BRAKE SYSTEM

SECTION BR

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

NABR0206

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS composition which is available to NISSAN MODEL R50 is as follows (The composition varies according to optional equipment.):

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

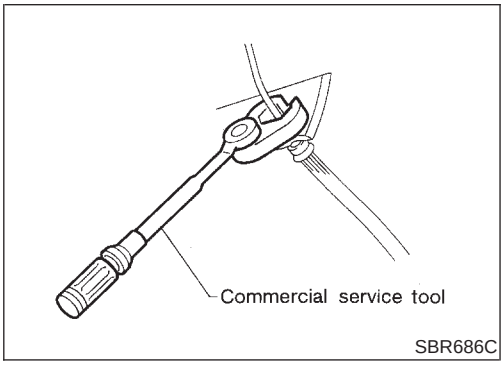
WARNING:

- **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.**
- **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 with yellow and/or orange harness connector (and with yellow harness protector or yellow insulation tape before the harness connectors).**

Precautions for SRS “Air Bag” and “SEAT BELT PRE-TENSIONER” Service

NABR0207

- Do not use electrical test equipment to check SRS circuits unless instructed to in this Service Manual.
- Before servicing the SRS, turn ignition switch “OFF”, disconnect both battery cables and wait at least 3 minutes.
  For approximately 3 minutes after the cables are removed, it is still possible for the air bag and seat belt pre-tensioner to deploy. Therefore, do not work on any SRS connectors or wires until at least 3 minutes have passed.
- Diagnosis sensor unit must always be installed with their arrow marks “⇐” pointing towards the front of the vehicle for proper operation. Also check diagnosis sensor unit for cracks, deformities or rust before installation and replace as required.
- The spiral cable must be aligned with the neutral position since its rotations are limited. Do not attempt to turn steering wheel or column after removal of steering gear.
- Handle air bag module carefully. Always place driver and passenger air bag modules with the pad side facing upward and place side air bag module standing with stud bolt side setting bottom.
- Conduct self-diagnosis to check entire SRS for proper function after replacing any components.
- After air bag inflates, the front instrument panel assembly should be replaced if damaged.



Precautions for Brake System

NABR0002

- **Use brake fluid “DOT 3”.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **To clean master cylinder parts, disc brake caliper parts or wheel cylinder parts, use clean brake fluid.**
- **Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.**

- **Use flare nut wrench when removing and installing brake tubes.**
- **Always torque brake lines when installing.**

WARNING:

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

Wiring Diagrams and Trouble Diagnoses

NABR0003

When you read wiring diagrams, refer to the following:

- GI-11, "HOW TO READ WIRING DIAGRAMS"
- EL-11, "POWER SUPPLY ROUTING" for power distribution circuit

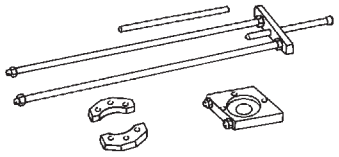
When you perform trouble diagnoses, refer to the following:

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

Special Service Tools

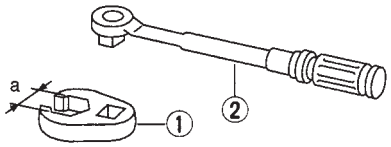
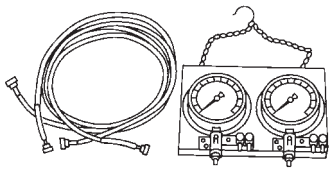
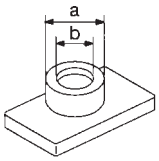
NABR0004

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

Tool number (Kent-Moore No.) Tool name	Description	
KV40106500 (J25852-B) Rear wheel bearing puller	 NT724	Removing rear wheel sensor rotor

Commercial Service Tools

NABR0005

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

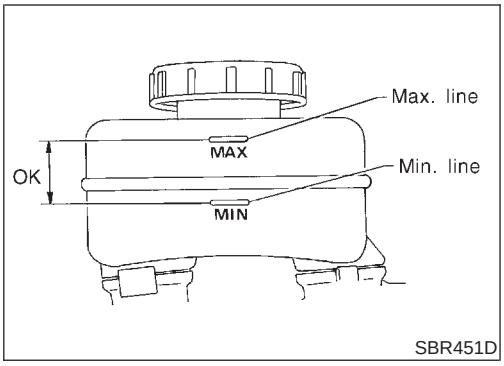
NVH Troubleshooting Chart

NABR0085S01

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

			Reference page	Linings or pads - damaged	Linings or pads - uneven wear	Return spring damaged	Shims damaged	Rotor or drum imbalance	Rotor or drum damage	Rotor or drum runout	Rotor or drum deformation	Rotor or drum deflection	Rotor or drum rust	Rotor thickness variation	Drum out of round	PROPELLER SHAFT	DIFFERENTIAL	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	STEERING
			Possible cause and SUSPECTED PARTS																				
				BR-22, 28	BR-22, 28	BR-26	BR-22	—	—	BR-24, 28	—	—	—	BR-25	BR-28	PD-4	PD-4	AX-3	AX-3	SU-4	SU-4	SU-4	ST-6
Symptom	BRAKE	Noise		×	×	×	×									×	×	×	×	×	×	×	×
		Shake						×								×		×	×	×	×	×	×
		Shimmy, Judder						×	×	×	×	×	×	×	×				×	×	×	×	×

×: Applicable

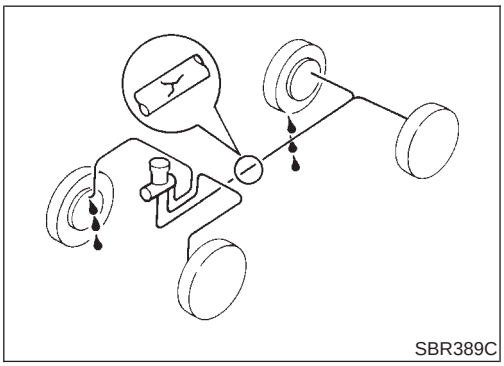


SBR451D

Checking Brake Fluid Level

NABR0006

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


SBR389C

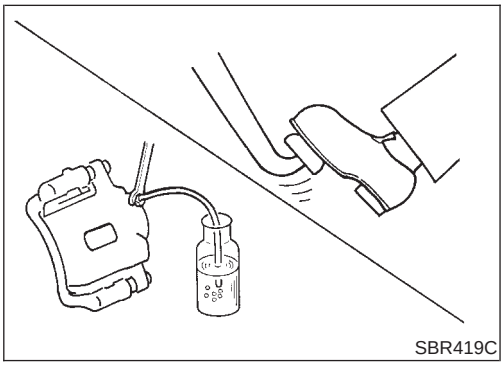
Checking Brake Line

NABR0007

CAUTION:

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

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


SBR419C

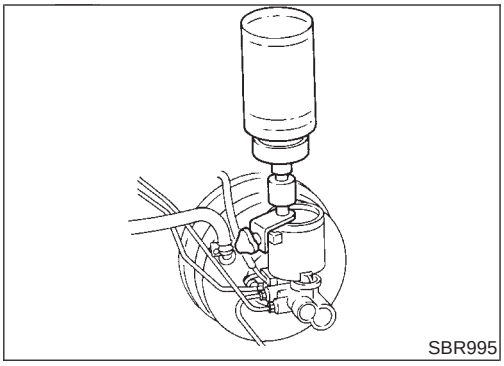
Changing Brake Fluid

NABR0008

CAUTION:

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

1. Clean inside of reservoir tank, and refill with new brake fluid.
2. Connect a vinyl tube to each air bleeder valve.
3. Drain brake fluid from each air bleeder valve by depressing brake pedal.
4. Refill until brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to “Bleeding Brake System”, BR-9.


SBR995

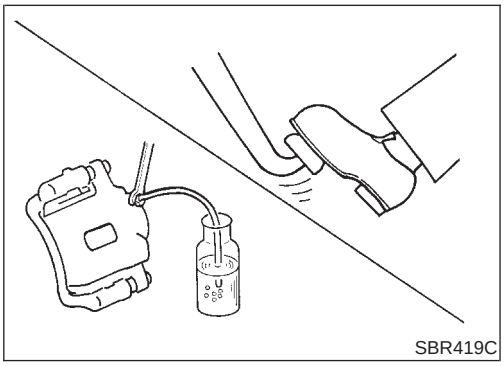
Bleeding Brake System

=NABR0009

CAUTION:

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **If master cylinder is suspected to have air inside, bleed air from master cylinder first. Refer to “Installation”, “MASTER CYLINDER”, BR-18.**
- **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 and electric unit connectors or battery ground cable.**
- **Bleed air in the following order.**

1. Left rear brake
2. Right rear brake
3. Left front brake
4. Right front brake


SBR419C

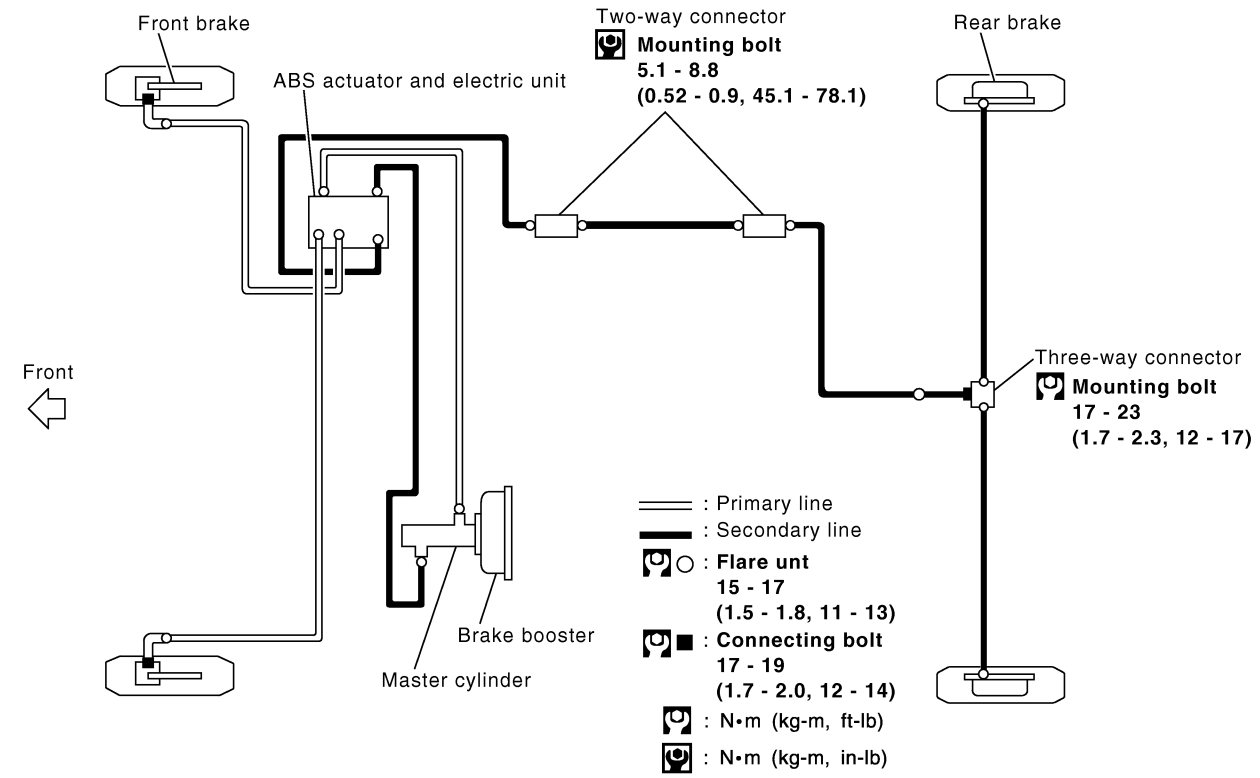
1. Connect a transparent vinyl tube to air bleeder valve.
2. Fully depress brake pedal several times.
3. With brake pedal depressed, open air bleeder valve to release air.
4. Close air bleeder valve.
5. Release brake pedal slowly.
6. Repeat steps 2. through 5. until clear brake fluid comes out of air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

