

BRAKE SYSTEM

SECTION **BR**

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PRECAUTIONS

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

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

NEBR0199

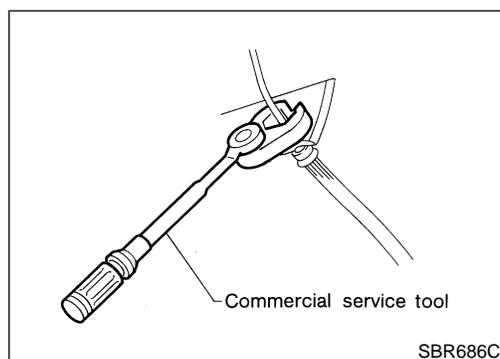
The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER" used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and in the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness, and spiral cable.

The vehicle (except Crew Cab model) is equipped with a passenger air bag deactivation switch. Because no rear seat exists where a rear-facing child restraint can be placed, the switch is designed to turn off the passenger air bag so that a rear-facing child restraint can be used in the front passenger seat. The switch is located in the center of the instrument panel, near the ashtray. When the switch is turned to the ON position, the passenger air bag is enabled and could inflate in a frontal collision. When the switch is turned to the OFF position, the passenger air bag is disabled and will not inflate in a frontal collision. A passenger air bag OFF indicator on the instrument panel lights up when the passenger air bag is switched OFF. The driver air bag always remains enabled and is not affected by the passenger air bag deactivation switch.

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

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance should be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the RS section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow harness connectors.
- The vehicle (except Crew Cab model) is equipped with a passenger air bag deactivation switch which can be operated by the customer. When the passenger air bag is switched OFF, the passenger air bag is disabled and will not inflate in a frontal collision. When the passenger air bag is switched ON, the passenger air bag is enabled and could inflate in a frontal collision. After SRS maintenance or repair, make sure the passenger air bag deactivation switch is in the same position (ON or OFF) as when the vehicle arrived for service.



Precautions for Brake System

NEBR0200

- Use brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- To clean master cylinder parts, disc brake caliper parts or wheel cylinder parts, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.
- Use flare nut wrench when removing and installing brake tubes.
- Always torque brake lines when installing.
- Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage. Refer to "Brake Burnishing Procedure", BR-10.

WARNING:

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

PRECAUTIONS

Wiring Diagrams and Trouble Diagnosis

NEBR0201

When you read wiring diagrams, refer to the following:

- Refer to **GI-11**, "HOW TO READ WIRING DIAGRAMS".
- Refer to **EL-10**, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnosis, refer to the following:

- Refer to **GI-34**, "How to Follow Test Groups In Trouble Diagnoses".
- Refer to **GI-23**, "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

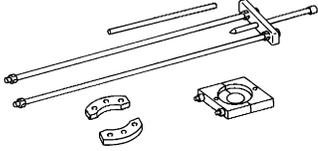
PREPARATION

Special Service Tools

Special Service Tools

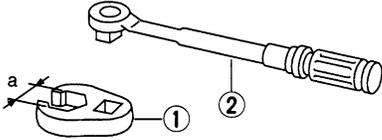
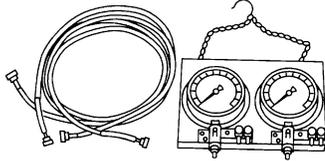
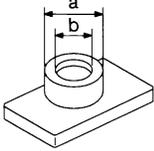
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The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

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

Commercial Service Tools

NEBR0203

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

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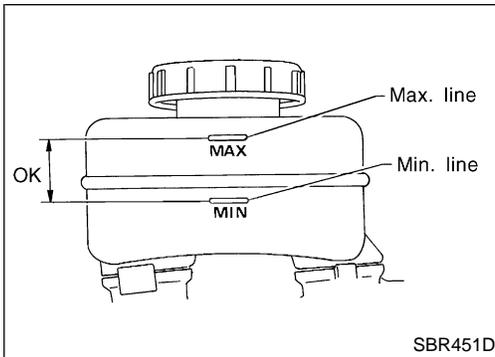
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Checking Brake Fluid Level

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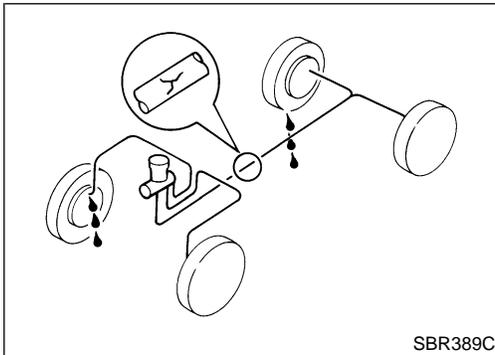
- Check fluid level in reservoir tank. It should be between MAX and MIN lines on reservoir tank.
- If fluid level is extremely low, check brake system.
- If the brake warning lamp comes on, check brake fluid level switch and parking brake switch.

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Checking Brake Line

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CAUTION:

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

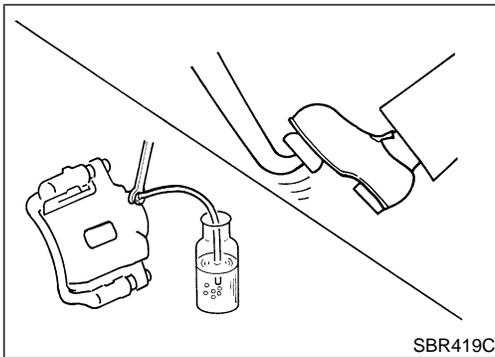
1. Check brake lines (tubes and hoses) for cracks, deterioration and other damage. Replace any damaged parts.
2. Check for oil leakage by fully depressing brake pedal while engine is running.

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Changing Brake Fluid

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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.

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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.

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Refer to "Bleeding Brake System", BR-11.

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Brake Burnishing Procedure

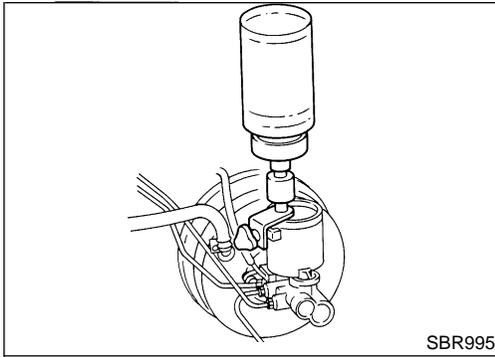
Burnish the brake contact surfaces according to the following procedure after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage. =NEBR0249

CAUTION:

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

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

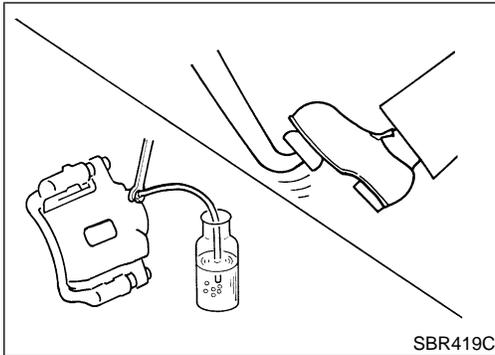
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Bleeding Brake System

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”, BR-21.
- Fill reservoir with new brake fluid “DOT 3”. Make sure it is full at all times while bleeding air out of system.
- Place a container under master cylinder to avoid spillage of brake fluid.
- Turn ignition switch OFF and disconnect ABS actuator (KA24DE)/ABS actuator and electric unit (VG33E and VG33ER) connector or battery cable.
- Bleed air in the following order.
 1. LSV air bleeder (Models equipped with LSV)
 2. Left rear brake
 3. Right rear brake
 4. Left front brake
 5. Right front brake
 6. ABS actuator (KA24DE) or ABS actuator and electric unit (VG33E and VG33ER)



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)

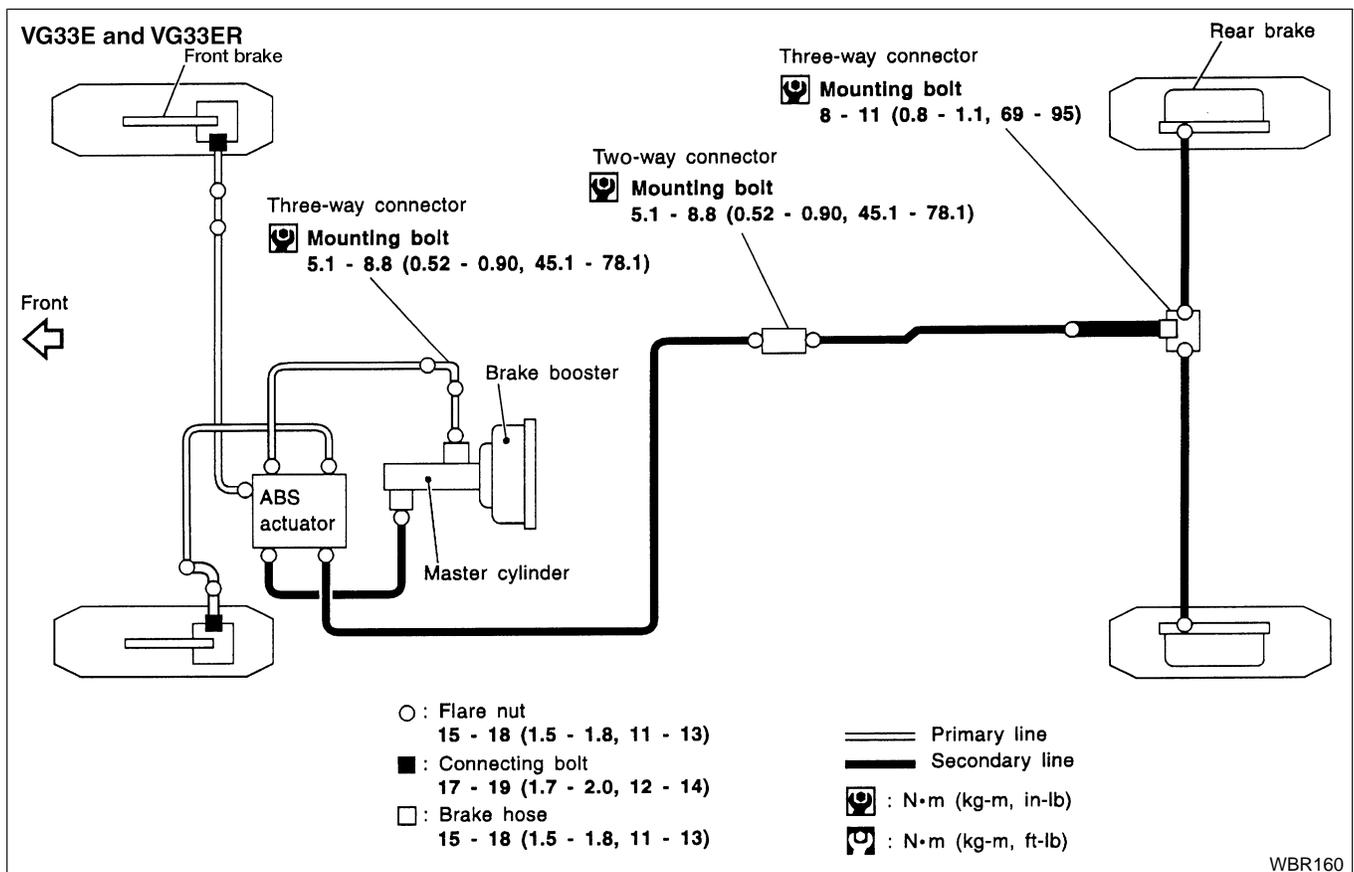
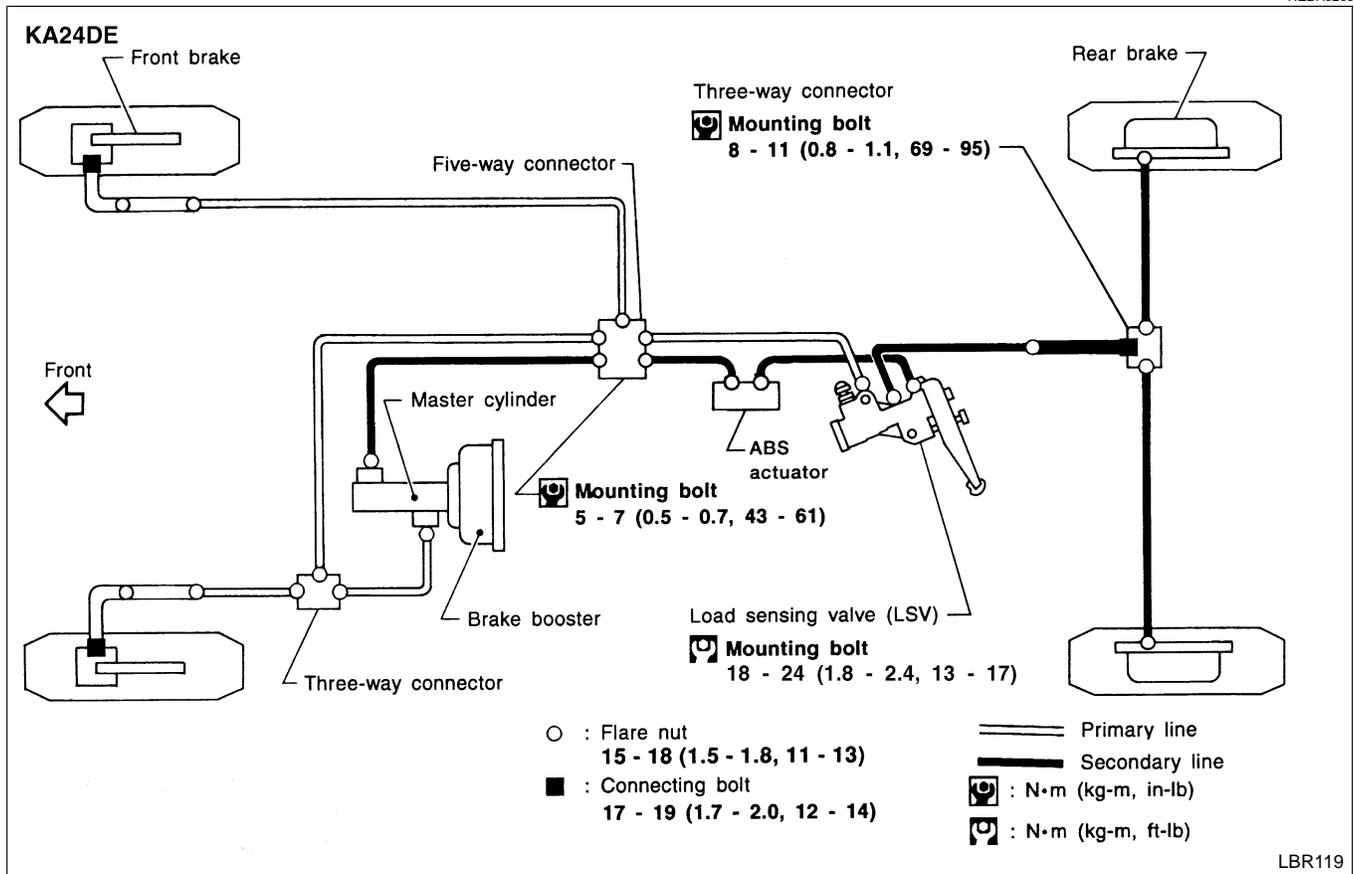
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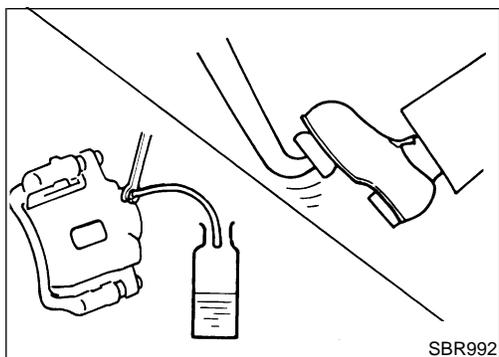
BRAKE HYDRAULIC LINE

Hydraulic Circuit

Hydraulic Circuit

NEBR0209





Removal

NEBR0210

CAUTION:

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

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

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Inspection

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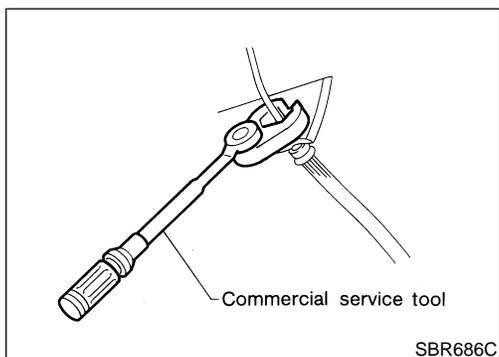
Check brake lines (tubes and hoses) for cracks, deterioration and other damage. Replace any damaged parts.

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Installation

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CAUTION:

- Refill with new brake fluid "DOT 3".
 - Never reuse drained brake fluid.
1. Tighten all flare nuts and connecting bolts.

Flare nut:

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

Connecting bolt:

 : 17 - 19 N·m (1.7 - 2.0 kg·m, 12 - 14 ft·lb)

2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to "Bleeding Brake System", BR-11.

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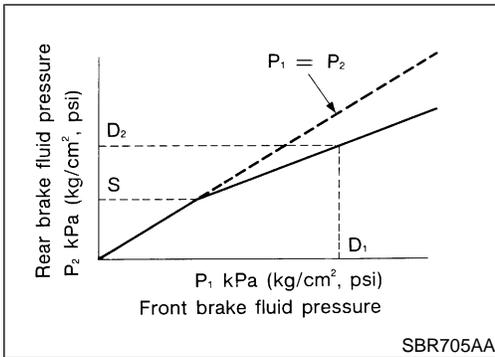
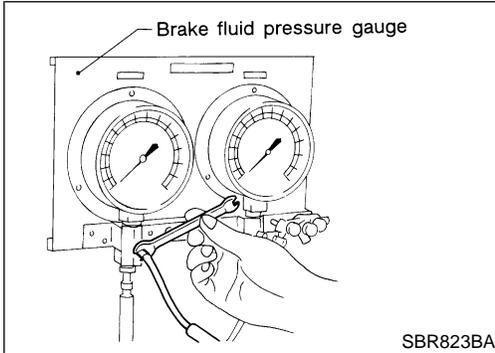
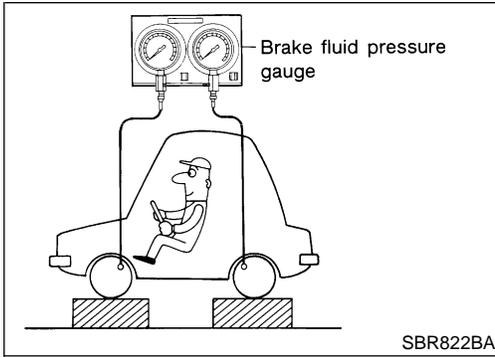
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PROPORTIONING VALVE (VG33E AND VG33ER)

Inspection



Inspection

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CAUTION:

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

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

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

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

kPa (kg/cm², psi)

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

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

6. Bleed air after disconnecting the tool. Refer to “Bleeding Brake System”, BR-11.
7. Install front LH tire.

Removal and Installation (Built-in type)

NEBR0214

Always replace together with master cylinder as an assembly.

- Refer to “MASTER CYLINDER”, BR-19.

LOAD SENSING VALVE (KA24DE)

Inspection

Inspection

NEBR0278

CAUTION:

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

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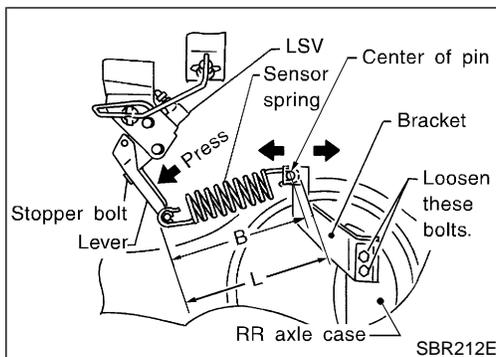
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1. Park vehicle on a level surface with vehicle unloaded*.
* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
2. Press a lever to the stopper bolt, then adjust length "B" as follows:

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

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

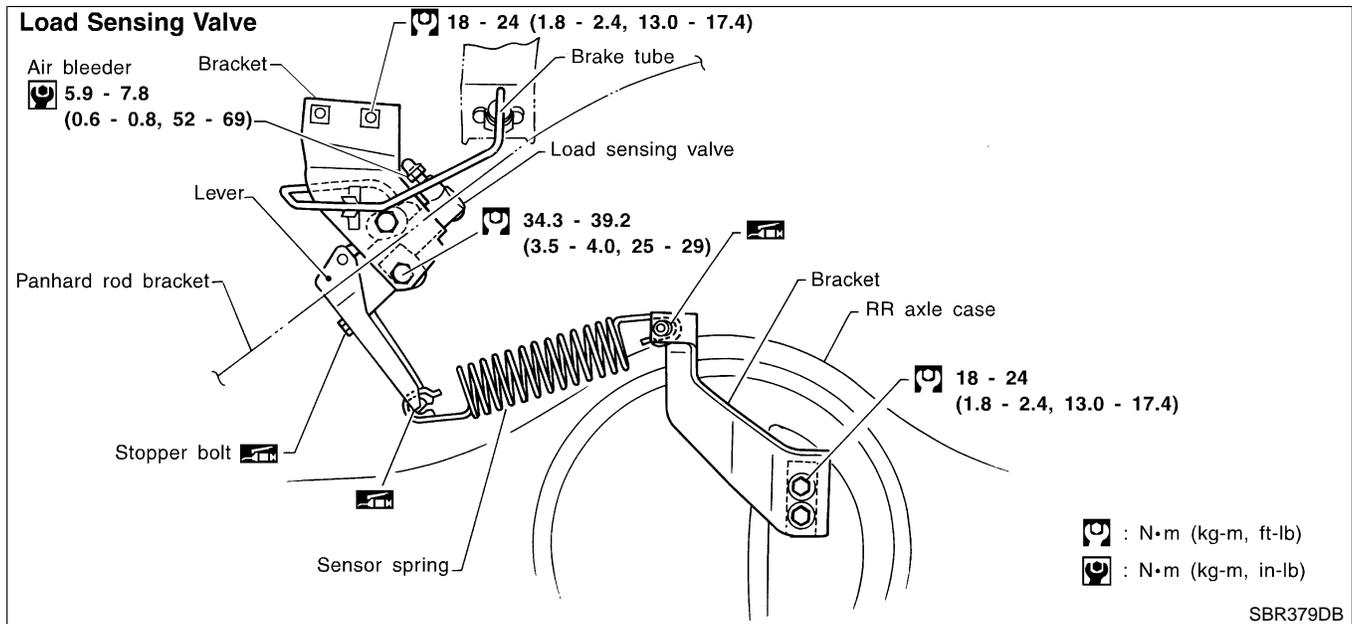
LOAD SENSING VALVE (KA24DE)

Removal and Installation

=NEBR0279

CAUTION:

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



1. Tighten all flare nuts and mounting bolts.

Flare nut:

□ : 15 - 17 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to "Bleeding Brake System", BR-11.

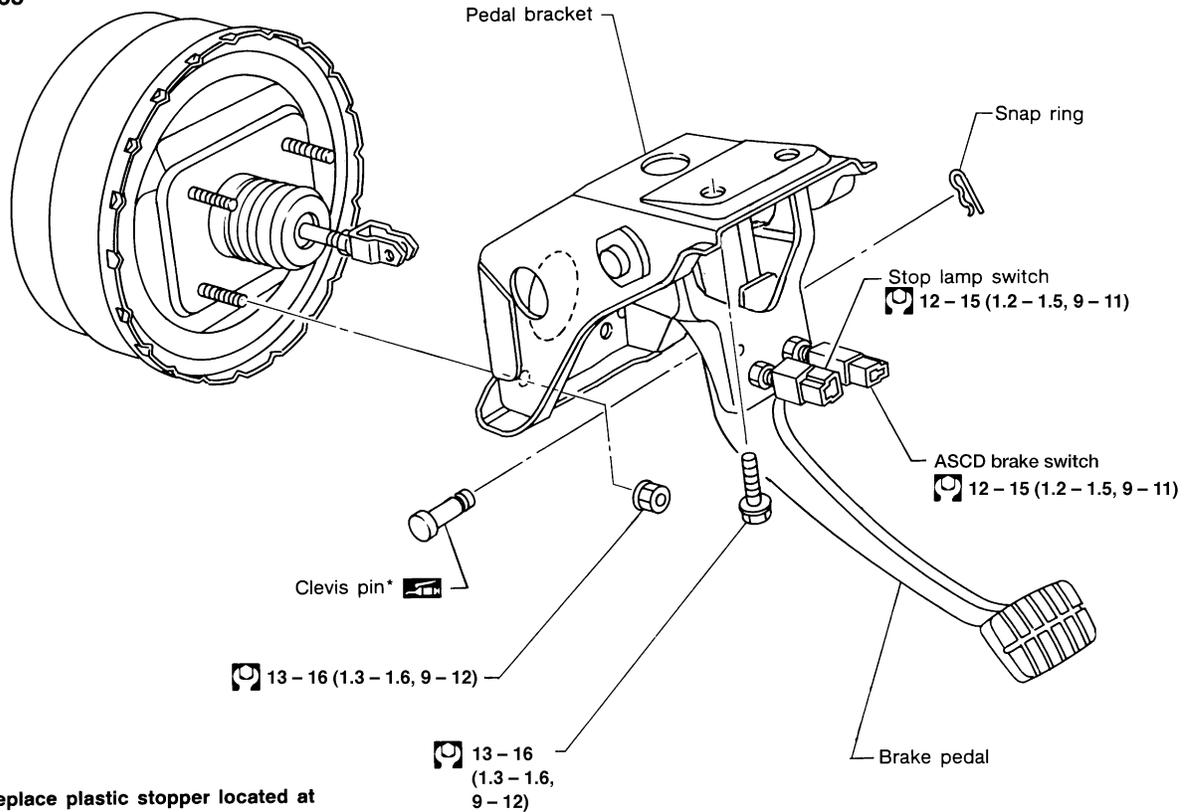
BRAKE PEDAL AND BRACKET

Removal and Installation

Removal and Installation

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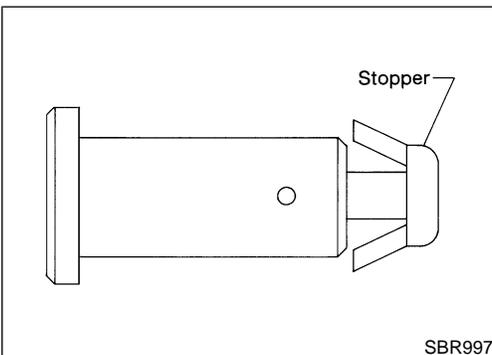
SEC. 465



* Replace plastic stopper located at the end of clevis pin if deformed or damaged.

: N·m (kg-m, ft-lb)

ABR815



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

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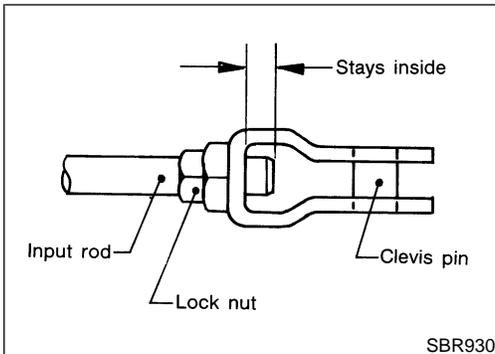
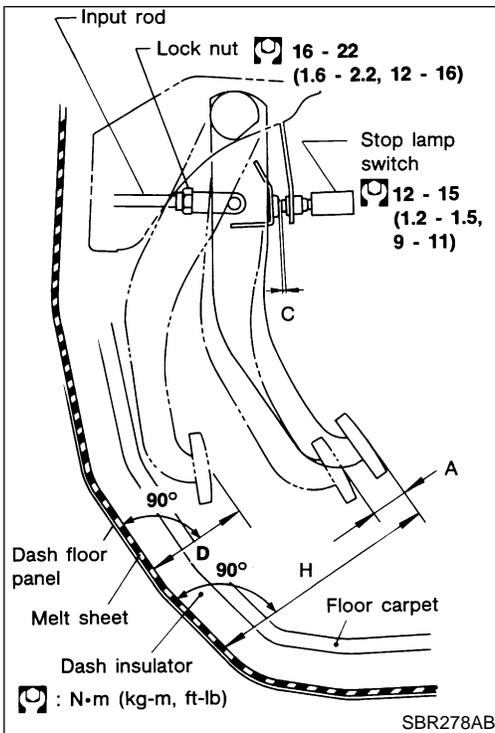
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BRAKE PEDAL AND BRACKET

Adjustment

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Adjustment

Check brake pedal free height from metal panel.

H: Free height

Refer to "Brake Pedal", BR-154.

D: Depressed height

Refer to "Brake Pedal", BR-154.

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)

If necessary, adjust brake pedal free height.

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

Make sure that tip of input rod stays inside.

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

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

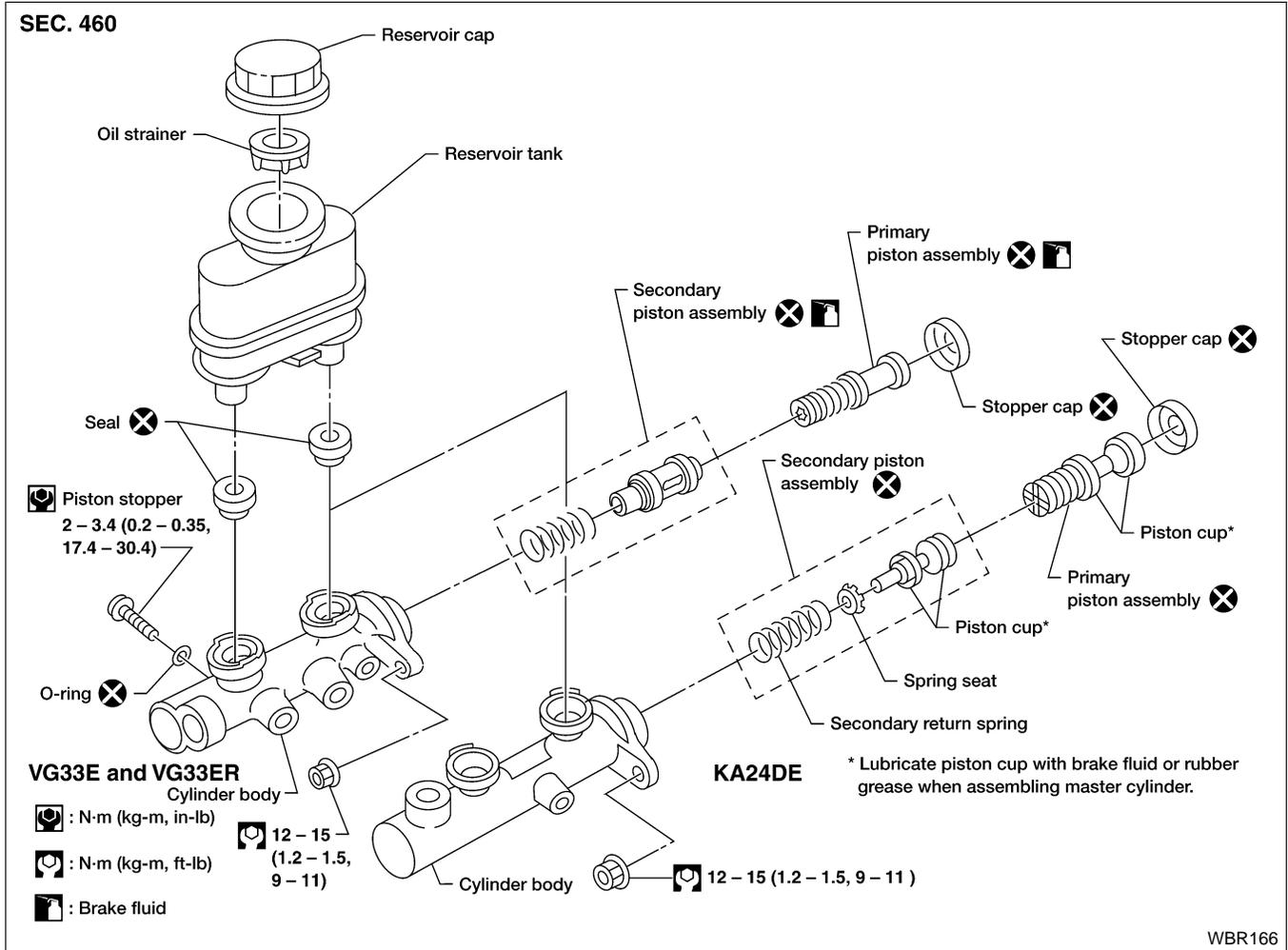
4. Check brake pedal depressed height while engine is running. If lower than specification, check for leaks, air in system, or damage to components (master cylinder, wheel cylinder, etc.). Then make necessary repairs.

MASTER CYLINDER

Removal

Removal

NEBR0220



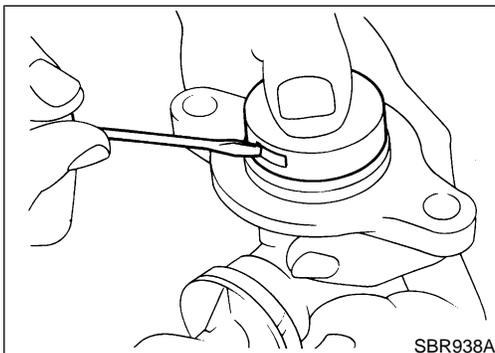
CAUTION:

- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
 - In the case of brake fluid leakage from the master cylinder, disassemble the cylinder. Then check piston cups for deformation and scratches and replace necessary parts.
1. Connect a vinyl tube to air bleeder valve.
 2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
 3. Remove brake pipe flare nuts.
 4. Remove master cylinder mounting nuts.

Disassembly

1. Bend claws of stopper cap outward.

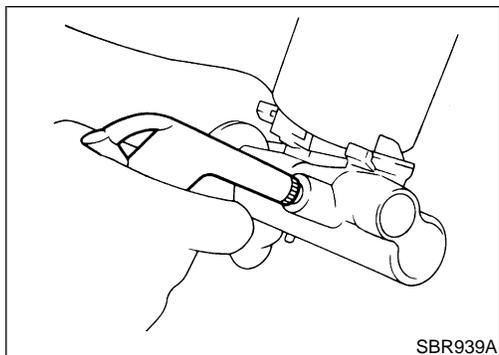
NEBR0221



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MASTER CYLINDER

Disassembly (Cont'd)



2. Remove piston assemblies.

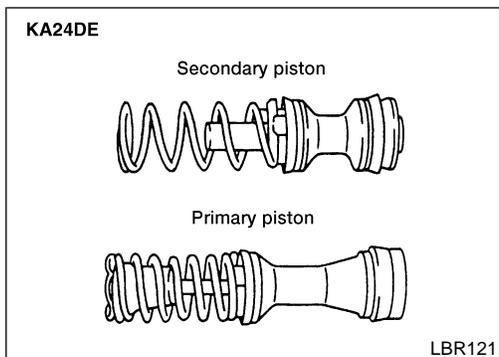
If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.

3. Draw out reservoir tank.

Inspection

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

NEBR0222

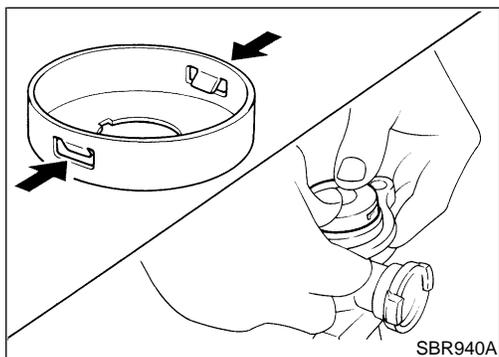
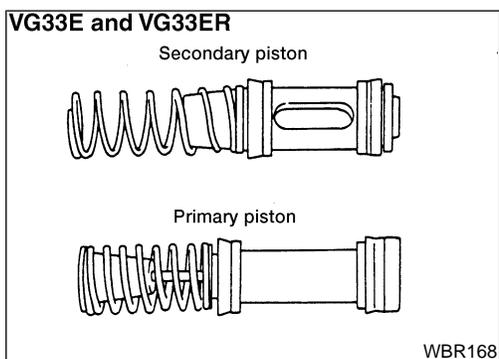


Assembly

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.

NEBR0223



2. Install stopper cap.

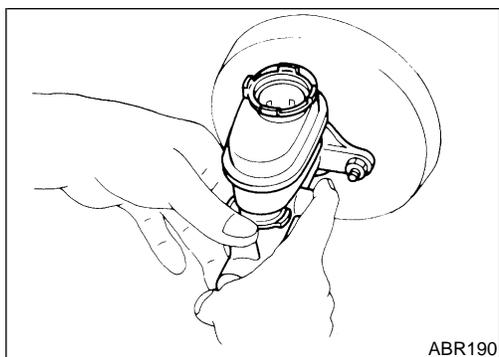
Before installing stopper cap, ensure that claws are bent inward.

3. Push reservoir tank seals into cylinder body.

4. Push reservoir tank into cylinder body.

MASTER CYLINDER

Installation



Installation

NEBR0224

CAUTION:

- Refill with new brake fluid “DOT 3”.
 - Never reuse drained brake fluid.
1. Place master cylinder onto brake booster and secure mounting nuts lightly.
 2. Torque mounting nuts.
🔧 : 12 - 15 N·m (1.2 - 1.5 kg-m, 9 - 11 ft-lb)
 3. Fill reservoir tank with new brake fluid.
 4. Plug all ports on master cylinder with fingers to prevent air suction while releasing brake pedal.
 5. Have driver depress brake pedal slowly several times until no air comes out of master cylinder.
 6. Fit brake lines to master cylinder.
 7. Tighten flare nuts.
🔧 : 15 - 17 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
 8. Bleed air from brake system. Refer to “Bleeding Brake System”, BR-11.

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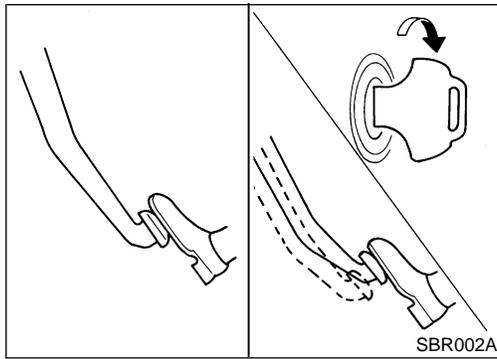
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BRAKE BOOSTER

On-vehicle Service



On-vehicle Service

OPERATING CHECK

NEBR0225

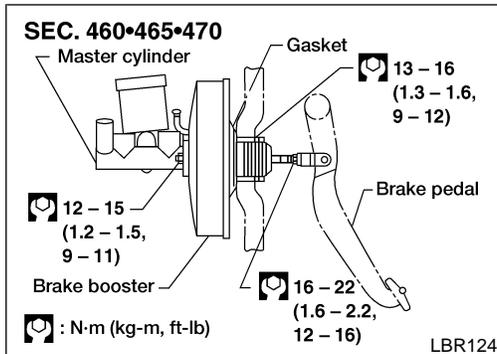
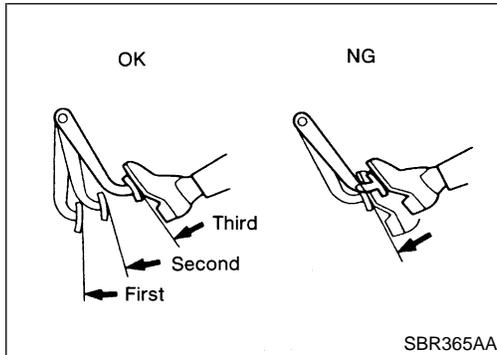
NEBR0225S01

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

AIRTIGHT CHECK

NEBR0225S02

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

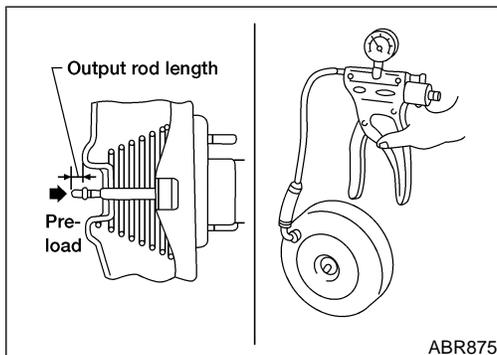


Removal

NEBR0226

CAUTION:

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



Inspection

OUTPUT ROD LENGTH CHECK

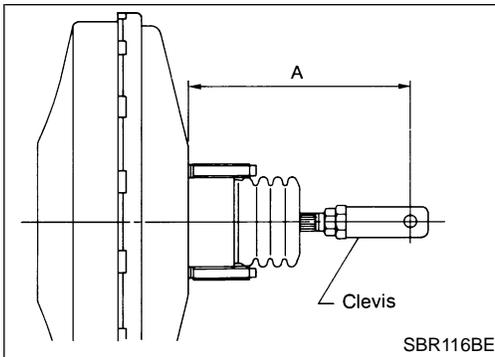
NEBR0227

NEBR0227S01

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

Specified length:

10.275 - 10.525 mm (0.4045 - 0.4144 in)



Installation

CAUTION:

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

A:

KA24DE

160 mm (6.30 in)

VG33E and VG33ER

165 mm (6.50 in)

1. Before fitting booster, temporarily adjust clevis to dimension shown.
2. Fit booster, then secure mounting nuts (brake pedal bracket to brake booster) lightly.
3. Connect brake pedal and booster input rod with clevis pin.
4. Secure mounting nuts.
 - Specification: 13 - 16 N·m (1.3 - 1.6 kg·m, 9 - 12 ft·lb)**
5. Install master cylinder. Refer to "Installation", BR-21.
6. Adjust brake pedal height and free play. Refer to "Adjustment", BR-18.
7. Secure lock nut for clevis.
 - ⚙️ : 16 - 22 N·m (1.6 - 2.2 kg·m, 12 - 16 ft·lb)**
8. Bleed air. Refer to "Bleeding Brake System", BR-11.

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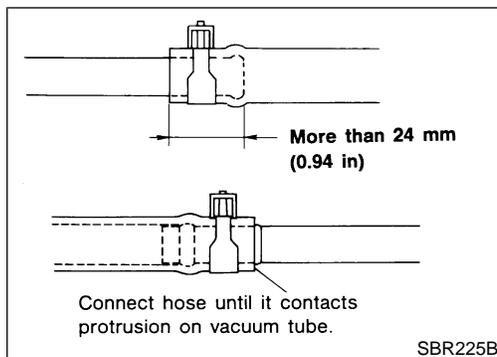
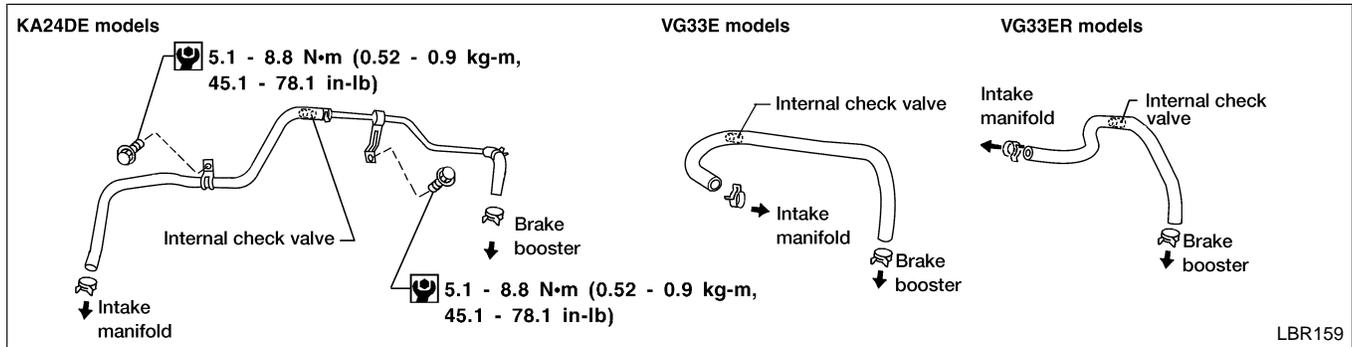
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VACUUM PIPING

Vacuum Hose

Vacuum Hose

NEBR0229



Removal and Installation

NEBR0230

CAUTION:

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

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

Inspection

HOSES AND CONNECTORS

=NEBR0231

NEBR0231S01

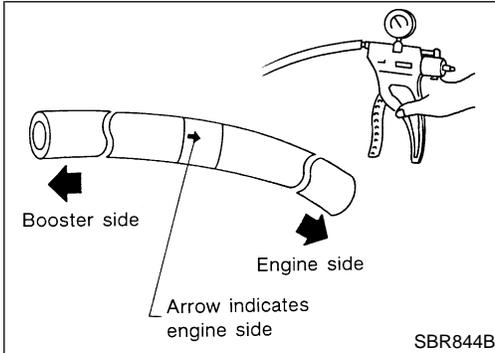
Check vacuum lines and connections for airtightness, improper attachment, chafing and deterioration.

