0.394)
Rotor outer diameter x thick- ness mm (in)		252 x 20 (9.92 x 0.79)
Rear brake		
Brake model		CL11H disc brake
Cylinder bore diameter mm (in)		38.18 (1.5031)
Pad mm (in) Length x width x thickness		75.0 x 40.0 x 9.5 (2.953 x 1.575 x 0.374)
Rotor outer diameter x thickness mm (in)		258 x 9 (10.16 x 0.35)

Model	Without ABS		With ABS
	M/T	A/T	
Master cylinder			
Cylinder bore diameter mm (in)	22.22 (7/8)		23.81 (15/16)
Control valve			
Valve model	Proportioning valve (built into master cylinder)		
Split point kPa (kg/cm ² , psi) x reducing ratio	1,961 (20, 284) x 0.4		
Brake booster			
Booster model	M23		M195T
Diaphragm diameter mm (in)	230 (9.06)		Primary: 205 (8.07) Secondary: 180 (7.09)
Recommended brake fluid	DOT 3		

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Inspection and Adjustment

DISC BRAKE

Brake model	CL22VF	CL11H
Pad wear limit mm (in) Minimum thickness	2.0 (0.079)	
Rotor repair limit mm (in) Minimum thickness	18.0 (0.709)	8 (0.31)

PARKING BRAKE

Type	Center lever
Number of notches [under force of 196 N (20 kg, 44 lb)]	7 - 9
Number of notches when warning lamp switch comes on	1

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BRAKE PEDAL

Model	Without ABS		With ABS	
	M/T	A/T	M/T	A/T
Free height "H" mm (in)	181 - 191 (7.13 - 7.52)	191 - 201 (7.52 - 7.91)	181 - 191 (7.13 - 7.52)	191 - 201 (7.52 - 7.91)
Depressed height "D" mm (in) [under force of 490 N (50 kg, 110 lb) with engine running]	105 (4.13)	125 (4.92)	115 (4.53)	125 (4.92)
Pedal free play "A" mm (in)	1 - 3 (0.04 - 0.12)			
Clearance "C" between pedal stopper and threaded end of stop lamp switch or ASCD switch mm (in)	0.3 - 1.0 (0.012 - 0.039)			

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