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

Hydraulic Circuit

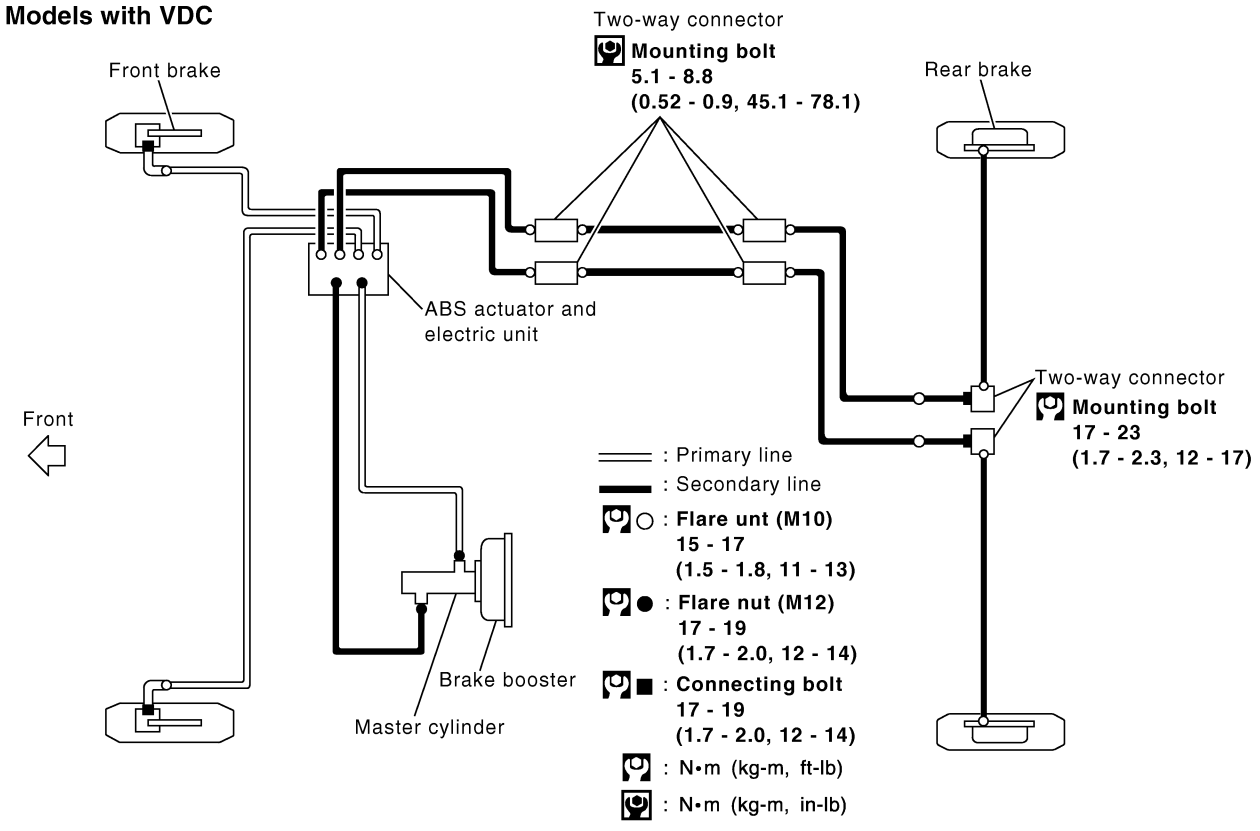
NABR0010

Models without VDC

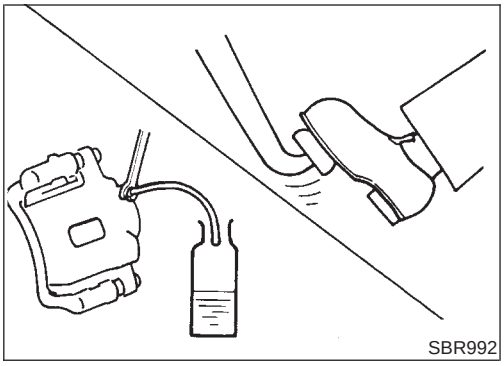


SBR058F

Models with VDC



SBR059F


SBR992

Removal

NABR0011

CAUTION:

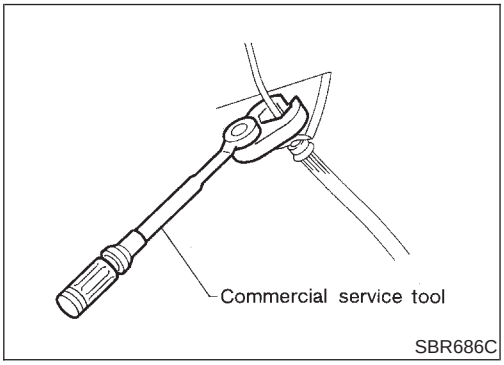
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **All hoses must be free from excessive bending, twisting and pulling.**

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

Inspection

NABR0012

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



SBR686C

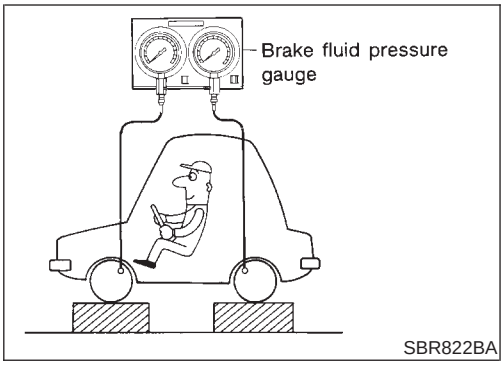
Installation

NABR0013

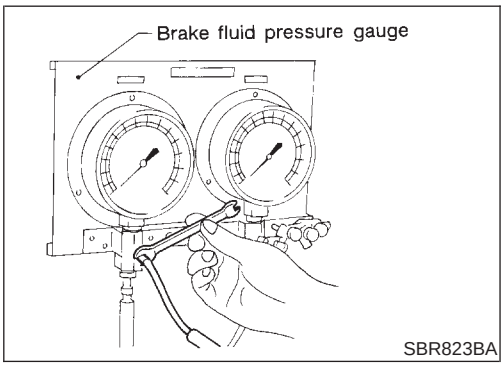
CAUTION:

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

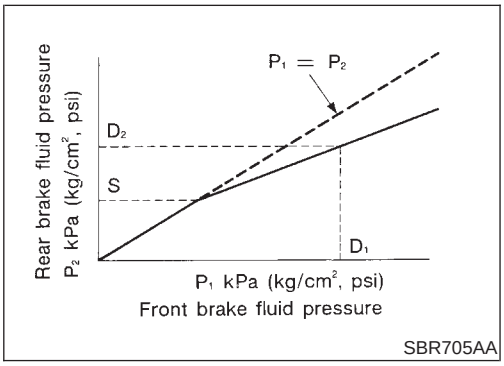
1. Tighten all flare nuts and connecting bolts.
   Flare nut: (M10)
   : 15 - 17 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
   Flare nut: (M12)
   : 17 - 19 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb)
   Connecting bolt:
   : 17 - 19 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb)
2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to “Bleeding Brake System”, BR-9.



SBR822BA



SBR823BA



SBR705AA

Inspection

NABR0116

CAUTION:

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

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

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

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

kPa (kg/cm^2, psi)

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

If output pressure is out of specifications, replace master cylinder assembly.

6. Bleed air after disconnecting the tool. Refer to “Bleeding Brake System”, BR-9.
7. Install front LH tire.

Removal and Installation

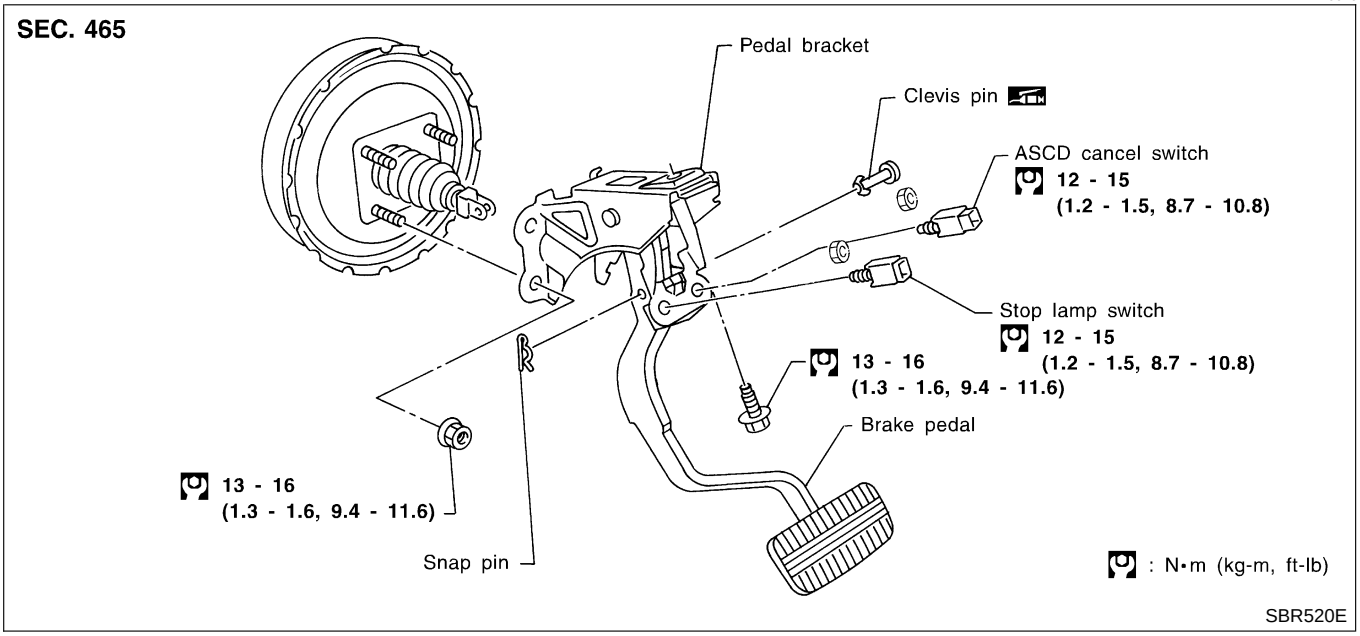
NABR0117

Always replace together with master cylinder as an assembly.

- Refer to “MASTER CYLINDER”, BR-15.

Removal and Installation

NABR0016

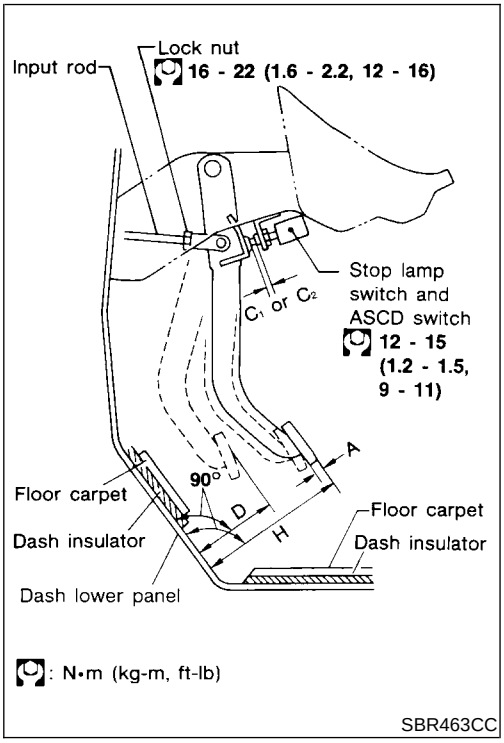


Inspection

NABR0017

Check brake pedal for following items.

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



Adjustment

NABR0018

Check brake pedal free height from metal panel.

H: Free height
Refer to SDS (BR-147).

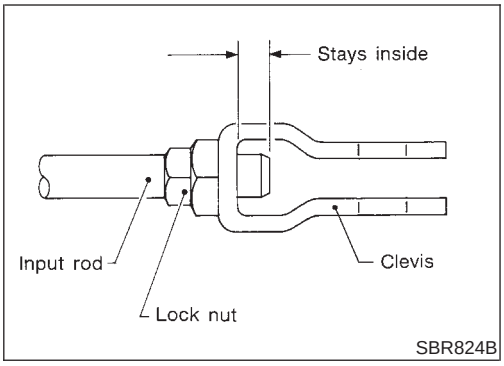
D: Depressed height
Refer to SDS (BR-147).
Under force of 490 N (50 kg, 110 lb) with engine running

C_1, C_2: Clearance between pedal stopper and threaded end of stop lamp switch and ASCD switch
0.3 - 1.0 mm (0.012 - 0.039 in)

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

If necessary, adjust brake pedal free height.

Adjustment (Cont'd)



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. Adjust clearance "C_1" and "C_2" with stop lamp switch and ASCD switch respectively. Then tighten lock nuts.
3. Check pedal free play.

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

4. Check brake pedal's depressed height while engine is running. If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.). Then make necessary repairs.