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CHECK VALVE

NEBR0231S02

Check vacuum with a vacuum pump.

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

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FRONT DISC BRAKE

Pad Replacement

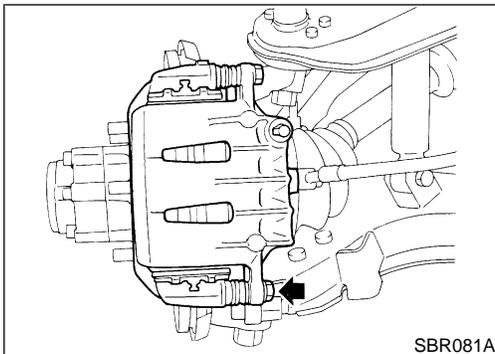
NEBR0232

WARNING:

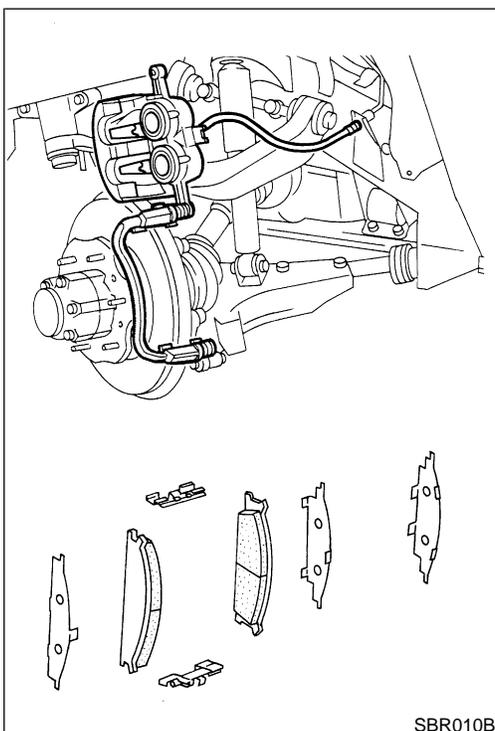
Clean brakes with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

CAUTION:

- When cylinder body is open, do not depress brake pedal, or piston will pop out.
- Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.
- If shims are rusted or show peeling of the rubber coat, replace them with new shims.
- It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.
- Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage. Refer to "Brake Burnishing Procedure", BR-10.



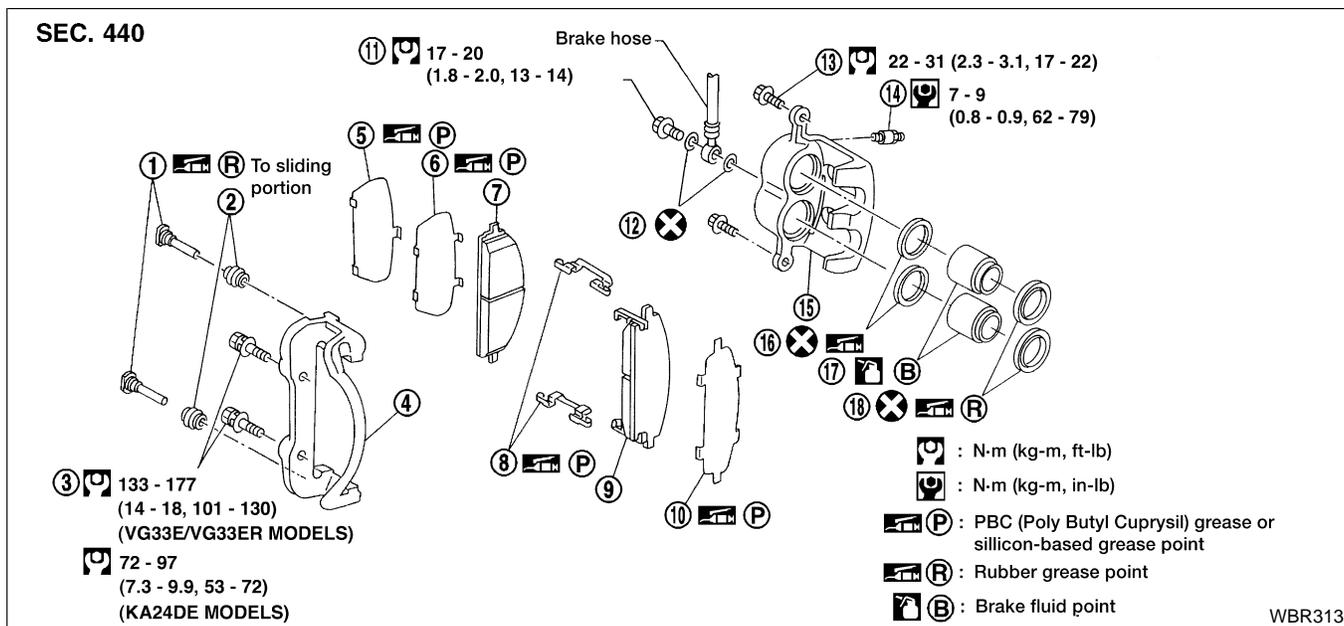
1. Remove master cylinder reservoir cap.
2. Remove lower pin bolt.



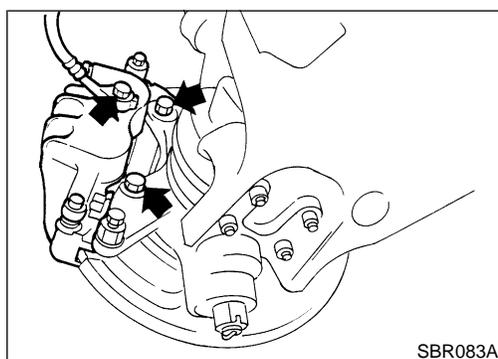
3. Open cylinder body upward. Then remove pad retainers, inner and outer shims and shim cover (if so equipped).
Standard pad thickness:
10 mm (0.39 in)
Pad wear limit:
2.0 mm (0.079 in)
- Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

FRONT DISC BRAKE

Pad Replacement (Cont'd)



- | | | |
|--------------------------------|---------------------|-------------------|
| 1. Main pin | 7. Inner pad | 13. Main pin bolt |
| 2. Pin boot | 8. Pad retainer | 14. Bleed valve |
| 3. Torque member fixing bolt | 9. Outer pad | 15. Cylinder body |
| 4. Torque member | 10. Outer shim | 16. Piston seal |
| 5. Shim cover (if so equipped) | 11. Connecting bolt | 17. Piston |
| 6. Inner shim | 12. Copper washer | 18. Piston boot |



Removal

WARNING:

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

CAUTION:

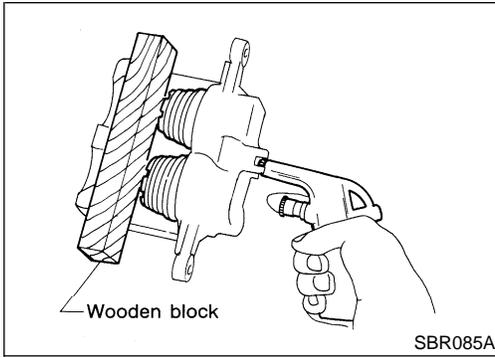
Suspend caliper assembly with wire so as not to stretch brake hose.

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.

FRONT DISC BRAKE

Disassembly



Disassembly

NEBR0234

WARNING:

Do not place your fingers in front of piston.

CAUTION:

- Do not scratch or score cylinder wall.
 - CL28VD type front disc brake uses plastic pistons. Handle them carefully.
1. Push out piston and dust covers with compressed air. Use a wooden block so that both pistons come out evenly.
 2. Remove piston seal with a suitable tool.

Inspection

NEBR0235

CALIPER

NEBR0235S01

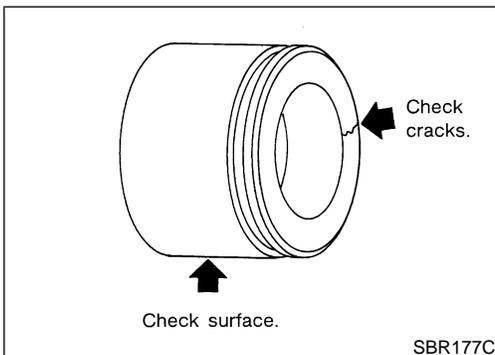
Cylinder Body

NEBR0235S0101

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

CAUTION:

Use brake fluid to clean. Never use mineral oil.



Piston

NEBR0235S0102

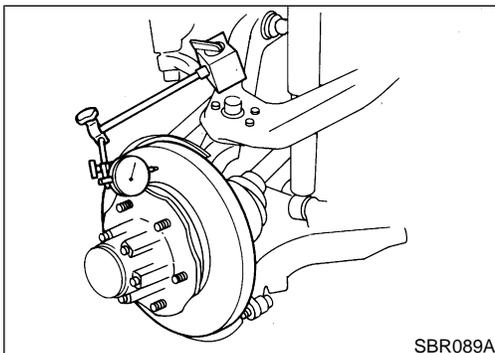
CAUTION:

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

Slide Pin, Pin Bolt and Pin Boot

NEBR0235S0103

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



ROTOR

NEBR0235S02

Runout

NEBR0235S0201

1. Check runout using a dial indicator.

Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to AX-5, "FRONT WHEEL BEARING".

Maximum runout:

0.07 mm (0.0028 in)

2. If the runout is out of specification, find minimum runout position as follows:

FRONT DISC BRAKE

Inspection (Cont'd)

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

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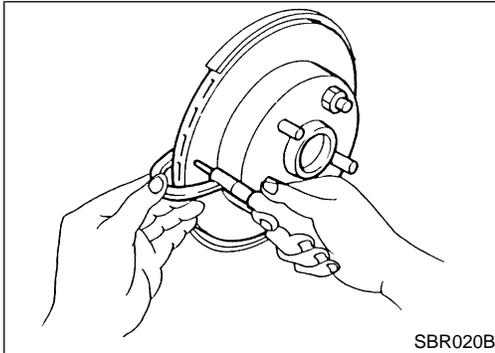
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Thickness

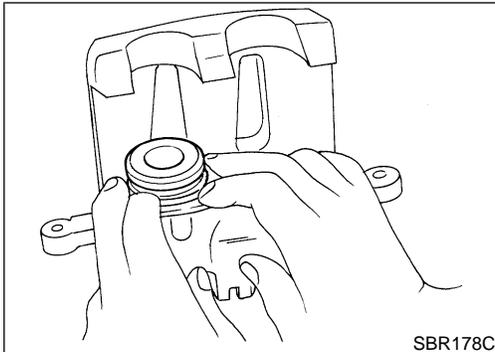
Thickness variation (At least 8 positions):
Maximum 0.02 mm (0.0008 in)

NEBR0235S0202

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

Rotor repair limit:
24.0 mm (0.945 in)

AT



Assembly

NEBR0236

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

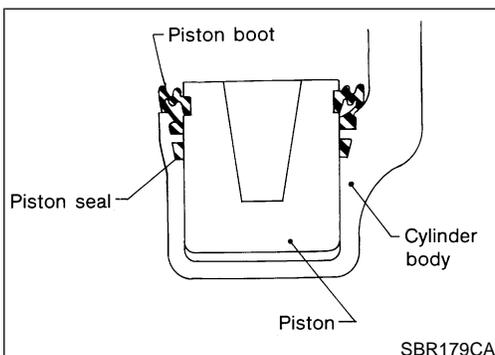
CAUTION:

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

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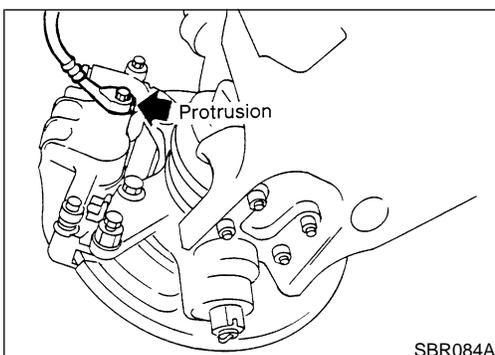


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Installation

NEBR0237

CAUTION:

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

- Install caliper assembly.
- Install brake hose to caliper securely.
- Install all parts and secure all bolts.
- Bleed air. Refer to "Bleeding Brake System", BR-11.

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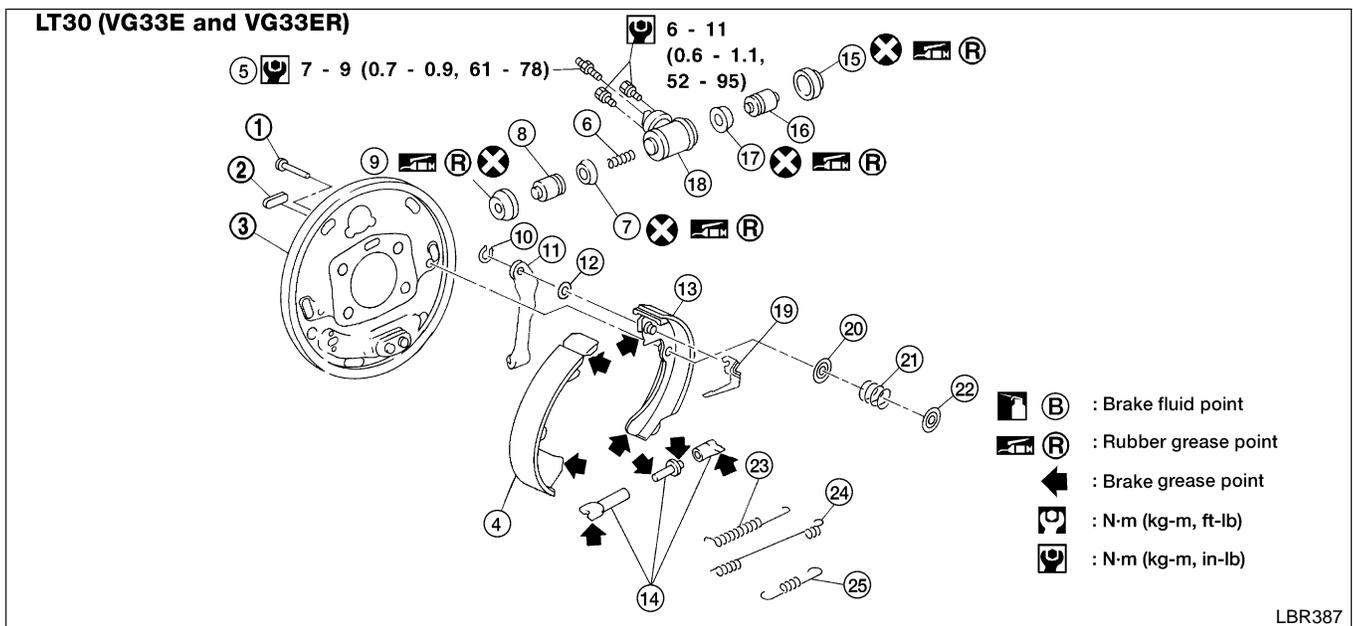
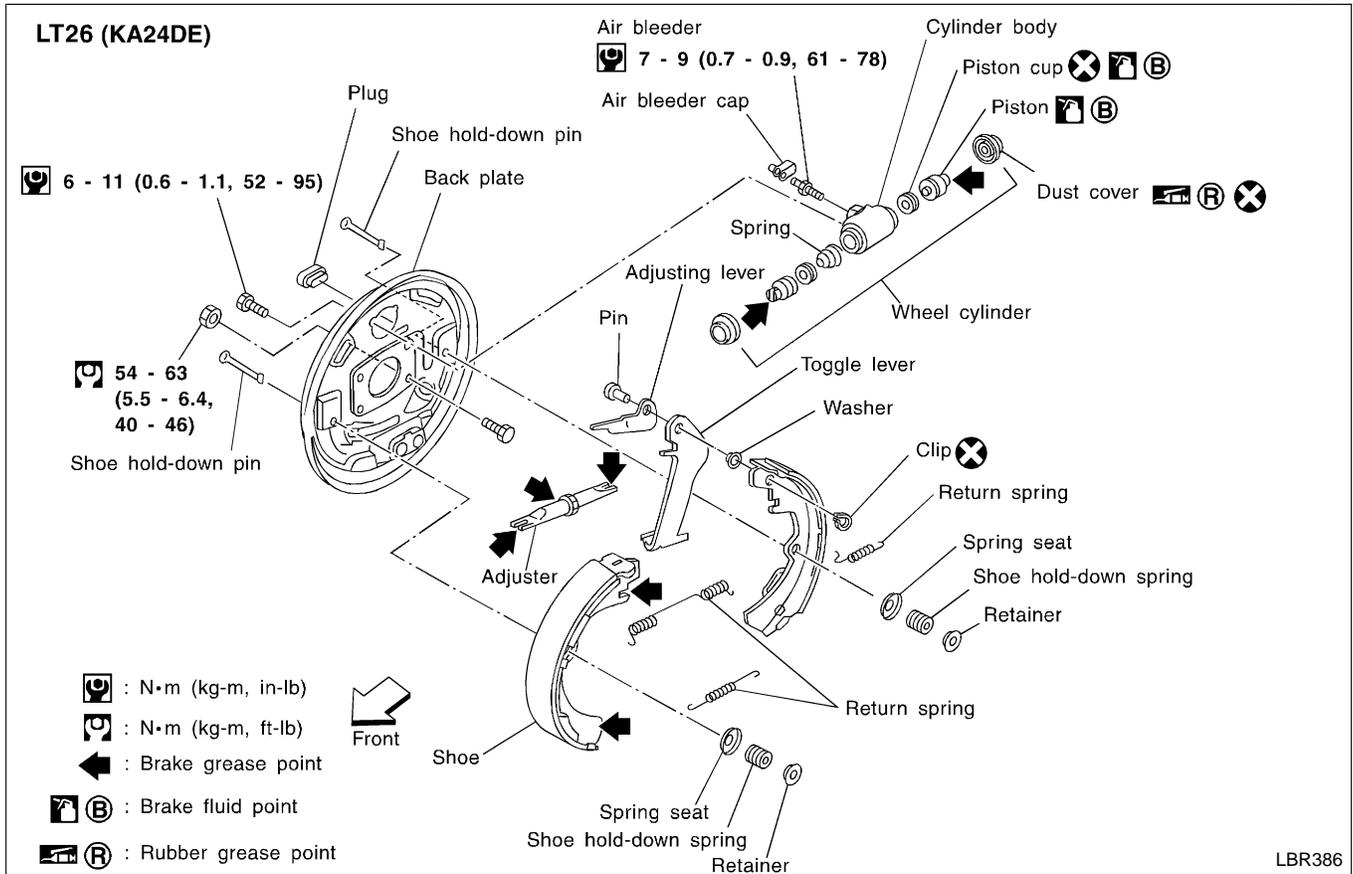
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REAR DRUM BRAKE

Components

Components

NEBR0239



- | | | |
|------------------------|--------------------------|---------------------------|
| 1. Shoe hold pin | 9. Boot | 17. Piston cup |
| 2. Plug | 10. Retainer ring | 18. Wheel cylinder |
| 3. Back plate | 11. Toggle lever | 19. Adjuster lever |
| 4. Shoe (leading side) | 12. Wave washer | 20. Spring seat |
| 5. Air bleeder | 13. Shoe (trailing side) | 21. Shoe hold spring |
| 6. Spring | 14. Adjuster | 22. Retainer |
| 7. Piston cup | 15. Boot | 23. Adjuster spring |
| 8. Piston | 16. Piston | 24. Return spring (upper) |

25. Return spring (lower)

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Removal

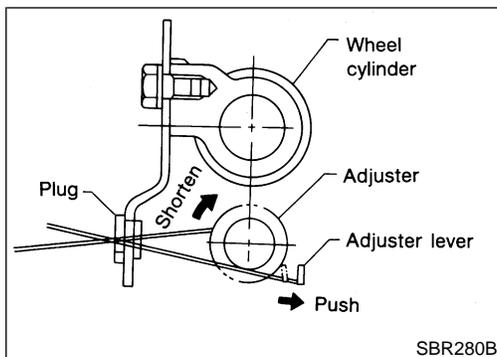
NEBR0240

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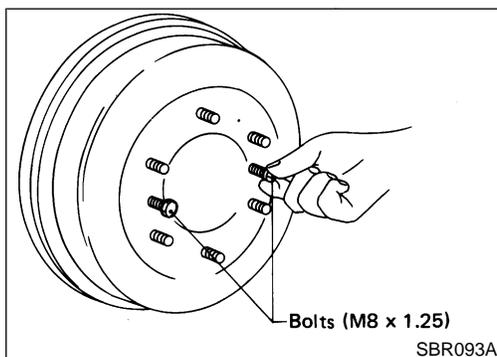
Clean brake lining with a vacuum dust collector to minimize the hazard of airborne asbestos or other materials.

CAUTION:

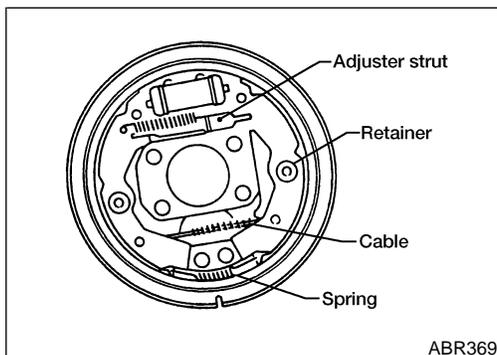
Make sure parking brake lever is released completely.



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



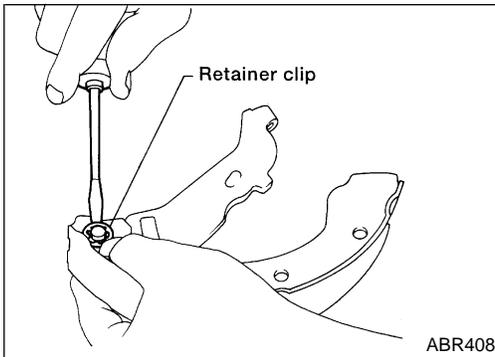
- b. Install two bolts as shown. Tighten the two bolts gradually.



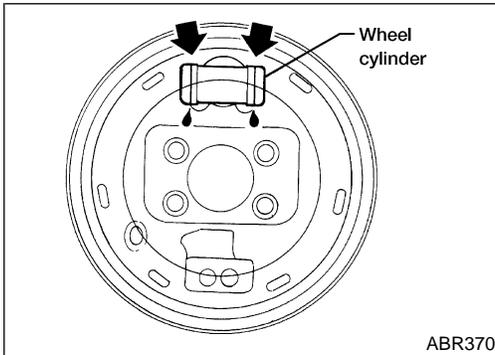
2. After removing shoe hold pin by rotating push retainer, remove leading shoe then remove trailing shoe. Remove spring by rotating shoes in direction arrow.
 - Be careful not to damage wheel cylinder piston boots.
 - Be careful not to damage parking brake cable when separating it.
 3. Remove adjuster.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

REAR DRUM BRAKE

Removal (Cont'd)



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



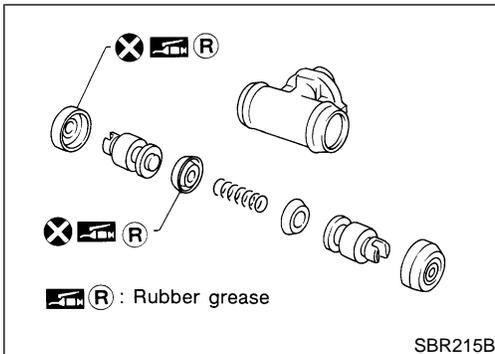
Inspection

WHEEL CYLINDER

NEBR0241

NEBR0241S01

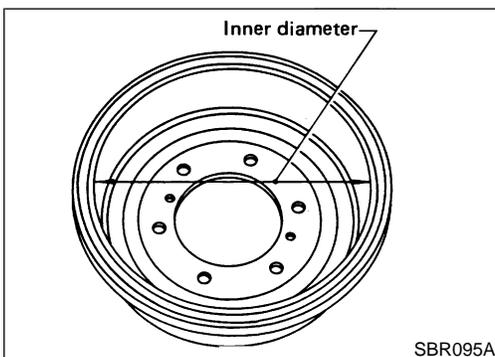
- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions. Replace if any such condition exists.



Wheel Cylinder Overhaul

NEBR0242

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



Inspection

DRUM

NEBR0243

NEBR0243S01

Maximum inner diameter (Repair limit):

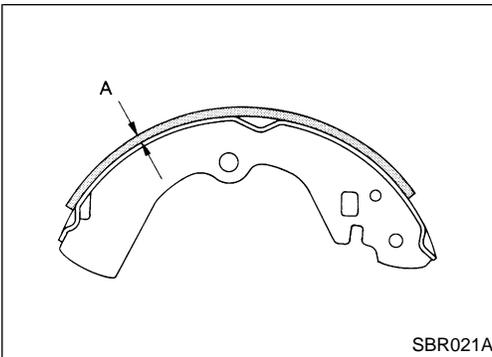
LT26 261.5 mm (10.30 in)

LT30 296.5 mm (11.67 in)

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

REAR DRUM BRAKE

Inspection (Cont'd)



LINING

Check lining thickness.

NEBR0243S02

Standard lining thickness:

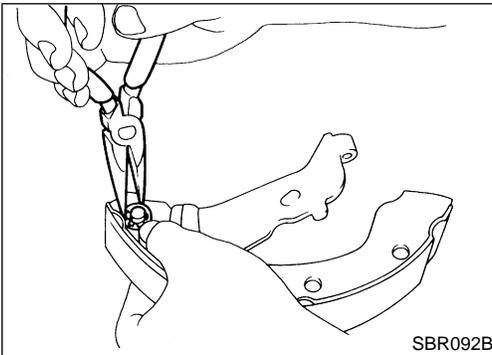
LT26 5.5 mm (0.217)

LT30 5.8 mm (0.228 in)

Lining wear limit (A):

LT26 1.5 mm (0.059 in)

LT30 1.5 mm (0.059 in)

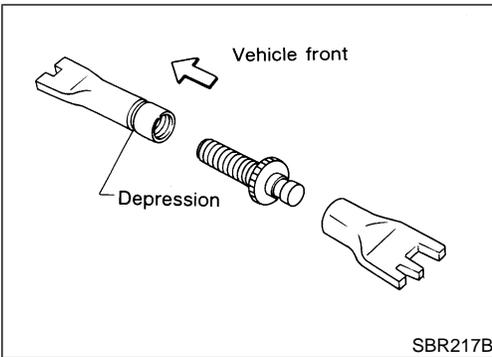


Installation

NEBR0244

- 1) **Always perform shoe clearance adjustment.**
- 2) **Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low mileage. Refer to "Brake Burnishing Procedure", BR-10.**

1. Fit toggle lever to brake shoe (trailing side) with retainer ring.



2. Shorten adjuster by rotating it.

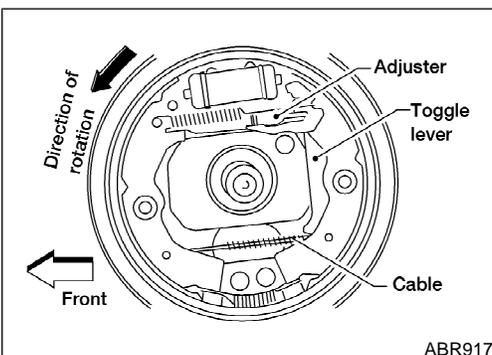
- **Pay attention to direction of adjuster.**

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

3. Connect parking brake cable to toggle lever.

4. Install all parts.

Be careful not to damage wheel cylinder piston boots.



5. Check all parts are installed properly.

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

6. Install brake drum.

7. When installing new wheel cylinder or overhauling wheel cylinder, bleed air. Refer to "Bleeding Brake System", BR-11.

8. Adjust parking brake. Refer to "Adjustment", BR-36.

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

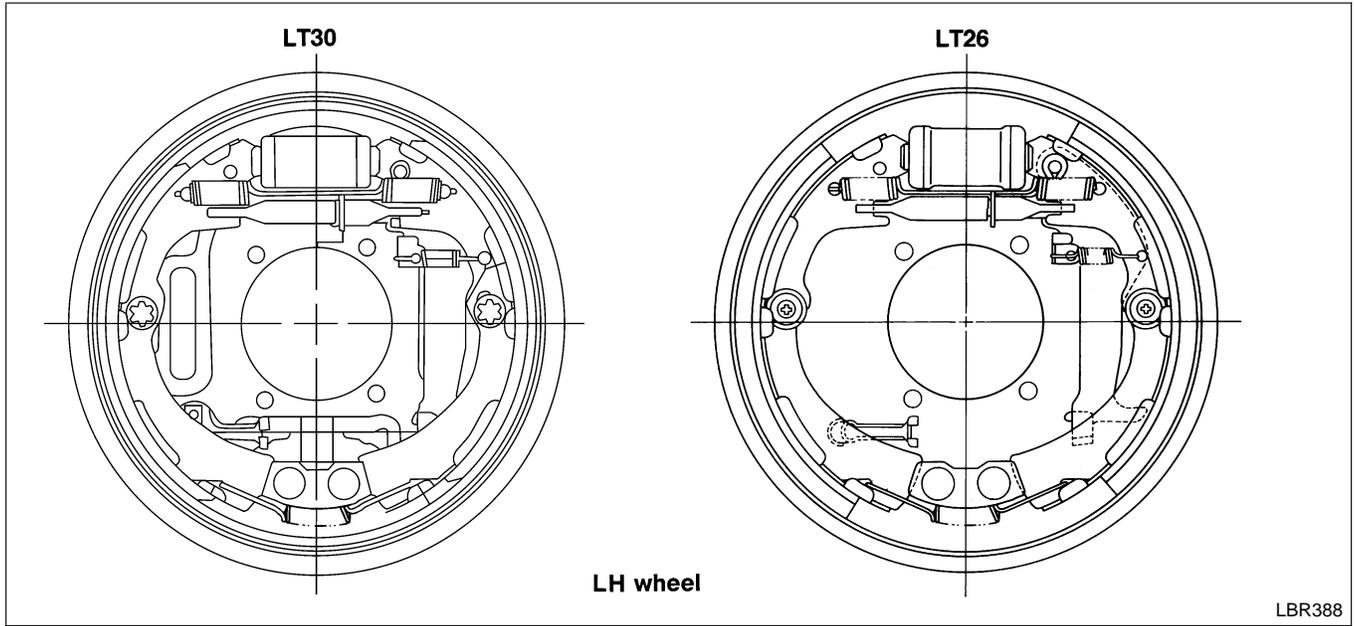
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REAR DRUM BRAKE

Installation (Cont'd)

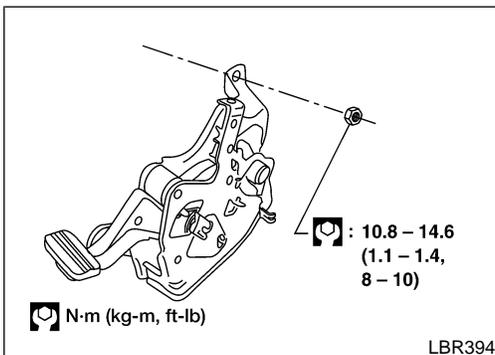
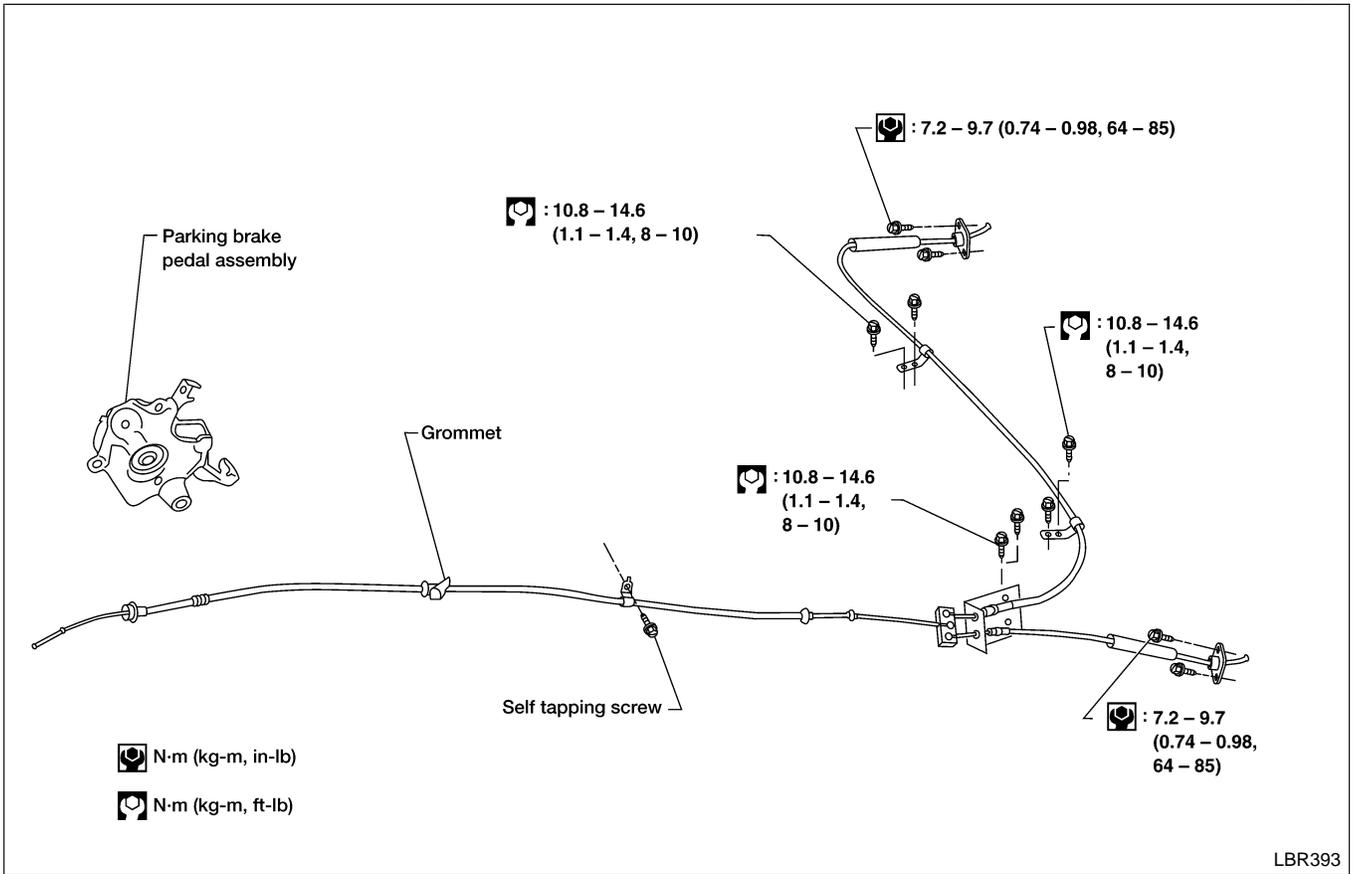
LT30 AND LT26 MODELS

NEBR0244S02



Components

NEBR0245



Removal and Installation

NEBR0246

1. To remove parking brake pedal, remove lower instrument panel on driver side.
2. Disconnect parking brake switch electrical connector.
3. Remove nuts, slacken off and remove adjusting nut.
4. Remove pedal assembly from vehicle and remove front cable from pedal assembly.

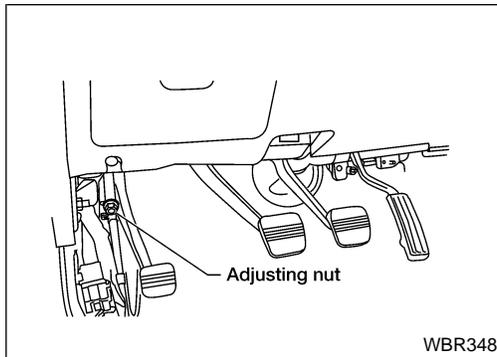
Inspection

NEBR0247

1. Check parking brake pedal assembly for wear or other damage. Replace if necessary.
2. Check cables for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Replace if necessary.
4. Check parts at each connection portion and, if found deformed or damaged, replace.

PARKING BRAKE CONTROL

Adjustment



Adjustment

Pay attention to the following point after adjustment.

NEBR0248

- 1) Ensure there is no drag when pedal is released.
1. Loosen parking brake cable.
2. Depress parking brake pedal fully more than five times.
3. Operate control pedal 10 times or more with a full stroke [169 mm (6.6 in)].
4. Adjust cable by turning adjusting nut.
5. Depress pedal with specified amount of force. Check pedal stroke and ensure smooth operation.

Force: 196 N (20 kg, 44 lb)

Number of notches:

KA24DE models: 6–8

VG33E and VG33ER models: 7–9

6. Bend warning lamp switch plate. Warning lamp should come on when pedal is depressed "A" notches. It should go off when the pedal is fully released.

Number of "A" notches for warning lamp actuation: 1

Purpose

NEBR0252

The rear wheel anti-lock brake system (ABS) consists of electronic and hydraulic components. It controls rear braking force so locking of the rear wheels can be avoided.

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

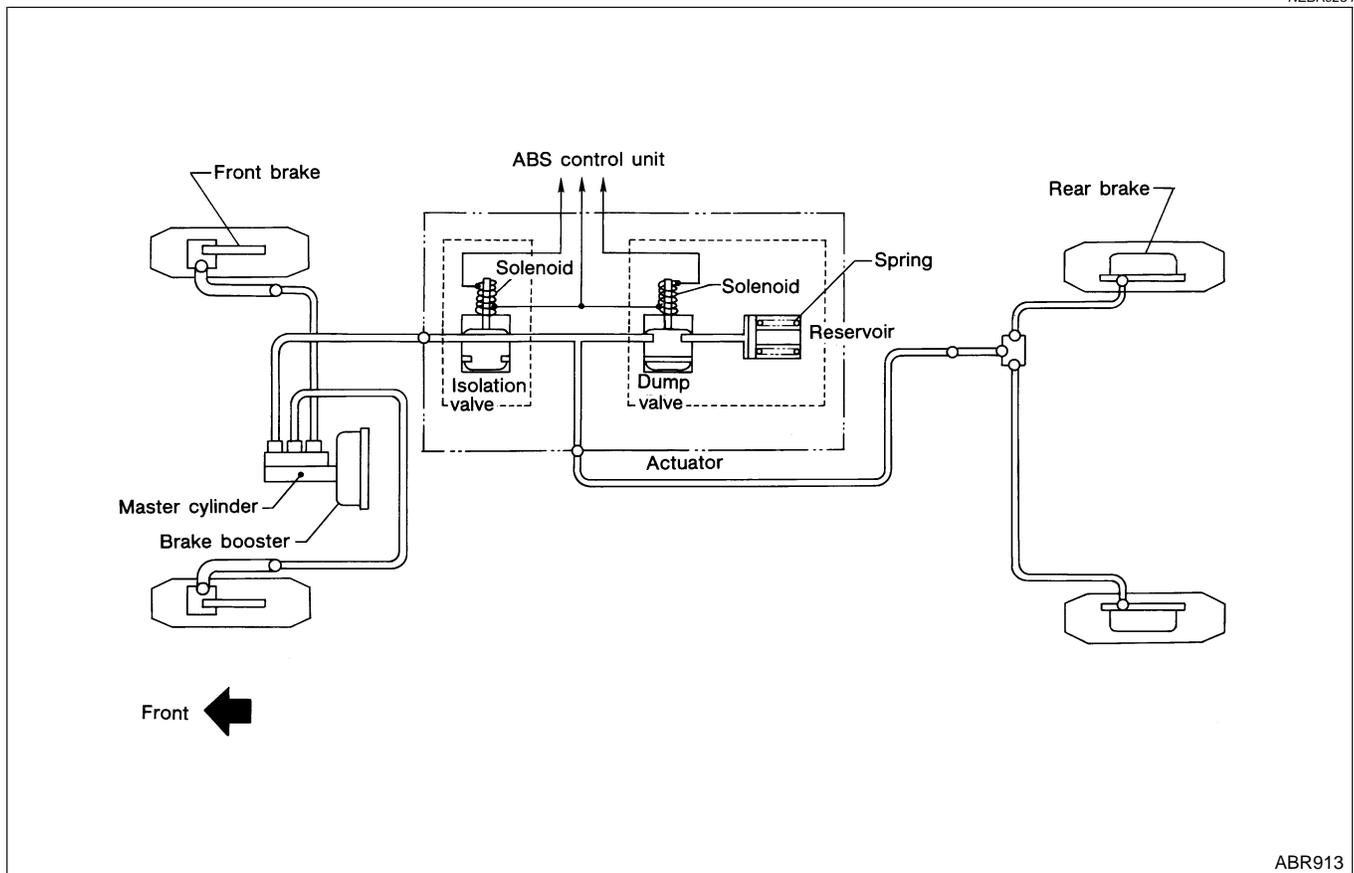
Operation

NEBR0253

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

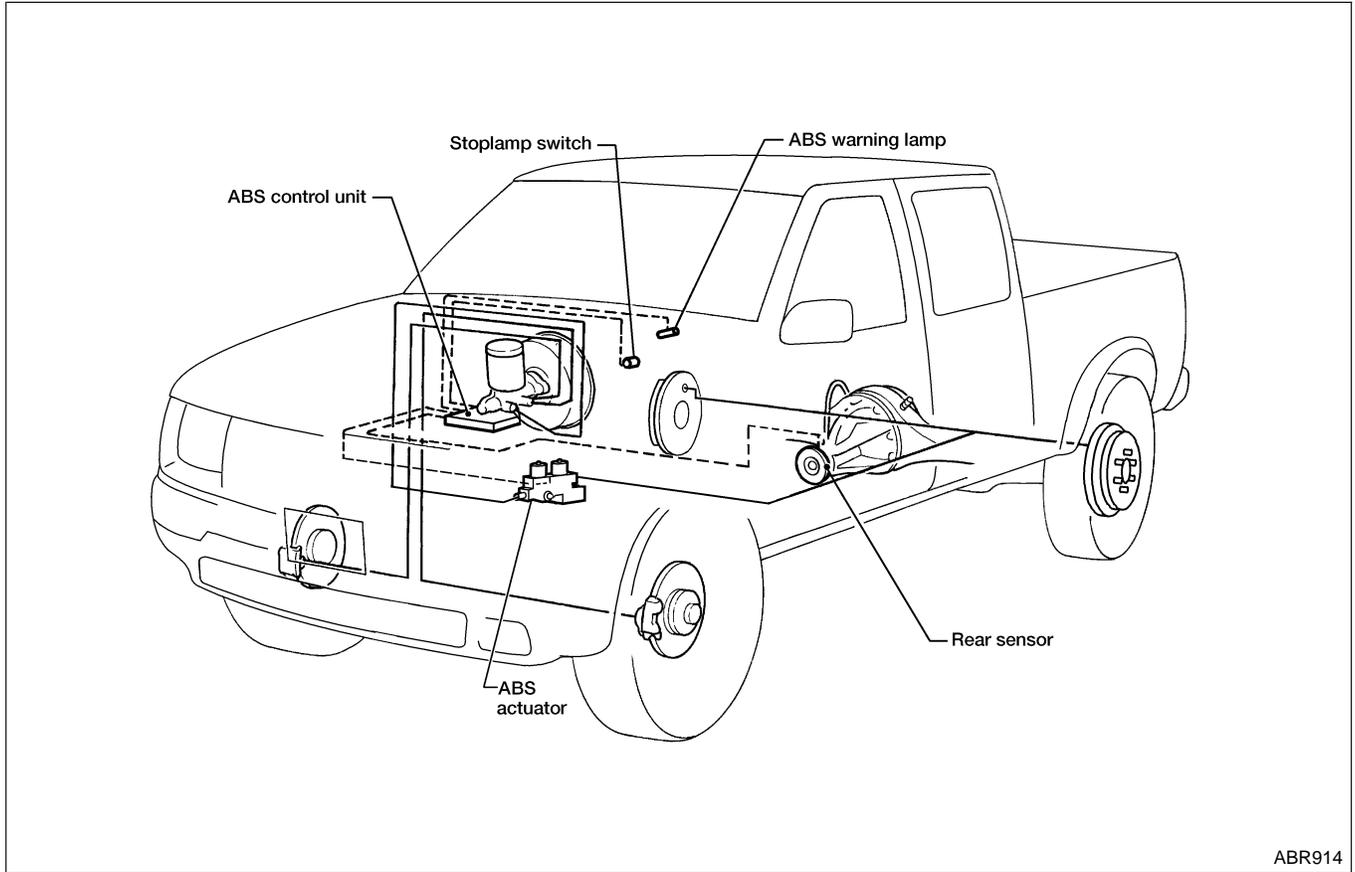
ABS Hydraulic Circuit

NEBR0254

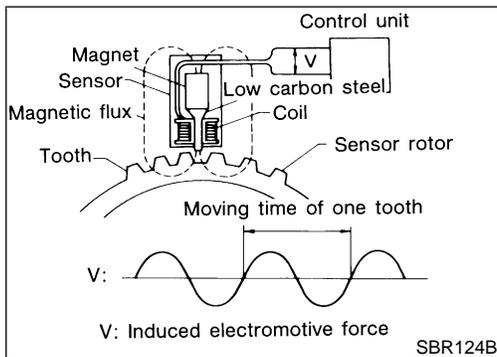


System Components

NEBR0255



ABR914



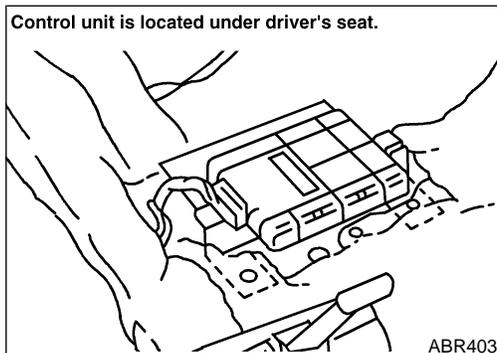
SBR124B

System Description
REAR SENSOR

NEBR0256

NEBR0256S01

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



ABR403

ABS CONTROL UNIT

NEBR0256S02

The ABS control unit computes the rear axle rotating speed by the signal current sent from the sensor unit. Then it supplies a DC current to the ABS actuator. If any electrical malfunction should be detected in the system, the control unit causes the warning lamp to light up. In this condition, the ABS system will be deactivated by the control unit, and the vehicle's brake system reverts to normal operation.

Removal and Installation

NEBR0257

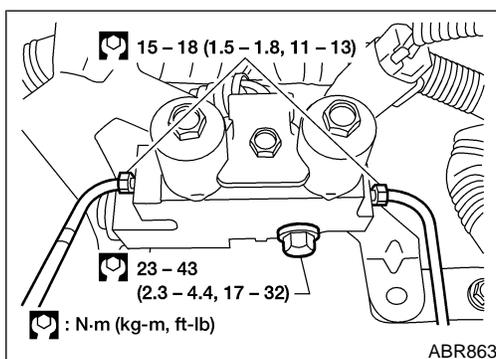
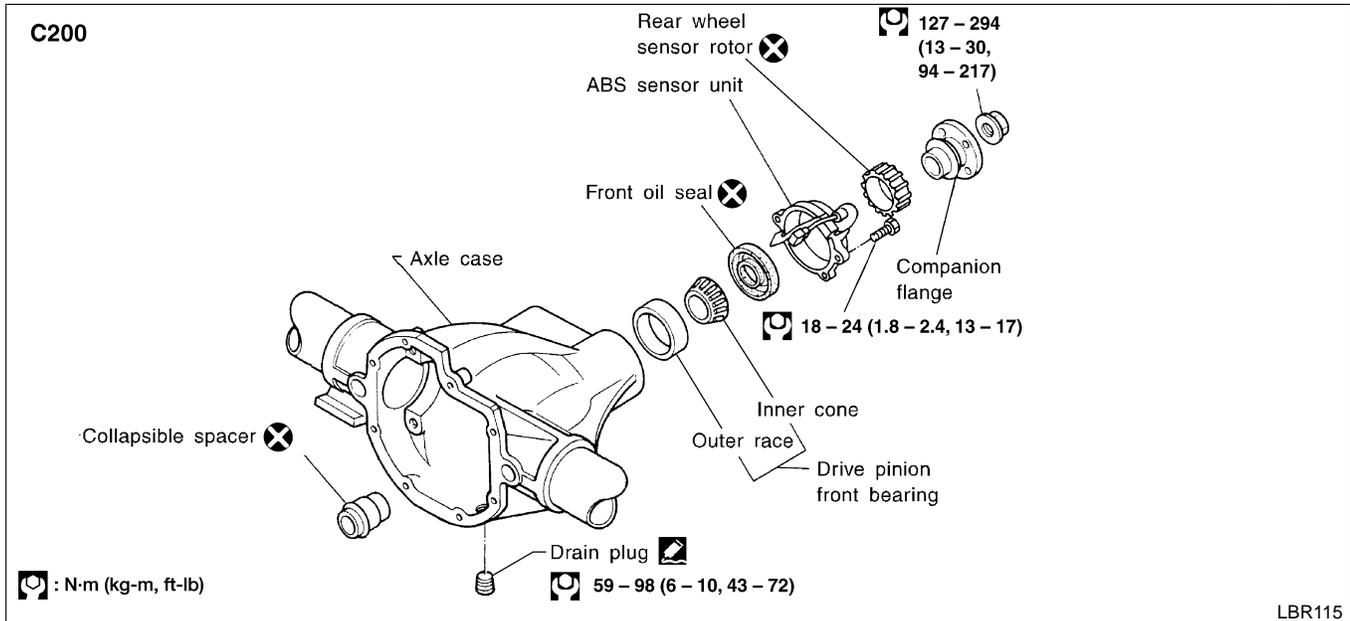
CAUTION:

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

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

REAR SENSOR

NEBR0257S01



ACTUATOR

Removal

NEBR0257S02

NEBR0257S0201

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

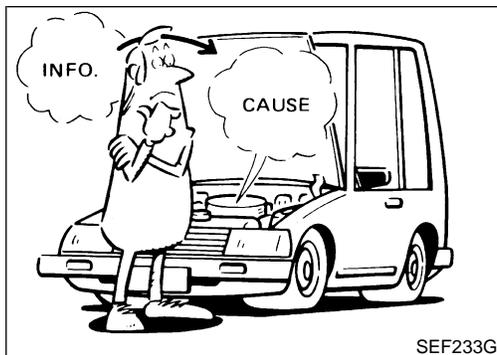
Installation

NEBR0257S0202

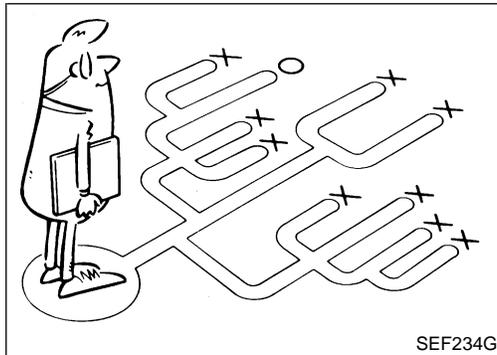
CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to "Bleeding Brake System", BR-11.

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



SEF233G



SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

NEBR0258

INTRODUCTION

NEBR0258S01

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

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

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

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with an ABS complaint. The customer is a very good source of information on such problems; especially intermittent ones. By talking to the customer, find out what symptoms are present and under what conditions they occur. Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot brake problems on an ABS controlled vehicle.

Also check related Service bulletins for information.

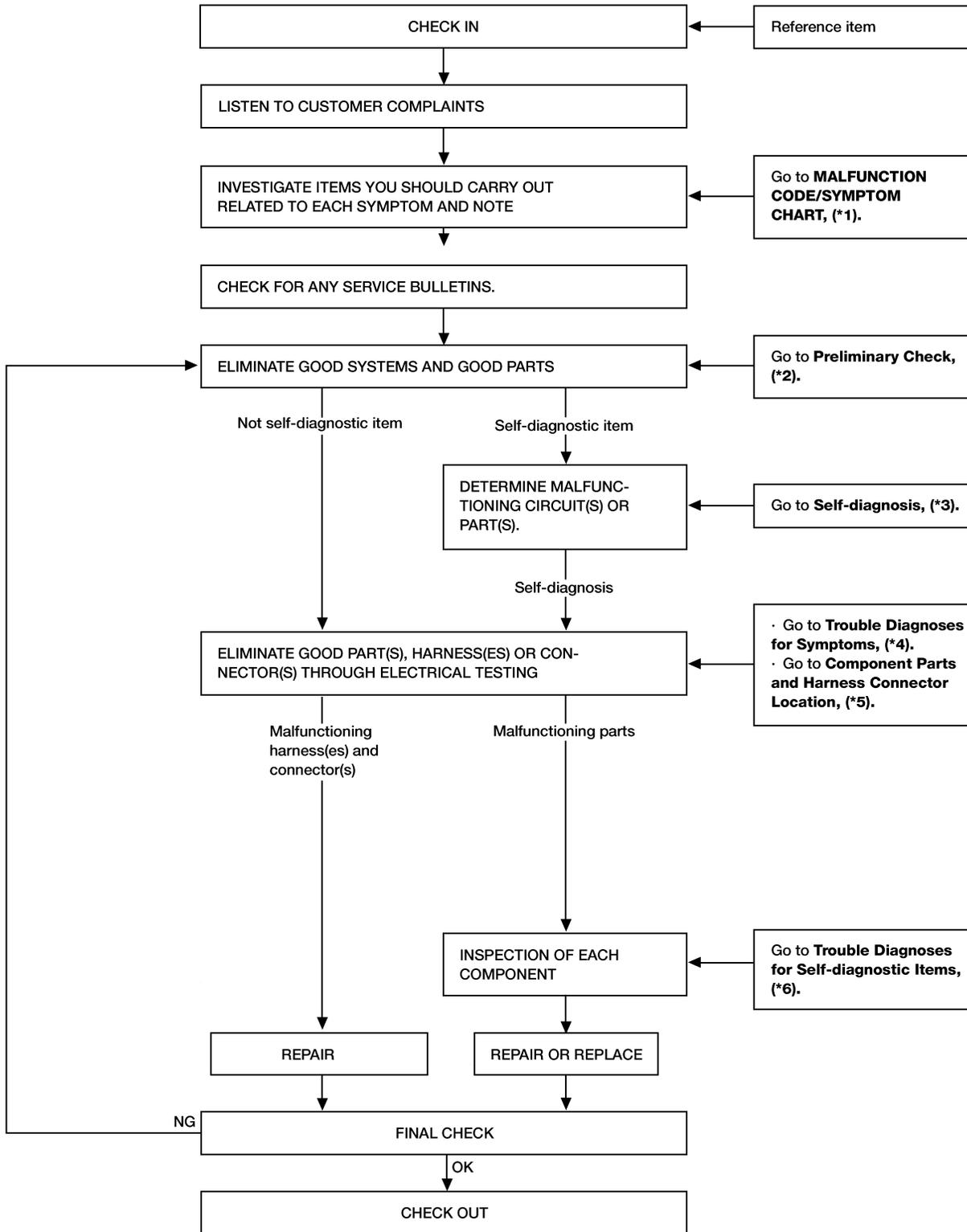
TROUBLE DIAGNOSES

KA24DE

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

WORK FLOW

NEBR0258S02



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ABR839

*1: BR-52

*2: BR-42

*3: BR-49

*4: BR-62 - 64

*5: BR-45

*6: BR-56 - 61

SC

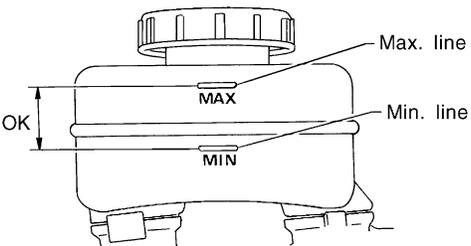
EL

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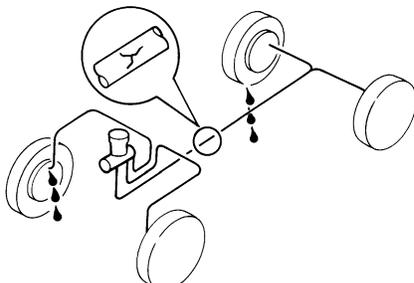
Preliminary Check

NEBR0259

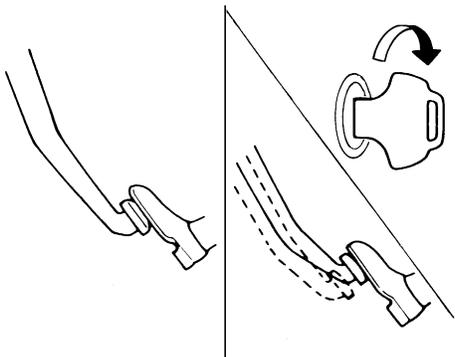
1	CHECK BRAKE FLUID	
Check brake fluid for contamination.		
Has brake fluid been contaminated?		
Yes	▶	Replace. GO TO 2.
No	▶	GO TO 2.

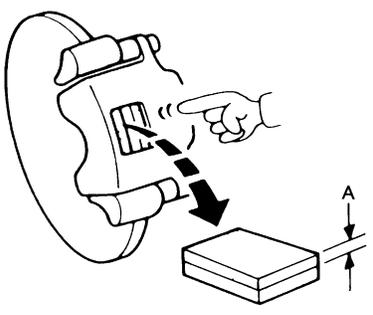
2	CHECK BRAKE FLUID LEVEL	
Check brake fluid level in reservoir tank. Low fluid level may indicate brake pad wear or leakage from brake line.		
		
Is brake fluid filled between MAX and MIN lines on reservoir tank ?		
Yes	▶	GO TO 3.
No	▶	Fill brake fluid. GO TO 3.

SBR451D

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

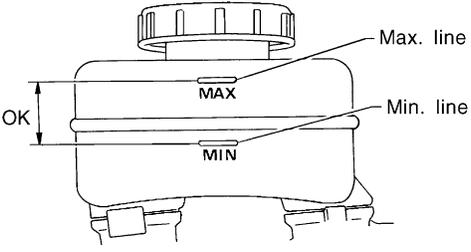
SBR389C

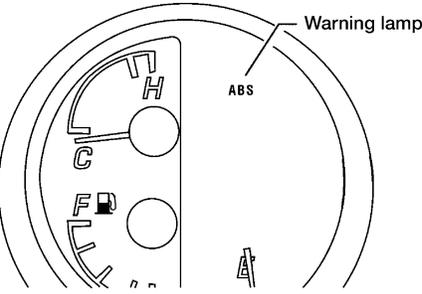
4	CHECK BRAKE BOOSTER OPERATION	
<p>Check brake booster for operation and air tightness. Refer to "On-vehicle Service", BR-22.</p> <div style="text-align: center;">  </div> <p style="text-align: right;">SBR058C</p>		
Is brake booster airtight and functioning properly?		
Yes	▶	GO TO 5.
No	▶	Replace. GO TO 5.

5	CHECK BRAKE PAD AND ROTOR	
<p>Check brake pad and rotor. Refer to "Pad Replacement", BR-26 and "ROTOR", 28.</p> <div style="text-align: center;">  </div> <p style="text-align: right;">SBR059C</p>		
Are brake pads and rotors functioning properly?		
Yes	▶	GO TO 6.
No	▶	Replace.

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Preliminary Check (Cont'd)

6	RECHECK BRAKE FLUID LEVEL	
Check brake fluid level in reservoir tank again.		
		
SBR451D		
Is brake fluid filled between MAX and MIN lines on reservoir tank ?		
Yes	▶	GO TO 7.
No	▶	Fill brake fluid.

7	CHECK WARNING LAMP ACTIVATION	
Check warning lamp activation.		
		
LBR380		
Does warning lamp turn on when ignition switch is turned ON?		
Yes	▶	GO TO 8.
No	▶	Check fuse, warning lamp bulb and warning lamp circuit.

8	CHECK WARNING LAMP DEACTIVATION	
Check warning lamp for deactivation after engine is started.		
Does warning lamp turn off when engine is started?		
Yes	▶	GO TO 9.
No	▶	Go to "Self-diagnosis", BR-49.

9	DRIVE VEHICLE	
Drive vehicle at speeds over 30 km/h (19 MPH) for at least one minute.		
Does warning lamp remain off after vehicle has been driven at 30 km/h (19 MPH) for at least one minute?		
Yes	▶	INSPECTION END
No	▶	Go to "Self-diagnosis", BR-49.

Component Parts and Harness Connector Location

NEBR0260

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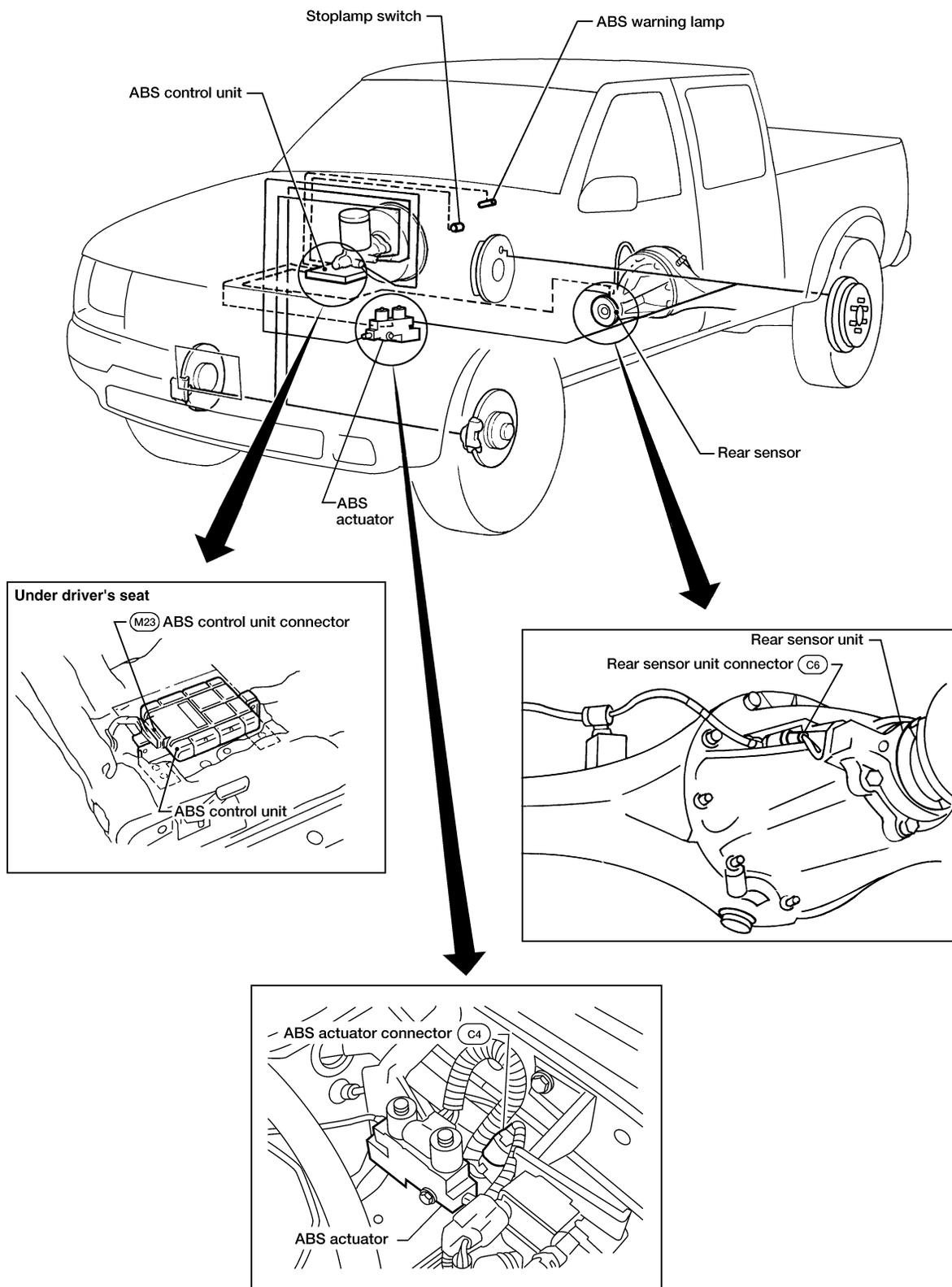
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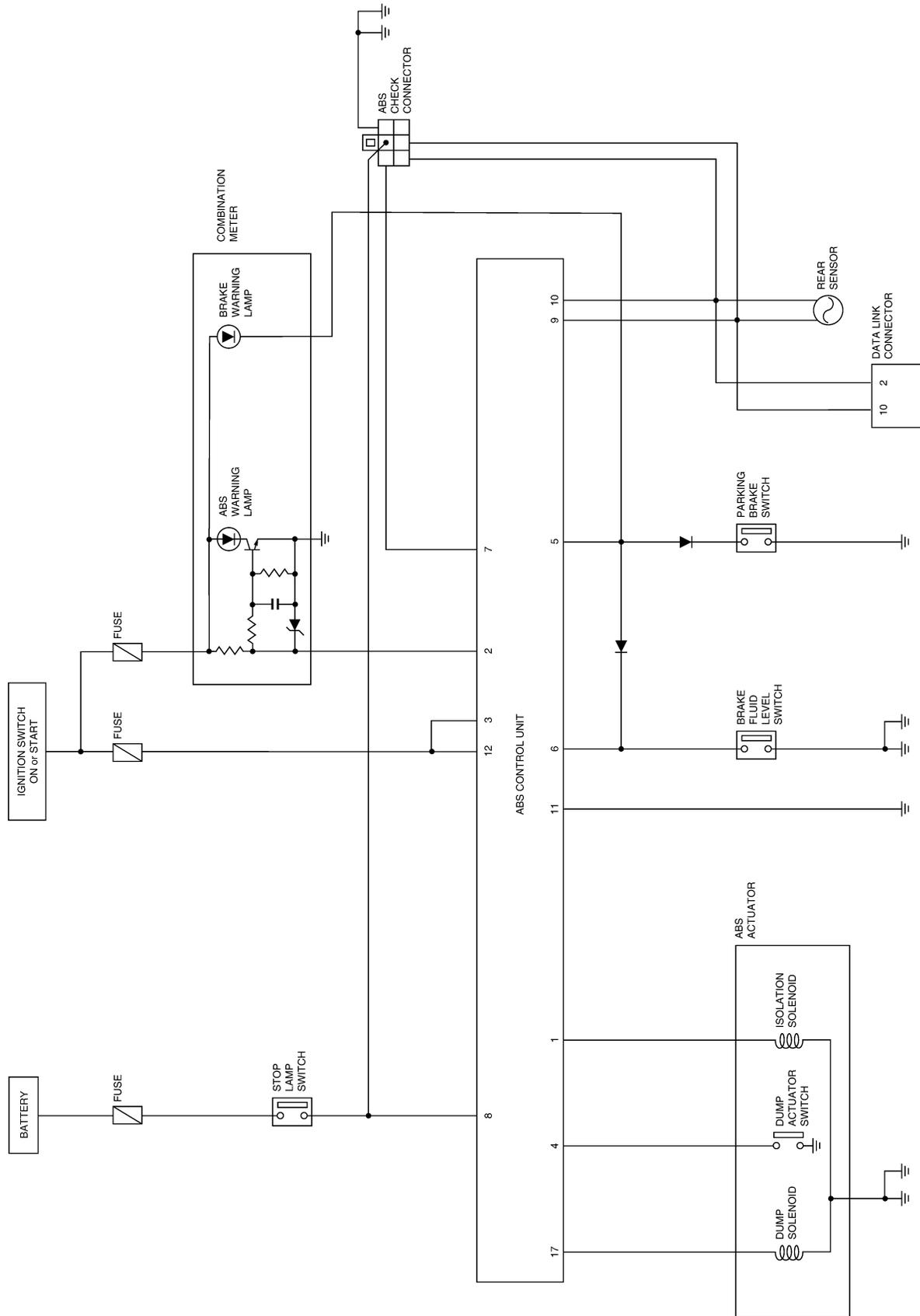
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ABR855

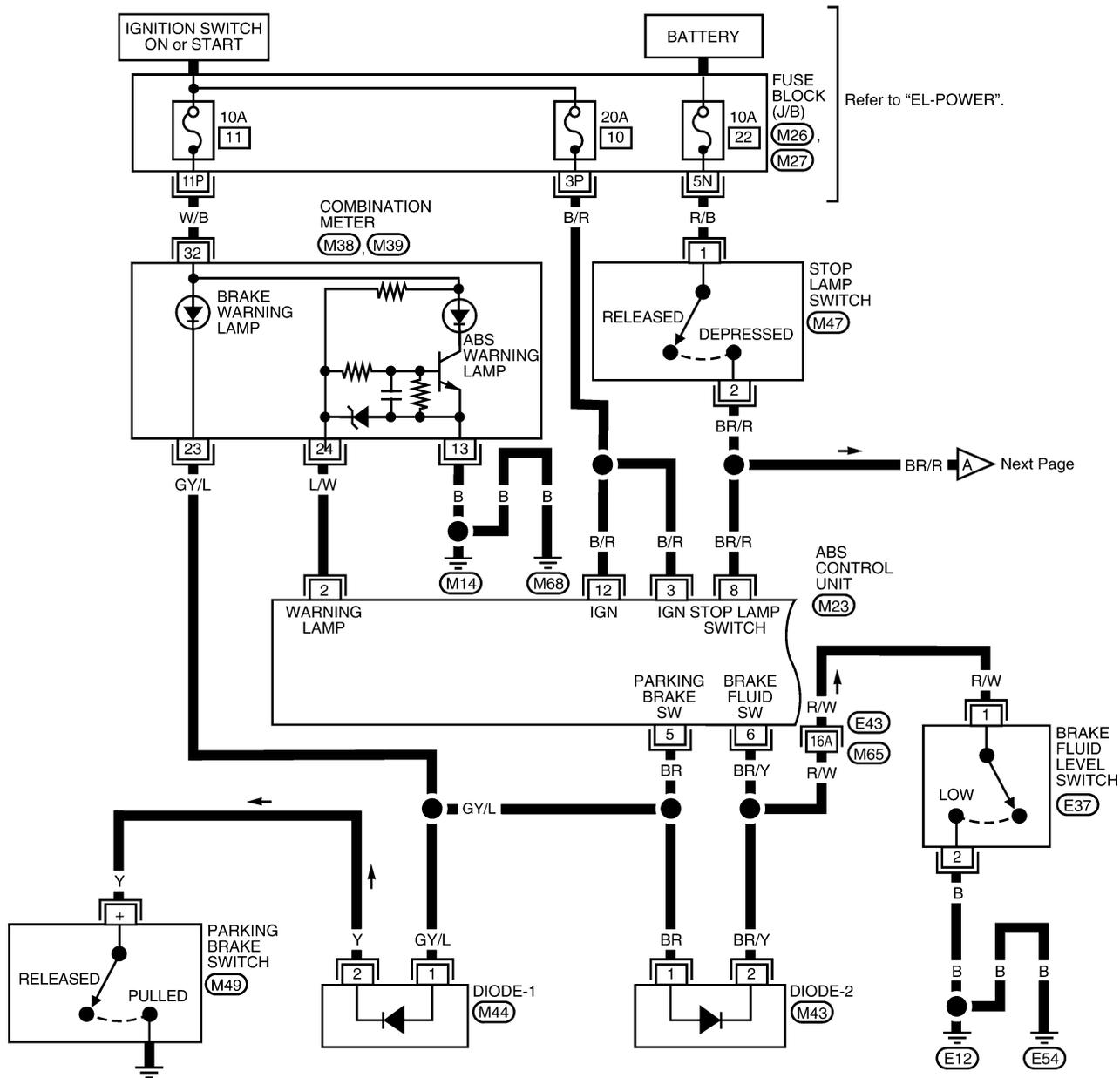
Schematic



Wiring Diagram — ABS —

NEBR0262

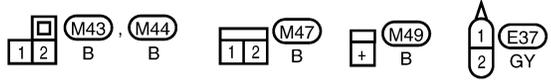
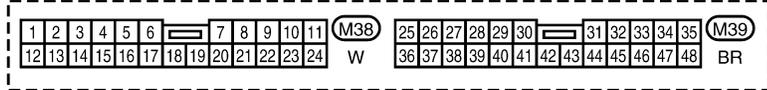
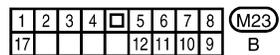
BR-ABS-01



Refer to "EL-POWER".

Next Page

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

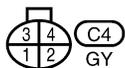
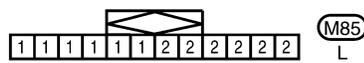
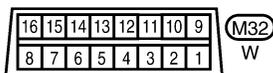
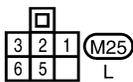
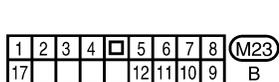
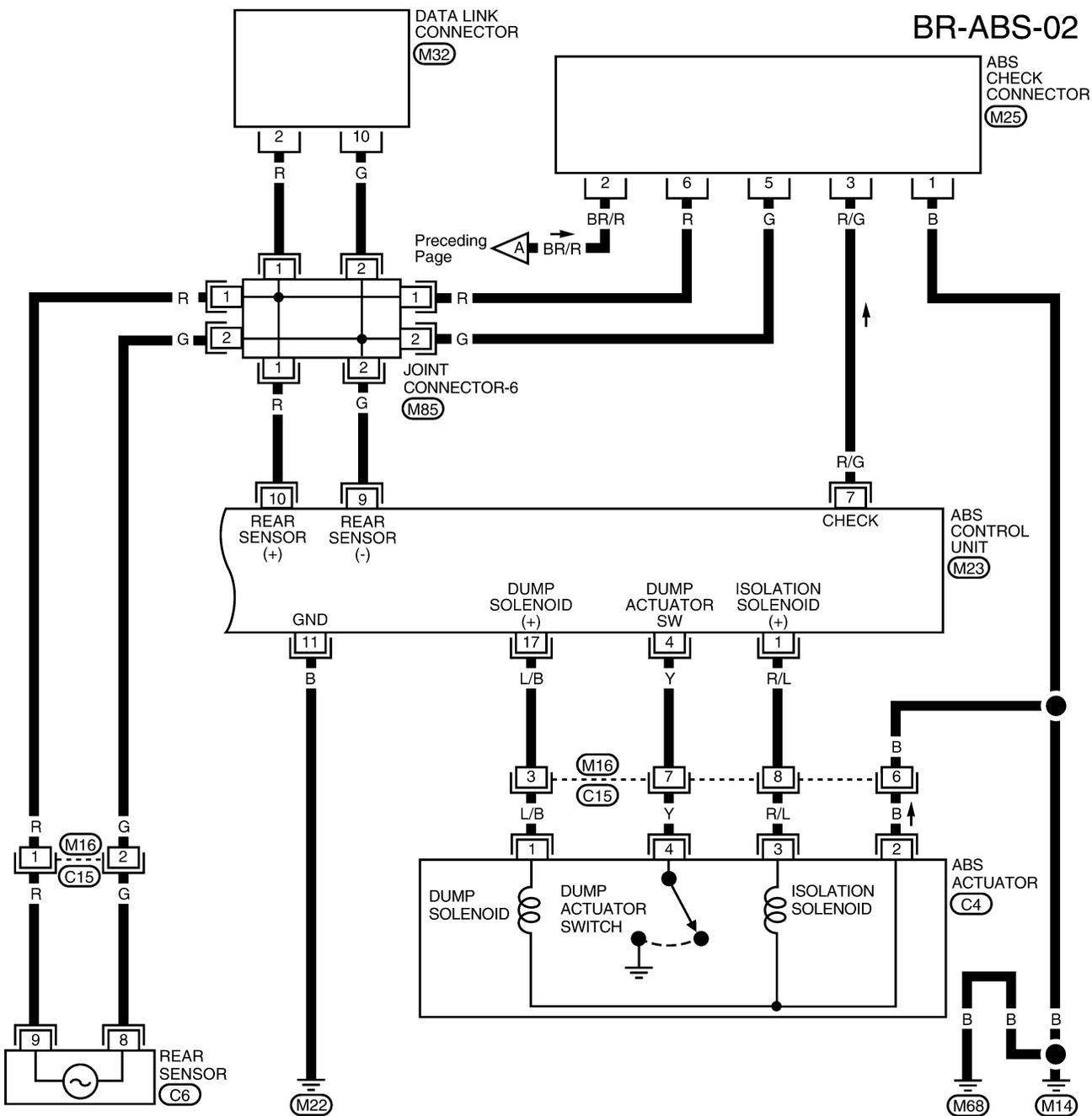


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TROUBLE DIAGNOSES

KA24DE

Wiring Diagram — ABS — (Cont'd)



LBR094

Self-diagnosis

NEBR0263

CHECKING THE NUMBER OF WARNING LAMP FLASHES

NEBR0263S01

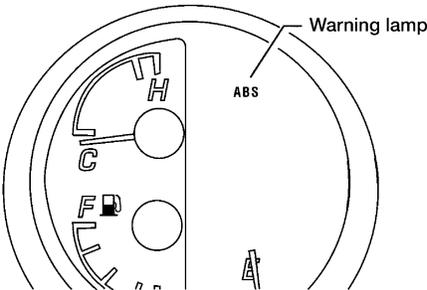
When a problem occurs in ABS, the ABS warning lamp on the instrument panel turns on. As shown in the table, the control unit performs self-diagnosis.

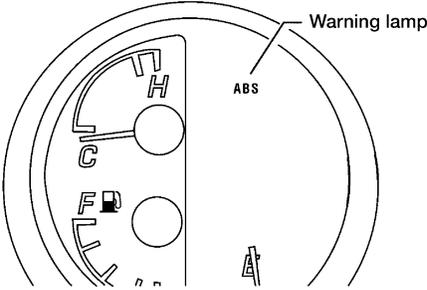
To obtain satisfactory self-diagnosing results, the vehicle must be driven above 40 km/h (25 MPH) for at least one minute before the self-diagnosis is performed. After the vehicle has been stopped, with the engine still running, the number of ABS warning lamp flashes are counted by grounding the check terminal, thereby identifying the malfunction code(s).

If more than two parts or units malfunction at the same time, the ABS warning lamp will flash to indicate one of the malfunctioning parts or units. After the part or unit has been repaired, the ABS warning lamp will then flash to indicate the other part or unit that is malfunctioning.

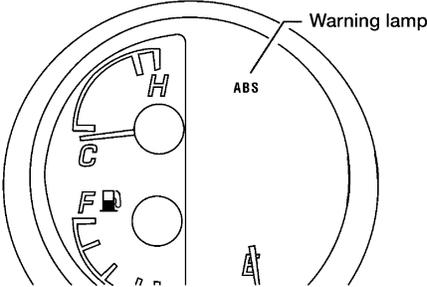
SELF-DIAGNOSIS PROCEDURE 1

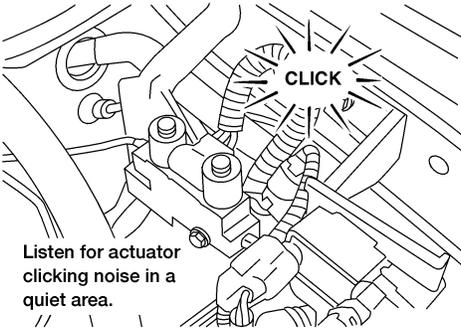
NEBR0263S02

1	INSPECTION START	
<p>1. Turn ignition switch ON. 2. Check warning lamp activation. When ignition switch is turned on, warning lamp should turn on.</p>		
		
<small>LBR380</small>		
Does warning lamp turn on?		
Yes	▶	GO TO 2.
No	▶	Go to "Main Power Supply and Ground Circuit Check", BR-52.

2	CHECK WARNING LAMP OPERATION	
<p>Check if warning lamp deactivates after a few seconds.</p>		
		
<small>LBR380</small>		
Warning lamp should deactivate after a few seconds.		
OK	▶	GO TO 3.
NG	▶	Go to "SELF DIAGNOSIS PROCEDURE 2", BR-51.

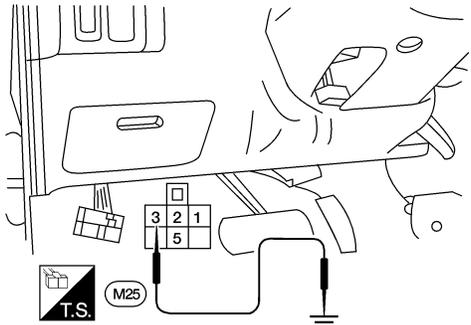
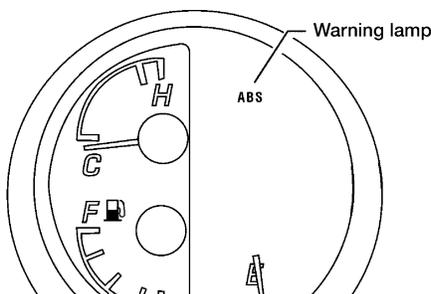
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3	ROAD TEST	<p>Drive vehicle above 40 km/h (25 MPH) for at least one minute.</p> <div style="text-align: center;">  <p style="text-align: right; margin-right: 50px;">Warning lamp</p> <p style="text-align: center;">ABS</p> </div> <p style="text-align: right; margin-right: 50px;">LBR380</p> <p style="text-align: center;">Does warning lamp activate again?</p>	
Yes	▶	Go to "SELF DIAGNOSIS PROCEDURE 2", BR-51.	
No	▶	GO TO 4.	

4	CHECK ACTUATOR	<p>1. Stop engine. 2. Turn ignition switch ON. Check actuator clicking noise when warning lamp deactivates.</p> <div style="text-align: center;">  <p style="text-align: center;">CLICK</p> <p style="text-align: center;">Listen for actuator clicking noise in a quiet area.</p> </div> <p style="text-align: right; margin-right: 50px;">ABR854</p> <p style="text-align: center;">Actuator should make clicking noise when warning lamp deactivates.</p>	
OK	▶	INSPECTION END	
NG	▶	Check actuator. Refer to "Electrical Components Inspection", BR-65.	

SELF-DIAGNOSIS PROCEDURE 2

NEBR0263S03

1	CHECK FOR MALFUNCTION CODE	
	<p>1. Start engine. 2. Ground the ABS check connector M25 terminal 3.</p> <div style="text-align: center;">  </div> <p>3. Observe the warning lamp.</p> <div style="text-align: center;">  </div> <p style="text-align: right;"><small>ABR696</small></p> <p style="text-align: right;"><small>LBR380</small></p> <p style="text-align: center;">Is the warning lamp flashing?</p>	
Yes	▶	Count the number of flashes. Refer to the "MALFUNCTION CODE/SYMPTOM CHART", BR-52.
No	▶	Check the brake fluid level. Go to the "Main Power Supply and Ground Circuit Check", BR-52. If OK, replace ABS control unit.

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MALFUNCTION CODE/SYMPTOM CHART

=NEBR0263S04

Code No./Symptom (No. of warning lamp flashes)	Malfunctioning part	Diagnostic Procedure
2	Actuator ISO solenoid (open-circuit)	BR-56
7	Actuator ISO solenoid (short-circuit)	BR-56
4	Actuator ISO solenoid (blocked)	BR-57
3	Actuator dump solenoid (open-circuit)	BR-58
8	Actuator dump solenoid (short-circuit)	BR-58
9	Rear sensor (open-circuit)	BR-60
10	Rear sensor (short-circuit)	BR-60
6	Sensor signal (erratic)	BR-60
13	Control	BR-61
14		
15		
16	None (system OK)	None
5	ABS actuator	BR-61
Pedal vibration or noise	—	BR-62
Long stopping distance	—	BR-63
Brake pedal stroke is large	—	BR-63
ABS does not work	—	BR-64
ABS works frequently	—	BR-64

Main Power Supply and Ground Circuit Check

NEBR0264

1	CHECK WARNING LAMP POWER SUPPLY
<p>1. Confirm battery voltage is 12V. 2. Disconnect ABS control unit connector. 3. Turn ignition switch ON.</p>	
<p>Do approx. 12 volts exist between ABS control unit connector M23 terminals 2 and 11?</p>	
Yes	▶ GO TO 2.
No	▶ GO TO 5.

LBR126

TROUBLE DIAGNOSES

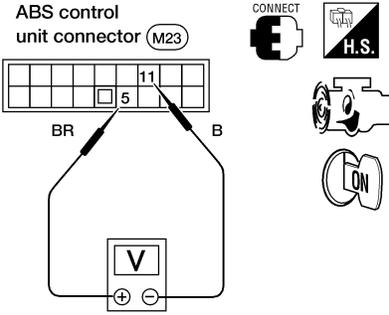
KA24DE

Main Power Supply and Ground Circuit Check (Cont'd)

2	CHECK ABS CONTROL UNIT POWER SUPPLY	
<p>1. Turn ignition switch ON. 2. Do approx. 12 volts exist between ABS control unit connector M23 terminals (3, 12) and 11?</p>		
Approx. 12 volts should exist.		
OK	▶	GO TO 3.
NG	▶	GO TO 5.

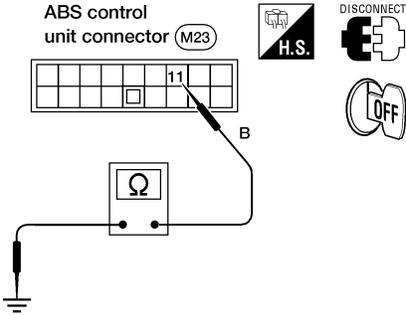
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3	CHECK STOP LAMP SWITCH POWER SUPPLY	
<p>1. Depress brake pedal. 2. Do approx. 12 volts exist between ABS control unit connector M23 terminals 8 and 11?</p>		
Approx. 12 volts should exist.		
OK	▶	GO TO 4.
NG	▶	Adjust stop lamp switch, if necessary. Replace stop lamp switch or repair harness or connectors, if necessary.

4	CHECK PARKING BRAKE SWITCH POWER SUPPLY
<p>1. Confirm that brake fluid level is adequate. If necessary, refill it.</p> <p>2. Start engine.</p> <p>3. Do approx. 12 volts exist between ABS control unit connector M23 terminals 5 and 11 without the parking brake applied? Do approx. 0 volts exist with the parking brake applied?</p>	
	
Yes or No?	
Yes	▶ INSPECTION END
No	▶ Adjust parking brake switch, if necessary. Replace parking brake switch, or repair harness or connectors, if necessary.

ABR628

5	CHECK FUSE
<p>Check 10A fuse No. 11. For fuse layout refer to EL-10, "POWER SUPPLY ROUTING".</p>	
Is fuse OK?	
Yes	▶ GO TO 6.
No	▶ GO TO 7.

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

ABR626

TROUBLE DIAGNOSES

KA24DE

Main Power Supply and Ground Circuit Check (Cont'd)

7	REPLACE FUSE	
Replace fuse.		
Does the fuse blow out when the ignition switch is turned ON?		
Yes	▶	Check and repair harness between ABS control unit connector M23 terminals (3, 12) and fuse block connector M26 terminal 3P (for fuse block details refer to EL-10 , "POWER SUPPLY ROUTING").
No	▶	INSPECTION END

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ABS Actuator ISO Solenoid Short or Open MALFUNCTION CODE NO. 2 OR 7

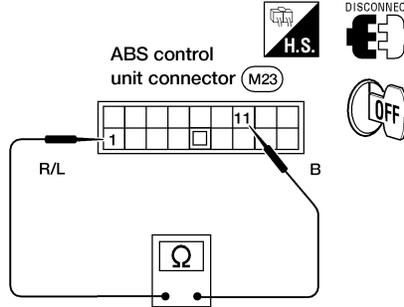
NEBR0265

NEBR0265S01

1	CHECK ISO SOLENOID CIRCUITS
----------	------------------------------------

Disconnect battery cable ground connection.

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



ABR629

Resistance should be approx. 4Ω

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

2	CHECK ABS CONTROL UNIT GROUND CIRCUIT
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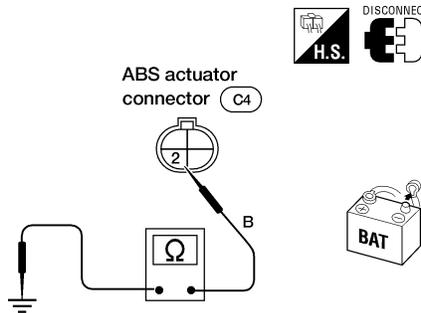
Check ABS control unit ground circuit. Refer to "Main Power Supply and Ground Circuit Check", BR-52.

OK or NG

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

3	CHECK ABS ACTUATOR GROUND CIRCUIT
----------	--

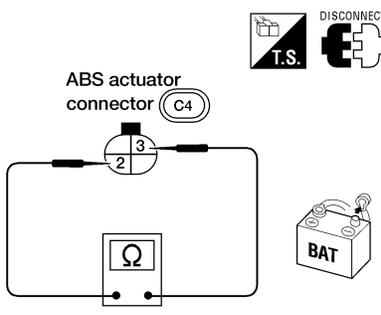
Check harness continuity between ABS actuator connector C4 terminal 2 and ground.



ABR630

Does continuity exist?