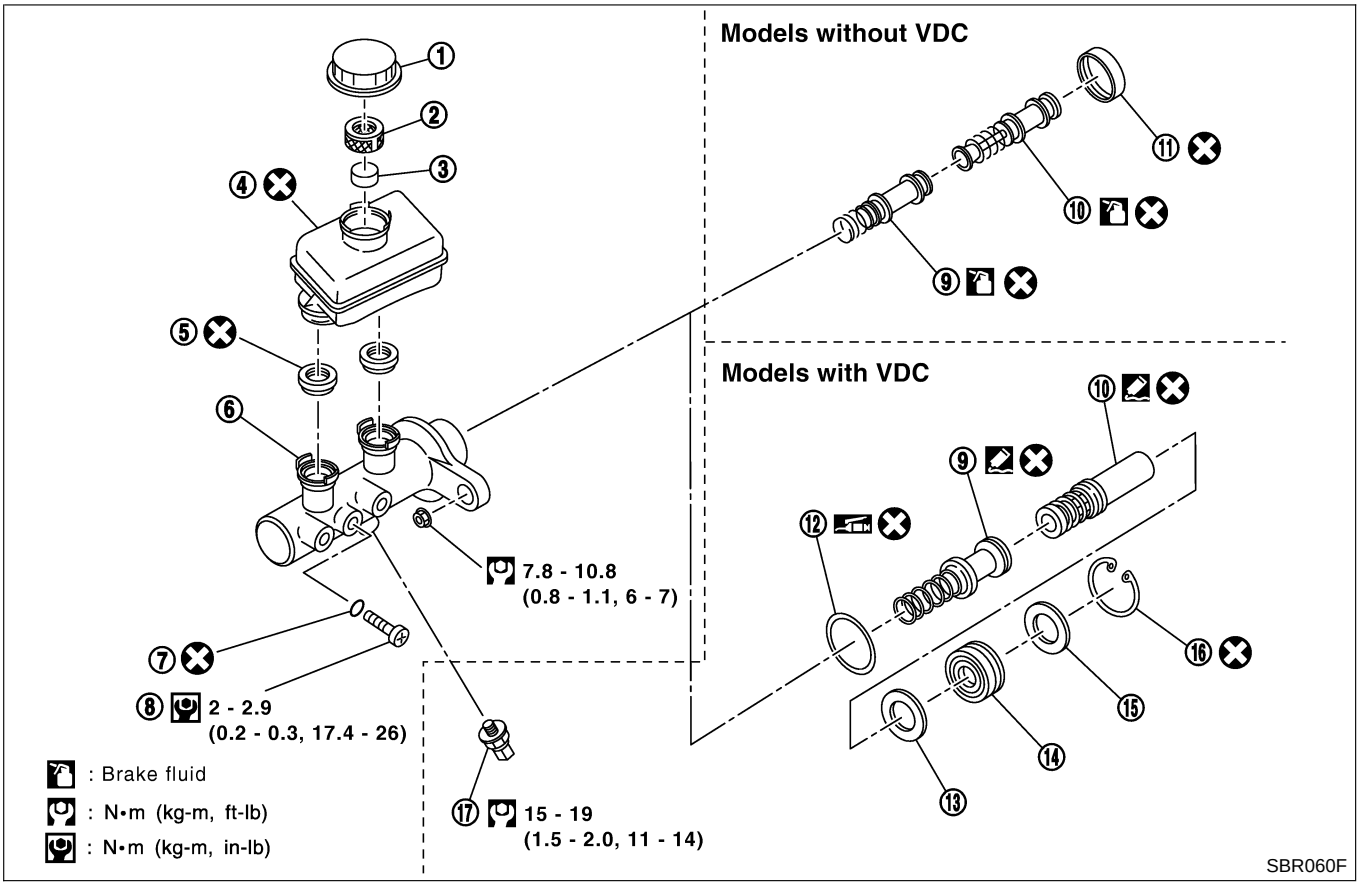
Removal

NABR0019

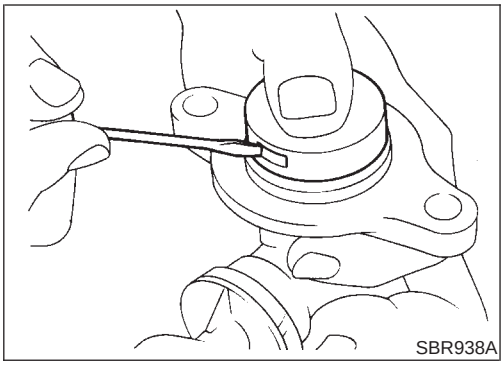
CAUTION:

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

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



1. Reservoir cap
2. Oil filter
3. Float
4. Reservoir tank
5. Seal
6. Cylinder body
7. O-ring
8. Piston stopper
9. Secondary piston assembly
10. Primary piston assembly
11. Stopper cap
12. O-ring
13. Plate
14. Guide assembly
15. Plate
16. Snap ring
17. Pressure sensor


SBR938A

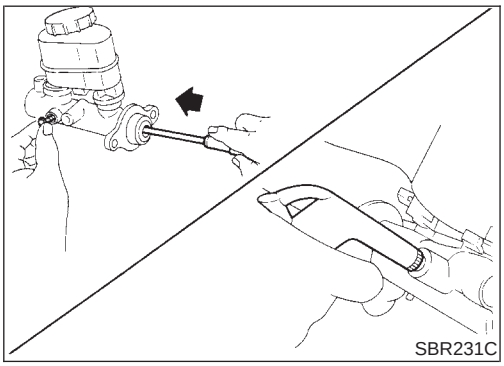
Disassembly

NABR0020

MODELS WITHOUT VDC

NABR0020S01

1. Bend claws of stopper cap outward.


SBR231C

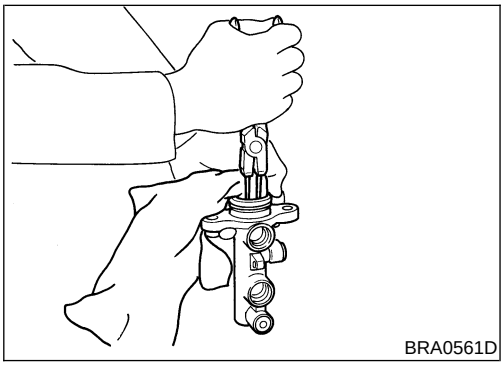
2. Remove piston stopper while piston is pushed into cylinder.
3. Remove piston assemblies.

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

4. Draw out reservoir tank.

MODELS WITH VDC

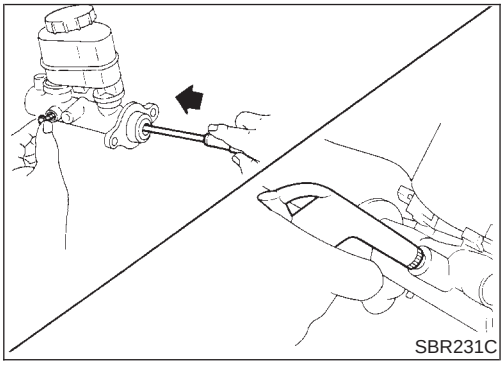
NABR0020S02


BRA0561D

1. Remove the snap ring in pushing primary piston.
2. Holding the rod of the primary piston, remove the primary piston assembly, the plate and the guide with pulling straight to prevent the cup from being caught by the inner wall of the cylinder.
3. Remove the plate and the guide from the primary piston.

CAUTION:

Be careful not to damage the rod from the inner wall of the plate.


SBR231C

4. Remove piston stopper while secondary piston is pushed into cylinder.
5. Remove secondary piston assemblies.

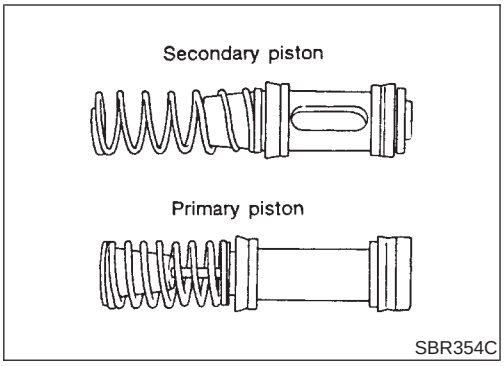
If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.

6. Draw out reservoir tank.

Inspection

NABR0021

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



Assembly

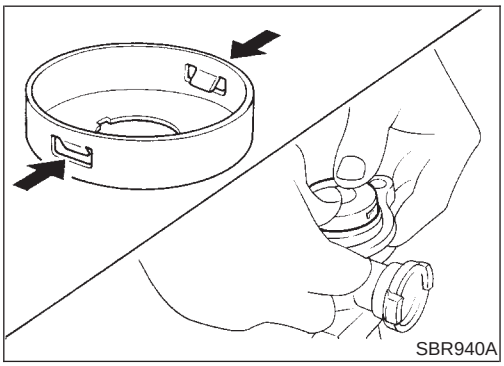
NABR0022

MODELS WITHOUT VDC

NABR0022S01

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

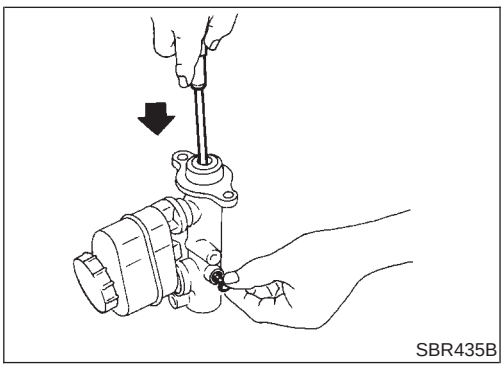
- **Pay attention to direction of piston cups in figure at left. Also, insert pistons squarely to avoid scratches on cylinder bore.**
- **Pay attention to alignment of secondary piston slit with valve stopper mounting hole of cylinder body.**



2. Install stopper cap.

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

3. Push reservoir tank seals into cylinder body.
4. Push reservoir tank into cylinder body.



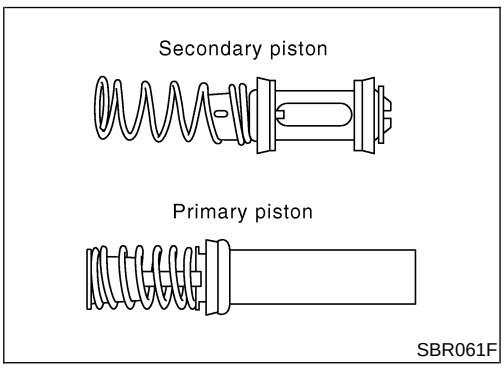
5. Install piston stopper while piston is pushed into cylinder.

MODELS WITH VDC

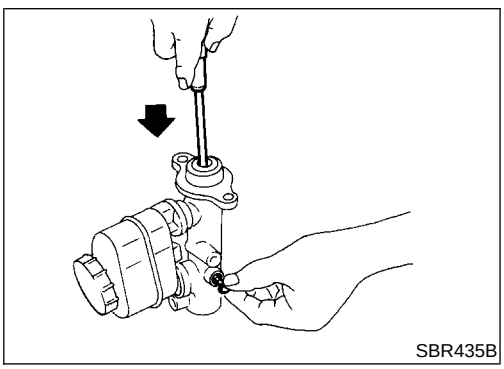
NABR0022S02

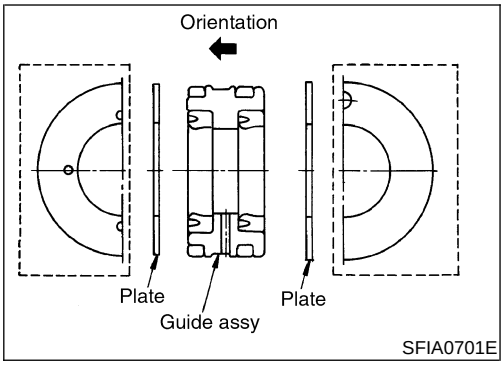
1. Insert secondary piston assembly. Then insert primary piston assembly.

- **Pay attention to direction of piston cups in figure at left. Also, insert pistons squarely to avoid scratches on cylinder bore.**
- **Pay attention to alignment of secondary piston slit with valve stopper mounting hole of cylinder body.**



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

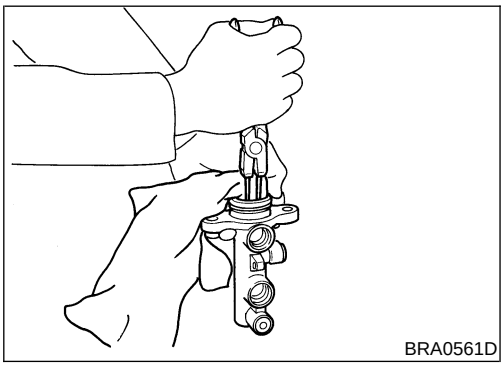




3. Install the plate and the guide into the cylinder body.

CAUTION:

- **Be careful not to damage the rod of the primary piston.**
- **Pay attention to the orientation of the guide.**
- **Do not drop the O-ring.**

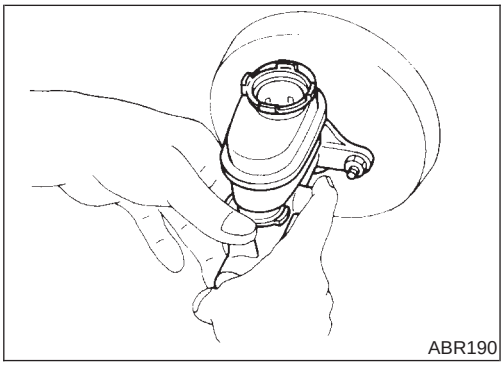


4. Be careful not to damage the rod of the primary piston with covering the close. Then insert snap ring to cylinder with pushing primary piston.

CAUTION:

- **Be careful to check the snap ring in the inner tip of the cylinder body.**
- **Do not reuse the snap ring.**

5. Push reservoir tank seals into cylinder body.
6. Push reservoir tank into cylinder body.



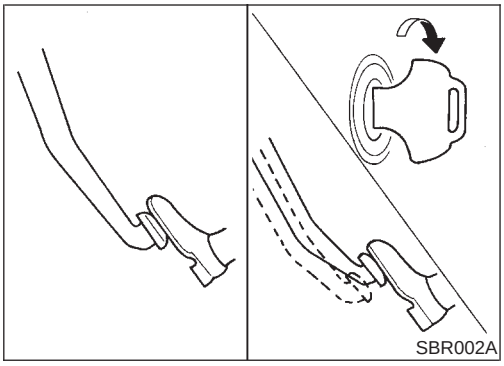
Installation

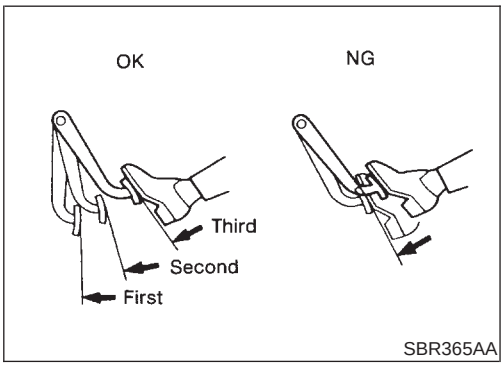
NABR0023

CAUTION:

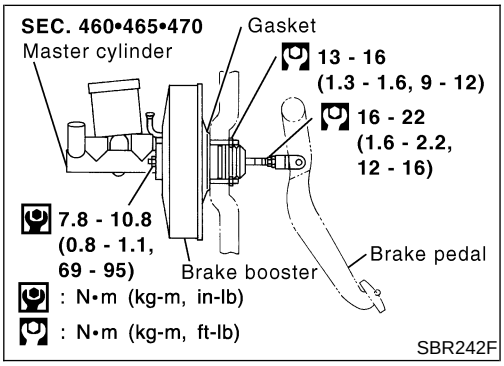
- **Refill with new brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**

1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Torque mounting nuts.
   : 7.8 - 10.8 N·m (0.8 - 1.1 kg-m, 69 - 95 in-lb)
3. Fill up reservoir tank with new brake fluid.
4. Plug all ports on master cylinder with fingers to prevent air suction while releasing brake pedal.
5. Have driver depress brake pedal slowly several times until no air comes out of master cylinder.
6. Fit brake lines to master cylinder.
7. Tighten flare nuts.
   : 15 - 17 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb) (M10)
   : 17 - 19 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb) (M12)
8. Bleed air. Refer to "Bleeding Brake System", BR-9.

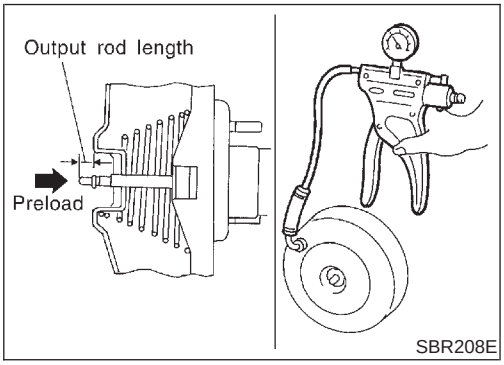

SBR002A



SBR365AA



SBR242F



SBR208E

On-vehicle Service

NABR0024

OPERATING CHECK

NABR0024S01

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

AIRTIGHT CHECK

NABR0024S02

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

Removal

NABR0025

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

NABR0026

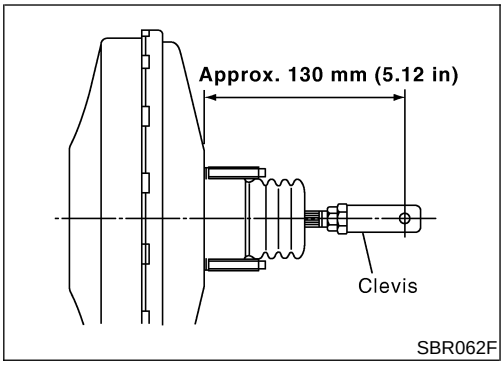
OUTPUT ROD LENGTH CHECK

NABR0026S01

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.
3. Check output rod length.

Specified length:

10.275 - 10.525 mm (0.4045 - 0.4144 in)



Installation

=NABR0027

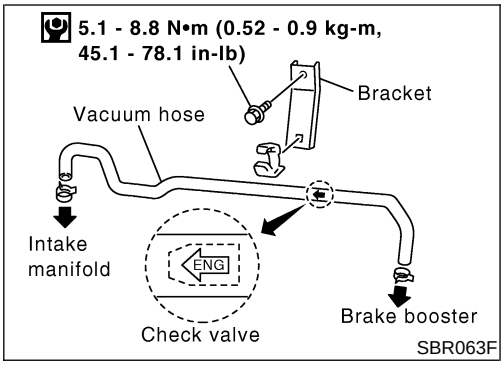
CAUTION:

- **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.**

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

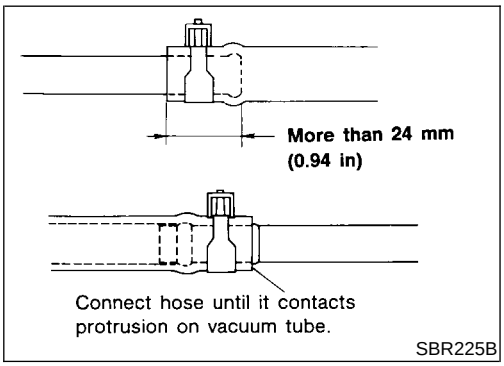
   Specification: 13 - 16 N·m (1.3 - 1.6 kg-m, 9 - 12 ft-lb)
5. Install master cylinder. Refer to “Installation” in “MASTER CYLINDER”, BR-18.
6. Adjust brake pedal height and free play. Refer to “Adjustment” in “BRAKE PEDAL AND BRACKET”, BR-13.
7. Secure lock nut for clevis.

   : 16 - 22 N·m (1.6 - 2.2 kg-m, 12 - 16 ft-lb)
8. Bleed air. Refer to “Bleeding Brake System”, BR-9.



Vacuum Hose

NABR0028



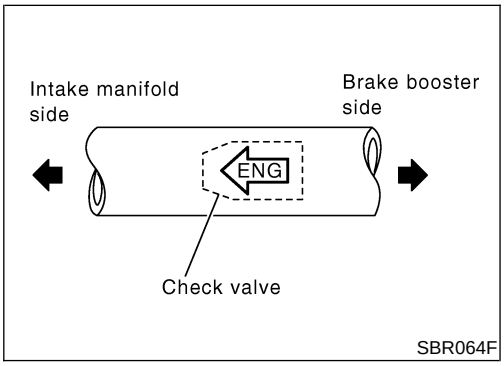
Removal and Installation

NABR0029

CAUTION:

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

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



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

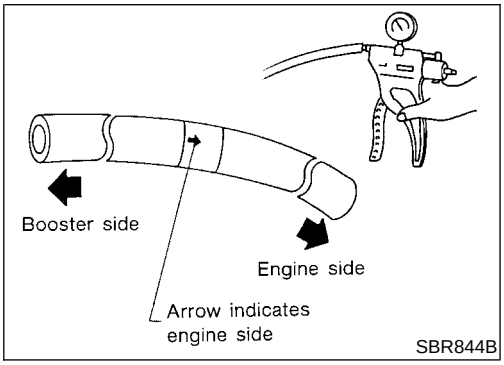
Inspection

NABR0030

HOSES AND CONNECTORS

NABR0030S01

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



CHECK VALVE

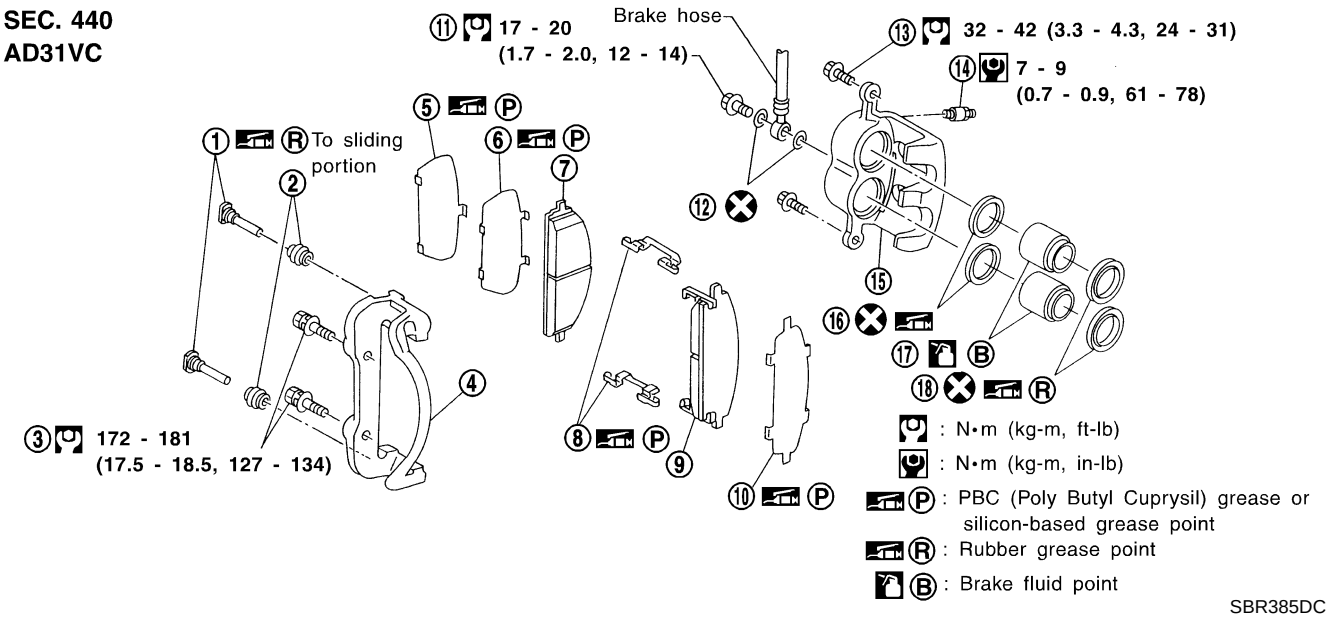
NABR0030S02

Check vacuum with a vacuum pump.

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

Components

NABR0031



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

Pad Replacement

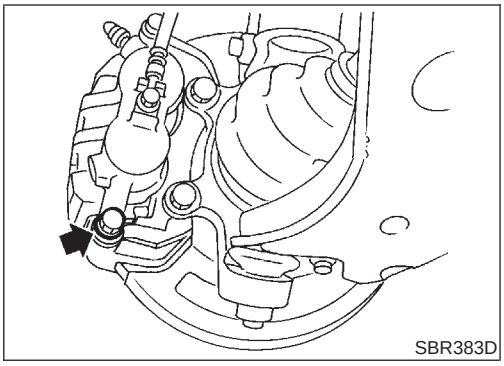
NABR0032

WARNING:

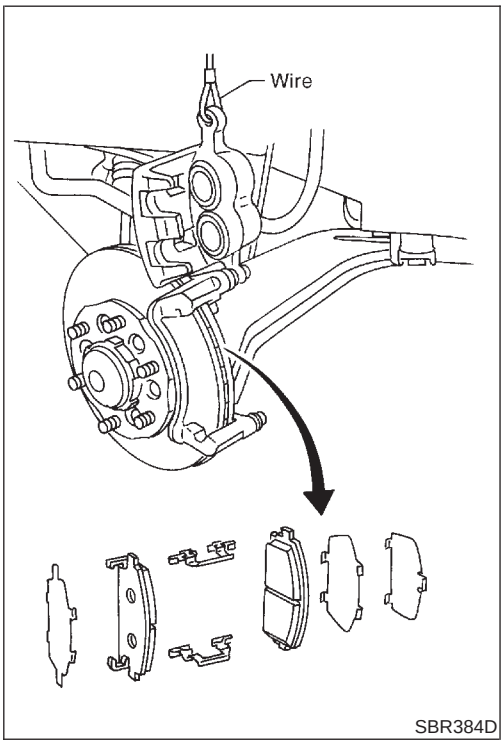
Clean brakes with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

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


SBR383D

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



SBR384D

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

Standard pad thickness:
11.0 mm (0.433 in)
Pad wear limit:
2.0 mm (0.079 in)

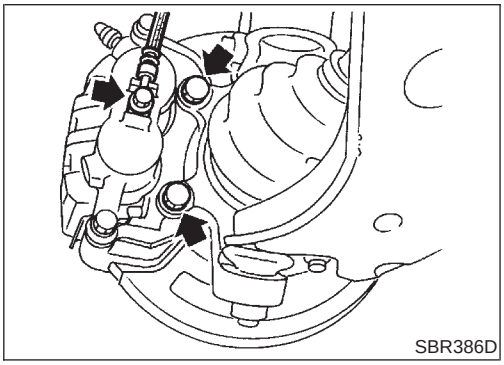
Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

Removal

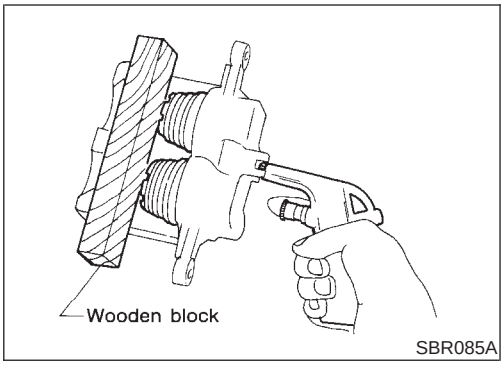
NABR0033

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.