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

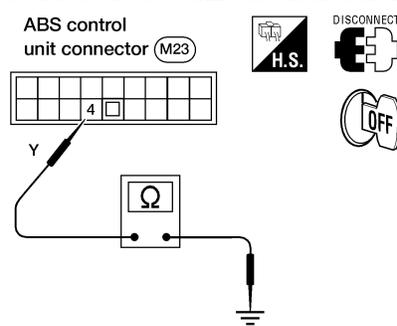
4	CHECK ISO SOLENOID		
<p>Check resistance between ABS actuator connector C4 terminals 2 and 3.</p> <div style="text-align: center;">  </div> <p style="text-align: right;">ABR631</p> <p style="text-align: center;">Resistance should be approx. 4Ω</p>			
OK	▶	Repair harness and connectors between the ISO solenoid and ABS control unit.	
NG	▶	Replace ABS actuator.	

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ABS Actuator ISO Blocked MALFUNCTION CODE NO. 4

NEBR0266

NEBR0266S01

1	CHECK ABS ACTUATOR SWITCH		
<p>Disconnect battery cable ground connection.</p> <p>1. Disconnect ABS control unit connector.</p> <p>2. Check for continuity between ABS control unit connector M23 terminal 4 and ground.</p> <div style="text-align: center;">  </div> <p style="text-align: right;">ABR632</p> <p style="text-align: center;">Continuity should not exist.</p>			
OK	▶	Replace ABS control unit.	
NG	▶	GO TO 2.	

2	CHECK ABS ACTUATOR CIRCUIT	<p>1. Disconnect ABS actuator connector. 2. Check for continuity between ABS actuator connector C4 terminal 4 and ground.</p> <div style="text-align: center;"> <p>Continuity should not exist.</p> </div>	
OK	▶	Repair harness or connectors between ABS control unit and ABS actuator.	
NG	▶	Replace ABS actuator.	

ABS Actuator Dump Solenoid Short Circuit or Open
MALFUNCTION CODE NO. 3 OR 8

NEBR0267

NEBR0267S01

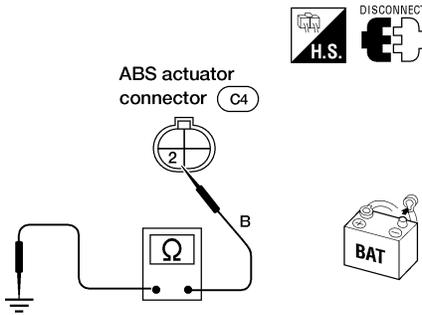
1	CHECK DUMP SOLENOID	<p>Disconnect battery cable ground connection. 1. Disconnect ABS control unit connector. 2. Check resistance between ABS control unit connector M23 terminals 11 and 17.</p> <div style="text-align: center;"> <p>Resistance should be approx. 1.5Ω</p> </div>	
OK	▶	Replace ABS control unit.	
NG	▶	GO TO 2.	

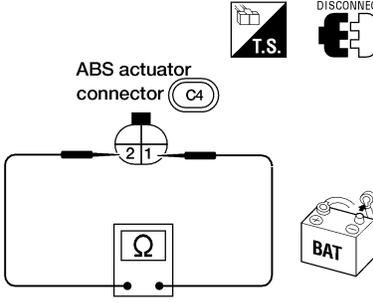
2	CHECK ABS CONTROL UNIT GROUND CIRCUIT	<p>Refer to "Main Power Supply and Ground Circuit Check", BR-52. OK or NG</p>	
OK	▶	GO TO 3.	
NG	▶	Repair harness or connectors.	

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

KA24DE

ABS Actuator Dump Solenoid Short Circuit or Open (Cont'd)

3	CHECK ABS ACTUATOR GROUND CIRCUIT	<p>Check harness continuity between ABS actuator connector C4 terminal 2 and ground.</p>  <p style="text-align: center;">Continuity should exist.</p>	GI MA EM LC EC
OK	▶	GO TO 4.	
NG	▶	Repair harness or connectors.	FE

4	CHECK DUMP SOLENOID	<p>1. Disconnect ABS actuator connector. 2. Check resistance between ABS actuator connector C4 terminals 1 and 2.</p>  <p style="text-align: center;">Resistance should be approx. 1.5Ω</p>	CL MT AT TF PD
OK	▶	Repair harness or connectors between ABS control unit and ABS actuator.	AX
NG	▶	Replace ABS actuator.	SU

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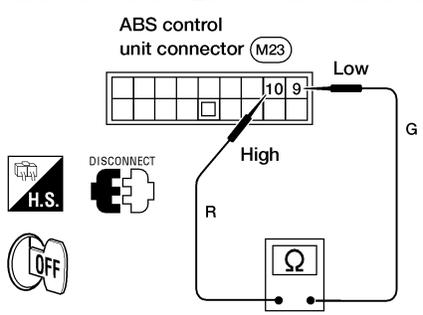
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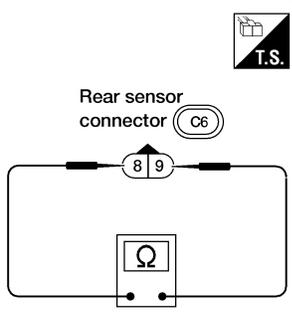
Rear Sensor Open or Short MALFUNCTION CODE NO. 9 OR 10

=NEBR0268

NEBR0268S01

1	CHECK REAR SENSOR CIRCUIT		
<p>Disconnect battery cable ground connection.</p> <ol style="list-style-type: none"> 1. Disconnect ABS control unit connector. 2. Check resistance between ABS control unit connector M23 terminals 9 and 10. 			
			
Resistance should be 1.05 - 1.35 kΩ			
OK	▶	Replace ABS control unit.	
NG	▶	GO TO 2.	

ABR637

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

ABR638

Sensor Signal Erratic MALFUNCTION CODE NO. 6

NEBR0269

NEBR0269S01

1	CHECK REAR SENSOR ROTOR TOOTH CONDITION		
<ol style="list-style-type: none"> 1. Remove propeller shaft. 2. Remove companion flange, refer to PD-47, "Disassembly". 3. Check rotor on companion flange. 			
OK or NG			
OK	▶	Replace ABS control unit.	
NG	▶	Replace rear sensor rotor with companion flange.	

ABS Control Unit

MALFUNCTION CODE NO. 13, 14 OR 15

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

=NEBR0270

NEBR0270S01

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ABS Actuator

MALFUNCTION CODE NO. 5

NEBR0271

NEBR0271S01

EC

1	CHECK BRAKE SYSTEM	
<p>Overhaul both rear brakes. 1. Refer to "SELF-DIAGNOSIS PROCEDURE 1", BR-49 2. Check if ABS system is OK.</p>		
OK or NG		
OK	▶	INSPECTION END
NG	▶	GO TO 2.

FE

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

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1. Pedal Vibration or Noise

NEBR0272

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

2	CHECK SYMPTOM
1. Apply brake. 2. Start engine.	
Does the symptom appear only when engine is started?	
Yes	▶ Carry out "Self-diagnosis". Refer to BR-49.
No	▶ Go to Test No. 3, "3. Unexpected Pedal Action", BR-64.

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 potholes.
- Engine speed is over 5,000 rpm with vehicle stopped.

2. Long Stopping Distance

=NEBR0273

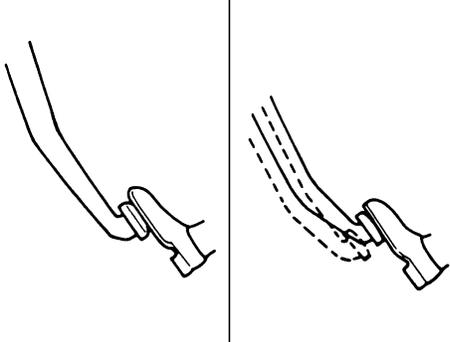
1	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE	
Disconnect ABS actuator connector and check whether stopping distance is still long.		
Does brake system function properly when brake pedal is depressed?		
Yes	▶	Perform "Preliminary Check", BR-42 and "Bleeding Brake System", BR-11 (if necessary).
No	▶	Go to Test No. 3, "3. Unexpected Pedal Action", BR-64.

NOTE:

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

3. Unexpected Pedal Action

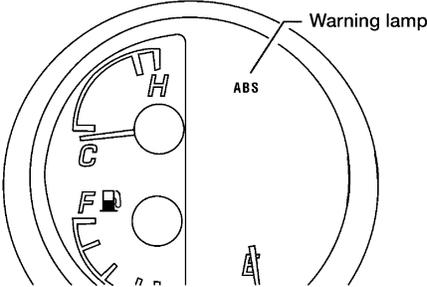
NEBR0274

1	CHECK BRAKE PEDAL STROKE	
Check brake pedal stroke.		
		
Is brake pedal stroke excessively large?		
Yes	▶	Perform "Preliminary Check", refer to BR-42.
No	▶	GO TO 2.

SBR540A

2	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE	
Disconnect ABS actuator connector and check whether brake is effective.		
Does brake system function properly when brake pedal is depressed?		
Yes	▶	GO TO 3.
No	▶	Perform "Preliminary Check", refer to BR-42.

3. Unexpected Pedal Action (Cont'd)

3	CHECK WARNING LAMP INDICATION	
Ensure warning lamp remains off while driving.		
		
LBR380		
Is warning lamp turned off?		
Yes	▶	GO TO 4.
No	▶	Carry out "Self-diagnosis", refer to BR-49.

4	CHECK REAR SENSOR	
1. Check rear sensor connector for terminal damage or loose connection. 2. Perform rear sensor check. Refer to Test No. 2, "MALFUNCTION CODE NO. 9 OR 10", BR-60.		
Is rear sensor OK?		
Yes	▶	Check ABS actuator terminals for damage or the connection of ABS actuator harness connector. Reconnect ABS actuator harness connector. Then retest.
No	▶	Repair or replace as necessary.

4. ABS Does Not Work

NEBR0275

1	CHECK WARNING LAMP INDICATION	
Does the ABS warning lamp activate?		
Yes or No		
Yes	▶	Carry out "Self-diagnosis". Refer to BR-49.
No	▶	Go to "SELF-DIAGNOSIS PROCEDURE 1", BR-49.

NOTE:

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

5. ABS Works Frequently

NEBR0276

1	CHECK BRAKE FLUID PRESSURE	
Check brake fluid pressure distribution. Refer to "Inspection", BR-14.		
Is brake fluid pressure distribution normal?		
Yes	▶	GO TO 2.
No	▶	Repair. Then perform "Preliminary Check", refer to BR-42.

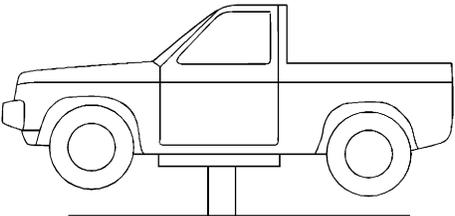
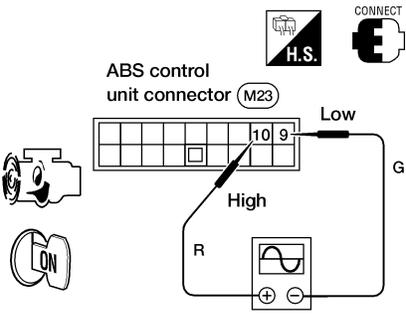
2	CHECK WHEEL SENSOR	
1. Check rear sensor connector for terminal damage or loose connections. 2. Refer to "Rear Sensor Open or Short", BR-60.		
Is rear sensor OK?		
Yes	▶	Check ABS actuator terminals for damage or the connection of ABS actuator harness connector. Reconnect ABS actuator harness connector. Then retest.
No	▶	Repair or replace as necessary.

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Electrical Components Inspection REAR SENSOR UNIT AND ACTUATOR

NEBR0277

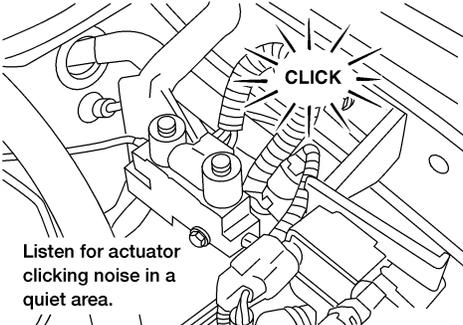
NEBR0277S01

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

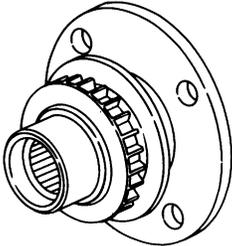
TROUBLE DIAGNOSES FOR SYMPTOMS

KA24DE

Electrical Components Inspection (Cont'd)

2	CHECK ABS ACTUATOR OPERATION	
<p>Refer to "SELF-DIAGNOSIS PROCEDURE 2", BR-51. Clicking noise sounds should be heard from ABS actuator when the ignition switch is turned ON.</p>		
		
ABR854		
Was clicking noise heard?		
Yes	▶	GO TO 3.
No	▶	GO TO 5.

3	CHECK ABS OPERATION	
<ol style="list-style-type: none"> 1. Perform ABS check in a safe place without obstacles in the vicinity. 2. Drive the vehicle for more than one minute at speeds over 40 km/h (25 MPH), then check that the ABS warning lamp does not light. After this, check for proper operation. 3. Check if ordinary braking occurs, and also check that the rear wheels do not lock when abrupt braking causes the front wheels to lock. 		
OK or NG		
OK	▶	The ABS system is functioning normally.
NG	▶	Replace ABS actuator.

4	CHECK REAR SENSOR ROTOR	
<p>Check the rear sensor rotor for the following points.</p> <ul style="list-style-type: none"> ● Tooth condition ● Proper installation on the companion flange ● Deformation ● Wear ● Looseness 		
		
ABR870		
OK or NG		
OK	▶	Replace rear sensor unit.
NG	▶	Replace rear sensor rotor with companion flange.

5	CHECK PULSING VOLTAGE FROM ABS CONTROL UNIT	
<p>Using a suitable digital voltmeter</p> <ol style="list-style-type: none"> 1. Check pulsing voltage for ISO solenoid between ABS control unit connector M23 terminals 11 and 17. 2. Also check pulsing voltage for DUMP solenoid between ABS control unit connector M23 terminals 11 and 1. <p>Pulsing voltage appears when ABS lamp goes off after ignition is turned on.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">ABR640</p>		
<p>Voltage: 0.3 - 3.5V for approx. 13 msec</p> <p style="text-align: center;">OK or NG</p>		
OK	▶	Replace ABS actuator.
NG	▶	Replace ABS control unit.

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Purpose

Purpose

The anti-lock brake system (ABS) consists of electronic and hydraulic components. It allows for control of braking force so locking of the wheels can be avoided.

NEBR0146

The ABS:

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

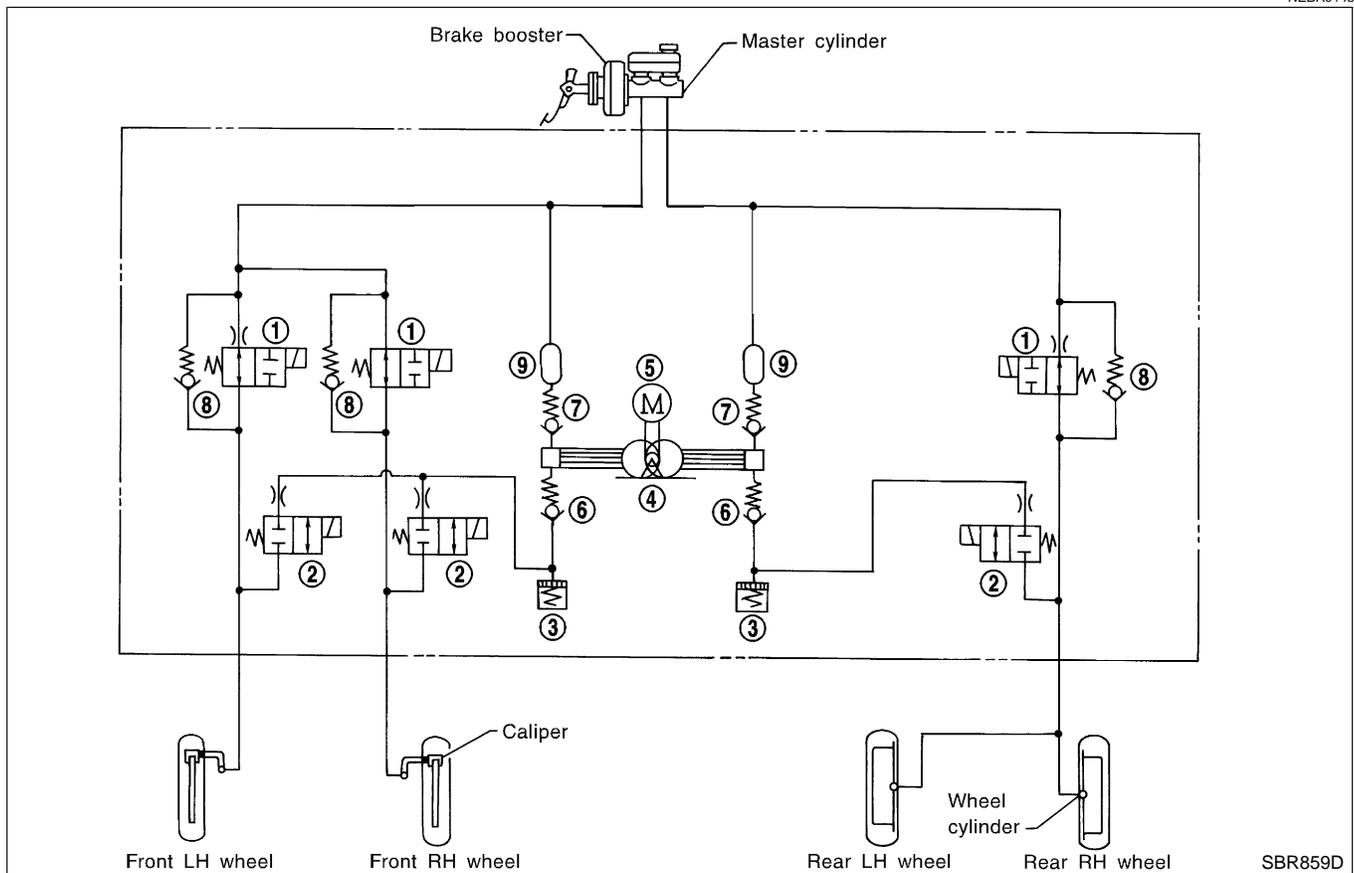
Operation

NEBR0147

- When the vehicle speed is less than 10 km/h (6 MPH) this system does not work.
- The anti-lock brake system (ABS) has a self-test function. The system turns on the ABS warning lamp for 1 second each time the ignition switch is turned ON. After the engine is started, the ABS warning lamp turns off. The system performs a test the first time the vehicle reaches 6 km/h (4 MPH). A mechanical noise may be heard as the ABS performs this self-test. This is a normal part of the self-test feature. If a malfunction is found during this check, the ABS warning lamp will stay on.
- While driving, a mechanical noise may be heard during ABS operation. This is a normal condition.

ABS Hydraulic Circuit

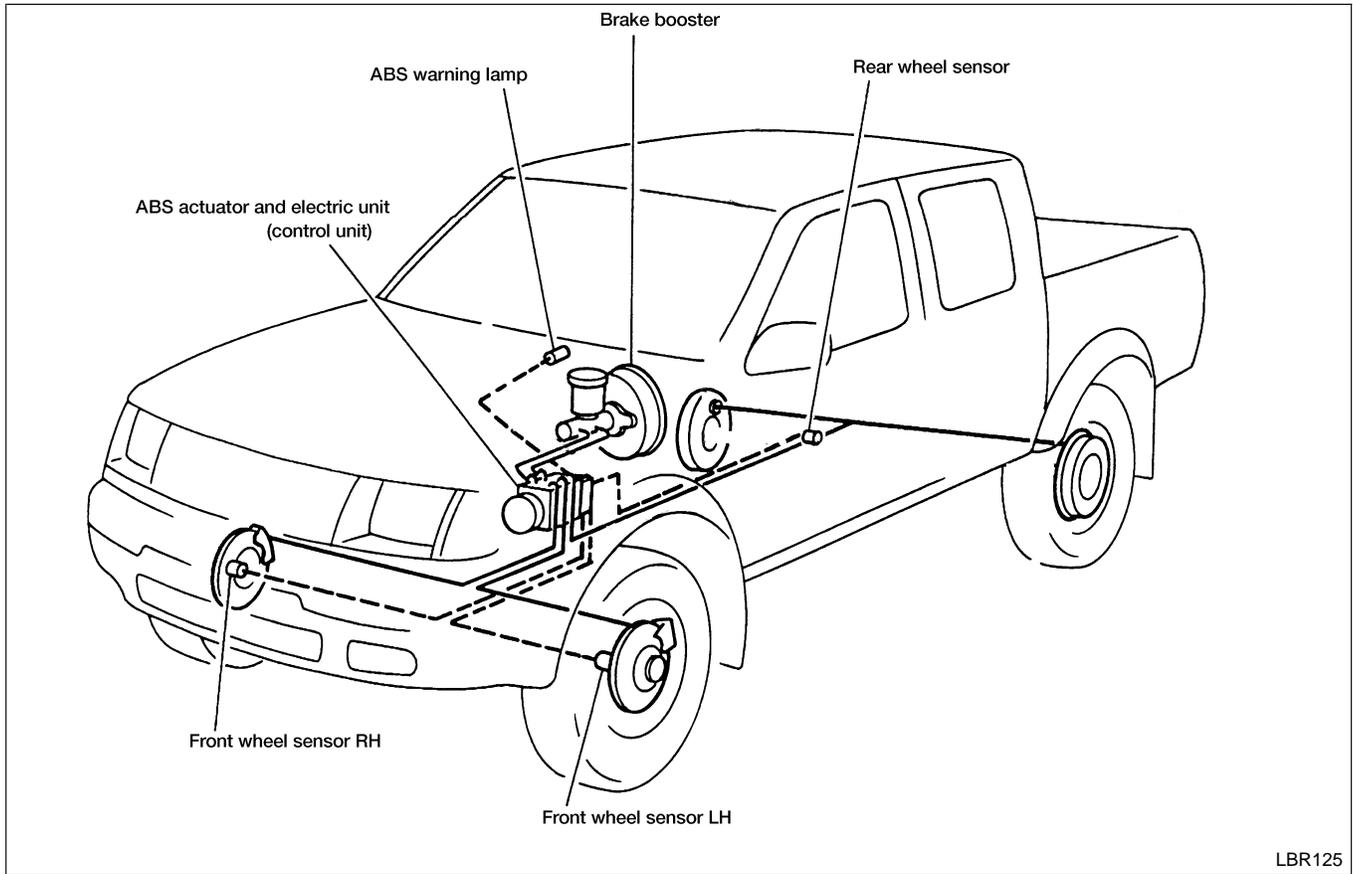
NEBR0148



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

System Components

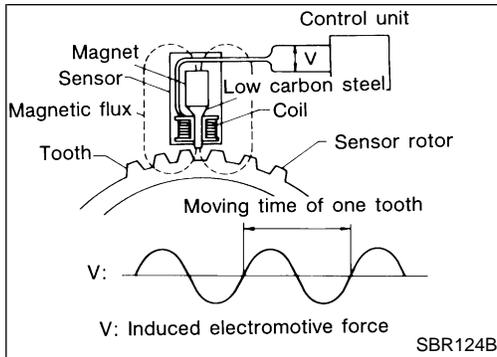
NEBR0149



LBR125

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System Description



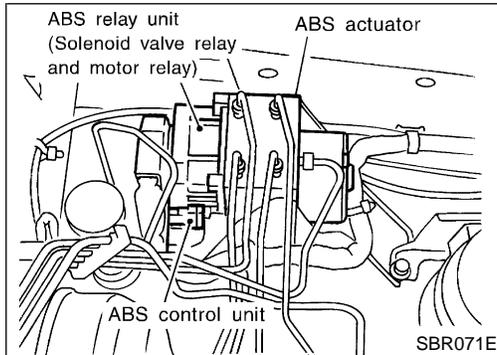
System Description

WHEEL SENSOR

=NEBR0150

NEBR0150S01

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



ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

NEBR0150S02

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

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

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

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

ABS Actuator Operation

NEBR0150S0201

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

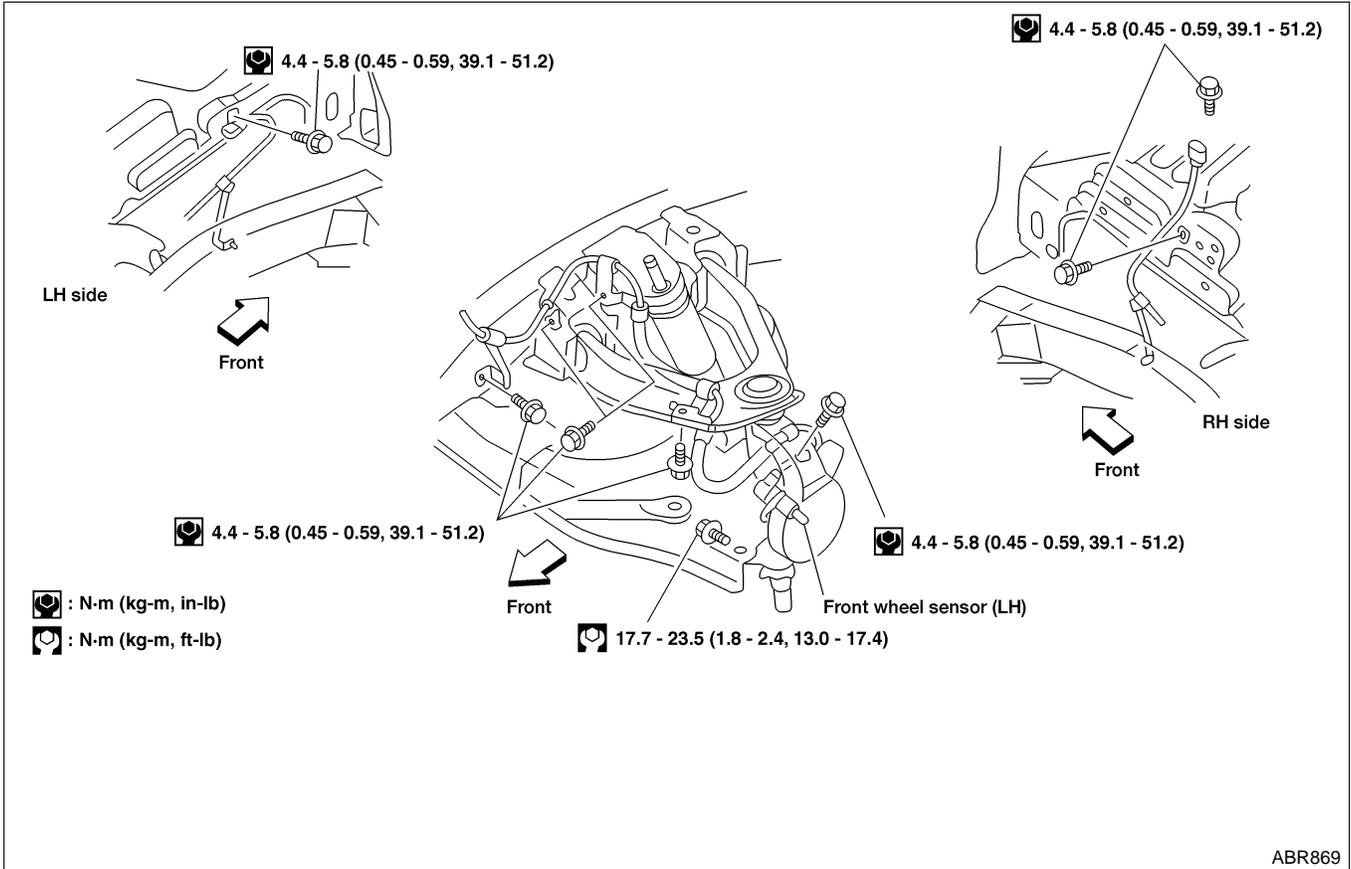
Removal and Installation
FRONT WHEEL SENSORS

=NEBR0174

NEBR0174S01

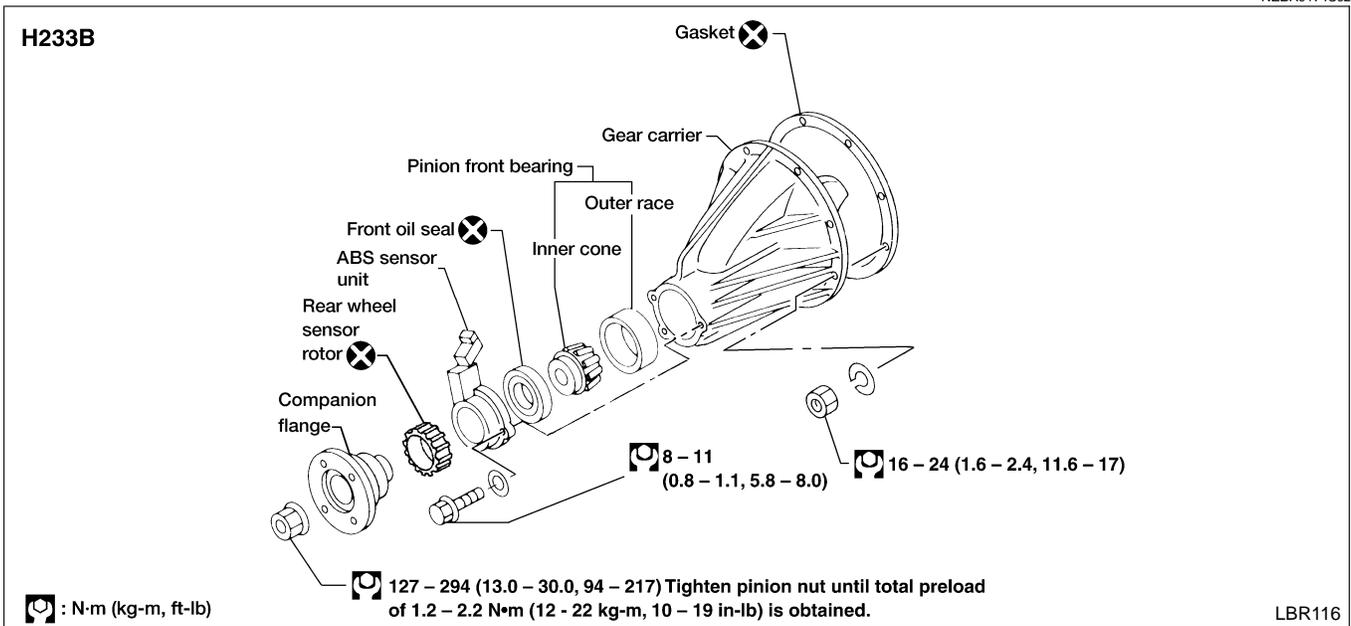
CAUTION:

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



REAR WHEEL SENSOR

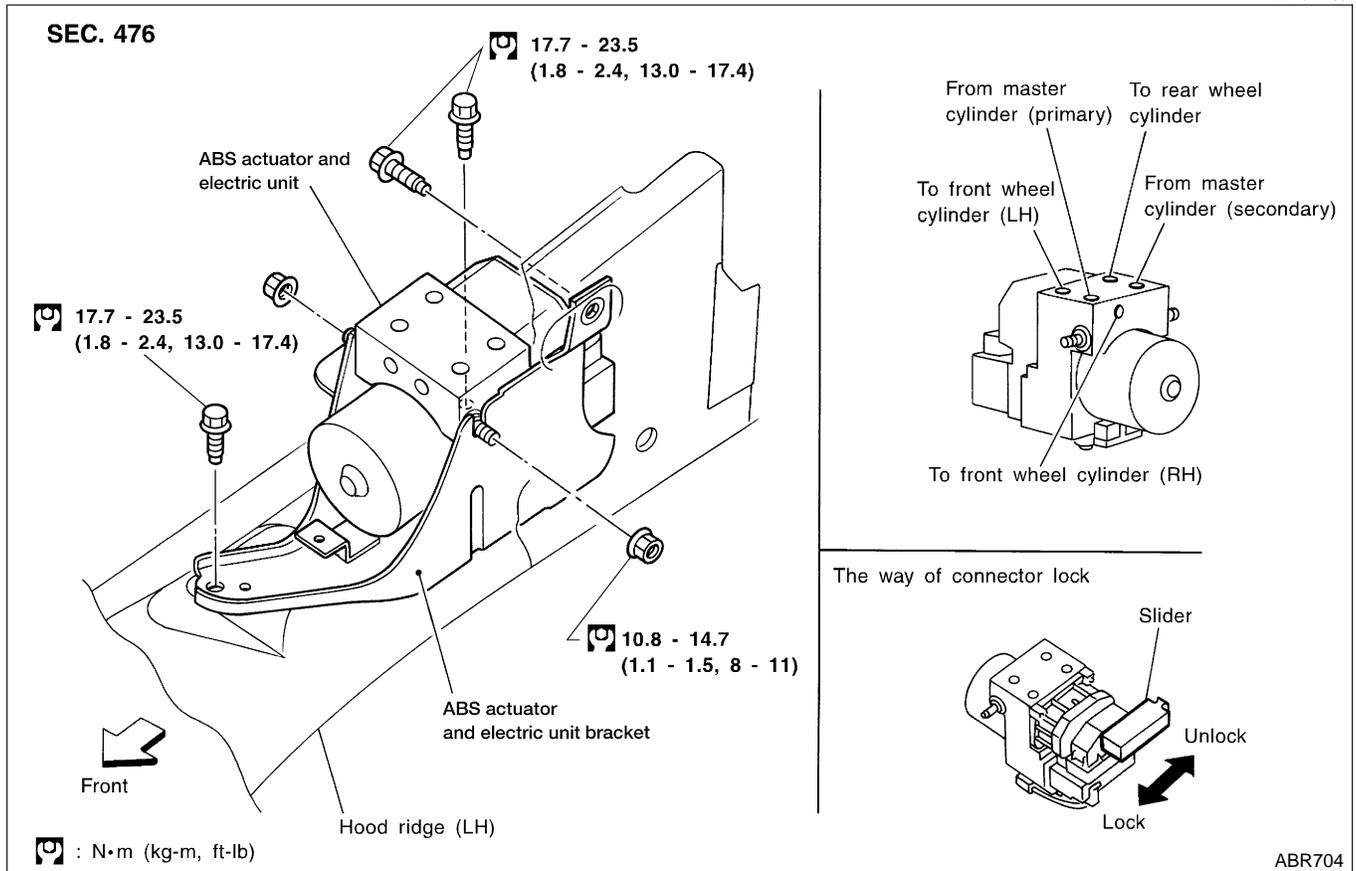
NEBR0174S02



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ABS ACTUATOR AND ELECTRIC UNIT

NEBR0174S04



Removal

NEBR0174S0402

- 1) Disconnect battery cable.
- 2) Drain brake fluid. Refer to "Changing Brake Fluid", BR-9.
- 3) Disconnect ABS actuator and electric unit (control unit connector) and brake pipes.
- 4) Remove mounting bracket fixing bolts and nuts.

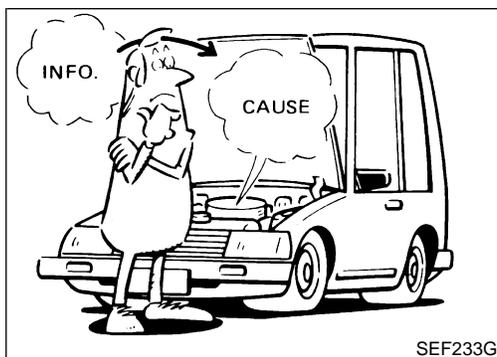
Installation

NEBR0174S0403

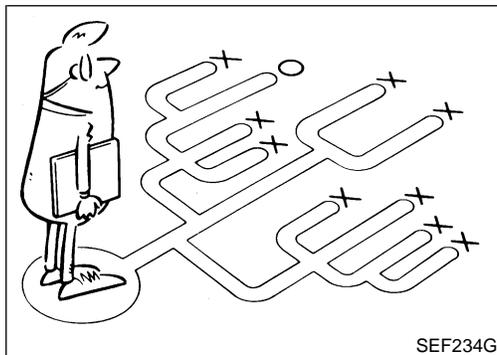
CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to "Bleeding Brake System", BR-11.

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



SEF233G



SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

NEBR0176

NEBR0176S01

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

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

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

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with an ABS complaint. The customer is a very good source of information on such problems; especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur. Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot brake problems on an ABS controlled vehicle.

Also check related Service bulletins for information.

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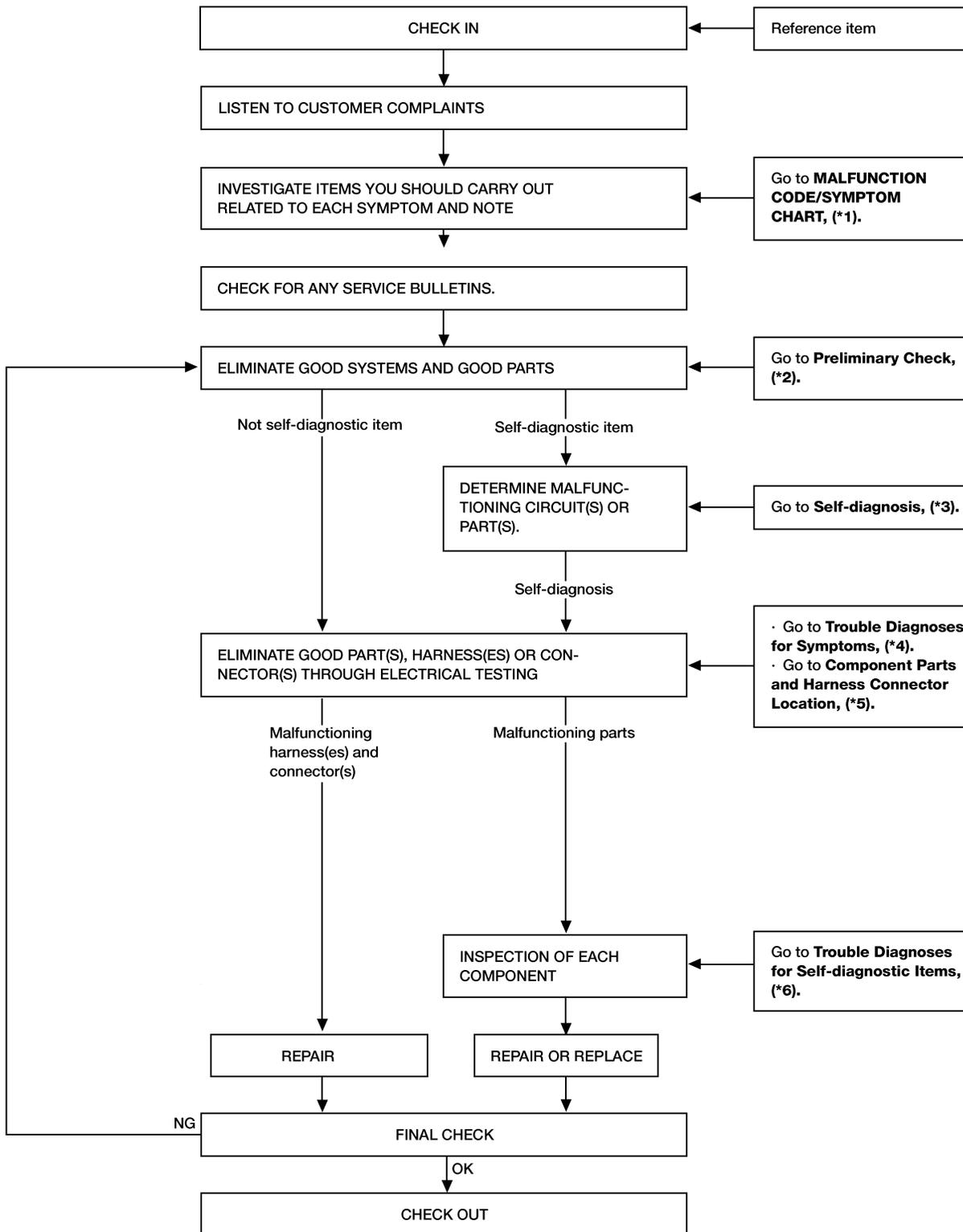
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WORK FLOW

NEBR0176S02



ABR839

*1: BR-92

*2: BR-75

*3: BR-83

*4: BR-102 - 107

*5: BR-78

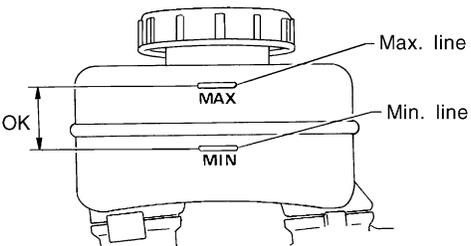
*6: BR-93 - 107

Preliminary Check

NEBR0177

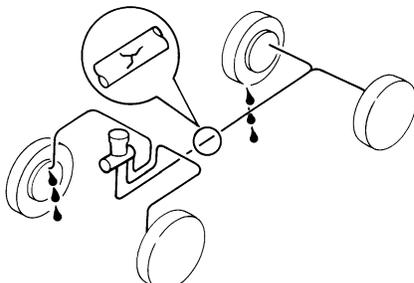
1	CHECK BRAKE FLUID	
Check brake fluid for contamination.		
Has brake fluid been contaminated?		
Yes	▶	Replace. GO TO 2.
No	▶	GO TO 2.

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

SBR451D

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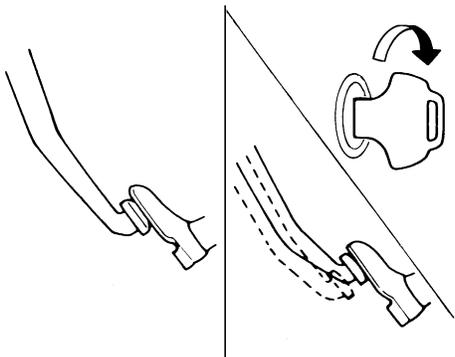
3	CHECK BRAKE LINE	
Check brake line for leakage.		
		
Is leakage present at or around brake lines, tubes or hoses or are any of these parts cracked or damaged?		
Yes	▶	Repair. GO TO 4.
No	▶	GO TO 4.

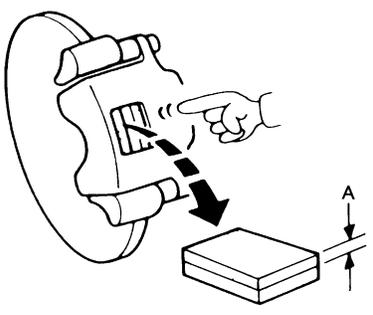
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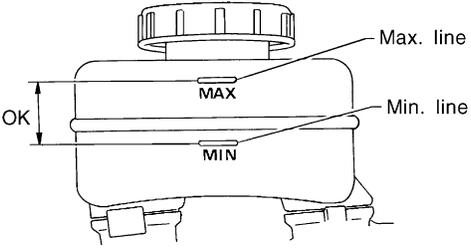
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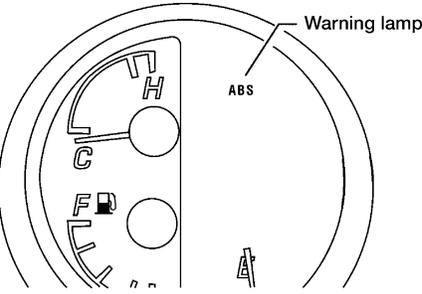
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Preliminary Check (Cont'd)

4	CHECK BRAKE BOOSTER OPERATION	
<p>Check brake booster for operation and air tightness. Refer to "On-vehicle Service", BR-22.</p>		
		
SBR058C		
Is brake booster airtight and functioning properly?		
Yes	▶	GO TO 5.
No	▶	Replace. GO TO 5.

5	CHECK BRAKE PAD AND ROTOR	
<p>Check brake pad and rotor. Refer to "Pad Replacement", BR-26 and "ROTOR", 28.</p>		
		
SBR059C		
Are brake pads and rotors functioning properly?		
Yes	▶	GO TO 6.
No	▶	Replace.

6	RECHECK BRAKE FLUID LEVEL	
Check brake fluid level in reservoir tank again.		
		
SBR451D		
Is brake fluid filled between MAX and MIN lines on reservoir tank?		
Yes	▶	GO TO 7.
No	▶	Fill brake fluid.

7	CHECK WARNING LAMP ACTIVATION	
Check warning lamp activation.		
		
LBR380		
Does warning lamp turn on when ignition switch is turned ON?		
Yes	▶	GO TO 8.
No	▶	Check fuse, warning lamp bulb and warning lamp circuit.

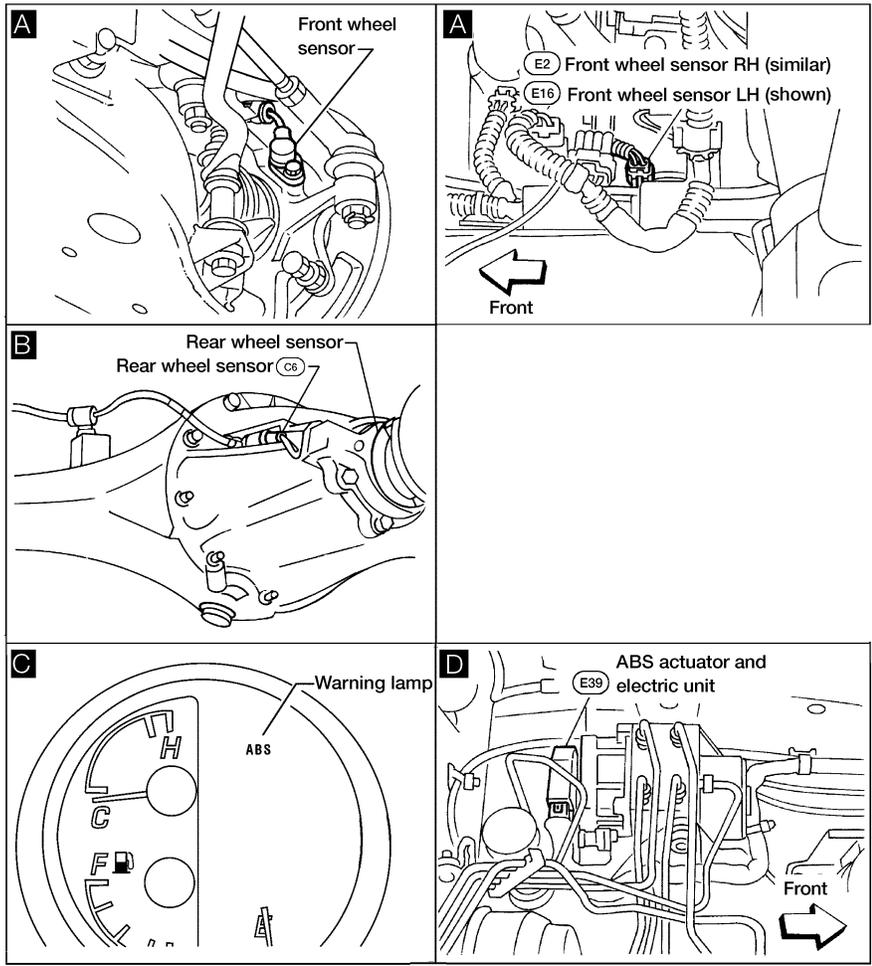
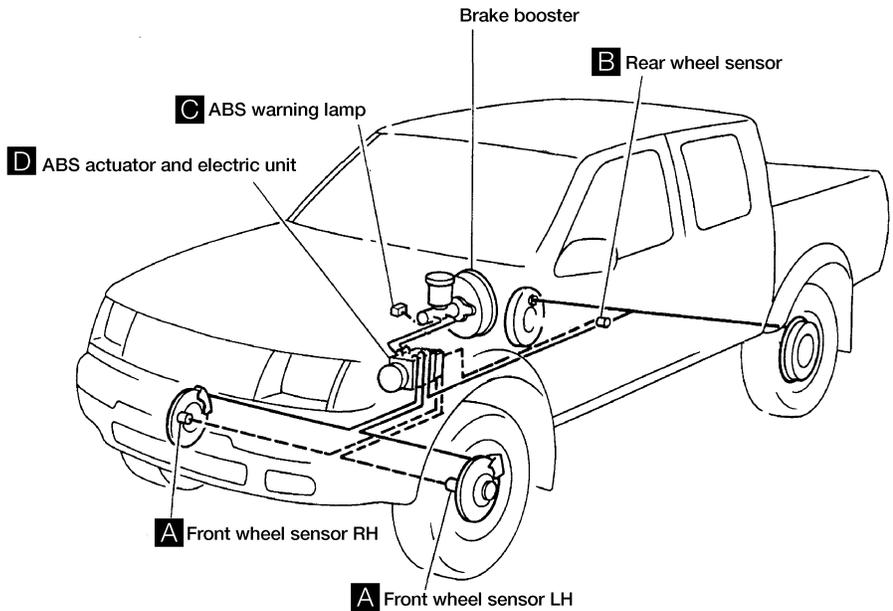
8	CHECK WARNING LAMP DEACTIVATION	
Check warning lamp for deactivation after engine is started.		
Does warning lamp turn off when engine is started?		
Yes	▶	GO TO 9.
No	▶	Go to "Self-diagnosis", BR-83.

9	DRIVE VEHICLE	
Drive vehicle at speeds over 30 km/h (19 MPH) for at least one minute.		
Does warning lamp remain off after vehicle has been driven at 30 km/h (19 MPH) for at least one minute?		
Yes	▶	INSPECTION END
No	▶	Go to "Self-diagnosis", BR-83.

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Component Parts and Harness Connector Location

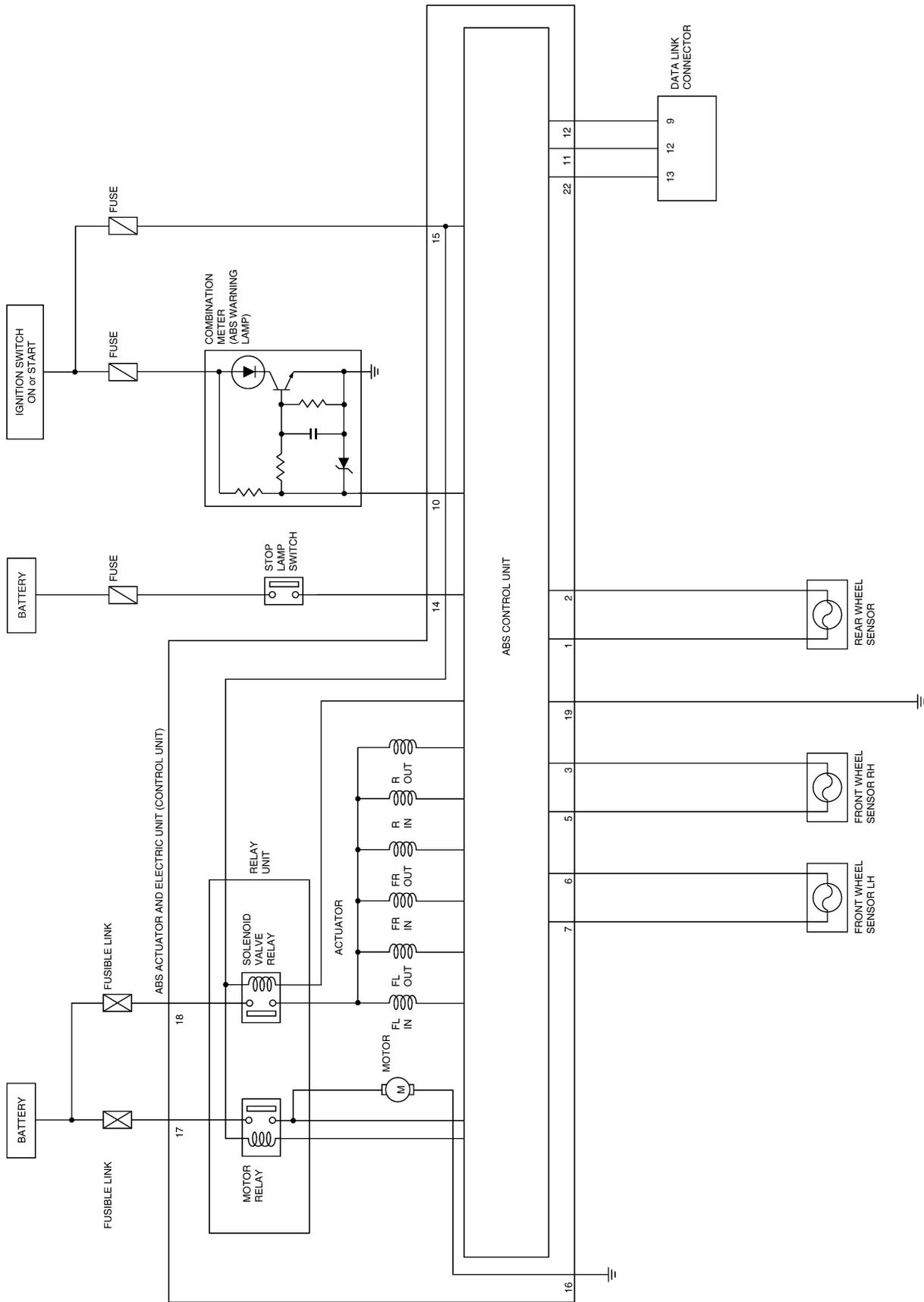
NEBR0178



LBR389

Schematic

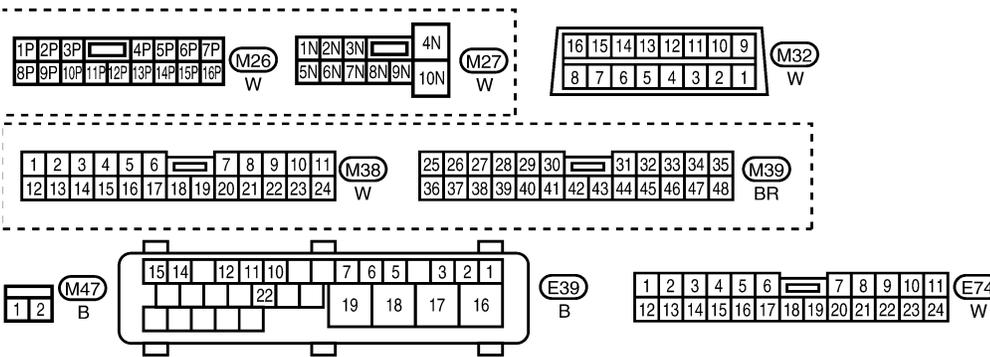
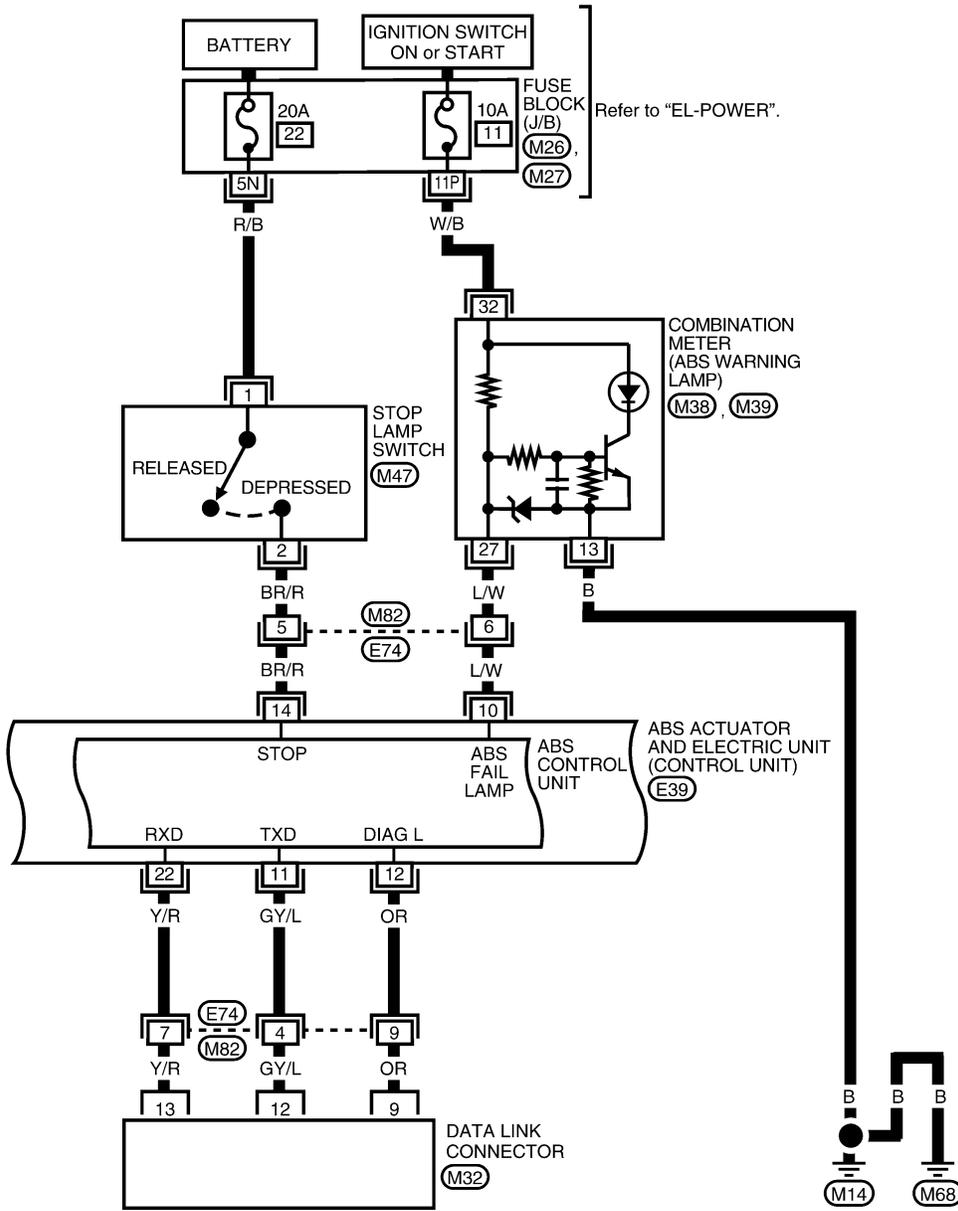
NEBR0152



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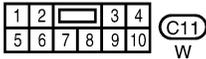
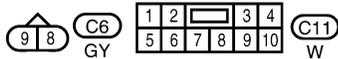
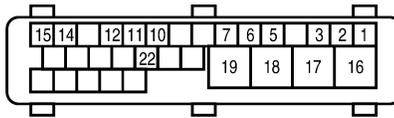
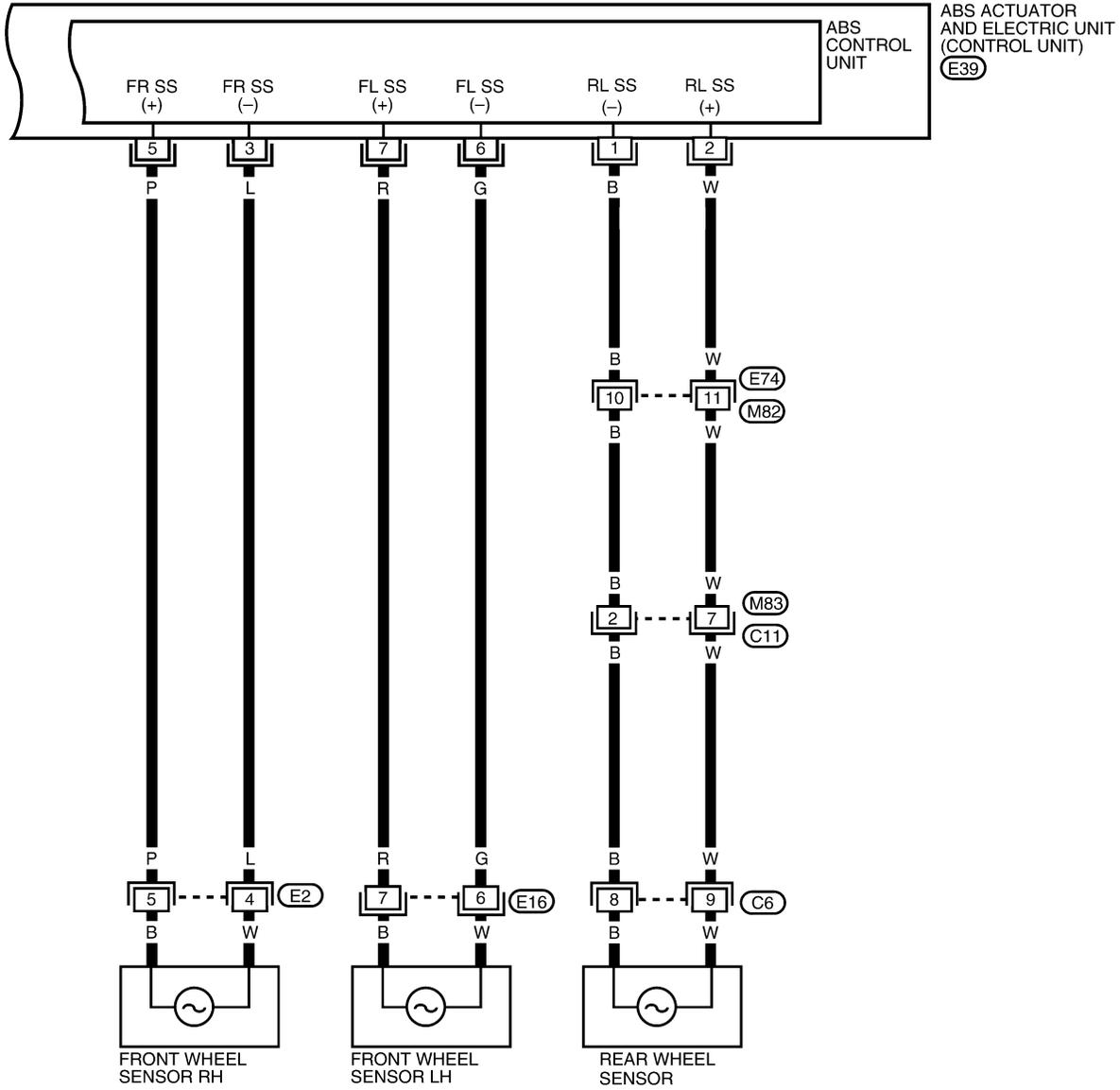
LBR385

BR-ABS-04



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BR-ABS-05



Self-diagnosis

FUNCTION

NEBR0154

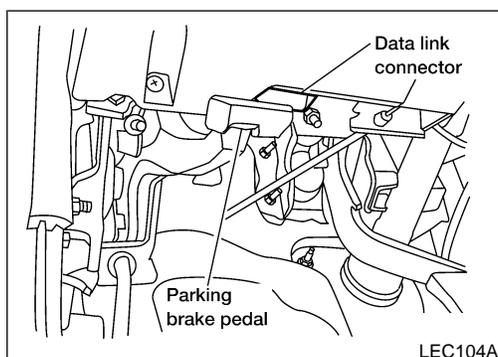
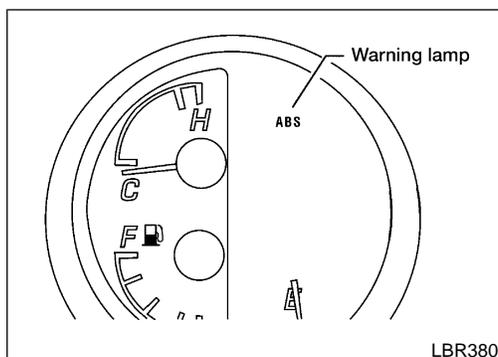
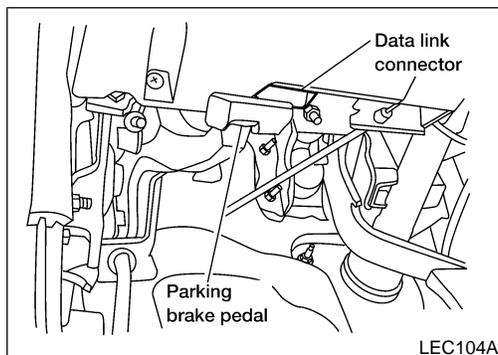
NEBR0154S01

- When a problem occurs in the ABS, the warning lamp on the instrument panel comes on. To start the self-diagnostic results mode, ground the self-diagnostic (check) terminal located on data link connector. The location of the malfunction is indicated by the warning lamp flashing.

SELF-DIAGNOSIS PROCEDURE

NEBR0154S02

1. Drive vehicle over 30 km/h (19 MPH) for at least one minute.
2. Turn ignition switch OFF.
3. Ground terminal 9 of data link connector with a suitable harness.
4. Turn ignition switch ON while grounding terminal 9.
Do not depress brake pedal.



5. After 3.0 seconds, the warning lamp starts flashing to indicate the malfunction code No. (See NOTE.)
6. Verify the location of the malfunction with the "Malfunction Code/Symptom Chart", refer to BR-92. Then make the necessary repairs following the diagnostic procedures.
7. After the malfunctions are repaired, erase the malfunction codes stored in the control unit. Refer to "HOW TO ERASE SELF-DIAGNOSTIC RESULTS (MALFUNCTION CODES)", BR-84.
8. Rerun the self-diagnostic results mode to verify that the malfunction codes have been erased.
9. Disconnect the check terminal from the ground. The self-diagnostic results mode is now complete.
10. Check warning lamp for deactivation after driving vehicle over 30 km/h (19 MPH) for at least one minute.
11. After making certain that warning lamp does not come on, test the ABS in a safe area to verify that it functions properly.

NOTE:

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

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

VG33E AND VG33ER (2WD)

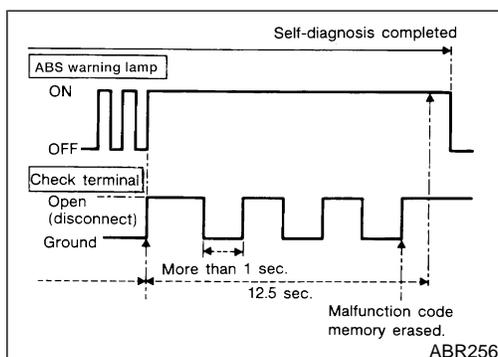
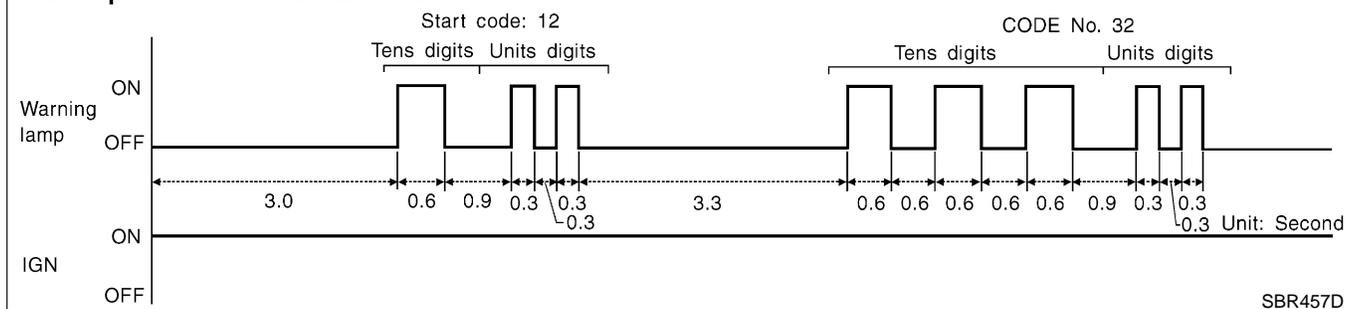
Self-diagnosis (Cont'd)

HOW TO READ SELF-DIAGNOSTIC RESULTS (MALFUNCTION CODES)

=NEBR0154S03

1. Determine the code No. by counting the number of times the warning lamp flashes on and off.
2. When several malfunctions occur at one time, up to three code numbers can be stored; the latest malfunction will be indicated first.
3. The indication begins with the start code 12. After that a maximum of three code numbers appear in the order of the latest one first. The indication then returns to the start code 12 to repeat (the indication will stay on for five minutes at the most).
4. The malfunction code is given in the "Malfunction Code/Symptom Chart", refer to BR-92.

Example: Code No. 32 REAR SENSOR SHORT-CIRCUIT



HOW TO ERASE SELF-DIAGNOSTIC RESULTS (MALFUNCTION CODES)

NEBR0154S04

1. Disconnect the check terminal from ground (ABS warning lamp will stay lit).
2. Within 12.5 seconds, ground the check terminal three times. Each terminal ground must last more than 1 second. The ABS warning lamp goes out after the erase operation has been completed.
3. Perform self-diagnosis again. Refer to "Self-diagnosis", BR-83. Only the start code should appear, no malfunction codes.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

VG33E AND VG33ER (2WD)

CONSULT-II

CONSULT-II

=NEBR0155

CONSULT-II APPLICATION TO ABS

NEBR0155S01

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	—	EM
ABS sensor	X	—	—	LC
Stop lamp switch	—	×	—	
Front right inlet solenoid valve	X	X	X	EC
Front right outlet solenoid valve	X	X	X	
Front left inlet solenoid valve	X	X	X	FE
Front left outlet solenoid valve	X	X	X	
Rear inlet solenoid valve	X	X	X	CL
Rear outlet solenoid valve	X	X	X	
Actuator solenoid valve relay	X	X	—	MT
Actuator motor relay (ABS MOTOR is shown on the Data Monitor screen.)	X	X	X	AT
ABS warning lamp	—	X	—	TF
Battery voltage	X	X	—	
ABS operating signal	—	X	X	PD

X : Applicable

—: Not applicable

ECU (ABS CONTROL UNIT) PART NUMBER MODE

NEBR0155S02

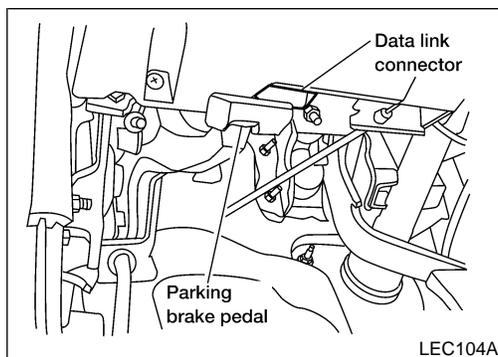
Ignore the ECU part number displayed in the ECU PART NUMBER MODE. Refer to Parts Catalog to order the ECU.

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

VG33E AND VG33ER (2WD)

CONSULT-II Inspection Procedure

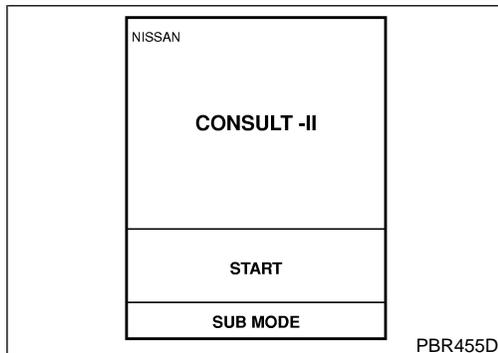


CONSULT-II Inspection Procedure SELF-DIAGNOSIS PROCEDURE

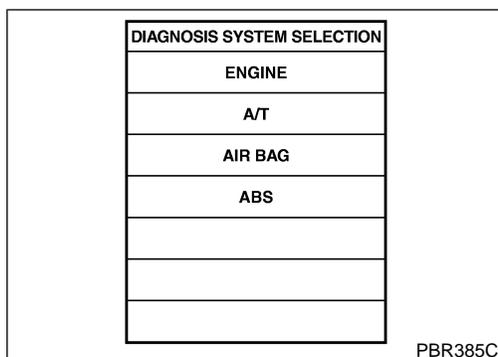
=NEBR0156

NEBR0156S01

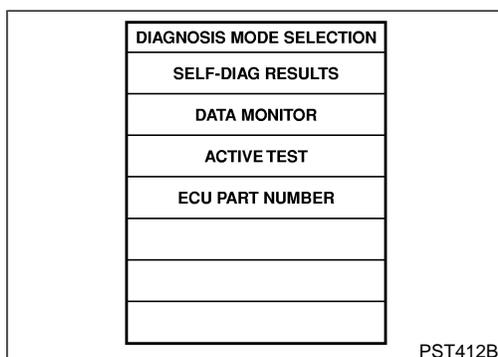
1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector.
3. Start engine.
4. Drive vehicle over 30 km/h (19 MPH) for at least one minute.
5. Stop vehicle with engine running and touch "START" on CONSULT-II screen.



6. Touch "ABS".

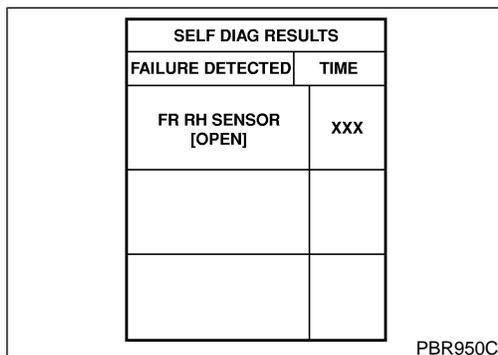


7. Touch "SELF-DIAG RESULTS".
 - The screen shows the detected malfunction and how many times the ignition switch has been turned ON since the malfunction.
8. Make the necessary repairs following the diagnostic procedures.



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

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



ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

VG33E AND VG33ER (2WD)

CONSULT-II Inspection Procedure (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

NEBR0156S02

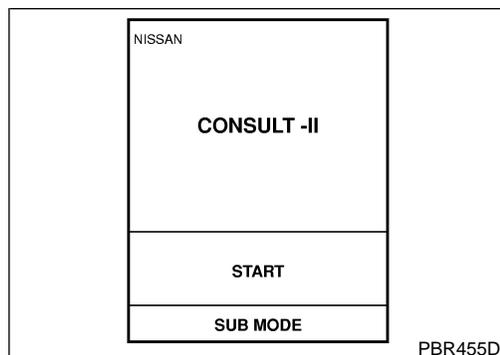
Diagnostic item	Diagnostic item is detected when ...	Reference Page
FR RH SENSOR★ [OPEN]	<ul style="list-style-type: none"> ● Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.) 	BR-93
FR LH SENSOR★ [OPEN]	<ul style="list-style-type: none"> ● Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.) 	BR-93
RR SENSOR★ [OPEN]	<ul style="list-style-type: none"> ● Circuit for rear sensor is open. (An abnormally high input voltage is entered.) 	BR-93
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.) 	BR-93
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.) 	BR-93
RR SENSOR★ [SHORT]	<ul style="list-style-type: none"> ● Circuit for rear sensor is shorted. (An abnormally low input voltage is entered.) 	BR-93
ABS SENSOR★ [ABNORMAL SIGNAL]	<ul style="list-style-type: none"> ● Teeth damage on sensor rotor or improper installation of wheel sensor. (Abnormal wheel sensor signal is entered.) 	BR-93
FR RH IN ABS SOL [OPEN, SHORT]	<ul style="list-style-type: none"> ● Circuit for front right inlet solenoid valve is open. (An abnormally low output voltage is entered.) 	BR-95
FR LH IN ABS SOL [OPEN, SHORT]	<ul style="list-style-type: none"> ● Circuit for front left inlet solenoid valve is open. (An abnormally low output voltage is entered.) 	BR-95
FR RH OUT ABS SOL [OPEN, SHORT]	<ul style="list-style-type: none"> ● Circuit for front right outlet solenoid valve is open. (An abnormally low output voltage is entered.) 	BR-95
FR LH OUT ABS SOL [OPEN, SHORT]	<ul style="list-style-type: none"> ● Circuit for front left outlet solenoid valve is open. (An abnormally low output voltage is entered.) 	BR-95
R IN ABS SOL [OPEN, SHORT]	<ul style="list-style-type: none"> ● Circuit for rear right inlet solenoid valve is shorted. (An abnormally high output voltage is entered.) 	BR-95
R OUT ABS SOL [OPEN, SHORT]	<ul style="list-style-type: none"> ● Circuit for rear left inlet solenoid valve is shorted. (An abnormally high output voltage is entered.) 	BR-95
ABS ACTUATOR RELAY [ABNORMAL]	<ul style="list-style-type: none"> ● Actuator solenoid valve relay is ON, even if control unit sends off signal. ● Actuator solenoid valve relay is OFF, even if control unit sends on signal. 	BR-95
ABS MOTOR RELAY [ABNORMAL]	<ul style="list-style-type: none"> ● Circuit for ABS motor relay is open or shorted. ● Circuit for actuator motor is open or shorted. ● Actuator motor relay is stuck. 	BR-97
BATTERY VOLT [VB-LOW]	<ul style="list-style-type: none"> ● Power source voltage supplied to ABS control unit is abnormally low. 	BR-99
CONTROL UNIT	<ul style="list-style-type: none"> ● Function of calculation in ABS control unit has failed. 	BR-101

★: If one or more wheels spin on a rough or slippery road for 40 seconds or more, the ABS warning lamp will illuminate. This does not indicate a malfunction. Only in the case of the short-circuit (Code Nos. 26, 22, 32 and 36), after repair the ABS warning lamp also illuminates when the ignition switch is turned ON. In this case, drive the vehicle at speeds greater than 30 km/h (19 MPH) for approximately 1 minute as specified in "SELF-DIAGNOSIS PROCEDURE", BR-83. Check to ensure that the ABS warning lamp goes out while the vehicle is being driven.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

VG33E AND VG33ER (2WD)

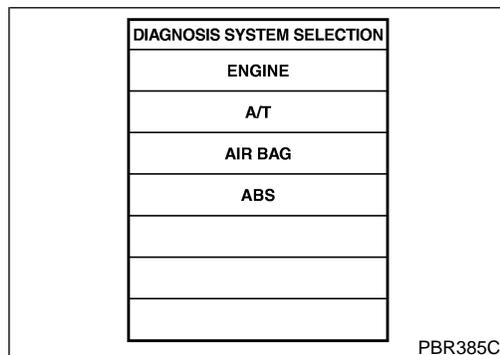
CONSULT-II Inspection Procedure (Cont'd)



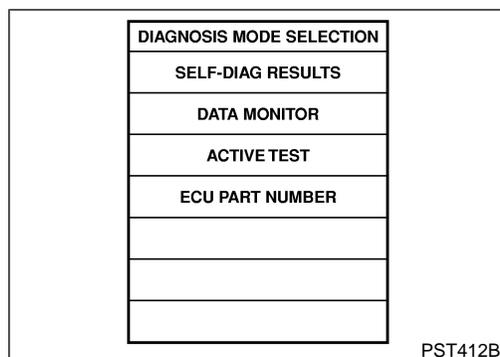
DATA MONITOR PROCEDURE

NEBR0156S03

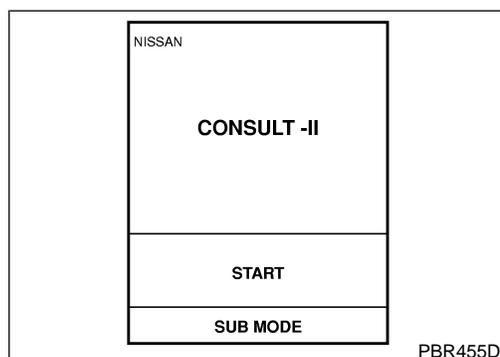
1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector.
3. Turn ignition switch ON.
4. Touch "START" on CONSULT-II screen.



5. Touch "ABS".



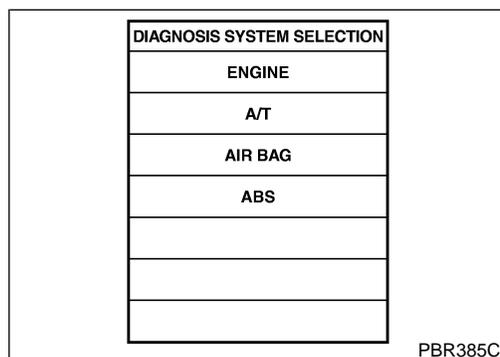
6. Touch "DATA MONITOR".



ACTIVE TEST PROCEDURE

NEBR0156S04

- When conducting Active test, vehicle must be stationary.
 - When ABS warning lamp stays on, never conduct Active test.
1. Turn ignition switch OFF.
 2. Connect CONSULT-II to data link connector.
 3. Start engine.
 4. Touch "START" on CONSULT-II screen.



5. Touch "ABS".

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

VG33E AND VG33ER (2WD)

CONSULT-II Inspection Procedure (Cont'd)

DIAGNOSIS MODE SELECTION
SELF-DIAG RESULTS
DATA MONITOR
ACTIVE TEST
ECU PART NUMBER

PST412B

6. Touch "ACTIVE TEST".

SELECT TEST ITEM
FR RH SOLENOID
FR LH SOLENOID
RR RH SOLENOID
RR LH SOLENOID
ABS MOTOR
ABS OPER SIG
G-SWITCH

SBR549E

7. Select active test item by touching screen.

FR RH SOL TEST
SELECT MONITOR ITEM
MAIN SIGNALS
SELECTION FROM MENU

PBR934C

8. Touch "START".

9. Carry out the active test by touching screen key.

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

VG33E AND VG33ER (2WD)

CONSULT-II Inspection Procedure (Cont'd)

DATA MONITOR MODE

-NEBR0156S05

MONITOR ITEM	CONDITION	SPECIFICATION
FR RH SENSOR FR LH SENSOR RR SENSOR	Drive vehicle. (Each wheel is rotating.)	Wheel speed signal (Almost the same speed as speedometer.)
STOP LAMP SWITCH	Brake is depressed.	Depress the pedal: ON Release the pedal: OFF
FR RH IN SOL FR RH OUT SOL FR LH IN SOL FR LH OUT SOL R IN SOL R OUT SOL	1. Drive vehicle at speeds over 30 km/h (19 MPH) for at least 1 minute. 2. Engine is running.	Operating conditions for each solenoid valve are indicated. ABS is not operating: OFF
MOTOR RELAY		ABS is not operating: OFF ABS is operating: ON
ACTUATOR RELAY		Ignition switch 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
BATTERY VOLT		Power supply voltage for control unit

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

VG33E AND VG33ER (2WD)

CONSULT-II Inspection Procedure (Cont'd)

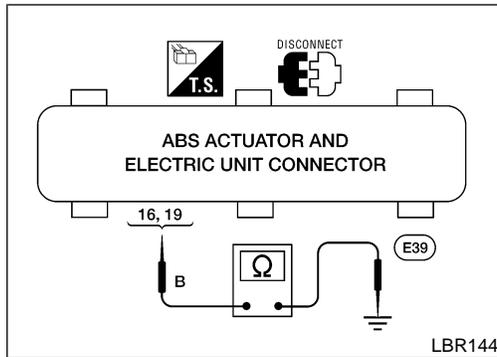
ACTIVE TEST MODE

-NEBR0156S06

TEST ITEM	CONDITION	JUDGEMENT		
FR RH SOLENOID FR LH SOLENOID R SOLENOID	Engine is running.	Brake fluid pressure control operation		
			IN SOL	OUT SOL
		UP (Increase):	OFF	OFF
		KEEP (Hold):	ON	OFF
ABS MOTOR	Engine is running.	DOWN (Decrease):	ON	ON
		ABS actuator motor ON: Motor runs (ABS motor relay ON) OFF: Motor stops (ABS motor relay OFF)		

NOTE:

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



Ground Circuit Check

ABS ACTUATOR AND ELECTRIC UNIT GROUND

NEBR0179

NEBR0179S01

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

Resistance: approximately 0Ω

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TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

NEBR0191

VG33E AND VG33ER (2WD)

Malfunction Code/Symptom Chart

Malfunction Code/Symptom Chart

NEBR0191S01

Code No. (No. of warning lamp flashes)	Malfunctioning part	Reference Page
45	Actuator front left outlet solenoid valve	BR-95
46	Actuator front left inlet solenoid valve	BR-95
41	Actuator front right outlet solenoid valve	BR-95
42	Actuator front right inlet solenoid valve	BR-95
55	Actuator rear outlet solenoid valve	BR-95
56	Actuator rear inlet solenoid valve	BR-95
25 ★1	Front left sensor (open-circuit)	BR-93
26 ★1	Front left sensor (short-circuit)	BR-93
21 ★1	Front right sensor (open-circuit)	BR-93
22 ★1	Front right sensor (short-circuit)	BR-93
35 ★1	Rear sensor (open-circuit)	BR-93
36 ★1	Rear sensor (short-circuit)	BR-93
18 ★1	Sensor rotor	BR-93
61 ★3	Actuator motor or motor relay	BR-97
63	Solenoid valve relay	BR-95
57 ★2	Power supply (Low voltage)	BR-99
71	Control unit	BR-101
Warning lamp stays on when ignition switch is turned ON.	Control unit power supply circuit Warning lamp bulb circuit Control unit or control unit connector Solenoid valve relay stuck Power supply for solenoid valve relay coil	BR-107
Warning lamp does not come on When ignition switch is turned ON.	Fuse, warning lamp bulb or warning lamp circuit Control unit	BR-105
Pedal vibration and noise	—	BR-105
Long stopping distance	—	BR-104
Unexpected pedal action	—	BR-103
ABS does not work	—	BR-104
ABS works frequently	—	BR-102

★1: If one or more wheels spin on a rough or slippery road for 40 seconds or more, the ABS warning lamp will illuminate. This does not indicate a malfunction. Only in the case of the short-circuit (Code Nos. 26, 22, 32 and 36), after repair the ABS warning lamp also illuminates when the ignition switch is turned ON. In this case, drive the vehicle at speeds greater than 30 km/h (19 MPH) for approximately 1 minute as specified in "SELF-DIAGNOSIS PROCEDURE", BR-83. Check to ensure that the ABS warning lamp goes out while the vehicle is being driven.

★2: The trouble code "57", which refers to a low power supply voltage, does not indicate that the ABS control unit is malfunctioning. Do not replace the ABS control unit with a new one.

★3: The trouble code "61" can sometimes appear when the ABS motor is not properly grounded. If it appears, be sure to check the condition of the ABS motor ground circuit connection.

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (2WD)

Wheel Sensor or Rotor

Wheel Sensor or Rotor

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

NEBR0184
NEBR0184S01

NOTE:

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

1	INSPECTION START
Wheel sensor inspection	
<p style="text-align: center;">Wheel sensor connectors (sensor side)</p>	
WBR178	
▶	GO TO 2.

2	CHECK CONNECTOR
1. Disconnect connectors from ABS actuator and electric unit and wheel sensor of malfunction code No. Check terminals for damage or loose connection. Then reconnect connectors. 2. Carry out "Self-diagnosis" again. Refer to BR-83.	
Does warning lamp activate again?	
Yes	▶ GO TO 3.
No	▶ INSPECTION END

3	CHECK WHEEL SENSOR ELECTRICAL
1. Disconnect ABS actuator and electric unit connector. 2. Check resistance between ABS actuator and electric unit connector E39 terminals. Code No. 21 or 22 (Front RH wheel) Terminals 3 (L) and 5 (P) Code No. 25 or 26 (Front LH wheel) Terminals 6 (G) and 7 (R) Code No. 35 or 36 (Rear wheel) Terminals 1 (B) and 2 (W)	
<p>Resistance: Front: 1.28 - 1.92 kΩ Rear: 1.05 - 1.35 kΩ</p>	
Are front and rear resistance values within specifications?	
Yes	▶ GO TO 5.
No	▶ GO TO 4.

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TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (2WD)

Wheel Sensor or Rotor (Cont'd)

4	CHECK WHEEL SENSOR	
<p>Check each sensor for resistance.</p> <div style="text-align: center;"> <p>Front RH sensor (E2) Front LH sensor (E16) Rear sensor (C6)</p> </div> <p>Resistance: Front 1.28 - 1.92 kΩ Rear 1.05 - 1.35 kΩ</p> <p style="text-align: right;">WBR179</p>		
Are front and rear sensor resistance values within specifications?		
Yes	▶	<p>Check the following. If NG, repair harness or connectors.</p> <ul style="list-style-type: none"> ● Harness connectors E2, E16, E39, C6 ● Harness for open or short between wheel sensor connectors and ABS actuator and electric unit
No	▶	Replace wheel sensor.

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

6	CHECK WHEEL BEARING	
Check wheel bearing axial end play. (See NOTE)		
Is wheel bearing axial end play within specifications? Refer to AX-5, "FRONT WHEEL BEARING" and AX-28, "REAR WHEEL BEARING".		
Yes	▶	GO TO 7.
No	▶	Check wheel bearing. Refer to AX-5 , "FRONT WHEEL BEARING" and AX-28 , "REAR WHEEL BEARING".

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

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (2WD)

ABS Actuator Solenoid Valve and Solenoid Valve Relay

ABS Actuator Solenoid Valve and Solenoid Valve Relay

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

NEBR0185

NEBR0185S01

1	INSPECTION START
Solenoid valve relay inspection	
WBR169	
▶	GO TO 2.

2	CHECK FUSE
Check 20A fuse 41. For fuse layout, refer to EL-10 , "POWER SUPPLY ROUTING".	
Is fusible link OK?	
Yes	▶ GO TO 3.
No	▶ GO TO 6.

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

4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT
Refer to "ABS ACTUATOR AND ELECTRIC UNIT GROUND", BR-91.	
Is ground circuit OK?	
Yes	▶ GO TO 5.
No	▶ Repair harness or connector.