SBR386D

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



Disassembly

NABR0034

WARNING:

Do not place your fingers in front of piston.

CAUTION:

Do not scratch or score cylinder wall.

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

Inspection

NABR0035

CALIPER

NABR0035S01

Cylinder Body

NABR0035S0101

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign objects. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign 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

NABR0035S0102

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

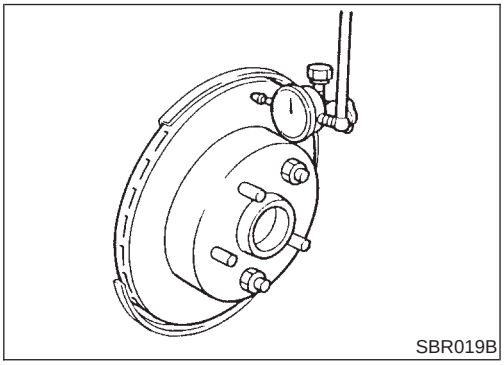
CAUTION:

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

Slide Pin, Pin Bolt and Pin Boot

NABR0035S0103

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



ROTOR

NABR0035S02

Runout

NABR0035S0201

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

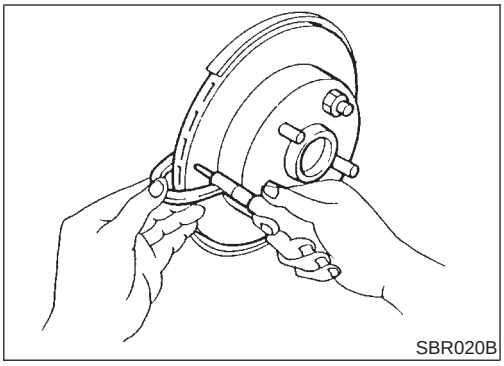
Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to AX-4, "Front Wheel Bearing".

Maximum runout:
0.1 mm (0.004 in)

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

a. Remove nuts and rotor from wheel hub.
b. Shift the rotor one hole and secure rotor to wheel hub with nuts.
c. Measure runout.
d. Repeat steps a. to c. so that minimum runout position can be found.

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


SBR020B

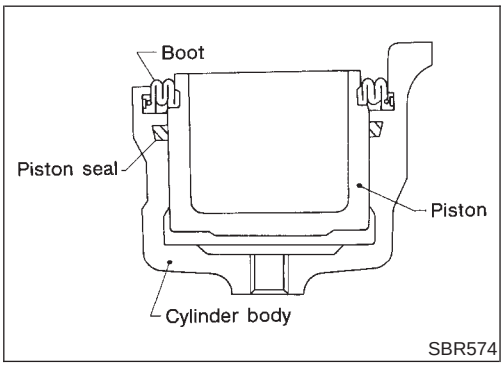
Thickness

NABR0035S0202

Thickness variation (At least 8 positions):
Maximum 0.015 mm (0.0006 in)

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

Rotor repair limit:
26.0 mm (1.024 in)

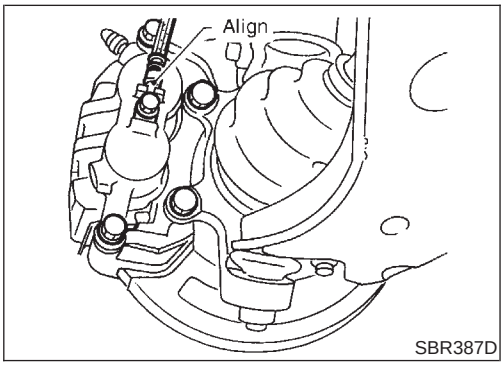


SBR574

Assembly

NABR0036

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



SBR387D

Installation

NABR0037

CAUTION:

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

1. Install caliper assembly.
2. Install brake hose to caliper securely.
3. Install all parts and secure all bolts.
4. Bleed air. Refer to "Bleeding Brake System", BR-9.

Brake Burnishing Procedure

NABR0086

When experiencing soft brake pedal feel at very low mileage, or after replacing the rotor, burnish the brake pad contact surfaces according to the following procedures.

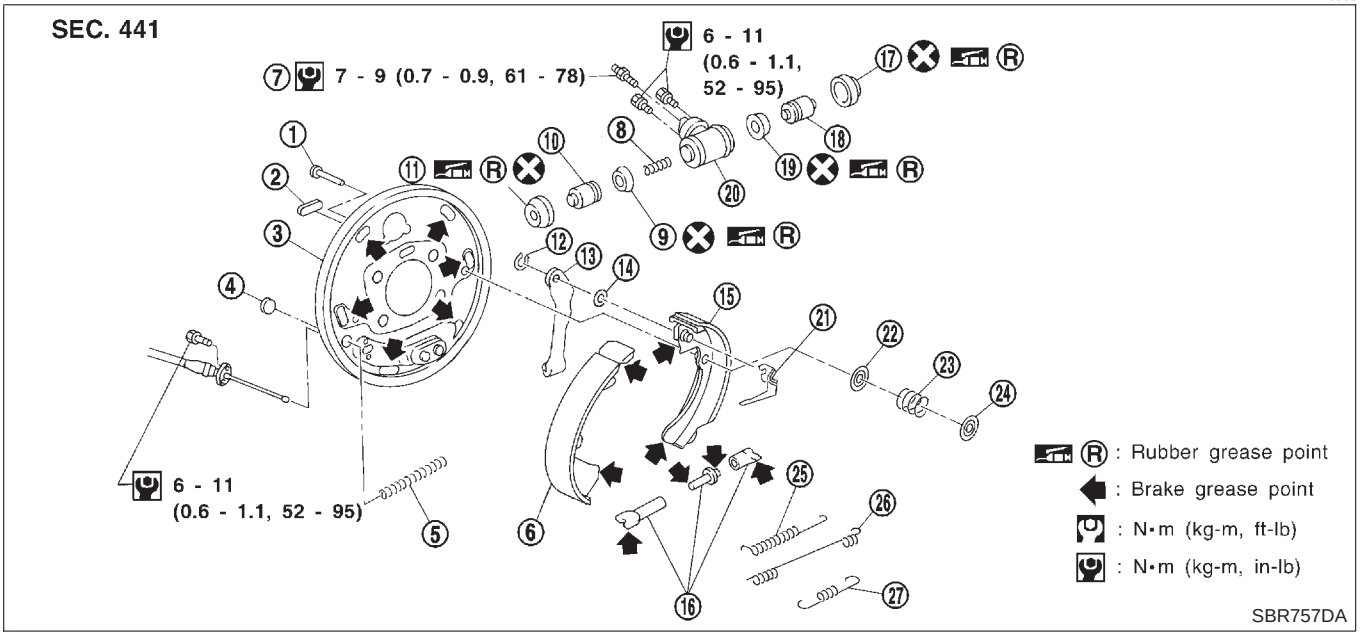
CAUTION:

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.

Components

NABR0038



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

Removal

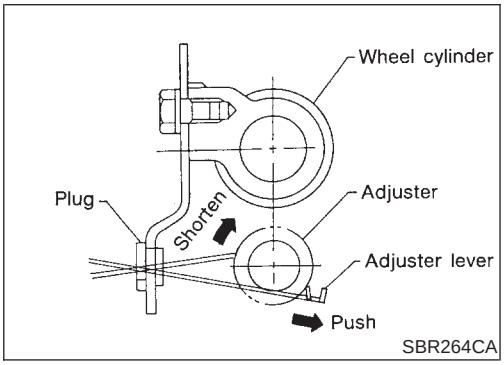
NABR0039

WARNING:

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

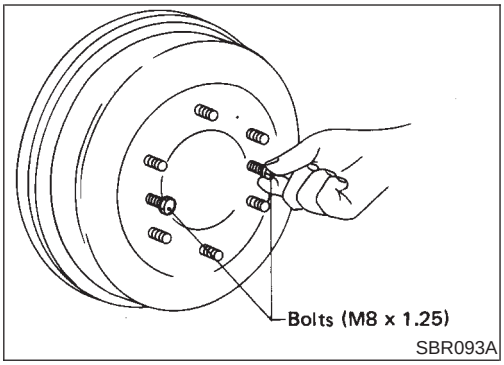
CAUTION:

Make sure parking brake lever is released completely.



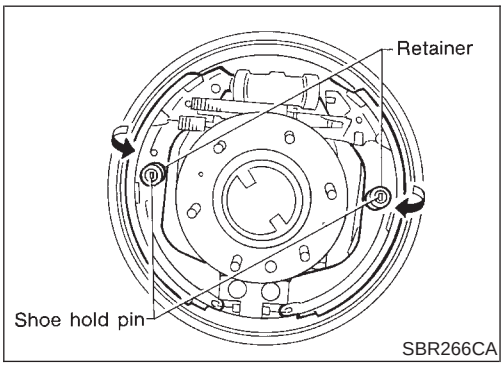
1. Release parking brake lever fully, then remove drum.
   If drum is hard to remove, the following procedures should be carried out.

a. Remove plug. Then shorten adjuster to make clearance between brake shoe and drum as shown.



SBR093A

b. Tighten the two bolts gradually.

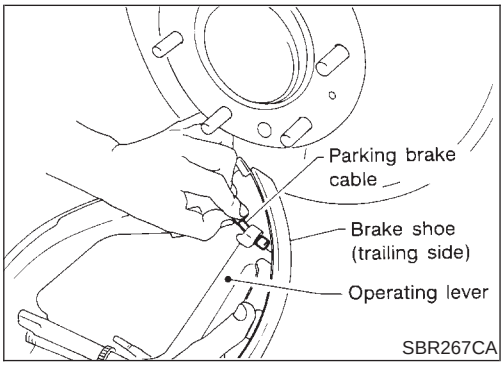


SBR266CA

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.

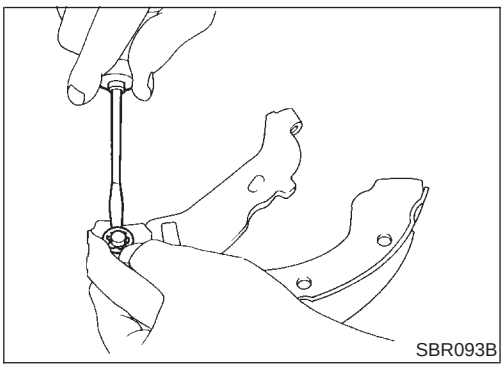
3. Remove adjuster.



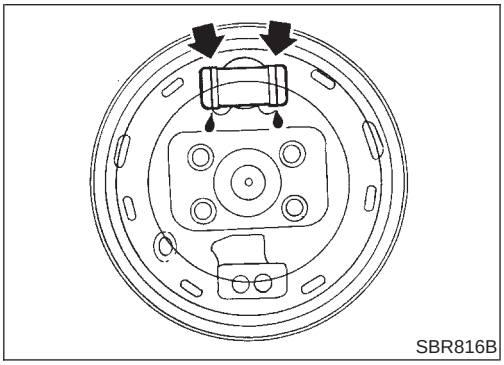
SBR267CA

4. Disconnect parking brake cable from toggle lever.

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


SBR093B

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


SBR816B

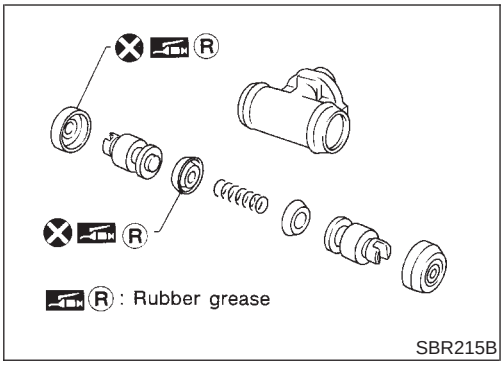
Inspection

NABR0040

WHEEL CYLINDER

NABR0040S01

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

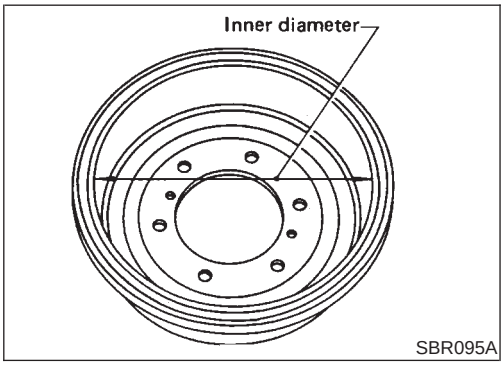


SBR215B

Wheel Cylinder Overhaul

NABR0041

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



SBR095A

Inspection

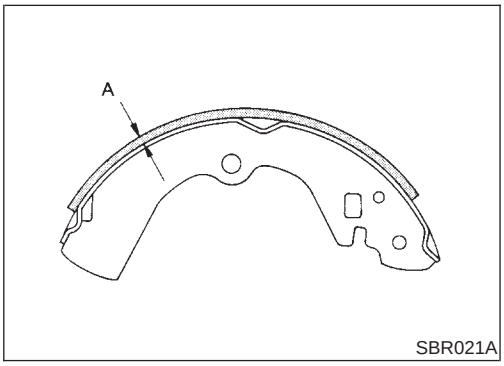
NABR0042

DRUM

NABR0042S01

Maximum inner diameter: 296.5 mm (11.67 in)
Out-of-roundness: 0.03 mm (0.0012 in) or less

- 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.