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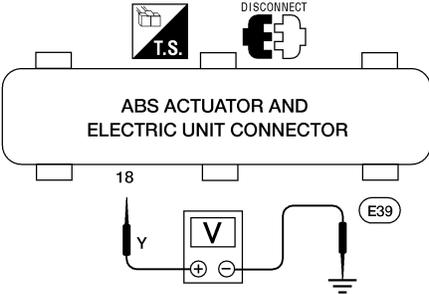
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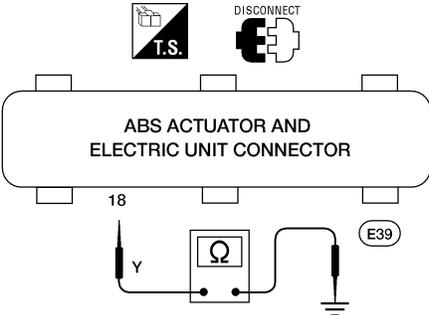
TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (2WD)

ABS Actuator Solenoid Valve and Solenoid Valve Relay (Cont'd)

5	CHECK SOLENOID VALVE POWER SUPPLY CIRCUIT	
<p>1. Disconnect ABS actuator and electric unit connector.</p> <p>2. Check voltage between ABS actuator and electric unit connector E39 (body side) terminal 18 and ground.</p>		
		
ABR646		
Does battery voltage exist?		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	<p>Check the following.</p> <p>If NG, repair harness or connectors.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse

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

7	CHECK SOLENOID VALVE RELAY POWER SUPPLY CIRCUIT FOR SHORT	
<p>1. Disconnect battery cable and ABS actuator and electric unit connector.</p> <p>2. Check continuity between ABS actuator and electric unit connector E39 (body side) terminal 18 and ground.</p>		
		
ABR647		
Continuity should not exist.		
Does continuity exist?		
Yes	▶	<p>Check the following.</p> <p>If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse
No	▶	Replace ABS actuator and electric unit.

Motor Relay or Motor MALFUNCTION CODE NO. 61

NEBR0186

NEBR0186S01

1	INSPECTION START	
<p>ABS motor relay inspection</p>		
▶		GO TO 2.

2	CHECK FUSIBLE LINK	
<p>Check 40A fusible link d. For fusible link layout, refer to <i>EL-10</i>, "POWER SUPPLY ROUTING".</p> <p style="text-align: center;">Is fusible link OK?</p>		
Yes ▶		GO TO 3.
No ▶		GO TO 6.

3	CHECK CONNECTOR	
<p>1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connection. Then reconnect connector.</p> <p>2. Carry out self-diagnosis again.</p> <p style="text-align: center;">Does warning lamp activate again?</p>		
Yes ▶		GO TO 4.
No ▶		INSPECTION END

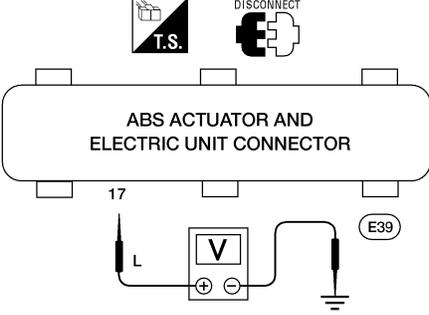
4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT	
<p>Refer to "ABS ACTUATOR AND ELECTRIC UNIT GROUND", BR-91.</p> <p style="text-align: center;">Is ground circuit OK?</p>		
Yes ▶		GO TO 5.
No ▶		Repair harness or connector.

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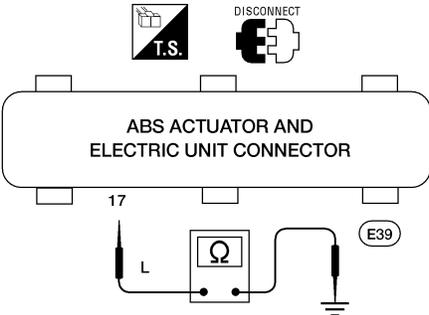
TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (2WD)

Motor Relay or Motor (Cont'd)

5	CHECK MOTOR RELAY POWER SUPPLY CIRCUIT	
<p>1. Disconnect ABS actuator and electric unit connector. 2. Check voltage between ABS actuator and electric unit connector E39 terminal 17 and ground.</p>		
		
ABR649		
Does battery voltage exist?		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	Check the following. If NG, repair harness or connector. <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fusible link

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

7	CHECK ABS ACTUATOR MOTOR POWER SUPPLY CIRCUIT FOR SHORT	
<p>1. Disconnect battery cable and ABS actuator and electric unit connector. 2. Check continuity between ABS actuator and electric unit connector E39 terminal 17 and ground.</p>		
		
ABR650		
Continuity should not exist.		
Does continuity exist?		
Yes	▶	Check the following. If NG, repair harness or connector. <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fusible link
No	▶	Replace ABS actuator and electric unit.

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (2WD)

Low Voltage

Low Voltage MALFUNCTION CODE NO. 57

NEBR0187

NEBR0187S01

1	INSPECTION START	<p>ABS actuator and electric unit power supply and ground circuit inspection</p> <p style="text-align: right;">LBR135</p>	GI
▶ GO TO 2.			MA

2	CHECK FUSE	<p>Check 10A fuse No. 8. For fuse layout, refer to EL-10, "POWER SUPPLY ROUTING".</p> <p style="text-align: center;">Is fuse OK?</p>	EM
Yes ▶		GO TO 3.	LC
No ▶		GO TO 6.	EC

3	CHECK CONNECTOR	<p>1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connections. Then reconnect connector.</p> <p>2. Carry out "Self-diagnosis" again. Refer to BR-83.</p> <p style="text-align: center;">Does warning lamp activate again?</p>	FE
Yes ▶		GO TO 4.	CL
No ▶		INSPECTION END	MT

4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT	<p>Refer to "ABS ACTUATOR AND ELECTRIC UNIT GROUND", BR-91.</p> <p style="text-align: center;">Is ground circuit OK?</p>	AT
Yes ▶		GO TO 5.	TF
No ▶		Repair harness or connector.	PD

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TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (2WD)

Low Voltage (Cont'd)

5	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT	
<p>1. Disconnect ABS actuator and electric unit connector. 2. Check voltage between ABS actuator and electric unit connector E39 terminal 15 and ground.</p>		
ABR652		
Does battery voltage exist when ignition switch is turned ON?		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	<p>Check the following. If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse

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

7	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT FOR SHORT	
<p>1. Disconnect battery cable and ABS actuator and electric unit connector. 2. Check continuity between ABS actuator and electric unit connector E39 terminal 15 and ground.</p>		
ABR775		
Does continuity exist?		
Yes	▶	<p>Check the following. If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse
No	▶	Replace ABS actuator and electric unit.

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

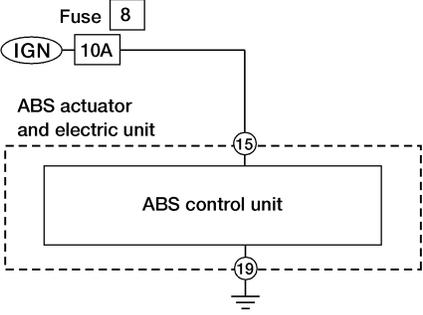
VG33E AND VG33ER (2WD)

Control Unit

Control Unit MALFUNCTION CODE NO. 71

=NEBR0189

NEBR0189S01

1	INSPECTION START	<p>ABS actuator and electric unit power supply and ground circuit inspection</p>  <p style="text-align: right;">LBR132</p>	GI MA EM LC EC FE
▶		GO TO 2.	

2	CHECK CONNECTOR	<p>1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connection. Then reconnect connector.</p> <p>2. Carry out "Self-diagnosis" again. Refer to BR-83.</p> <p style="text-align: center;">Does warning lamp activate again?</p>	CL MT AT TF
Yes ▶		GO TO 3.	
No ▶		INSPECTION END	

3	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT	<p>Check voltage. Refer to "MALFUNCTION CODE NO. 57", BR-99.</p> <p style="text-align: center;">Does battery voltage exist when ignition switch is turned ON?</p>	PD AX SU
Yes ▶		GO TO 4.	
No ▶		Repair.	

4	CHECK WARNING LAMP INDICATION	<p>Does warning lamp indicate code No. 71 again?</p> <p style="text-align: center;">Yes or No</p>	BR ST RS BT HA SC EL IDX
Yes ▶		Replace ABS actuator and electric unit.	
No ▶		Inspect the system according to the code No.	

TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (2WD)

1. ABS Works Frequently

1. ABS Works Frequently

NEBR0192

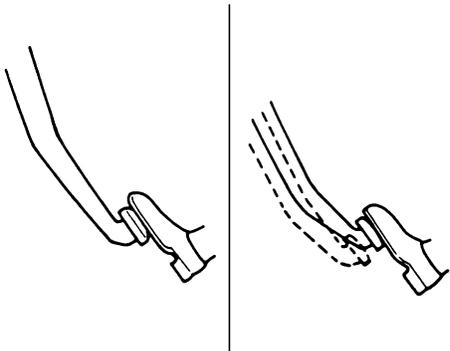
1	CHECK BRAKE FLUID PRESSURE
Check brake fluid pressure distribution. Refer to "PROPORTIONING VALVE (VG33E and VG33ER)", BR-14.	
Is brake fluid pressure distribution normal?	
Yes	▶ GO TO 2.
No	▶ Repair. Then perform "Preliminary Check". Refer to BR-75.

2	CHECK WHEEL SENSOR
1. Check wheel sensor connector for terminal damage or loose connections. 2. Perform wheel sensor mechanical check. Refer to "Wheel Sensor or Rotor", BR-93.	
Is wheel sensor mechanism OK?	
Yes	▶ GO TO 3.
No	▶ Repair.

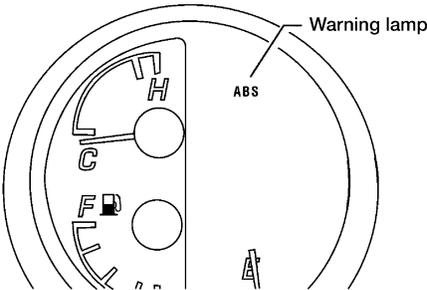
3	CHECK FRONT AXLE
Check front axles for excessive looseness. Refer to AX-5 , "Front Wheel Bearing".	
Is front axle installed properly?	
Yes	▶ Go to Test No. 3, "2. Unexpected Pedal Action", BR-103.
No	▶ Repair.

2. Unexpected Pedal Action

=NEBR0193

1	CHECK BRAKE PEDAL STROKE	
Check brake pedal stroke.		
		
SBR540A		
Is brake pedal stroke excessively large?		
Yes	▶	Perform "Preliminary Check", refer to BR-75.
No	▶	GO TO 2.

2	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE	
Disconnect ABS actuator and electric unit connector and check whether brake is effective.		
Does brake system function properly when brake pedal is depressed?		
Yes	▶	GO TO 3.
No	▶	Perform "Preliminary Check", refer to BR-75.

3	CHECK WARNING LAMP INDICATION	
Ensure warning lamp remains off while driving.		
		
LBR380		
Is warning lamp turned off?		
Yes	▶	GO TO 4.
No	▶	Perform "Self-diagnosis", refer to BR-83.

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TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (2WD)

2. Unexpected Pedal Action (Cont'd)

4	CHECK WHEEL SENSOR	
1. Check wheel sensor connector for terminal damage or loose connection. 2. Perform wheel sensor mechanical check. Refer to Test No. 7, "Wheel Sensor or Rotor", BR-93.		
Is wheel sensor mechanism OK?		
Yes	▶	Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.
No	▶	Repair.

3. Long Stopping Distance

NEBR0194

1	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE	
Disconnect ABS actuator and electric unit connector and check whether stopping distance is still long.		
Does brake system function properly when brake pedal is depressed?		
Yes	▶	Perform Preliminary Check and air bleeding (if necessary).
No	▶	Go to Test No. 3, "2. Unexpected Pedal Action", BR-103.

NOTE:

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

4. ABS Does Not Work

NEBR0195

1	CHECK WARNING LAMP INDICATION	
Does the ABS warning lamp activate?		
Yes or No		
Yes	▶	Carry out "Self-diagnosis". Refer to BR-83, 86.
No	▶	Go to Test No. 3, "2. Unexpected Pedal Action", BR-103.

NOTE:

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

5. Pedal Vibration and Noise

=NEBR0196

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

2	CHECK SYMPTOM
1. Apply brake. 2. Start engine.	
Does the symptom appear only when engine is started?	
Yes	▶ Carry out "Self-diagnosis". Refer to BR-83.
No	▶ Go to Test No. 3, "2. Unexpected Pedal Action", BR-103.

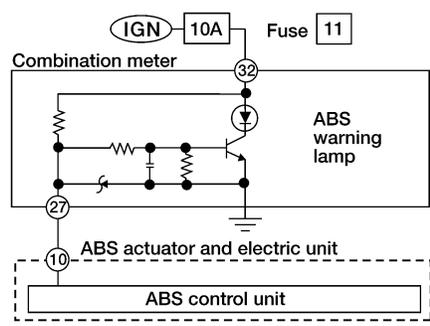
NOTE:

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 potholes.
- Engine speed is over 5,000 rpm with vehicle stopped.

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

NEBR0197

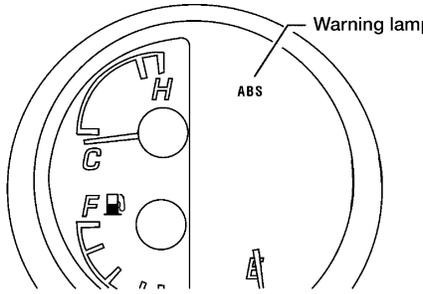
1	INSPECTION START
Warning lamp circuit inspection	
	
WBR315	
▶ GO TO 2.	

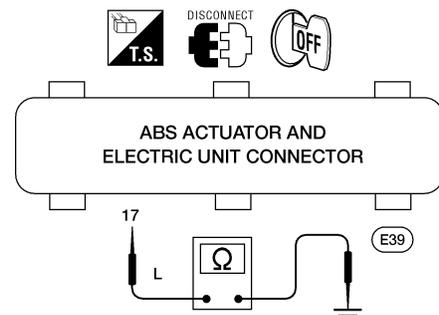
TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (2WD)

6. Warning Lamp Does Not Come On When Ignition Switch Is Turned ON (Cont'd)

2	CHECK FUSE	
Check 10A fuse No. 11. For fuse layout, refer to <i>EL-10</i> , "POWER SUPPLY ROUTING".		
Is fuse OK?		
Yes	▶	GO TO 3.
No	▶	Replace fuse.

3	CHECK WARNING LAMP ACTIVATE	
Disconnect ABS actuator and electric unit connector.		
		
LBR380		
Does the warning lamp activate?		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	GO TO 4.

4	CHECK HARNESS FOR SHORT	
<ol style="list-style-type: none"> 1. Disconnect ABS actuator and electric unit connector E39 and combination meter connector M38. 2. Check continuity between ABS actuator and electric unit connector E39 terminal 17 and ground. 		
		
Continuity should not exist.		
Does continuity exist?		
Yes	▶	Repair harness or connectors.
No	▶	Check combination meter. Refer to <i>EL-94</i> , "WARNING LAMPS".

TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (2WD)

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

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

=NEBR0198

1	INSPECTION START		
		<p>ABS control unit inspection</p> <div style="text-align: center;"> </div> <p style="text-align: right;">WBR316</p>	
▶		GO TO 2.	

2	CHECK FUSE		
		<p>Check 10A fuse No. 8. For fuse layout, refer to <i>EL-10</i>, "POWER SUPPLY ROUTING".</p> <p style="text-align: center;">Is fuse OK?</p>	
Yes ▶		GO TO 3.	
No ▶		GO TO 8.	

3	CHECK HARNESS CONNECTOR		
		<p>Check ABS actuator and electric unit pin terminals for damage or bad connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.</p> <p style="text-align: center;">Does warning lamp stay on when ignition switch is turned ON?</p>	
Yes ▶		GO TO 4.	
No ▶		INSPECTION END	

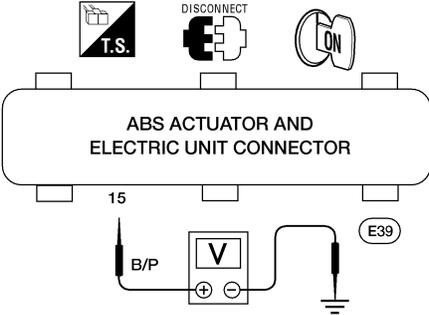
4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT		
		<p>Refer to "Ground Circuit Check", BR-91.</p> <p style="text-align: center;">Is ground circuit OK?</p>	
Yes ▶		GO TO 5.	
No ▶		Repair harness or connector.	

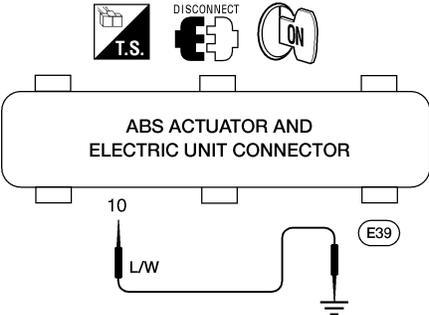
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TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (2WD)

7. Warning Lamp Stays On When Ignition Switch Is Turned On (Cont'd)

5	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT	
<p>1. Disconnect ABS actuator and electric unit connector.</p> <p>2. Check voltage between ABS actuator and electric unit connector E39 terminal 15 and ground.</p>		
		
ABR652		
Does battery voltage exist when ignition switch is turned ON?		
Yes	▶	GO TO 6.
No	▶	<p>Check the following.</p> <p>If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse No. 8

6	CHECK WARNING LAMP	
<p>1. Disconnect ABS actuator and electric unit connector.</p> <p>2. Connect suitable wire between ABS actuator and electric unit connector E39 terminal 10 and ground.</p>		
		
LBR133		
Does the warning lamp deactivate?		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	GO TO 7.

TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (2WD)

7. Warning Lamp Stays On When Ignition Switch Is Turned On (Cont'd)

7	CHECK ABS WARNING LAMP CONTROL CIRCUIT FOR OPEN	
<p>1. Disconnect combination meter connector M38. 2. Check continuity between combination meter harness connector M39 terminal 27 and ABS actuator and electric unit harness connector E39 terminal 10.</p>		
<p>Continuity should exist.</p> <p>Does continuity exist?</p>		
Yes	▶	<p>Check combination meter. Refer to <i>EL-94</i>, "WARNING LAMPS".</p>
No	▶	<p>Check the following. If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connectors M39, E39 ● Harness for open or short between ABS actuator and electric unit and fuse No. 11

8	REPLACE FUSE	
Replace fuse.		
Does the fuse blow out when ignition switch is turned ON?		
Yes	▶	GO TO 9.
No	▶	INSPECTION END

9	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT FOR SHORT	
<p>1. Disconnect battery cable and ABS actuator and electric unit connector. 2. Check continuity between ABS actuator and electric unit harness connector E39 terminal 15 and ground.</p>		
<p>Continuity should not exist.</p> <p>Does continuity exist?</p>		
Yes	▶	<p>Check the following. If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse No. 8
No	▶	Replace ABS actuator and electric unit.

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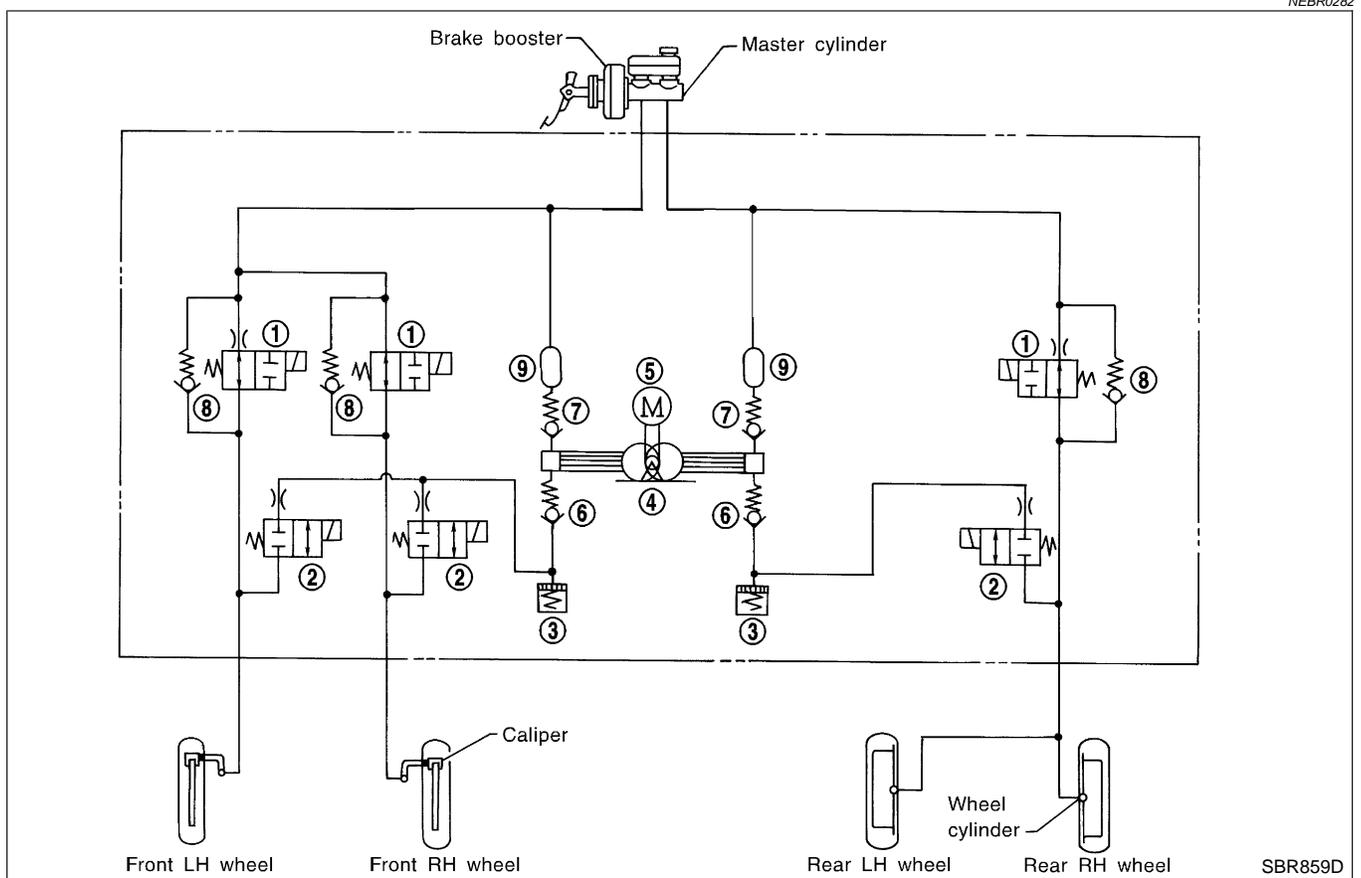
The anti-lock brake system (ABS) consists of electronic and hydraulic components. It allows for control of braking force so locking of the wheels can be avoided. NEBR0280

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

Operation

- When the vehicle speed is less than 10 km/h (6 MPH) this system does not work. NEBR0281
- The anti-lock brake system (ABS) has a self-test function. The system turns on the ABS warning lamp for 1 second each time the ignition switch is turned ON. After the engine is started, the ABS warning lamp turns off. The system performs a test the first time the vehicle reaches 6 km/h (4 MPH). A mechanical noise may be heard as the ABS performs this self-test. This is a normal part of the self-test feature. If a malfunction is found during this check, the ABS warning lamp will stay on.
- While driving, a mechanical noise may be heard during ABS operation. This is a normal condition.

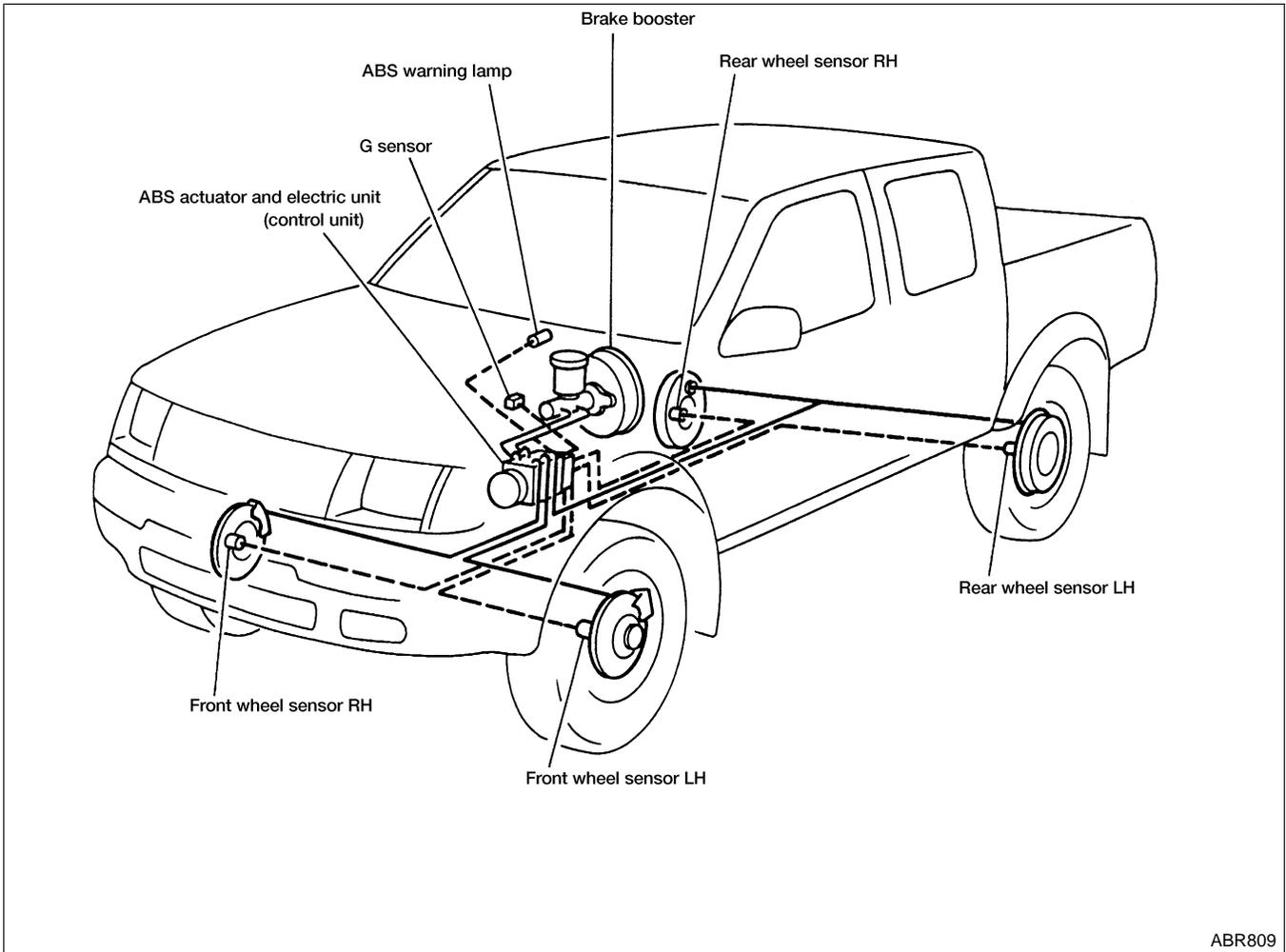
ABS Hydraulic Circuit



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

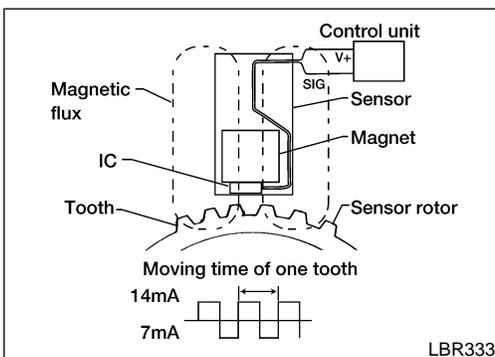
System Components

NEBR0283



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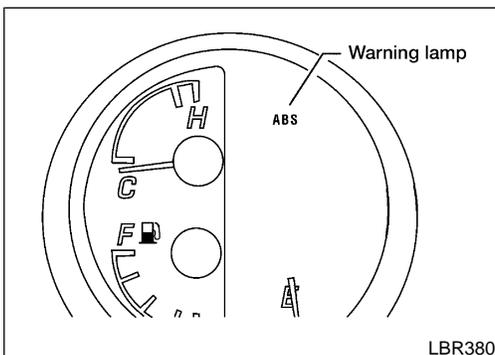
LBR333

System Description
WHEEL SENSOR

NEBR0284

NEBR0284S01

The sensor units consist of a gear-shaped sensor rotor and a sensor element. The front sensors are installed on the back of the front brake rotors. A rear sensor is installed at each rear brake drum. As the wheel rotates, the sensor generates a square-wave pattern. The frequency increases as the rotating speed increases.

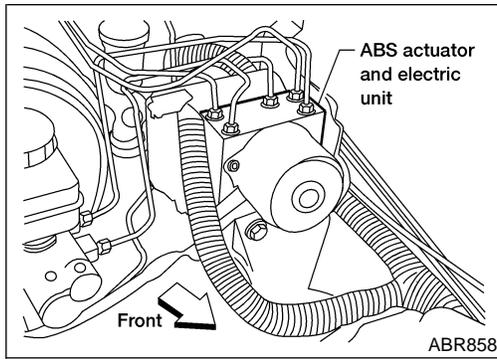


LBR380

CONTROL UNIT (BUILT-IN ABS ACTUATOR AND ELECTRIC UNIT)

NEBR0284S02

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 brake system reverts to normal operation. For control unit layout, refer to "ABS ACTUATOR AND ELECTRIC UNIT", BR-112.



ABS ACTUATOR AND ELECTRIC UNIT

NEBR0284S03

The ABS actuator and electric unit contains:

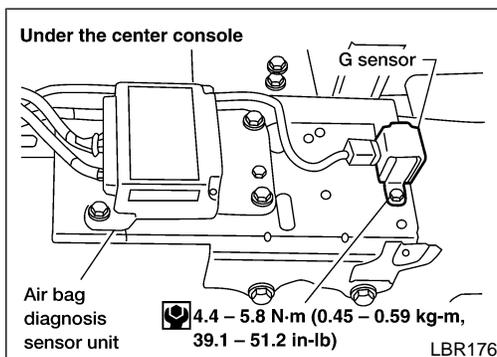
- An electric motor and pump
- Two relays
- Six solenoid valves, an inlet and outlet each for
 - LH front
 - RH front
 - Rear
- ABS control unit

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

ABS Actuator Operation

NEBR0284S0301

		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.

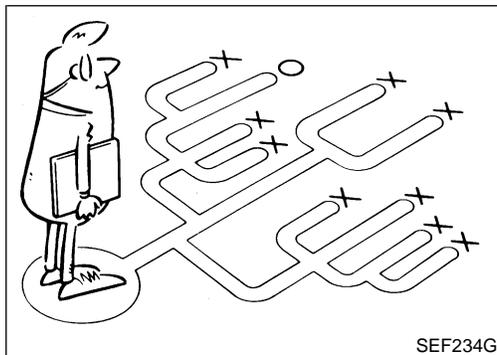
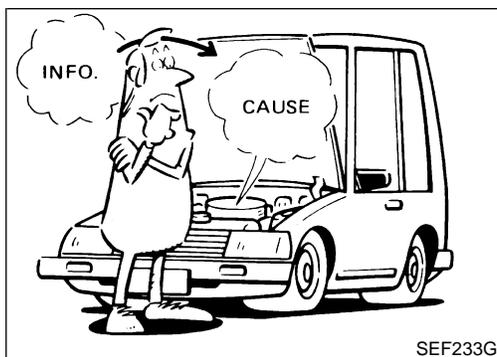


G SENSOR

NEBR0284S04

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

This signal is received by the ABS control unit as a variable voltage signal. The input voltage varies from 1.3V \pm 0.125V during a hard deceleration condition, to 2.5V \pm 0.125V with the vehicle stopped and to 3.7V \pm 0.125V during a hard deceleration in reverse.



How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

NEBR0285

NEBR0285S01

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

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

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

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with an ABS complaint. The customer is a very good source of information on such problems; especially intermittent ones. By talking to the customer, find out what symptoms are present and under what conditions they occur. Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot brake problems on an ABS controlled vehicle.

Also check related Service bulletins for information.

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TROUBLE DIAGNOSIS — BASIC INSPECTION

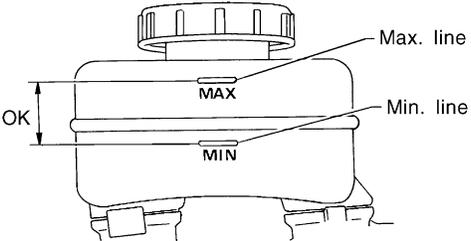
VG33E AND VG33ER (4WD)

Preliminary Check

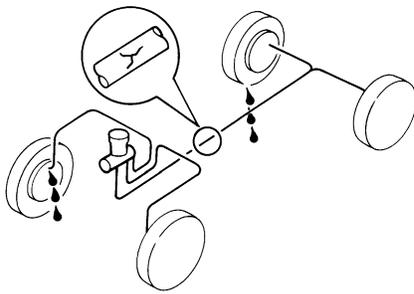
Preliminary Check

NEBR0286

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

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

SBR451D

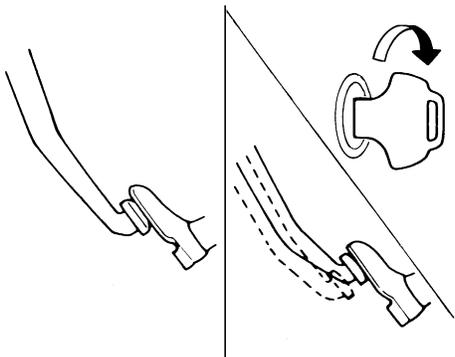
3	CHECK BRAKE LINE	
Check brake line for leakage.		
		
Is leakage present at or around brake lines, tubes or hoses or are any of these parts cracked or damaged?		
Yes	▶	Repair. GO TO 4.
No	▶	GO TO 4.

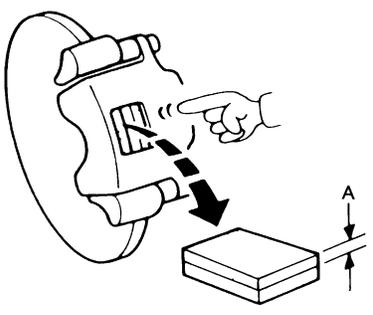
SBR389C

TROUBLE DIAGNOSIS — BASIC INSPECTION

VG33E AND VG33ER (4WD)

Preliminary Check (Cont'd)

4	CHECK BRAKE BOOSTER OPERATION	
<p>Check brake booster for operation and air tightness. Refer to "On-vehicle Service", BR-22.</p> <div style="text-align: center;">  </div> <p style="text-align: right;">SBR058C</p>		
Is brake booster airtight and functioning properly?		
Yes	▶	GO TO 5.
No	▶	Replace. GO TO 5.

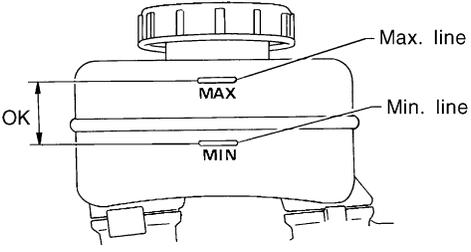
5	CHECK BRAKE PAD AND ROTOR	
<p>Check brake pad and rotor. Refer to "Pad Replacement", BR-26 and "ROTOR", 28.</p> <div style="text-align: center;">  </div> <p style="text-align: right;">SBR059C</p>		
Are brake pads and rotors functioning properly?		
Yes	▶	GO TO 6.
No	▶	Replace.

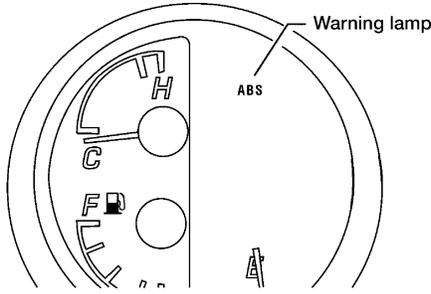
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TROUBLE DIAGNOSIS — BASIC INSPECTION

VG33E AND VG33ER (4WD)

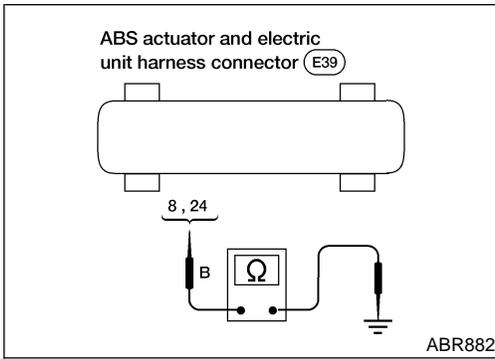
Preliminary Check (Cont'd)

6	RECHECK BRAKE FLUID LEVEL	
Check brake fluid level in reservoir tank again.		
		
SBR451D		
Is brake fluid filled between MAX and MIN lines on reservoir tank ?		
Yes	▶	GO TO 7.
No	▶	Fill up brake fluid.

7	CHECK WARNING LAMP ACTIVATION	
Check warning lamp activation.		
		
LBR380		
Does warning lamp turn on when ignition switch is turned ON?		
Yes	▶	GO TO 8.
No	▶	Check fuse, warning lamp bulb and warning lamp circuit.

8	CHECK WARNING LAMP DEACTIVATION	
Check warning lamp for deactivation after engine is started.		
Does warning lamp turn off when engine is started?		
Yes	▶	GO TO 9.
No	▶	Go to "Self-diagnosis", BR-123.

9	DRIVE VEHICLE	
Drive vehicle at speeds over 30 km/h (19 MPH) for at least one minute.		
Does warning lamp remain off after vehicle has been driven at 30 km/h (19 MPH) for at least one minute?		
Yes	▶	INSPECTION END
No	▶	Go to "Self-diagnosis", BR-123.



Ground Circuit Check

ABS ACTUATOR AND ELECTRIC UNIT GROUND

=NEBR0287

NEBR0287S01

- Check continuity between ABS actuator and electric unit connector terminals and ground.

Continuity should exist.