SBR021A

LINING

NABR0042S02

Check lining thickness.

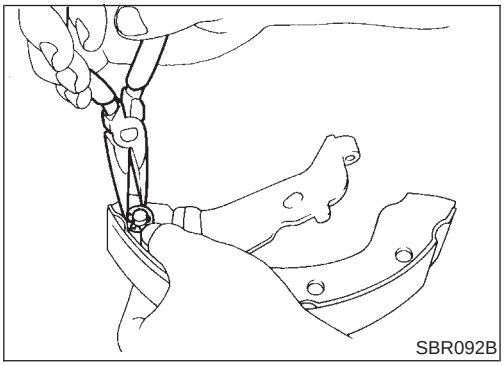
Standard lining thickness:
6.1 mm (0.240 in)
Lining wear limit (A):
1.5 mm (0.059 in)

Installation

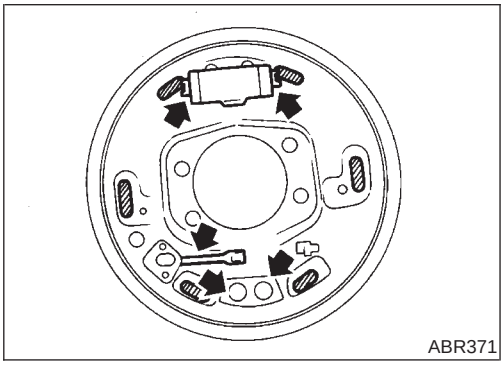
NABR0043

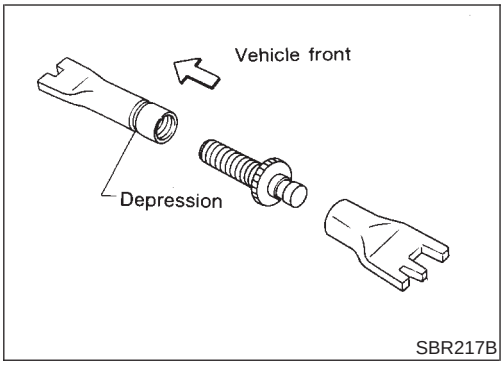
Always perform shoe clearance adjustment. Refer to BR-31.

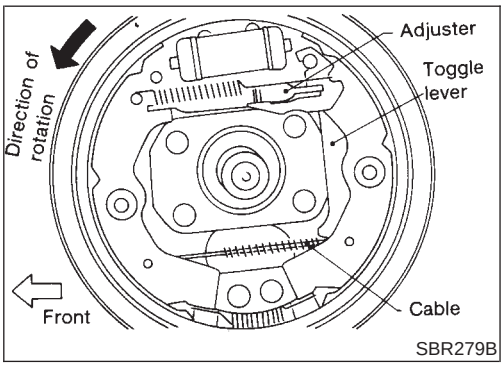
1. Fit toggle lever to brake shoe (trailing side) with retainer ring.


SBR092B

2. Apply brake grease to the contact areas (indicated by arrows and hatching) shown at left.


ABR371





3. Shorten adjuster by rotating it.

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

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

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

Be careful not to damage wheel cylinder piston boots.

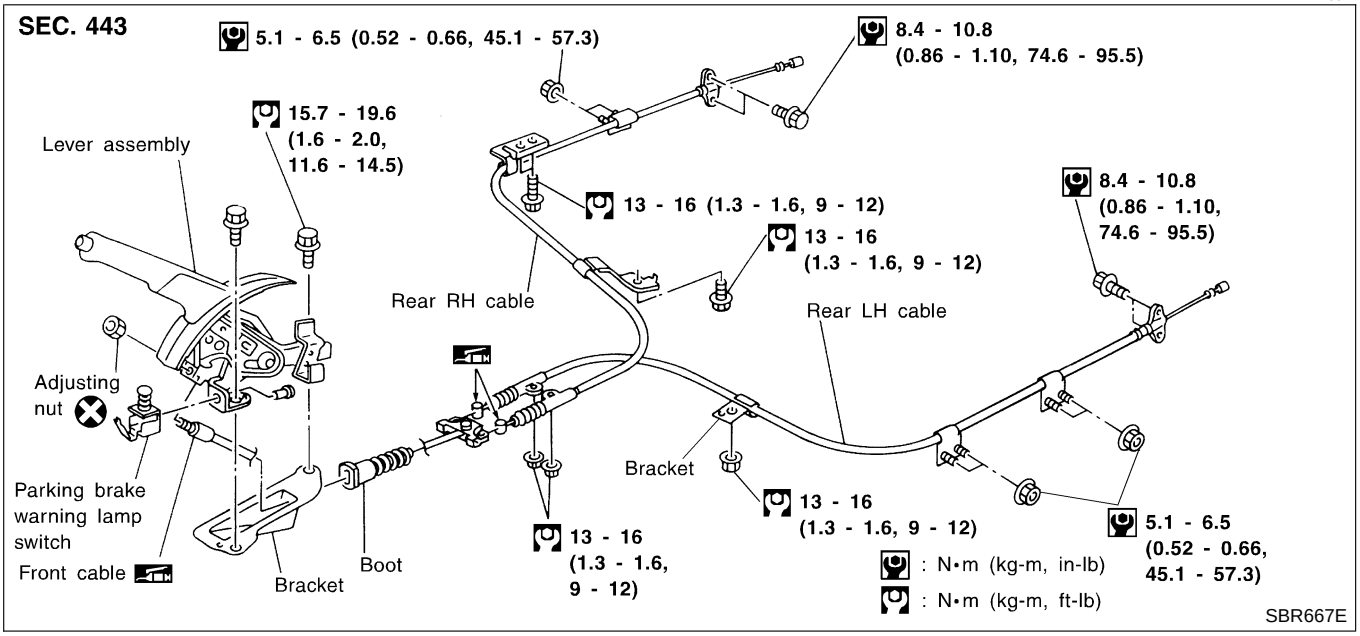
6. Check all parts are installed properly.

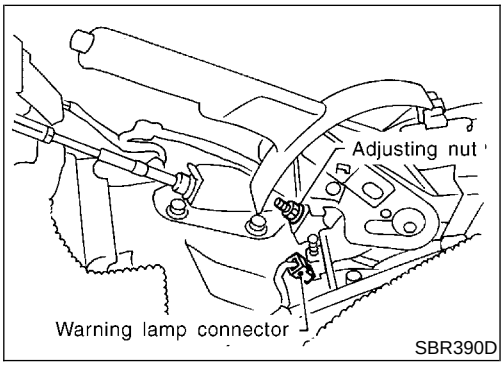
Pay attention to direction of adjuster assembly.

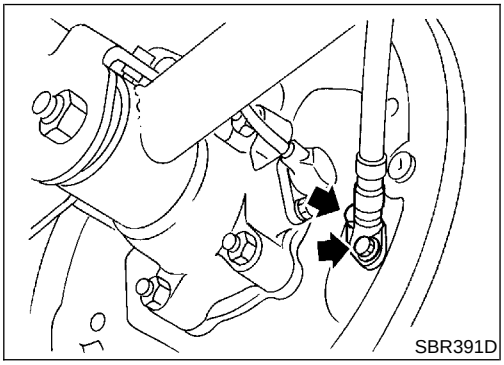
7. Install brake drum.
8. When installing new wheel cylinder or overhauling wheel cylinder, bleed air. Refer to "Bleeding Brake System", BR-9.
9. Adjust parking brake. Refer to "Adjustment", "PARKING BRAKE CONTROL", BR-31.

Components

NABR0044







Removal and Installation

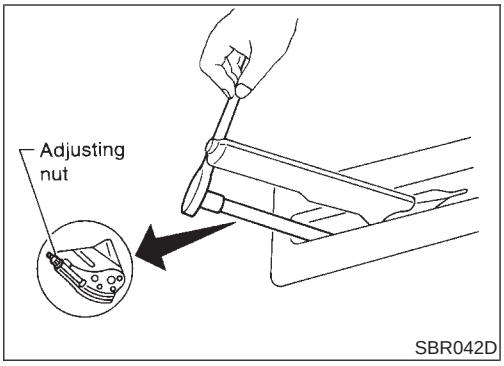
NABR0045

1. To remove parking brake cable, first remove center console.
2. Disconnect warning lamp connector.
3. Remove bolts, slacken off and remove adjusting nut.
4. Disconnect cable. Refer to “Removal”, “REAR DRUM BRAKE”, BR-26.

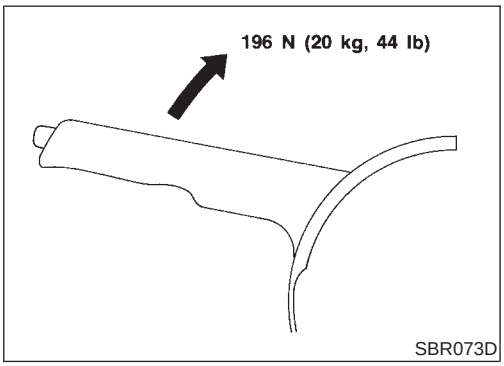
Inspection

NABR0046

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



SBR042D



SBR073D

Adjustment

NABR0047

1. Adjust clearance between shoe and drum as follows:

a. Release parking brake lever and loosen adjusting nut.

b. Depress brake pedal fully at least 10 times with engine running.

2. Pull control lever 4 - 5 notches. Then adjust control lever by turning adjusting nut.

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

Number of notches: 6 - 8

4. Bend warning lamp switchplate to ensure:

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

Number of “A” notches: 1 or less

Purpose

NABR0087

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.

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

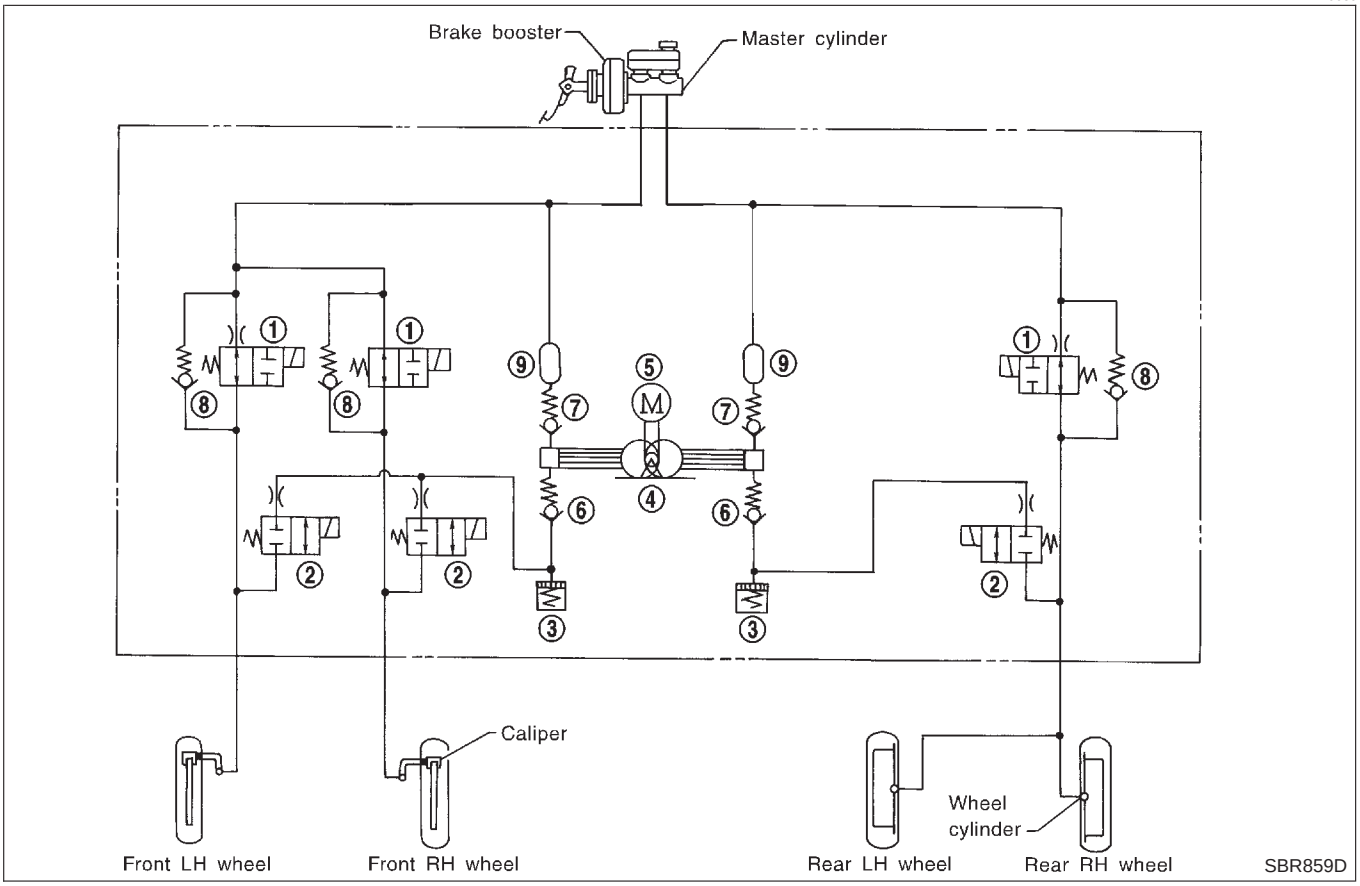
Operation

NABR0088

- 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

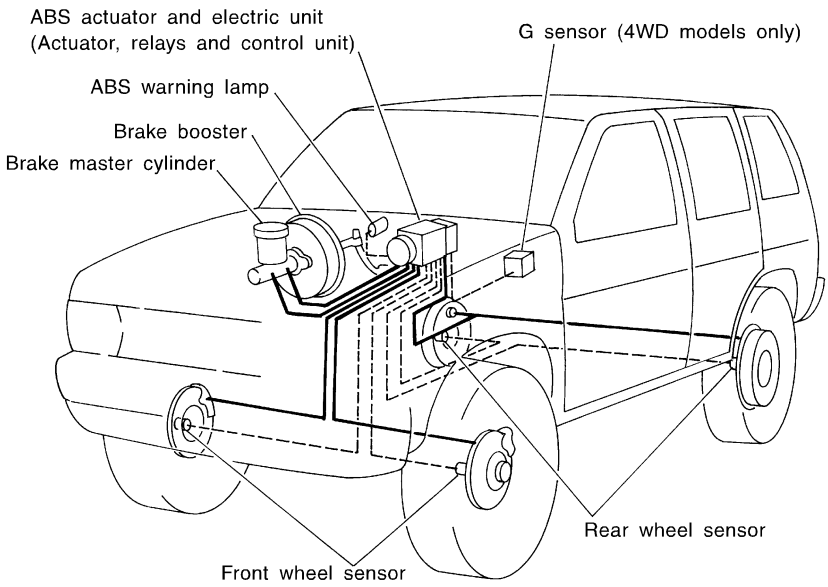
NABR0089



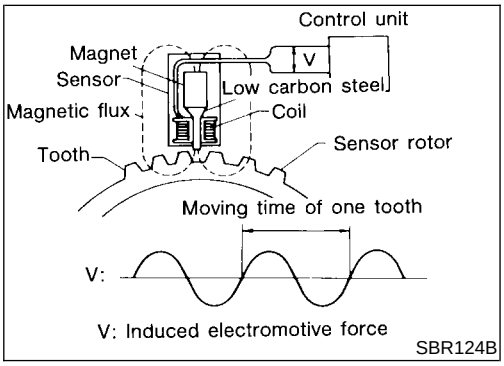
1. Inlet solenoid valve
2. Outlet solenoid valve
3. Reservoir
4. Pump
5. Motor
6. Inlet valve
7. Outlet valve
8. Bypass check valve
9. Damper

System Components

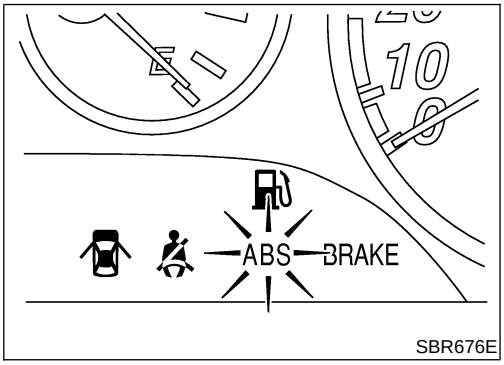
NABR0090



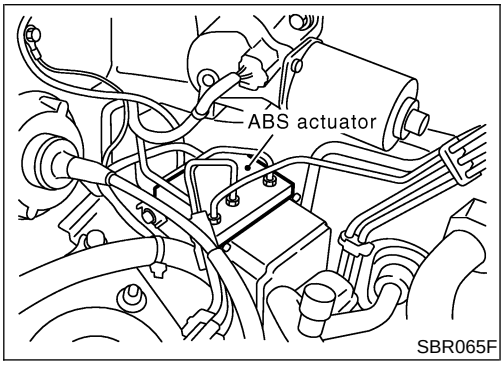
SBR447EB



SBR124B



SBR676E



SBR065F

System Description

NABR0091

SENSOR

NABR0091S01

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

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

NABR0091S02

The control unit computes the wheel rotating speed by the signal current sent from the sensor. Then it supplies a DC current to the actuator solenoid valve. It also controls ON-OFF operation of the valve relay and motor relay. If any electrical malfunction should be detected in the system, the control unit causes the warning lamp to light up. In this condition, the ABS will be deactivated by the control unit, and the vehicle's brake system reverts to normal operation. (For control unit layout, refer to ABS ACTUATOR AND ELECTRIC UNIT, BR-33.)

ABS ACTUATOR AND ELECTRIC UNIT

NABR0091S03

The ABS actuator and electric unit contains:

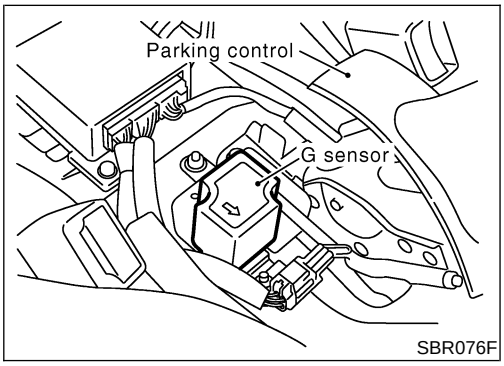
- An electric motor and pump
- Two relays
- Six solenoid valves, each inlet and outlet for
  — LH front
  — RH front
  — Rear
- ABS control unit

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

NABR0091S0301

		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 (4WD MODELS ONLY)

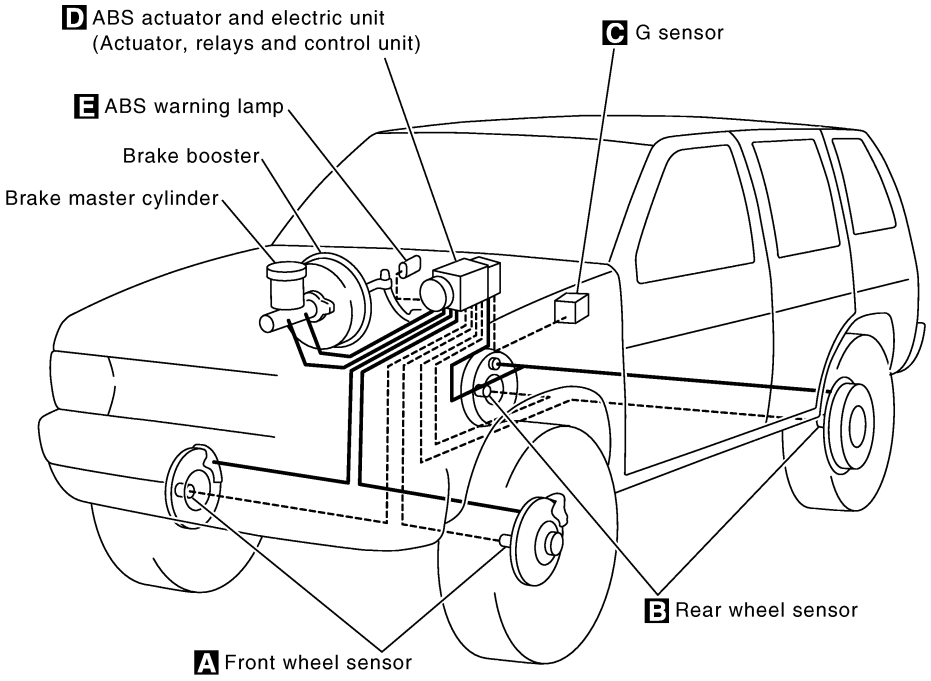
NABR0091S05

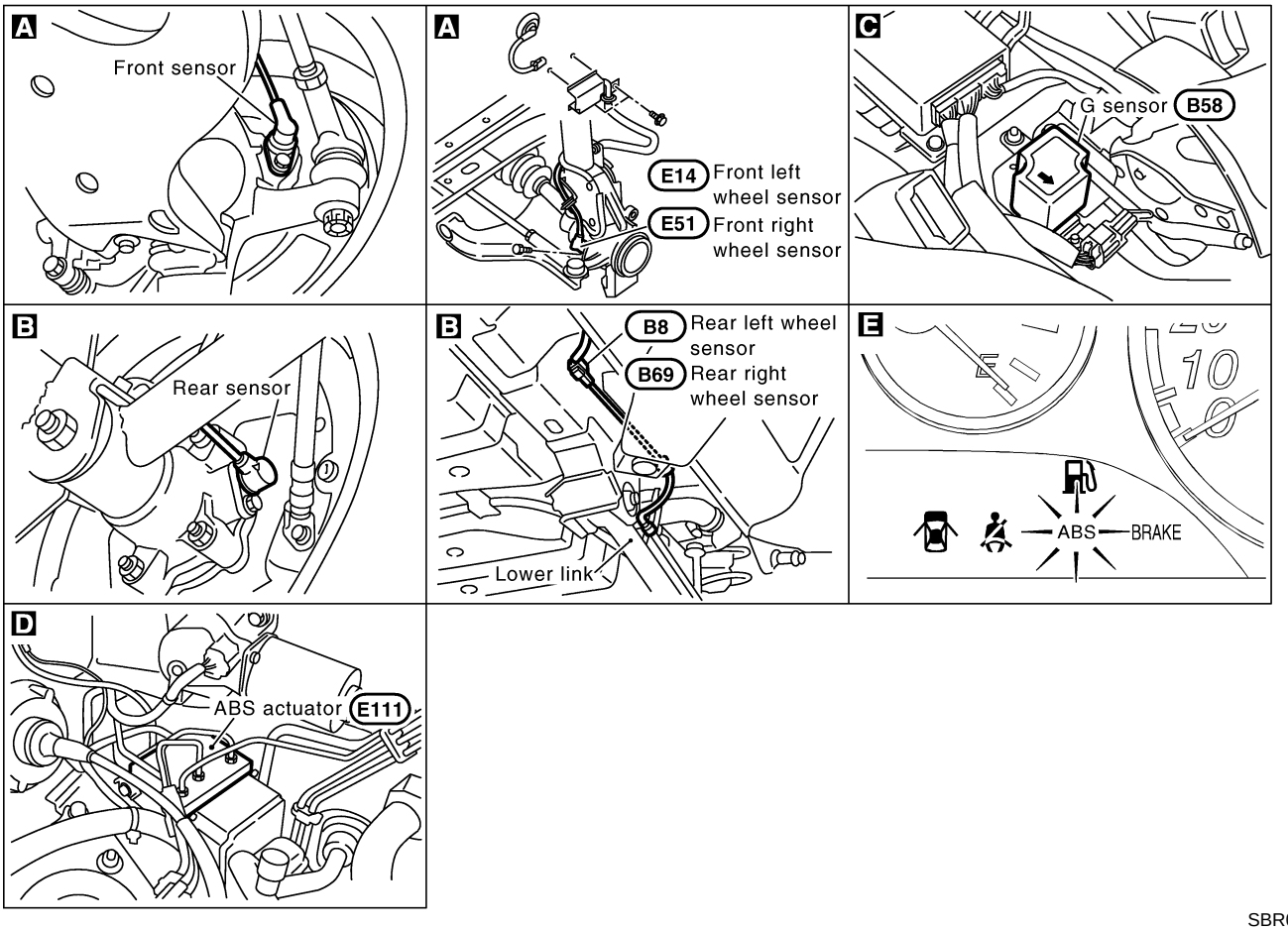
The G sensor senses deceleration during braking to determine whether the vehicle is being driven on a high μ road (asphalt road, etc.) or a low μ road (snow-covered road, etc.). It then sends a signal to the ABS control unit.