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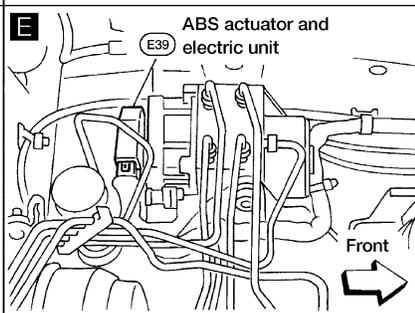
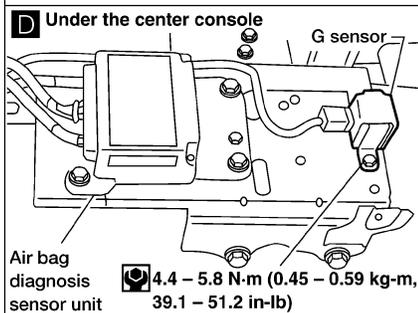
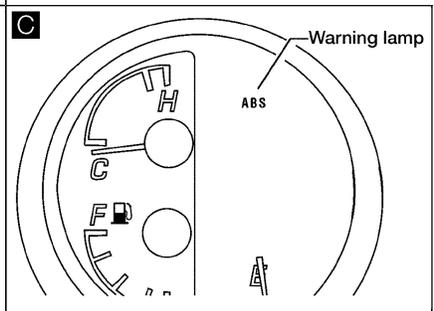
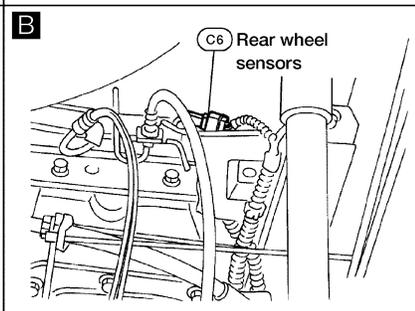
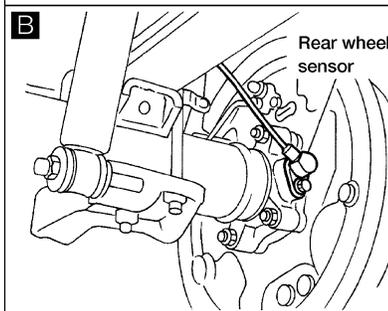
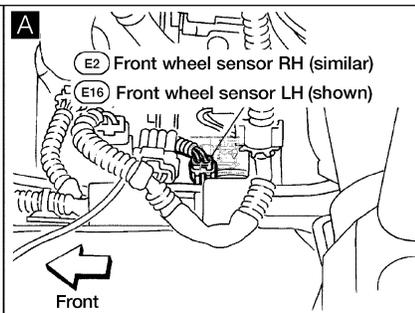
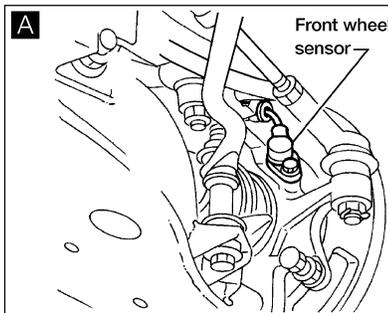
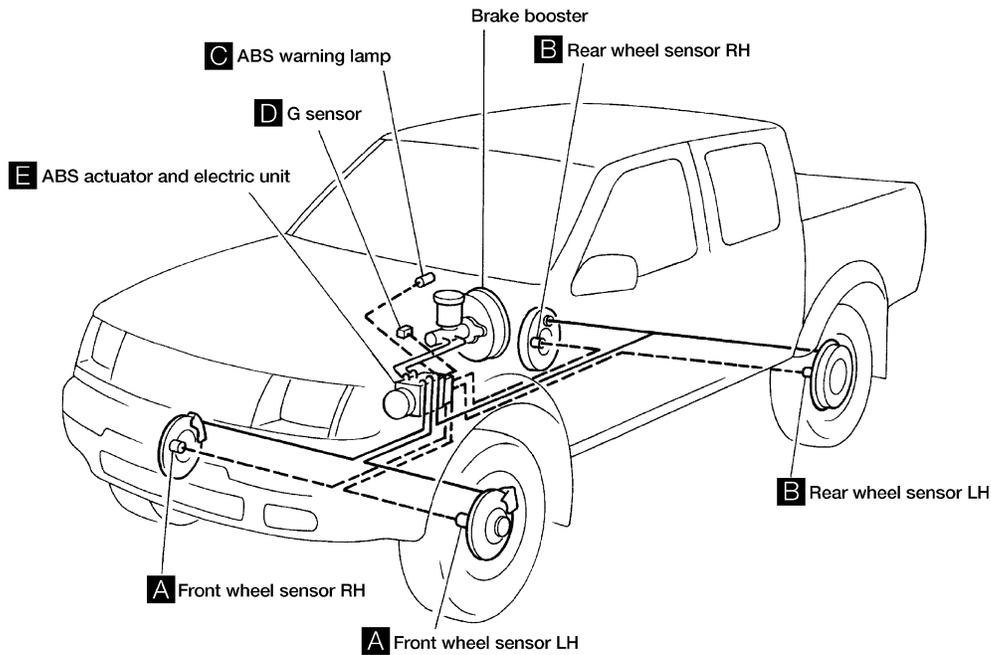
TROUBLE DIAGNOSIS — BASIC INSPECTION

VG33E AND VG33ER (4WD)

Component Parts and Harness Connector Location

Component Parts and Harness Connector Location

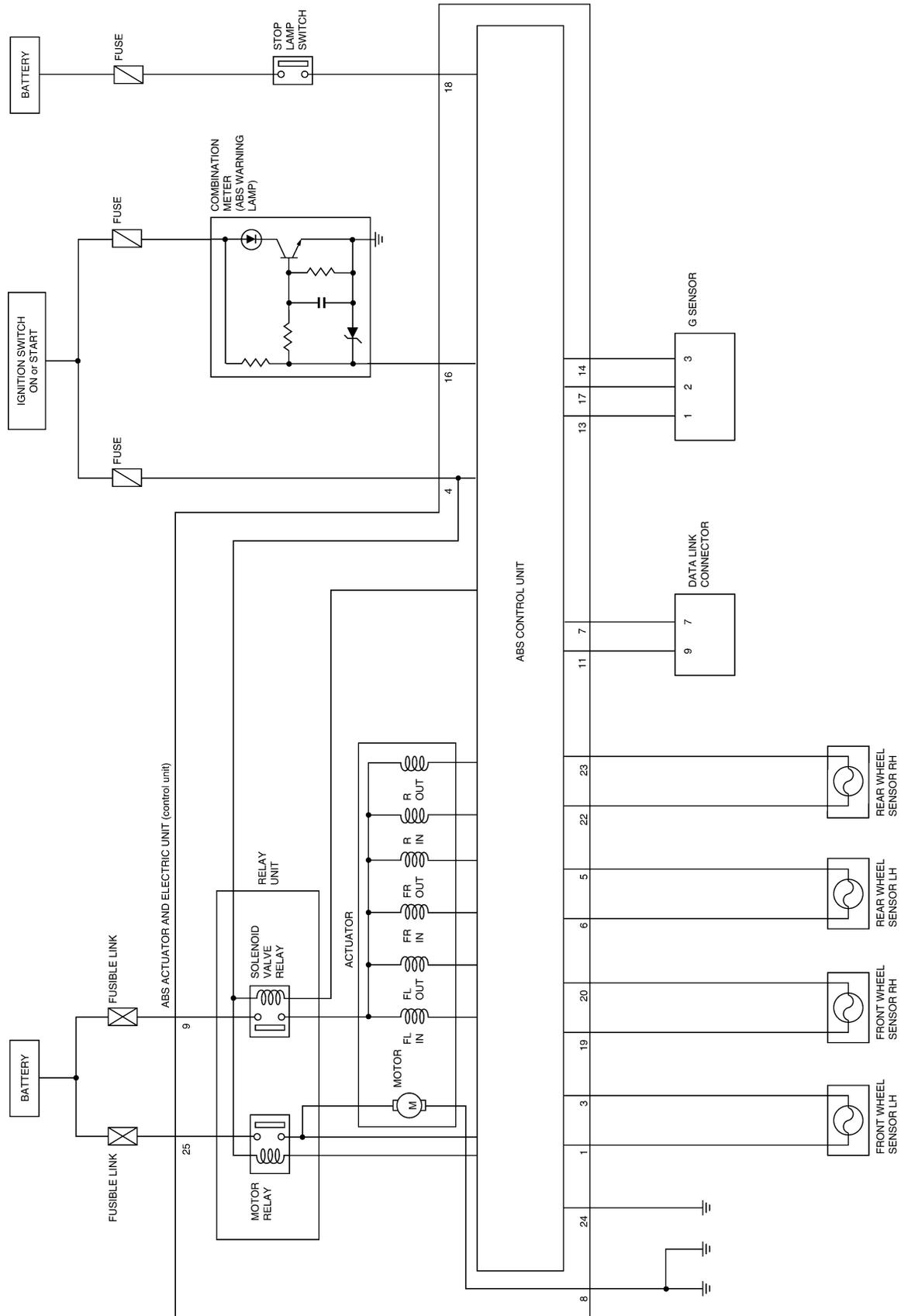
NEBR0288



LBR390

Schematic

NEBR0289



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- HA
- SC
- EL
- IDX

WBR190

TROUBLE DIAGNOSIS — BASIC INSPECTION

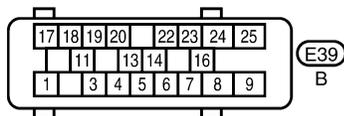
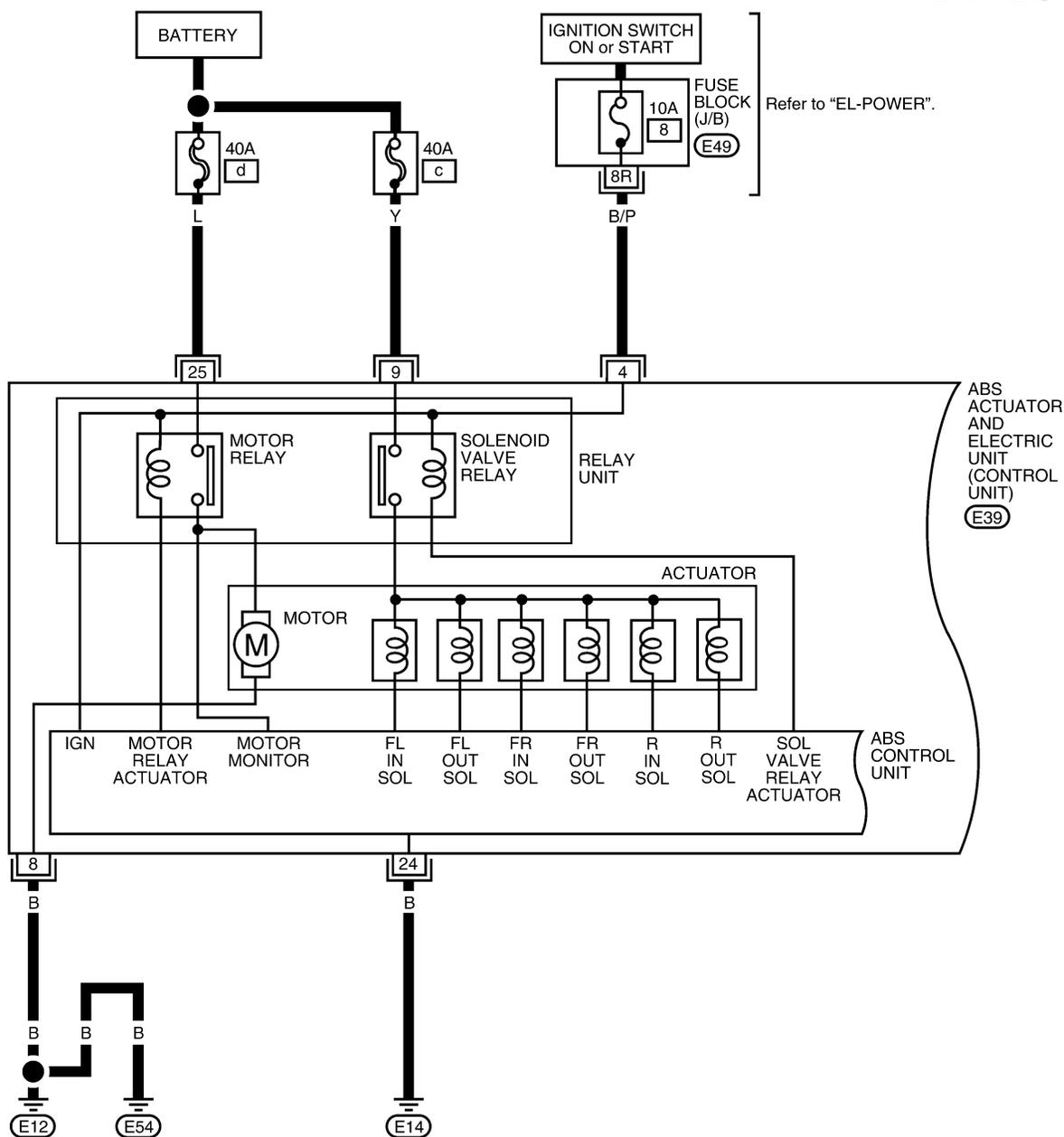
VG33E AND VG33ER (4WD)

Wiring Diagram — ABS —

Wiring Diagram — ABS —

NEBR0290

BR-ABS-06

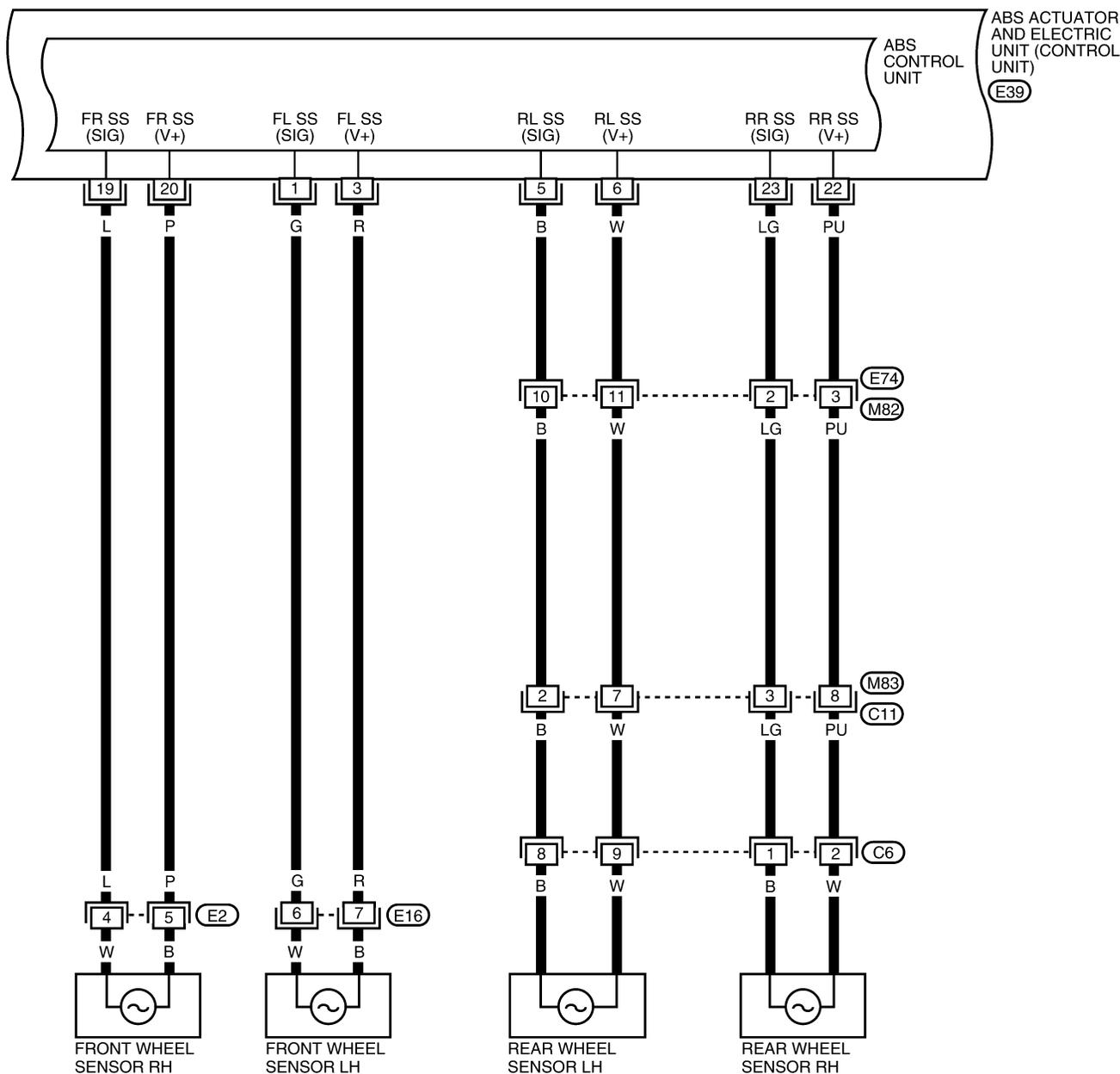


TROUBLE DIAGNOSIS — BASIC INSPECTION

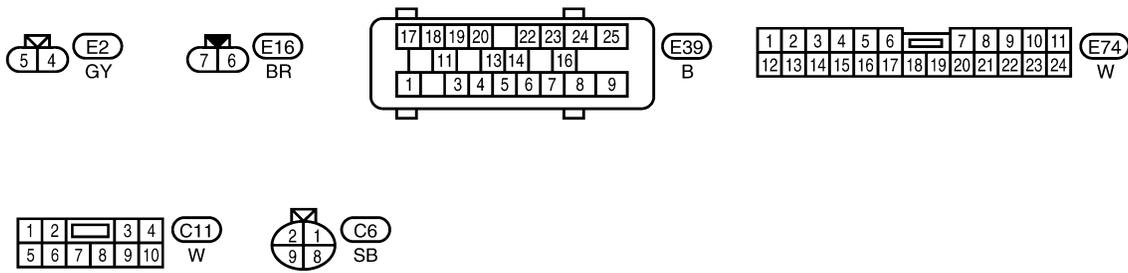
VG33E AND VG33ER (4WD)

Wiring Diagram — ABS — (Cont'd)

BR-ABS-07



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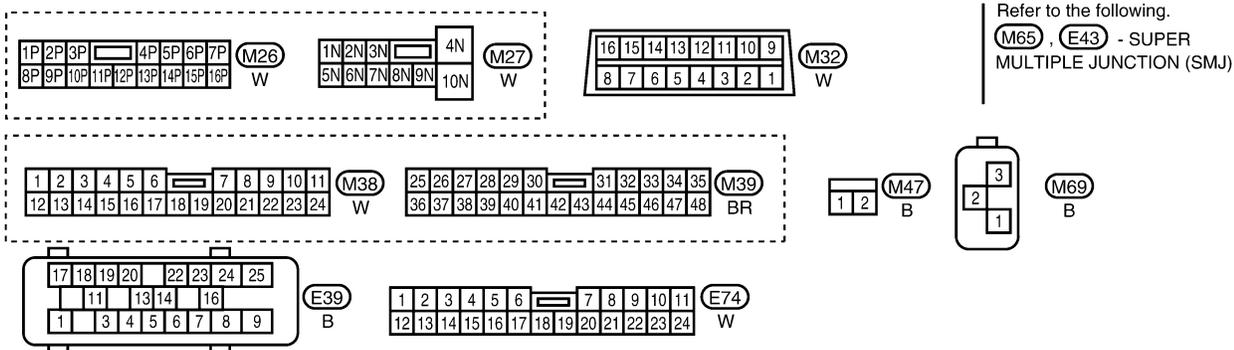
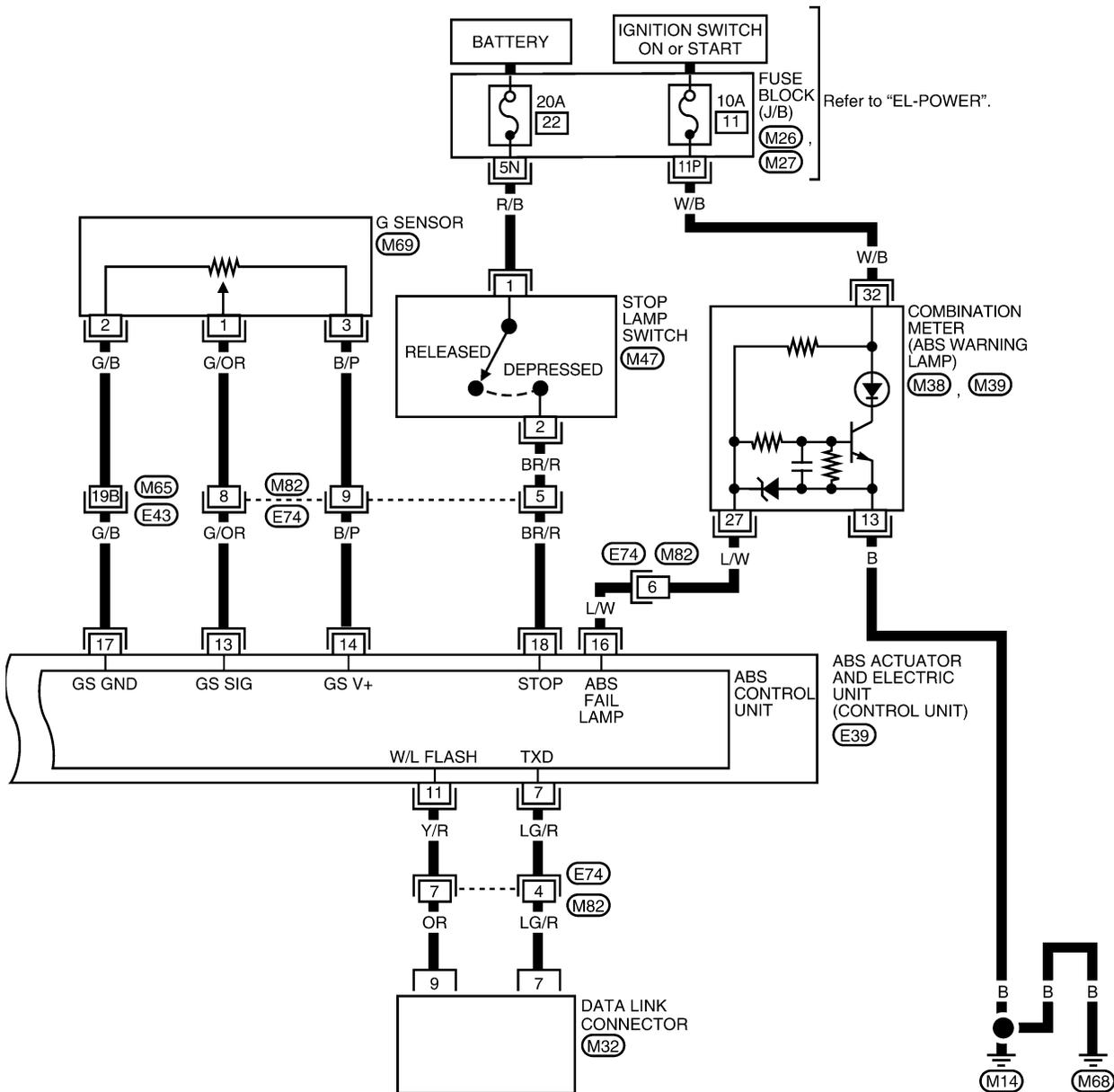


TROUBLE DIAGNOSIS — BASIC INSPECTION

VG33E AND VG33ER (4WD)

Wiring Diagram — ABS — (Cont'd)

BR-ABS-08



WBR192

Self-diagnosis (Without CONSULT-II)

NEBR0292

FUNCTION

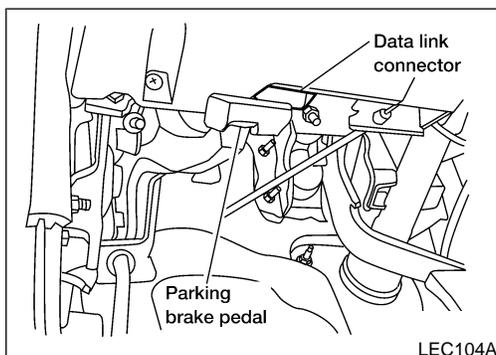
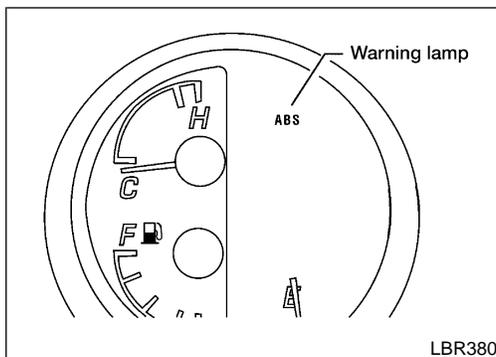
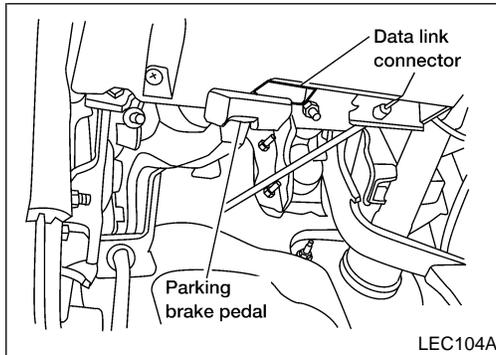
NEBR0292S01

- When a problem occurs in the ABS, the warning lamp on the instrument panel comes on. [To start the self-diagnostic results mode, ground the self-diagnostic (check) terminal 9 located on the data link connector. The location of the malfunction is indicated by the warning lamp flashing]

SELF-DIAGNOSIS PROCEDURE

NEBR0292S02

- Drive vehicle over 30 km/h (19 MPH) for at least one minute.
- Turn ignition switch OFF.
- Ground terminal 9 of data link connector with a suitable harness.
- Turn ignition switch ON while grounding terminal 9.
Do not depress brake pedal.



- After 3.0 seconds, the warning lamp starts flashing to indicate the malfunction code No. (See NOTE.)
- Verify the location of the malfunction with the "Malfunction Code/Symptom Chart". Refer to BR-125. Then make the necessary repairs following the diagnostic procedures.
- After the malfunctions are repaired, erase the malfunction codes stored in the control unit. Refer to "HOW TO ERASE SELF-DIAGNOSTIC RESULTS (MALFUNCTION CODES)", BR-124.
- Rerun the self-diagnostic results mode to verify that the malfunction codes have been erased.
- Disconnect the data link connector terminal from the ground. The self-diagnostic results mode is now complete.
- Check warning lamp for deactivation after driving vehicle over 30 km/h (19 MPH) for at least one minute.
- After making certain that warning lamp does not come on, test the ABS in a safe area to verify that it functions properly.

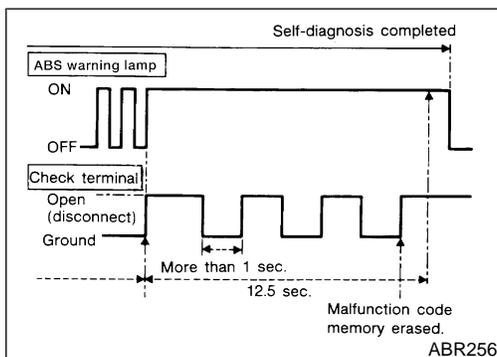
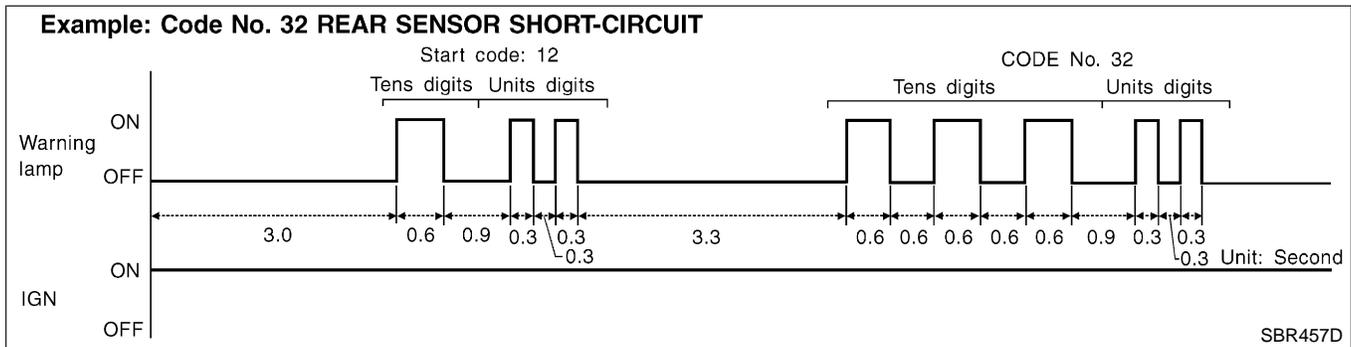
NOTE:

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

HOW TO READ SELF-DIAGNOSTIC RESULTS (MALFUNCTION CODES)

=NEBR0292S03

1. Determine the code No. by counting the number of times the warning lamp flashes on and off.
2. When several malfunctions occur at one time, up to three code numbers can be stored; the latest malfunction will be indicated first.
3. The indication begins with the start code 12. After that a maximum of three code numbers appear in the order of the lowest to highest. The indication then returns to the start code 12 to repeat (the indication will stay on for five minutes at the most).
4. The "Malfunction Code/Symptom Chart" is given on page BR-125.



HOW TO ERASE SELF-DIAGNOSTIC RESULTS (MALFUNCTION CODES)

NEBR0292S04

1. Disconnect the check terminal from ground (ABS warning lamp will stay lit).
2. Within 12.5 seconds, ground the check terminal three times. Each terminal ground must last more than 1 second. The ABS warning lamp goes out after the erase operation has been completed.
3. Perform self-diagnosis again. Refer to "Self-diagnosis", BR-123. Only the startcode should appear, no malfunction codes.

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

VG33E AND VG33ER (4WD)

Malfunction Code Chart (Without CONSULT-II)

Malfunction Code Chart (Without CONSULT-II)

NEBR0293

Code No. (No. of warning lamp flashes)	Malfunctioning part	Reference Page
12	Self-diagnosis could not detect any malfunctions.	—
17 ★1	G sensor and circuit	BR-141
18 ★1	Sensor rotor or abnormal tire size	BR-132
21 ★1	Front right sensor	BR-132
25 ★1	Front left sensor	BR-132
31 ★1	Rear right sensor	BR-132
35 ★1	Rear left sensor	BR-132
57 ★2	Abnormal battery voltage (High or low voltage)	BR-139
61 ★3	Actuator motor or motor relay	BR-137
63	Solenoid valve relay	BR-135
71	Control unit or Actuator solenoid valve	BR-135, 143

★1: If one or more wheels spin on a rough or slippery road for 40 seconds or more, the ABS warning lamp will illuminate. This does not indicate a malfunction. Only in the case of the short-circuit (Code Nos. 25, 21, 31 and 35), after repair the ABS warning lamp also illuminates when the ignition switch is turned ON. In this case, drive the vehicle at speeds greater than 30 km/h (19 MPH) for approximately 1 minute as specified in "SELF-DIAGNOSIS PROCEDURE", BR-123. Check to ensure that the ABS warning lamp goes out while the vehicle is being driven.

★2: The trouble code "57", which refers to a low power supply voltage, does not indicate that the ABS control unit is malfunctioning. Do not replace the ABS control unit with a new one.

★3: The trouble code "61" can sometimes appear when the ABS motor is not properly grounded. If it appears, be sure to check the condition of the ABS motor ground circuit connection.

Symptom Chart

NEBR0310

Symptom	Malfunctioning part	Reference Page
ABS works frequently	—	BR-144
Unexpected pedal action	—	BR-144
Long stopping distance	—	BR-146
ABS does not work	—	BR-146
Pedal vibration and noise	—	BR-146
Warning lamp does not come on when ignition switch is turned ON.	Fuse, warning lamp bulb or warning lamp circuit Control unit	BR-147
Warning lamp stays on when ignition switch is turned ON.	Control unit power supply circuit Warning lamp bulb circuit Control unit or control unit connector Solenoid valve relay stuck Power supply for solenoid valve relay coil	BR-148

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

VG33E AND VG33ER (4WD)

CONSULT-II

CONSULT-II

=NEBR0294

CONSULT-II APPLICATION TO ABS

NEBR0294S01

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

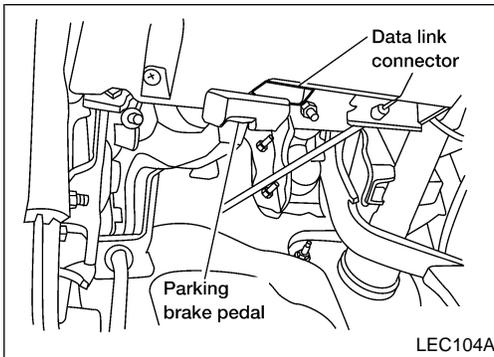
×: Applicable

—: Not applicable

ECU (ABS CONTROL UNIT) PART NUMBER MODE

NEBR0294S02

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



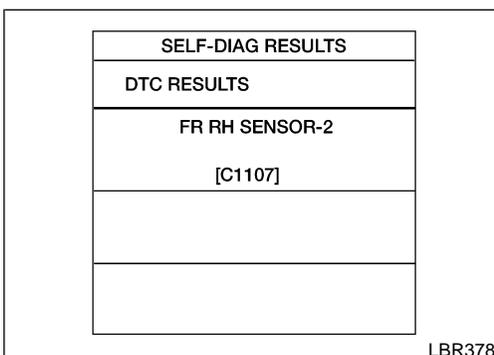
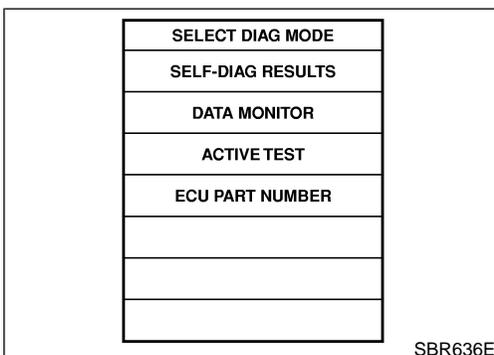
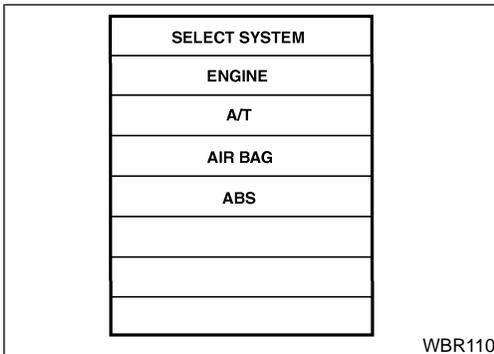
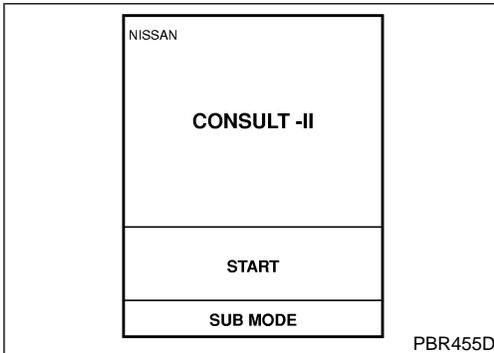
CONSULT-II Inspection Procedure

=NEBR0295

SELF-DIAGNOSIS PROCEDURE

NEBR0295S01

1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector.
3. Start engine.
4. Drive vehicle over 30 km/h (19 MPH) for at least one minute.
5. Stop vehicle with engine running and touch "START" on CONSULT-II screen.



6. Touch "ABS".
7. Touch "SELF-DIAG RESULTS".
 - The screen shows the detected malfunction and how many times the ignition switch has been turned ON since the malfunction.
8. Make the necessary repairs following the diagnostic procedures.
9. After the malfunctions are repaired, erase the self-diagnostic results stored in the control unit by touching "ERASE".
10. Check warning lamp for deactivation after driving vehicle over 30 km/h (19 MPH) for at least one minute.
11. Test the ABS in a safe area to verify that it functions properly.

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TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

VG33E AND VG33ER (4WD)

CONSULT-II Inspection Procedure (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

-NEBR0295S02

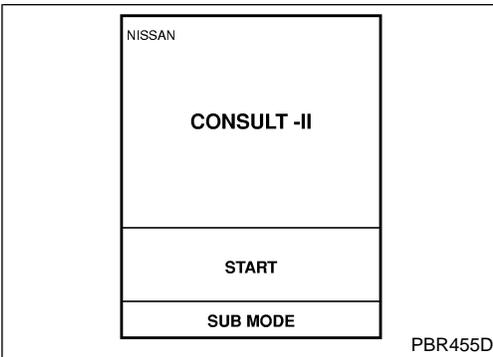
Diagnostic item	Diagnosed condition	Diagnostic item is detected when ...	Reference Page
FR RH SENSOR-2★1 [C1107]	Open	<ul style="list-style-type: none"> ● Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.) 	BR-132
FR LH SENSOR-2★1 [C1108]	Open	<ul style="list-style-type: none"> ● Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.) 	BR-132
RR RH SENSOR-2★1 [C1105]	Open	<ul style="list-style-type: none"> ● Circuit for rear right sensor is open. (An abnormally high input voltage is entered.) 	BR-132
RR LH SENSOR-2★1 [C1106]	Open	<ul style="list-style-type: none"> ● Circuit for rear left sensor is open. (An abnormally high input voltage is entered.) 	BR-132
FR RH SENSOR-1★1 [C1103]	Short	<ul style="list-style-type: none"> ● Circuit for front right wheel sensor is shorted. (An abnormally low input voltage is entered.) 	BR-132
FR LH SENSOR-1★1 [C1104]	Short	<ul style="list-style-type: none"> ● Circuit for front left wheel sensor is shorted. (An abnormally low input voltage is entered.) 	BR-132
RR RH SENSOR-1★1 [C1101]	Short	<ul style="list-style-type: none"> ● Circuit for rear right sensor is shorted. (An abnormally low input voltage is entered.) 	BR-132
RR LH SENSOR-1★1 [C1102]	Short	<ul style="list-style-type: none"> ● Circuit for rear left sensor is shorted. (An abnormally low input voltage is entered.) 	BR-132
ABS SENSOR★1 [C1115]	Abnormal signal	<ul style="list-style-type: none"> ● Teeth damage on sensor rotor or improper installation of wheel sensor. (Abnormal wheel sensor signal is entered.) 	BR-132
MAIN RELAY [C1114]	Abnormal	<ul style="list-style-type: none"> ● Actuator solenoid valve relay is ON, even if control unit sends off signal. ● Actuator solenoid valve relay is OFF, even if control unit sends on signal. 	BR-135
PUMP MOTOR [C1111]	Abnormal	<ul style="list-style-type: none"> ● Circuit for ABS motor relay is open or shorted. ● Circuit for actuator motor is open or shorted. ● Actuator motor relay is stuck. 	BR-137
BATTERY VOLTAGE [ABNORMAL] [C1109]	High or low	<ul style="list-style-type: none"> ● Power source voltage supplied to ABS control unit is abnormally high or low. 	BR-139
CONTROLLER FAILURE [C1110]	Control unit	<ul style="list-style-type: none"> ● Function of calculation in ABS control unit has failed. 	BR-143
	Solenoid valve open/short	<ul style="list-style-type: none"> ● Circuit for solenoid valve is open or shorted. (An abnormally high or low voltage is entered.) 	BR-135
G SENSOR [C1113]	Abnormal signal	<ul style="list-style-type: none"> ● G sensor circuit is open or shorted. 	BR-141
ABNORMAL TIRE SIZE [C1112]	Abnormal	<ul style="list-style-type: none"> ● Sensor rotor damaged or incorrect tire size. 	BR-132

★1: If one or more wheels spin on a rough or slippery road for 40 seconds or more, the ABS warning lamp will illuminate. This does not indicate a malfunction. Only in the case of the short-circuit (Code Nos. C1101, C1102, C1103, and C1104), after repair the ABS warning lamp also illuminates when the ignition switch is turned ON. In this case, drive the vehicle at speeds greater than 30 km/h (19 MPH) for approximately 1 minute as specified in "SELF-DIAGNOSIS PROCEDURE", BR-123. Check to ensure that the ABS warning lamp goes out while the vehicle is being driven.

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

VG33E AND VG33ER (4WD)

CONSULT-II Inspection Procedure (Cont'd)



DATA MONITOR PROCEDURE

=NEBR0295S03

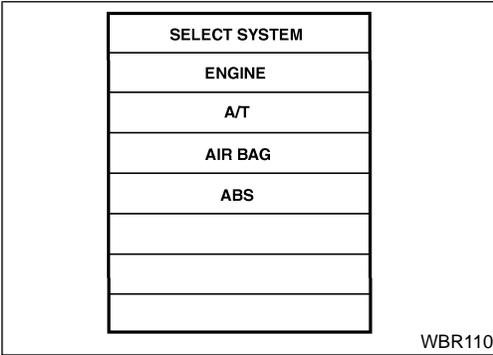
1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector.
3. Turn ignition switch ON.
4. Touch "START" on CONSULT-II screen.

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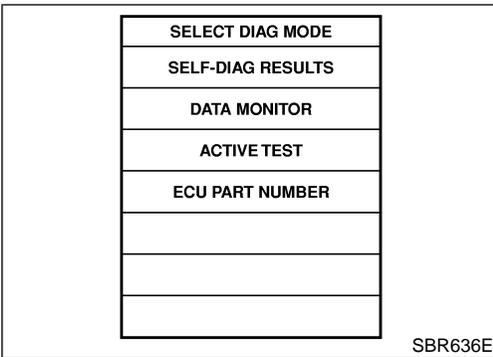
5. Touch "ABS".

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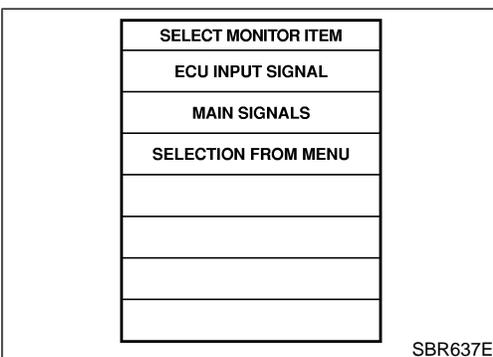
6. Touch "DATA MONITOR".

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7. Touch "SETTING" on "SELECT MONITOR ITEM" screen.

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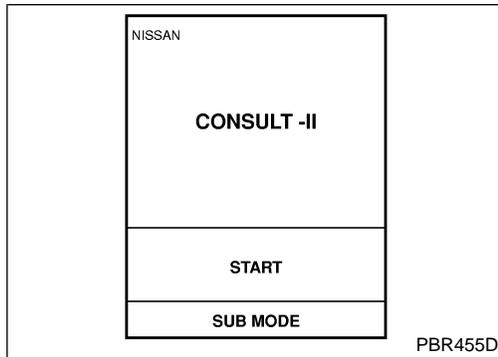
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TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

VG33E AND VG33ER (4WD)

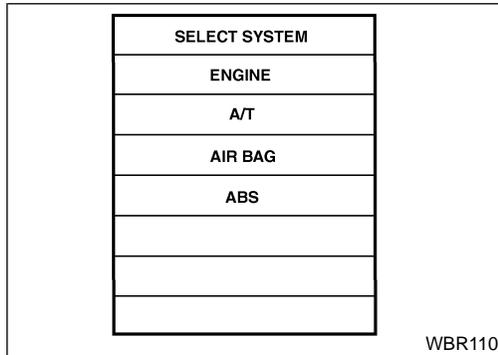
CONSULT-II Inspection Procedure (Cont'd)



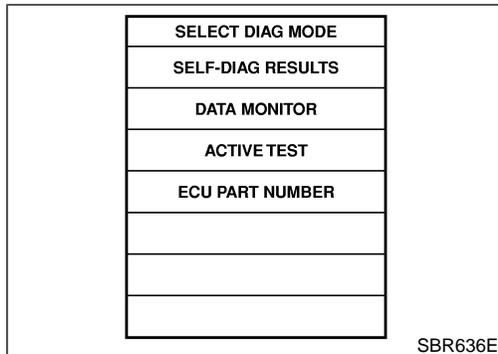
ACTIVE TEST PROCEDURE

=NEBR0295S04

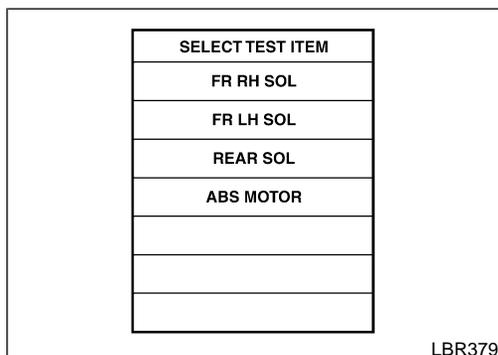
- When conducting Active test, vehicle must be stationary.
 - When ABS warning lamp stays on, never conduct Active test.
1. Turn ignition switch OFF.
 2. Connect CONSULT-II to data link connector.
 3. Start engine.
 4. Touch "START" on CONSULT-II screen.



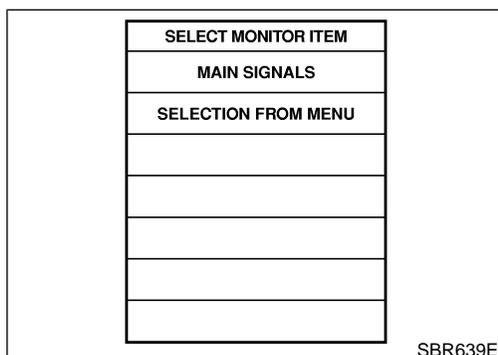
5. Touch "ABS".



6. Touch "ACTIVE TEST".



7. Select active test item by touching screen.



8. Touch "START".

9. Carry out the active test by touching screen key.

TROUBLE DIAGNOSIS — GENERAL DESCRIPTION

VG33E AND VG33ER (4WD)

CONSULT-II Inspection Procedure (Cont'd)

DATA MONITOR MODE

=NEBR0295S05

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

ACTIVE TEST MODE

NEBR0295S06

TEST ITEM	CONDITION	JUDGEMENT		
FR RH SOL FR LH SOL REAR SOL	Engine is running.	Brake fluid pressure control operation		
			IN SOL	OUT SOL
		UP (Increase):	OFF	OFF
		KEEP (Hold):	ON	OFF
		DOWN (Decrease):	ON	ON
ABS MOTOR		ABS actuator motor ON: Motor runs (ABS motor relay ON) OFF: Motor stops (ABS motor relay OFF)		

NOTE:

Active test will automatically stop ten seconds after the test starts. (TEST IS STOPPED is displayed.)

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TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (4WD)

Wheel Sensor or Rotor

Wheel Sensor or Rotor DIAGNOSTIC PROCEDURE

With CONSULT-II: Malfunction code No. C1101, C1102, C1103, C1104, C1105, C1106, C1107, C1108, C1112, or C1115 NEBR0296

Without CONSULT-II: Malfunction code No. 21, 25, 31, 35, or 18

NOTE:

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

1	INSPECTION START
<p>Wheel sensor inspection</p> <div style="text-align: center;"> </div> <p style="text-align: right; margin-right: 50px;">Wheel sensors shown (sensor side)</p>	
WBR352	
▶ GO TO 2.	

2	CHECK CONNECTOR
<p>1. Disconnect connectors from ABS actuator and electric unit and wheel sensor of malfunction code No. Check terminals for damage or loose connection. Then reconnect connectors.</p> <p>2. Carry out "Self-diagnosis" again. Refer to BR-123.</p> <p style="text-align: center;">Does warning lamp activate again?</p>	
Yes	▶ GO TO 3.
No	▶ INSPECTION END

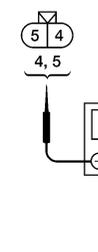
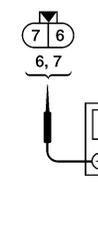
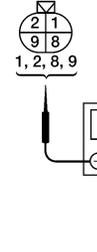
3	CHECK TIRE
<p>Check for inflation pressure, wear and size of each tire. (See NOTE)</p> <p style="text-align: center;">Are tire pressure and size correct and is tire wear within specifications?</p>	
Yes	▶ GO TO 4.
No	▶ Adjust tire pressure or replace tire(s). (See NOTE)

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (4WD)

Wheel Sensor or Rotor (Cont'd)

4	CHECK WHEEL BEARING	
Check wheel bearing axial end play. (See NOTE)		
Is wheel bearing axial end play within specifications? Refer to AX-5, "FRONT WHEEL BEARING" and AX-28, "REAR WHEEL BEARING".		
Yes	▶	GO TO 5.
No	▶	Check wheel bearing. Refer to AX-5 , "FRONT WHEEL BEARING" and AX-28 , "REAR WHEEL BEARING".

5	CHECK WIRING HARNESS FOR SHORT	
<p>1. Disconnect ABS actuator and electric unit connector E39 and ABS sensor connectors E2, E16, and C6.</p> <p>2. Check resistance between indicated wiring harness connector/terminal and ground.</p> <p>Front RH wheel Connector E2, terminals 4 and 5</p> <p>Front LH wheel Connector E16, terminals 6 and 7</p> <p>Rear RH wheel Connector C6, terminals 1 and 2</p> <p>Rear LH wheel Connector C6, terminals 8 and 9</p>		
<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Front wheel sensor RH harness connector</p>  </div> <div style="text-align: center;"> <p>Front wheel sensor LH harness connector</p>  </div> <div style="text-align: center;"> <p>Rear wheel sensor LH/RH harness connector</p>  </div> </div> <div style="margin-top: 20px;"> <p>0Ω:NG ∞Ω:OK</p> </div>		
LBR336		
Are resistance values OK?		
Yes	▶	GO TO 6.
No	▶	Repair/replace harness or connectors.

Connector	Terminals		Continuity
	(+)	(-)	
E2	4 (L)	Ground	No
E2	5 (P)	Ground	No
E16	6 (G)	Ground	No
E16	7 (R)	Ground	No
C6	1 (LG)	Ground	No
C6	2 (PU)	Ground	No
C6	8 (B)	Ground	No
C6	9 (W)	Ground	No

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TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (4WD)

Wheel Sensor or Rotor (Cont'd)

6 CHECK WIRING HARNESS FOR OPEN

1. Disconnect ABS actuator and electric unit connector E39 and ABS sensor connectors E2, E16 and C6.
2. Check resistance of wiring harness between indicated connectors and terminals.

Front RH wheel

Connector E39, terminal 19 and connector E2, terminal 4

Connector E39, terminal 20 and connector E2, terminal 5

Front LH wheel

Connector E39, terminal 1 and connector E16, terminal 6

Connector E39, terminal 3 and connector E16, terminal 7

Rear RH wheel

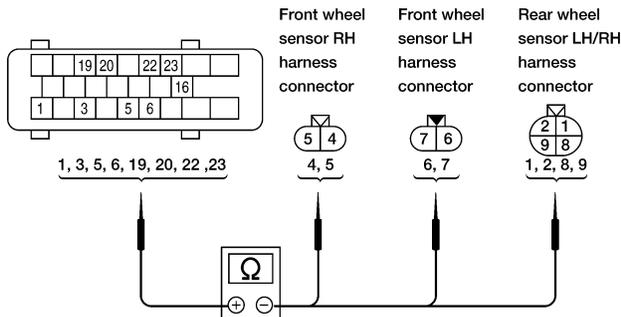
Connector E39, terminal 23 and connector C6, terminal 1

Connector E39, terminal 22 and connector C6, terminal 2

Rear LH wheel

Connector E39, terminal 5 and connector C6, terminal 8

Connector E39, terminal 6 and connector C6, terminal 9



Connector	Terminals		Continuity
	(+) Terminal (Wire color)	(-) Terminal (Wire color)	
E39	1 (G)	E16 6 (G)	Yes
E39	3 (R)	E16 7 (R)	Yes
E39	19 (L)	E2 4 (L)	Yes
E39	20 (P)	E2 5 (P)	Yes
E39	23 (LG)	C6 1 (LG)	Yes
E39	22 (PU)	C6 2 (PU)	Yes
E39	5 (B)	C6 8 (B)	Yes
E39	6 (W)	C6 9 (W)	Yes

LBR337

0Ω:OK
∞Ω:NG

Are resistance values OK?

Yes	▶	GO TO 7.
No	▶	Repair/replace harness or connectors.

7 CHECK SENSOR ROTOR

Check sensor rotor for teeth damage. (See NOTE)

Is sensor rotor free from damage?

Yes	▶	<ol style="list-style-type: none"> 1. Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest. 2. If retest is NG, replace wheel speed sensor.
No	▶	Replace sensor rotor. (See NOTE)

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (4WD)

ABS Actuator Solenoid Valve or Solenoid Valve Relay

ABS Actuator Solenoid Valve or Solenoid Valve Relay

DIAGNOSTIC PROCEDURE

- With CONSULT-II: Malfunction code No. C1110 or C1114 =NEBR0297
- Without CONSULT-II: Malfunction code No. 63 or 71

1	INSPECTION START
Solenoid valve relay inspection	
WBR338	
	GO TO 2.

2	CHECK FUSIBLE LINK
Check 40A fusible link c . For fusible link layout, refer to EL-10 , "POWER SUPPLY ROUTING".	
Is fusible link OK?	
Yes	GO TO 3.
No	GO TO 6.

3	CHECK CONNECTOR
1. Disconnect connector from ABS actuator and electric unit. Check terminals for damage or loose connection. Then reconnect connector.	
2. Carry out "Self-diagnosis" again. Refer to BR-123.	
Does warning lamp activate again?	
Yes	GO TO 4.
No	INSPECTION END

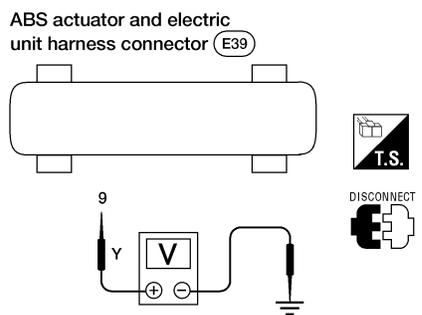
4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT
Refer to "Ground Circuit Check", BR-117.	
Is ground circuit OK?	
Yes	GO TO 5.
No	Repair harness or connector.

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TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

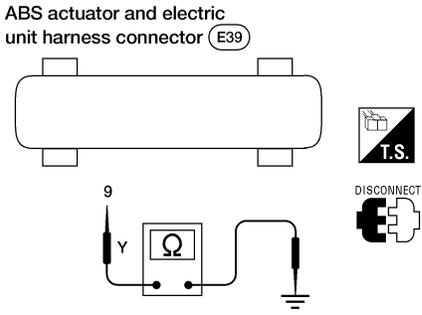
VG33E AND VG33ER (4WD)

ABS Actuator Solenoid Valve or Solenoid Valve Relay (Cont'd)

5	CHECK SOLENOID VALVE POWER SUPPLY CIRCUIT	
<p>1. Disconnect ABS actuator and electric unit connector.</p> <p>2. Check voltage between ABS actuator and electric unit connector E39 terminal 9 and ground.</p>		
		
Does battery voltage exist?		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	<p>Check the following.</p> <p>If NG, repair harness or connectors.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fusible link

ABR887

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

7	CHECK SOLENOID VALVE RELAY POWER SUPPLY CIRCUIT FOR SHORT	
<p>1. Disconnect battery cable and ABS actuator and electric unit connector.</p> <p>2. Check continuity between ABS actuator and electric unit connector E39 terminal 9 and ground.</p>		
		
Does continuity exist?		
Continuity should not exist.		
Yes	▶	<p>Check the following.</p> <p>If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fusible link
No	▶	Replace ABS actuator and electric unit.

ABR888

Motor Relay or Motor DIAGNOSTIC PROCEDURE

- With CONSULT-II: Malfunction code No. C1111
- Without CONSULT-II: Malfunction code No. 61

=NEBR0298

1	INSPECTION START
ABS motor relay inspection	
ABR889	
► GO TO 2.	

2	CHECK FUSIBLE LINK
Check 40A fusible link d . For fusible link layout, refer to <i>EL-10</i> , "POWER SUPPLY ROUTING".	
Is fusible link OK?	
Yes	► GO TO 3.
No	► GO TO 6.

3	CHECK CONNECTOR
1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connection. Then reconnect connector. 2. Carry out "Self-diagnosis" again. Refer to BR-123.	
Does warning lamp activate again?	
Yes	► GO TO 4.
No	► INSPECTION END

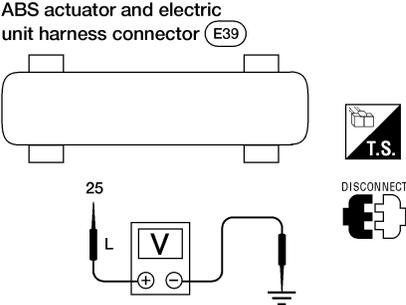
4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT
Refer to "Ground Circuit Check", BR-117.	
Is ground circuit OK?	
Yes	► GO TO 5.
No	► Repair harness or connector.

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TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

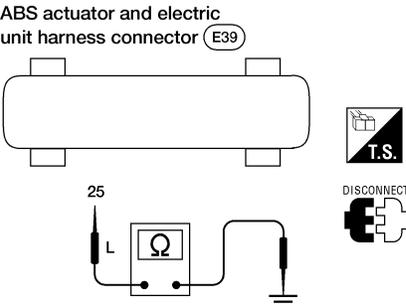
VG33E AND VG33ER (4WD)

Motor Relay or Motor (Cont'd)

5	CHECK MOTOR RELAY POWER SUPPLY CIRCUIT	
<p>1. Disconnect ABS actuator and electric unit connector.</p> <p>2. Check voltage between ABS actuator and electric unit connector E39 terminal 25 and ground.</p>		
 <p style="text-align: center;">Does battery voltage exist?</p>		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	<p>Check the following.</p> <p>If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fusible link

ABR890

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

7	CHECK ABS ACTUATOR MOTOR POWER SUPPLY CIRCUIT FOR SHORT	
<p>1. Disconnect battery cable and ABS actuator and electric unit connector.</p> <p>2. Check continuity between ABS actuator and electric unit connector E39 terminal 25 and ground.</p>		
 <p style="text-align: center;">Does continuity exist?</p>		
Continuity should not exist.		
Yes	▶	<p>Check the following.</p> <p>If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fusible link
No	▶	Replace ABS actuator and electric unit.

ABR891

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (4WD)

Low Voltage

Low Voltage DIAGNOSTIC PROCEDURE

- With CONSULT-II: Malfunction code No. C1109**
- Without CONSULT-II: Malfunction code No. 57**

NEBR0299

1	INSPECTION START
ABS actuator and electric unit power supply and ground circuit inspection	
ABR892	
	GO TO 2.

2	CHECK FUSE
Check 10A fuse No. 8. For fuse layout, refer to <i>EL-10</i> , "POWER SUPPLY ROUTING".	
Is fuse OK?	
Yes	GO TO 3.
No	GO TO 6.

3	CHECK CONNECTOR
1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connections. Then reconnect connector. 2. Carry out "Self-diagnosis" again. Refer to BR-123.	
Does warning lamp activate again?	
Yes	GO TO 4.
No	INSPECTION END

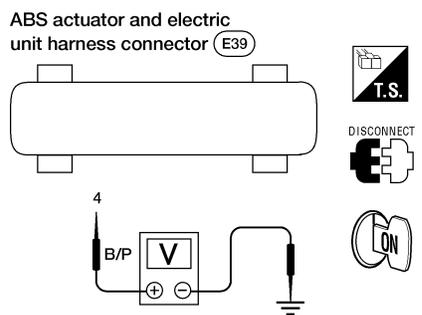
4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT
Refer to "Ground Circuit Check", BR-117.	
Is ground circuit OK?	
Yes	GO TO 5.
No	Repair harness or connector.

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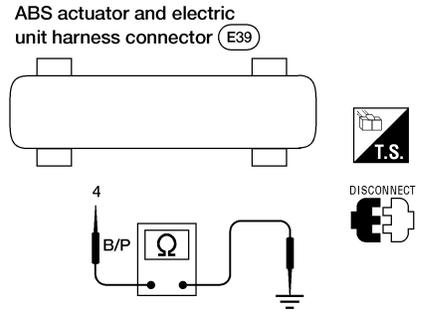
TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (4WD)

Low Voltage (Cont'd)

5	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT	
<p>1. Disconnect ABS actuator and electric unit connector.</p> <p>2. Check voltage between ABS actuator and electric unit connector E39 terminal 4 and ground.</p>		
		
ABR893		
Does battery voltage exist when ignition switch is turned ON?		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	<p>Check the following.</p> <p>If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse

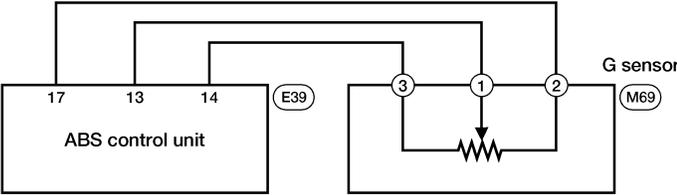
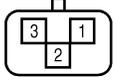
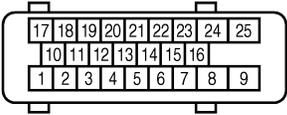
6	REPLACE FUSE	
Replace fuse.		
Does the fuse blow out when ignition switch is turned ON?		
Yes	▶	GO TO 7.
No	▶	INSPECTION END

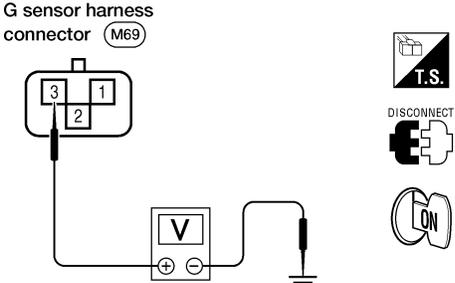
7	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT FOR SHORT	
<p>1. Disconnect battery cable and ABS actuator and electric unit connector.</p> <p>2. Check continuity between ABS actuator and electric unit connector E39 terminal 4 and ground.</p>		
		
ABR894		
Does continuity exist?		
Yes	▶	<p>Check the following.</p> <p>If NG, repair harness or connector.</p> <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse
No	▶	Replace ABS actuator and electric unit.

G Sensor and Circuit DIAGNOSTIC PROCEDURE

NEBR0300

-  With CONSULT-II: Malfunction code No. C1113
-  Without CONSULT-II: Malfunction code No. 17

1	INSPECTION START	
G sensor inspection		
		
<p>G sensor connector (M69)</p>  <p>ABS actuator and electric unit connector (E39)</p>  <p style="text-align: right;">ABR895</p>		
▶		GO TO 2.

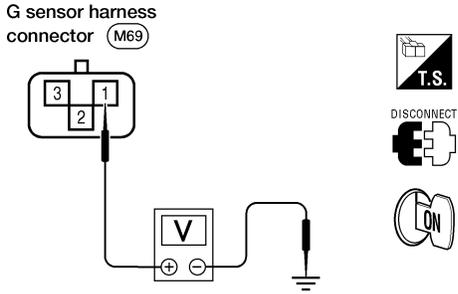
2	CHECK G SENSOR POWER	
<ol style="list-style-type: none"> 1. Turn ignition switch OFF and disconnect G sensor harness connector. 2. Turn ignition switch ON. 3. Check voltage between G sensor harness connector M69 terminal 3 (B/P) and ground. 		
 <p style="text-align: center;">Do approx. 5V exist?</p>		
Yes ▶		GO TO 3.
No ▶		GO TO 4.

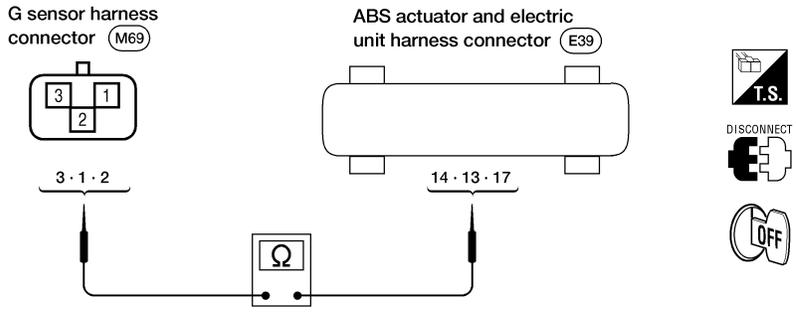
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TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS

VG33E AND VG33ER (4WD)

G Sensor and Circuit (Cont'd)

3	CHECK G SENSOR
<p>1. Turn ignition switch OFF.</p> <p>2. Remove G sensor from bracket.</p> <p>3. Reconnect harness connector to G sensor and hold sensor in same attitude/position as when installed in vehicle.</p> <ul style="list-style-type: none"> ● Check voltage between G sensor connector M69 terminal 1 (G/OR) and ground for the following tests. <p>There should be approx. 2.5V.</p> <p>4. Turn sensor 90° with connector point up.</p> <ul style="list-style-type: none"> ● There should be approx. 3.7V. <p>5. Turn sensor 180° with connector pointing down.</p> <ul style="list-style-type: none"> ● There should be approx. 1.3V. 	
	
ABR897	
Were the voltage readings correct for steps 3, 4 and 5?	
Yes	▶ GO TO 4.
No	▶ Replace G Sensor.

4	CHECK G SENSOR CIRCUIT
<p>1. Disconnect ABS actuator and electric unit connector.</p> <p>2. Check continuity from G sensor connector M69 terminal 3 (B/P) to ABS actuator and electric unit connector E39 terminal 14 (B/P).</p> <p>3. Check continuity from G sensor connector M69 terminal 1 (G/OR) to ABS actuator and electric unit connector E39 terminal 13 (G/OR).</p> <p>4. Check continuity from G sensor connector M69 terminal 2 (G/B) to ABS actuator and electric unit connector E39 terminal 17 (G/B).</p>	
	
ABR898	
Does continuity exist?	
Yes	▶ Replace ABS actuator and electric unit.
No	▶ Repair harness or connector.

Control Unit DIAGNOSTIC PROCEDURE

- With CONSULT-II: Malfunction code No. C1110
- Without CONSULT-II: Malfunction code No. 71

=NEBR0301

1	INSPECTION START	<p>ABS actuator and electric unit power supply and ground circuit inspection</p> <div style="text-align: center;"> </div> <p style="text-align: right;">ABR899</p>
▶		GO TO 2.

2	CHECK CONNECTOR	<p>1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connection. Then reconnect connector.</p> <p>2. Carry out self-diagnosis again.</p> <p style="text-align: center;">Does warning lamp activate again?</p>
Yes	▶	GO TO 3.
No	▶	INSPECTION END

3	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT	<p>Check voltage. Refer to Test No. 5, "Low Voltage", BR-139.</p> <p style="text-align: center;">Does battery voltage exist when ignition switch is turned ON?</p>
Yes	▶	GO TO 4.
No	▶	Repair.

4	CHECK WARNING LAMP INDICATION	<p>Does warning lamp indicate code No. 71 again?</p> <p style="text-align: center;">Yes or No</p>
Yes	▶	Replace ABS actuator and electric unit.
No	▶	Inspect the system according to the code No.

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TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (4WD)

1. ABS Works Frequently

1. ABS Works Frequently

NEBR0302

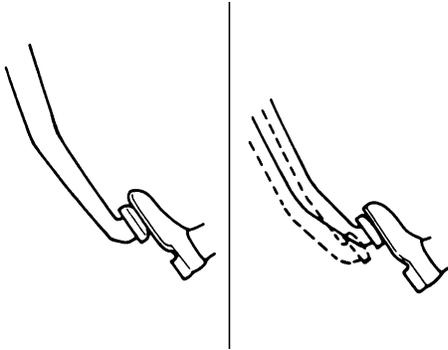
1	CHECK BRAKE FLUID PRESSURE	
Check brake fluid pressure distribution.		
Is brake fluid pressure distribution normal?		
Yes	▶	GO TO 2.
No	▶	Repair. Then perform "Preliminary Check". Refer to BR-114.

2	CHECK WHEEL SENSOR	
1. Check wheel sensor connector for terminal damage or loose connections. 2. Perform wheel sensor mechanical check. Refer to Test No. 7, "Wheel Sensor or Rotor", BR-132.		
Is wheel sensor mechanism OK?		
Yes	▶	GO TO 3.
No	▶	Repair.

3	CHECK FRONT AXLE	
Check front axles for excessive looseness. Refer to AX-5 , "FRONT WHEEL BEARING".		
Is front axle installed properly?		
Yes	▶	Go to Test No. 3, "2. Unexpected Pedal Action", BR-144.
No	▶	Repair.

2. Unexpected Pedal Action

NEBR0303

1	CHECK BRAKE PEDAL STROKE	
Check brake pedal stroke.		
		
Is brake pedal stroke excessively large?		
Yes	▶	Perform "Preliminary Check". Refer to BR-114.
No	▶	GO TO 2.

SBR540A

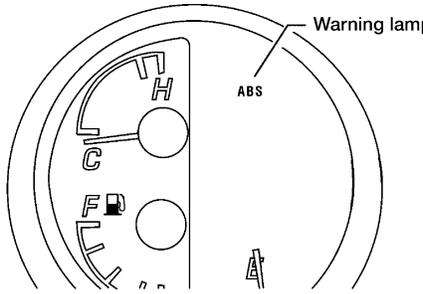
TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (4WD)

2. Unexpected Pedal Action (Cont'd)

2	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE	
Disconnect ABS actuator and electric unit connector and check whether brake is effective.		
Does brake system function properly when brake pedal is depressed?		
Yes	▶	GO TO 3.
No	▶	Perform "Preliminary Check". Refer to BR-114.

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3	CHECK WARNING LAMP INDICATION	
Ensure warning lamp remains off while driving.		
		
LBR380		
Is warning lamp turned off?		
Yes	▶	GO TO 4.
No	▶	Carry out "Self-diagnosis". Refer to BR-123.

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4	CHECK WHEEL SENSOR	
1. Check wheel sensor connector for terminal damage or loose connection. 2. Perform wheel sensor mechanical check. Refer to Test No. 7, "Wheel Sensor or Rotor", BR-132.		
Is wheel sensor mechanism OK?		
Yes	▶	Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.
No	▶	Repair.

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TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (4WD)

3. Long Stopping Distance

3. Long Stopping Distance

=NEBR0304

1	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE	
Disconnect ABS actuator and electric unit connector and check whether stopping distance is still long.		
Does brake system function properly when brake pedal is depressed?		
Yes	▶	Perform "Preliminary Check", BR-114 and air bleeding (if necessary).
No	▶	Go to Test No 3, "2. Unexpected Pedal Action", BR-144.

NOTE:

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

4. ABS Does Not Work

NEBR0305

1	CHECK WARNING LAMP INDICATION	
Does the ABS warning lamp activate?		
Yes or No		
Yes	▶	Carry out "Self-diagnosis". Refer to BR-123.
No	▶	Go to Test No. 3, "2. Unexpected Pedal Action", BR-144.

NOTE:

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

5. Pedal Vibration and Noise

NEBR0306

1	INSPECTION START	
Pedal vibration and noise inspection		
<p>Brake pedal</p> 		
SAT797A		
NOTE:		
ABS may operate and cause vibration under any of the following conditions.		
<ul style="list-style-type: none"> ● 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. 		
▶		GO TO 2.

TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (4WD)

5. Pedal Vibration and Noise (Cont'd)

2	CHECK SYMPTOM	
1. Apply brake. 2. Start engine.		
Does the symptom appear only when engine is started?		
Yes	▶	Carry out "Self-diagnosis". Refer to BR-123.
No	▶	Go to Test No. 3, "2. Unexpected Pedal Action", BR-144.

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

NEBR0307

1	INSPECTION START																																																																												
Warning lamp circuit inspection																																																																													
<p style="text-align: center;">Combination meter harness connectors</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr> <tr><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td></tr> </table> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td></tr> <tr><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td></tr> </table> <p style="text-align: center;">ABS actuator and electric unit connector</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td></tr> <tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td></td><td></td></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr> </table>			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	17	18	19	20	21	22	23	24	25	10	11	12	13	14	15	16			1	2	3	4	5	6	7	8	9
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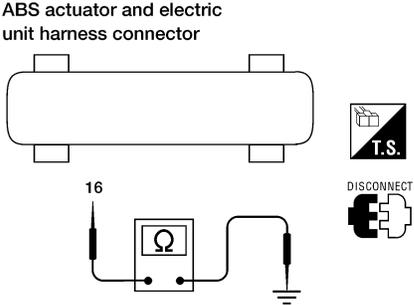
2	CHECK FUSE	
Check 10A fuse No. 11. For fuse layout, refer to EL-10 , "POWER SUPPLY ROUTING".		
Is fuse OK?		
Yes	▶	GO TO 3.
No	▶	Replace fuse.

3	CHECK WARNING LAMP ACTIVATE	
Disconnect ABS actuator and electric unit connector.		
LBR380		
Does the warning lamp activate?		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	GO TO 4.

TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (4WD)

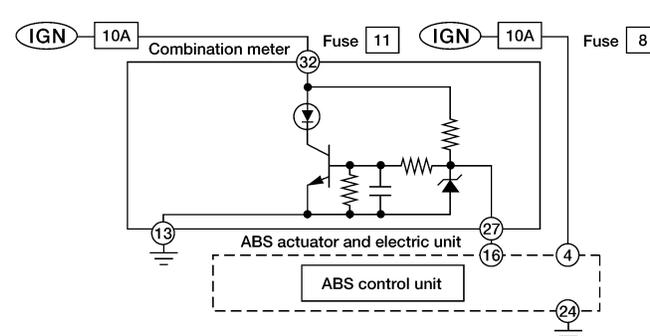
6. Warning Lamp Does Not Come On When Ignition Switch Is Turned On (Cont'd)

4	CHECK HARNESS FOR SHORT
<p>1. Disconnect ABS actuator and electric unit connector E39 and combination meter connector M38.</p> <p>2. Check continuity between ABS actuator and electric unit connector E39 (body side) terminal 16 (L/W) and ground.</p>	
 <p style="text-align: center;">ABS actuator and electric unit harness connector</p>	
<p>Continuity should not exist.</p> <p>Does continuity exist?</p>	
Yes	▶ Repair harness or connectors.
No	▶ Check combination meter. Refer to <i>EL-94</i> , "WARNING LAMPS".

LBR152

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

NEBR0308

1	INSPECTION START																																																
<p>ABS control unit inspection</p>																																																	
																																																	
<p>Combination meter harness connectors</p> <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr> <tr><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td></tr> </table> <table border="1" style="display: inline-table; border-collapse: collapse; margin-left: 20px;"> <tr><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td></tr> <tr><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td></tr> </table>		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
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<p>▶ GO TO 2.</p>																																																	

WBR319

2	CHECK FUSE
<p>Check 10A fuse No. 8. For fuse layout, refer to <i>EL-10</i>, "POWER SUPPLY ROUTING".</p> <p style="text-align: center;">Is fuse OK?</p>	
Yes	▶ GO TO 3.
No	▶ GO TO 8.

3	CHECK HARNESS CONNECTOR
<p>Check ABS actuator and electric unit pin terminals for damage or bad connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.</p> <p style="text-align: center;">Does warning lamp stay on when ignition switch is turned ON?</p>	
Yes	▶ GO TO 4.
No	▶ INSPECTION END

TROUBLE DIAGNOSES FOR SYMPTOMS

VG33E AND VG33ER (4WD)

7. Warning Lamp Stays On When Ignition Switch Is Turned On (Cont'd)

4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT	
Refer to "Ground Circuit Check", BR-117.		
Is ground circuit OK?		
Yes	▶	GO TO 5.
No	▶	Repair harness or connector.

5	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT	
1. Disconnect ABS actuator and electric unit connector. 2. Check voltage between ABS actuator and electric unit connector E39 terminal 4 (B/P) and ground.		
ABR893		
Does battery voltage exist when ignition switch is turned ON?		
Yes	▶	GO TO 6.
No	▶	Check the following. If NG, repair harness or connector. <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse

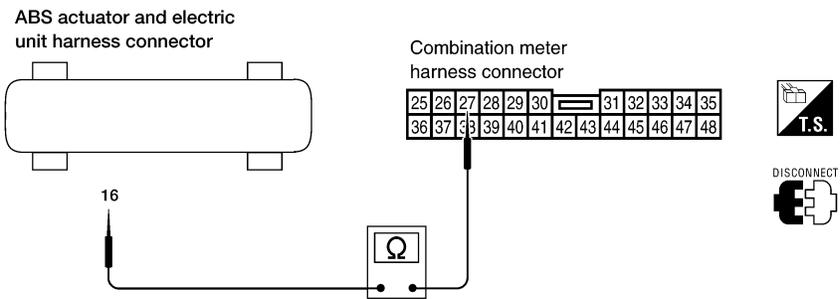
6	CHECK WARNING LAMP	
1. Disconnect ABS actuator and electric unit connector. 2. Connect suitable wire between ABS actuator and electric unit connector E39 terminal 16 (L/W) and ground.		
LBR154		
Does the warning lamp deactivate?		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	GO TO 7.

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TROUBLE DIAGNOSES FOR SYMPTOMS

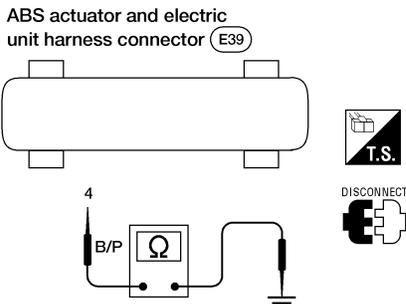
VG33E AND VG33ER (4WD)

7. Warning Lamp Stays On When Ignition Switch Is Turned On (Cont'd)

7	CHECK ABS WARNING LAMP CONTROL CIRCUIT FOR OPEN	
<p>1. Disconnect combination meter connector M39.</p> <p>2. Check continuity between combination meter connector M39 (body side) terminal 27 (L/W) and ABS actuator and electric unit connector E39 (body side) terminal 16 (L/W).</p> <p>NOTE: Connect positive lead of multimeter to combination meter connector M39 (body side) terminal 27 (L/W) and negative lead to ABS actuator and electric unit connector E39 (body side) terminal 16 (L/W).</p>		
		
<p>Continuity should exist.</p> <p>Does continuity exist?</p>		
Yes	▶	Check combination meter. Refer to <i>EL-94</i> , "WARNING LAMPS".
No	▶	Repair harness or connectors.

WBR320

8	REPLACE FUSE	
Replace fuse.		
Does the fuse blow out when ignition switch is turned ON?		
Yes	▶	GO TO 9.
No	▶	INSPECTION END

9	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT FOR SHORT	
<p>1. Disconnect battery cable and ABS actuator and electric unit connector.</p> <p>2. Check continuity between ABS actuator and electric unit connector E39 (body side) terminal 4 and ground.</p>		
		
<p>Continuity should not exist.</p> <p>Does continuity exist?</p>		
Yes	▶	Check the following. If NG, repair harness or connector. <ul style="list-style-type: none"> ● Harness connector E39 ● Harness for open or short between ABS actuator and electric unit and fuse
No	▶	Replace ABS actuator and electric unit.

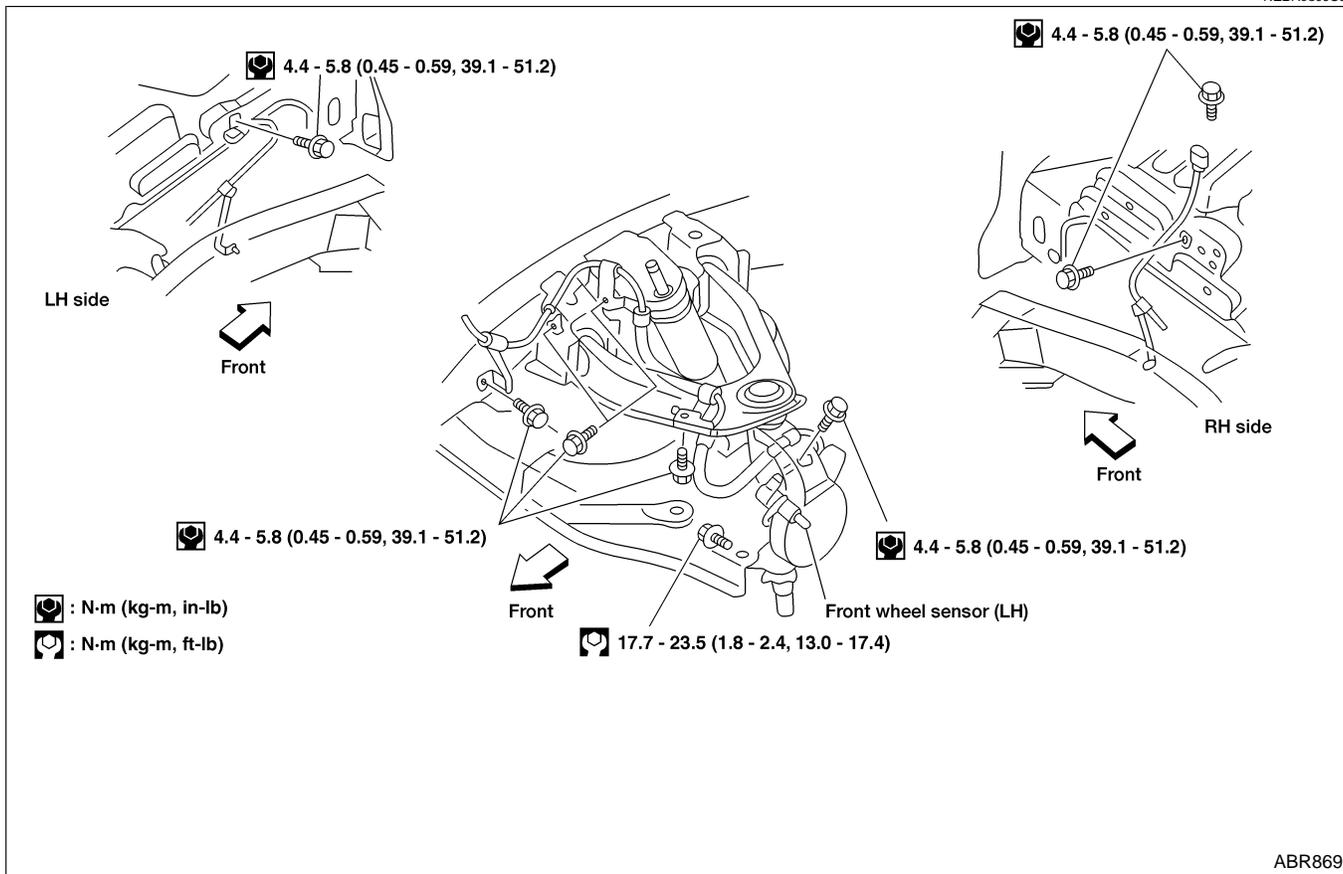
ABR894

CAUTION:

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

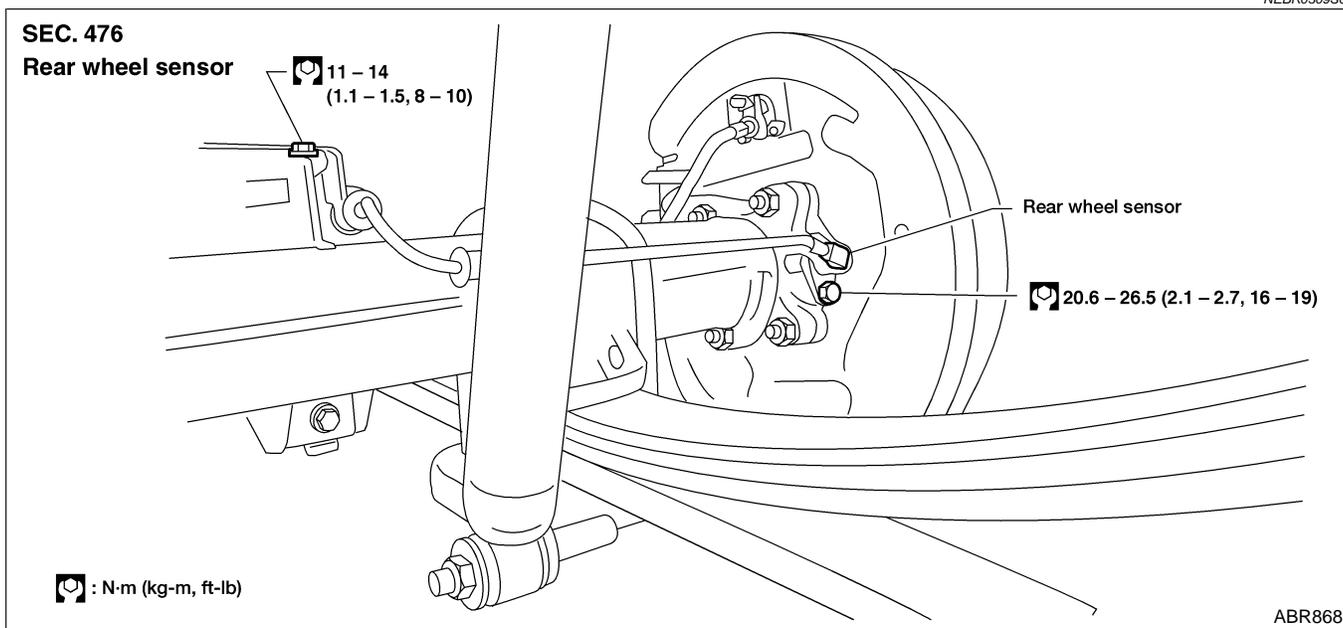
Front Wheel Sensor

NEBR0309S01



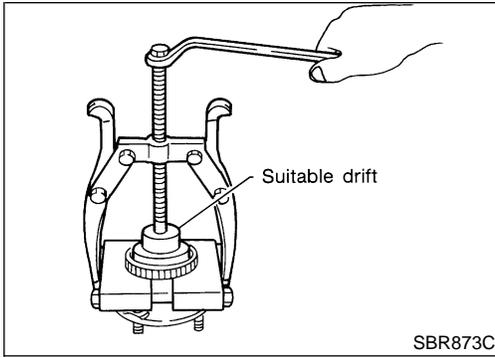
Rear Wheel Sensor

NEBR0309S02



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Front Sensor Rotor

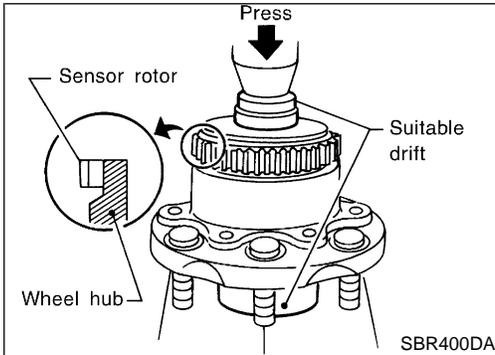


Front Sensor Rotor REMOVAL

NEBR0309S03

NEBR0309S0301

1. Remove the front wheel hub. Refer to **AX-12**, "REMOVAL AND INSTALLATION".
2. Remove the sensor rotor using suitable puller, drift and bearing replacer.

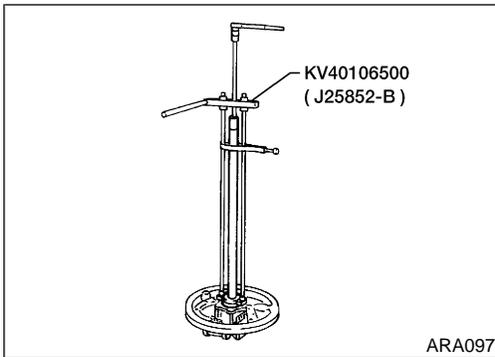


INSTALLATION

NEBR0309S0302

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.

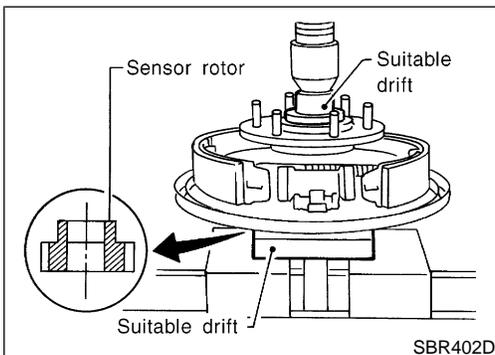


Rear Sensor Rotor REMOVAL

NEBR0309S04

NEBR0309S0401

- Remove the sensor rotor using Tool.

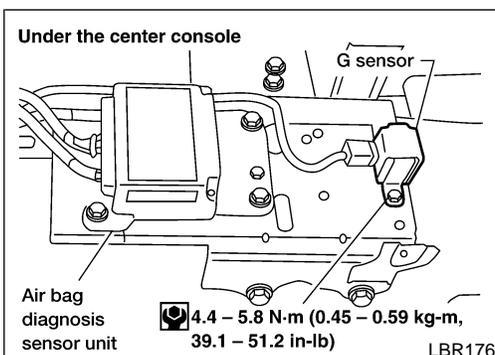


INSTALLATION

NEBR0309S0402

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.



G Sensor

NEBR0309S06

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

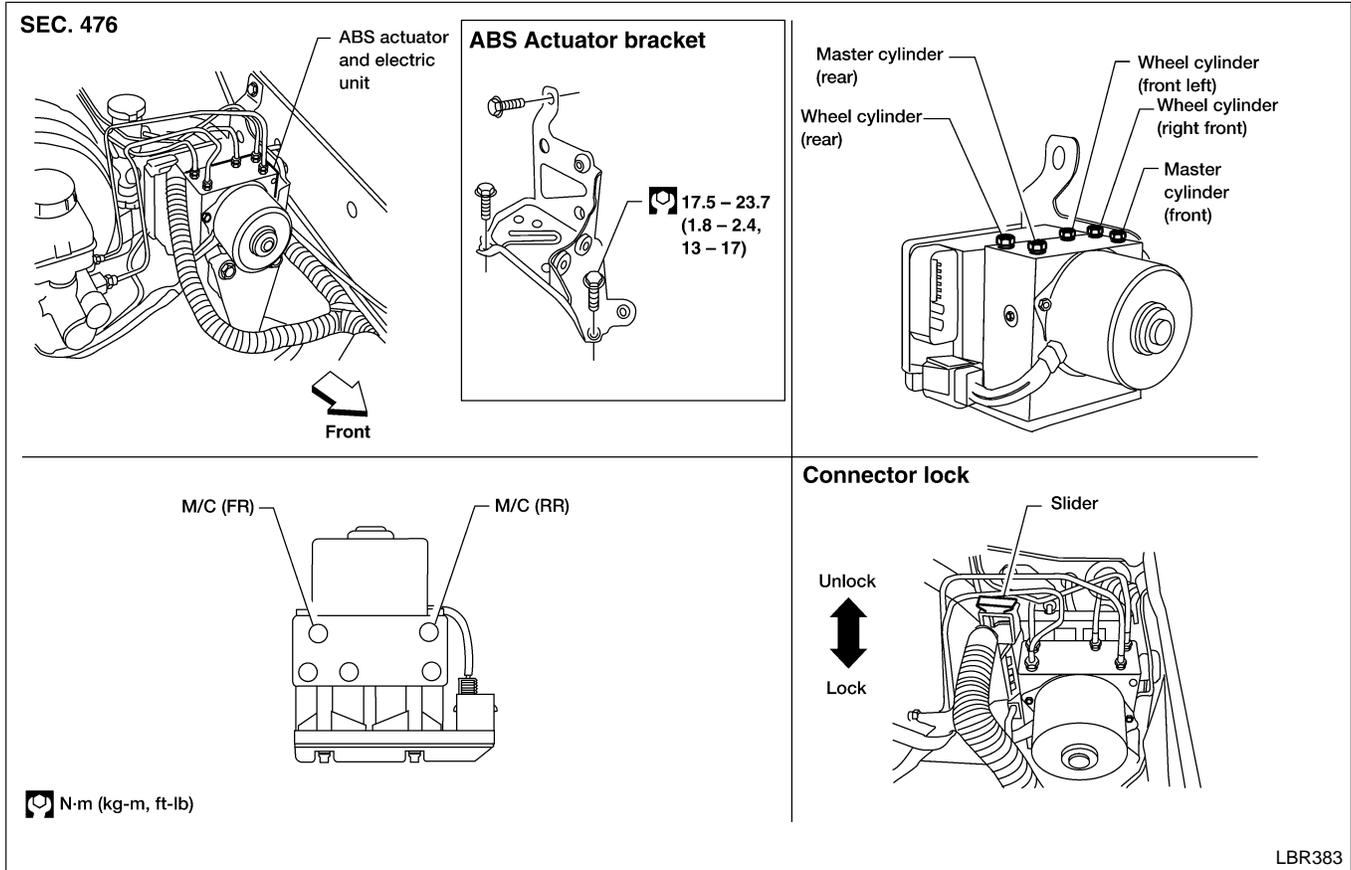
REMOVAL AND INSTALLATION

VG33E AND VG33ER (4WD)

ABS Actuator and Electric Unit

ABS Actuator and Electric Unit

=NEBR0309S07



REMOVAL

NEBR0309S0701

1. Disconnect battery cable.
2. Drain brake fluid. Refer to "Changing Brake Fluid", BR-9.
3. Remove mounting bracket fixing bolts and nuts.
4. Disconnect connector, brake pipes and remove fixing nuts and actuator ground cable.

INSTALLATION

NEBR0309S0702

CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to "Bleeding Brake System", BR-11.

1. Tighten actuator ground cable.

Place ground cable at a notch of mounting bracket.

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

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

General Specifications

NEBR0080
Unit: mm (in)

Applied model		KA24DE	VG33E and VG33ER
Front brake	Brake model	CL28VD	
	Cylinder bore diameter × number of pistons	42.8 (1.685) × 2	
	Pad Length × width × thickness	146.6 × 48.5 × 10 (5.77 × 1.909 × 0.39)	
	Rotor outer diameter × thickness	260 × 26 (10.2 × 1.02)	277 × 26 (10.9 × 1.02)
Rear brake	Brake model	LT26	LT30
	Cylinder bore diameter	22.22 (7/8)	20.64 (13/16)
	Lining length × width × thickness	249.6 × 50 ¹ , 40 ² × 5.5 (9.83 × 1.97 ¹ , 1.57 ² × 0.217)	296 × 50 ¹ , 40 ² × 6.1 (11.65 × 1.97 ¹ , 1.57 ² × 0.240)
	Drum inner diameter	260.0 (10.23)	295.0 (11.61)
Master cylinder	Bore diameter	25.40 (1)	
Control valve	Valve model	Linkage type load sensing valve	Proportioning valve within master cylinder
	Split point kPa (kg/cm ² , psi) × reducing ratio	(Variable) × 0.23	2,452 (25,356) × 0.3
Brake booster	Booster model	M195T	M230T
	Diaphragm diameter	Pri: 205 (8.07) Sec: 180 (7.09)	Pri: 230 (9.06) Sec: 230 (9.06)
Recommended brake fluid		DOT 3	

1. Early production
2. Late production

Disc Brake

NEBR0081
Unit: mm (in)

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

Drum Brake

NEBR0082
Unit: mm (in)

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

Brake Pedal

NEBR0083
Unit: mm (in)

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

SERVICE DATA AND SPECIFICATIONS (SDS)

Parking Brake Control

*: Measured from surface of metal floor to pedal pad

Parking Brake Control

NEBR0084
Unit: notch

Control Type	Pedal
Pedal stroke [under force of 196 N (20 kg, 44 lb)]	5 - 6
Pedal stroke when warning switch comes on	1

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

AX

SU

BR

ST

RS

BT

HA

SC

EL

IDX

NOTES