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

Component Parts and Harness Connector Location

NABR0147

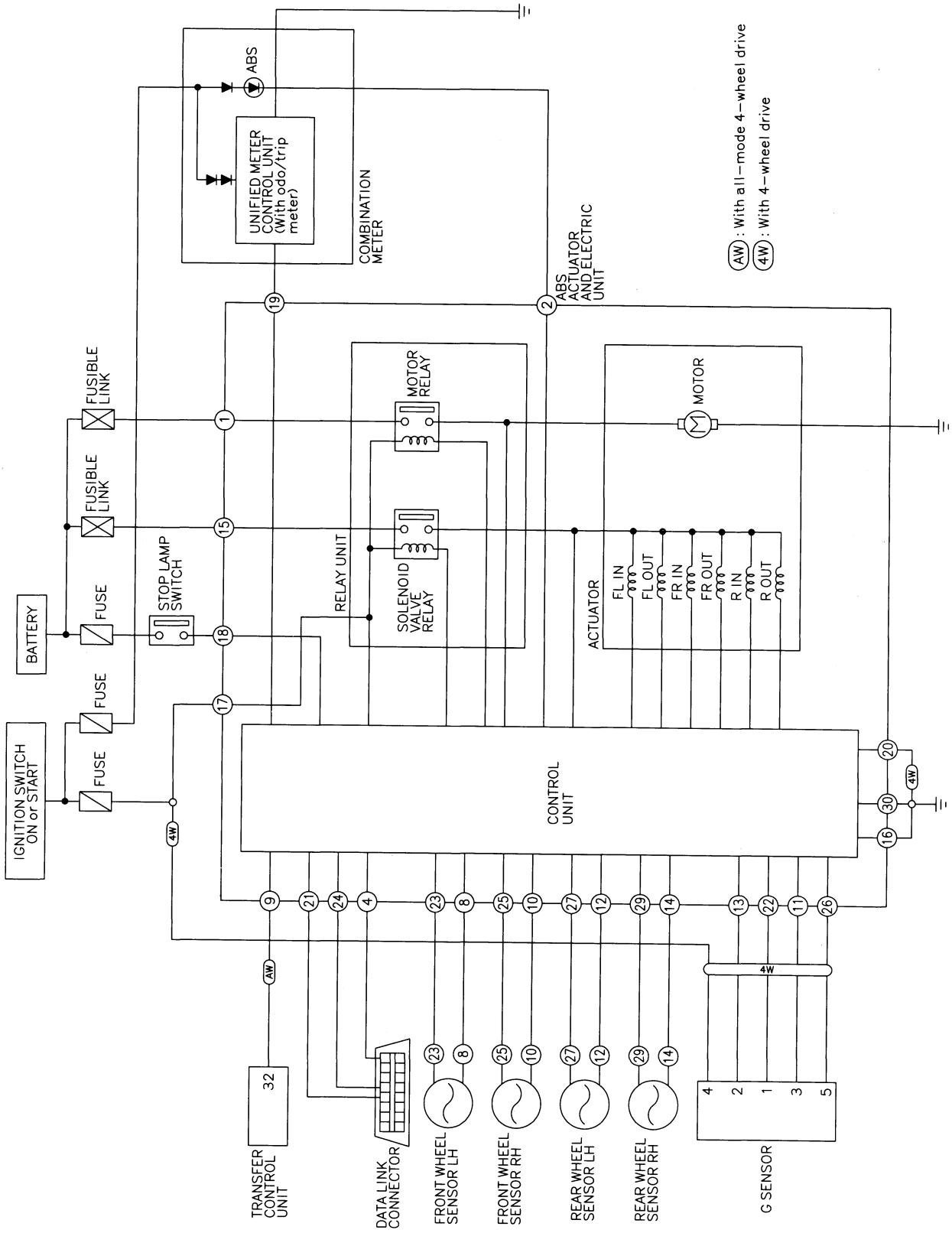




SBR075F

Schematic

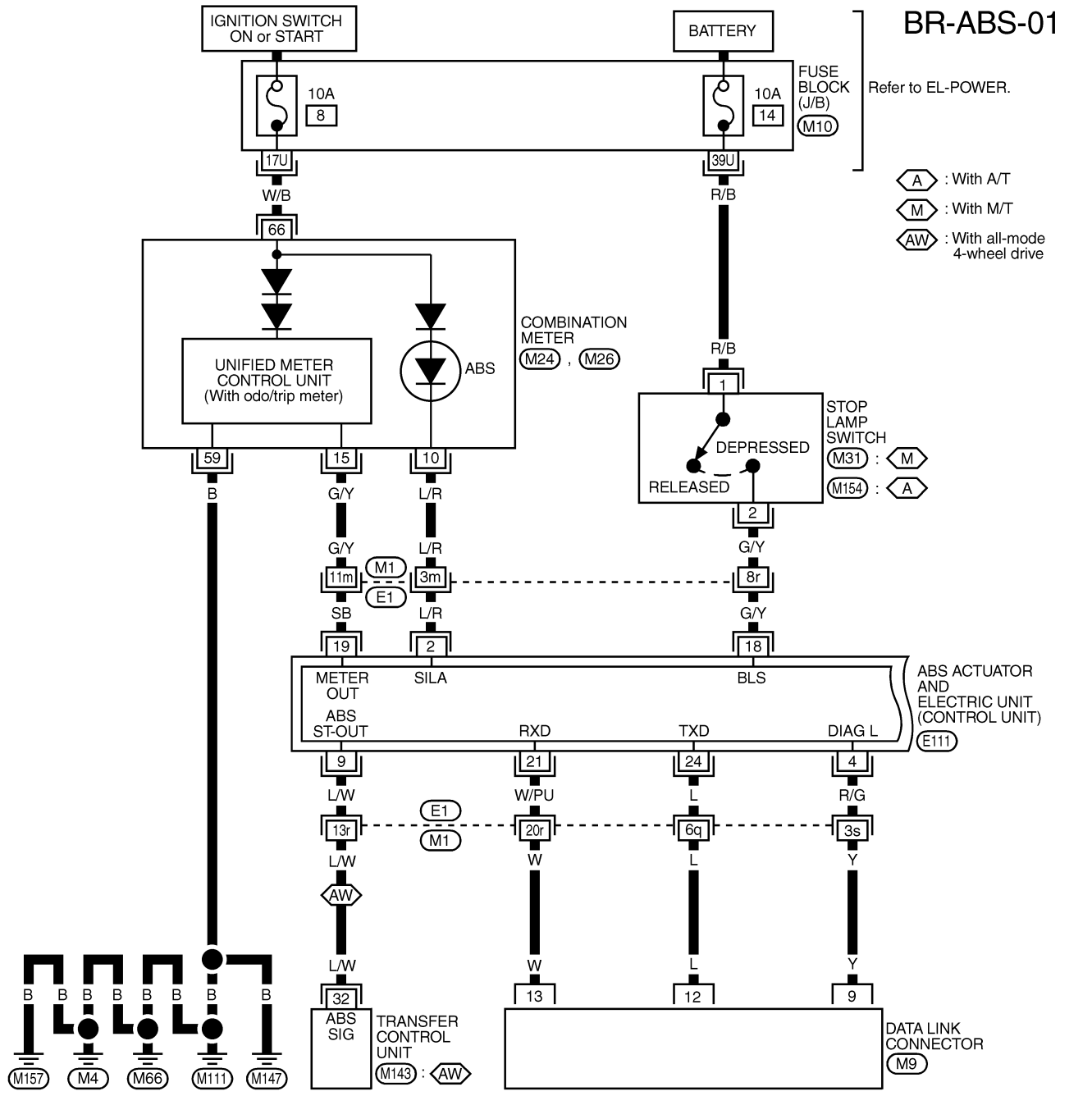
NABR0093



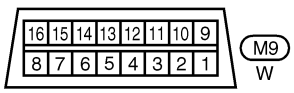
MBR624A

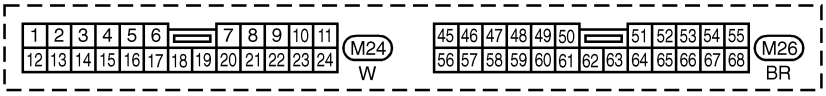
Wiring Diagram — ABS —

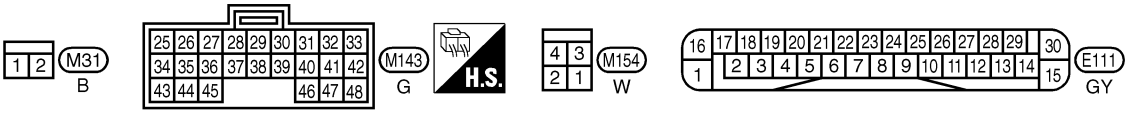
NABR0094



REFER TO THE FOLLOWING.
E1 -SUPER MULTIPLE JUNCTION (SMJ)
M10 -FUSE BLOCK- JUNCTION BOX (J/B)

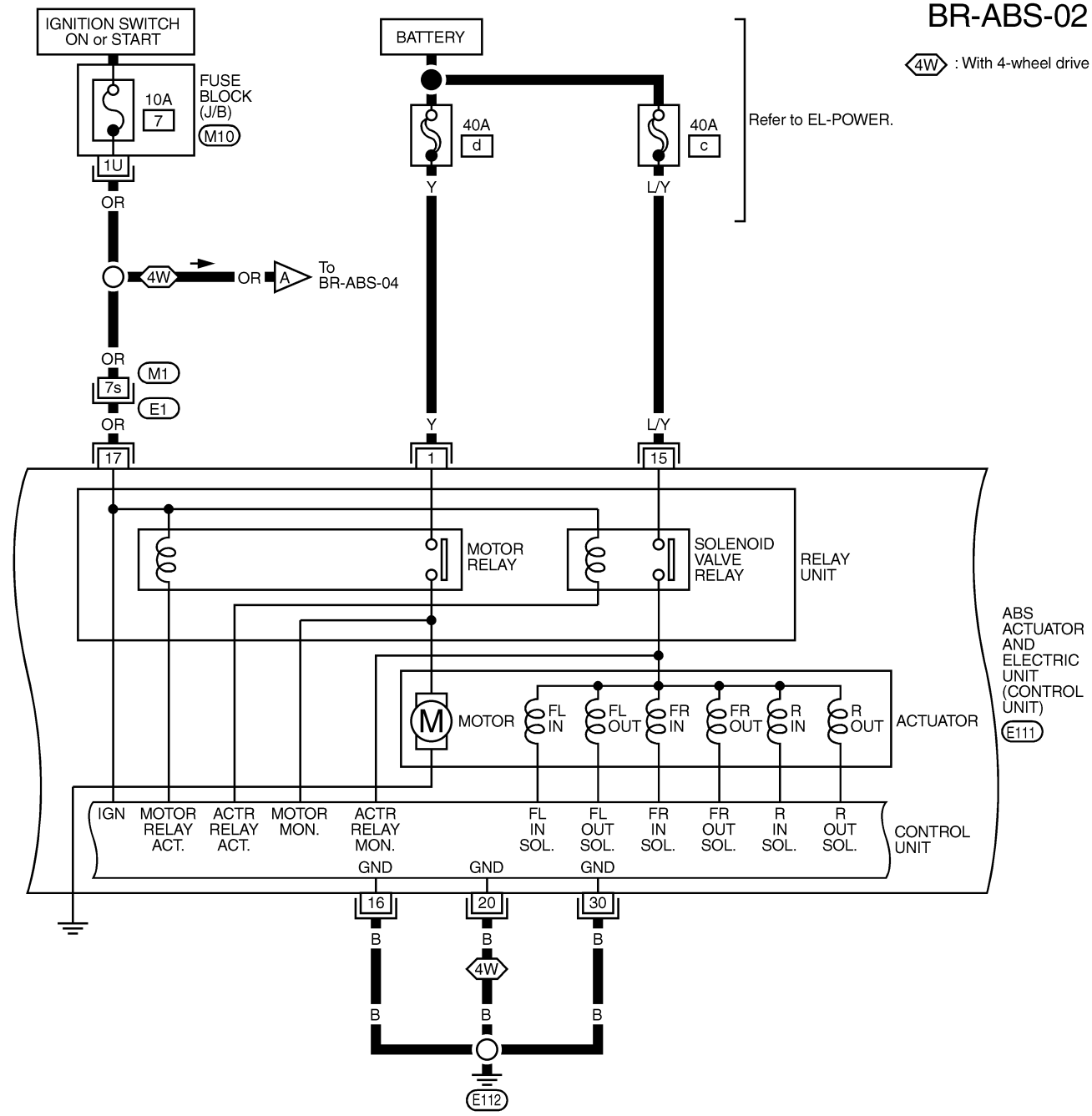


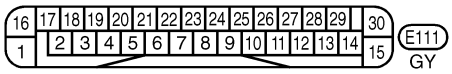




MBR625A

BR-ABS-02

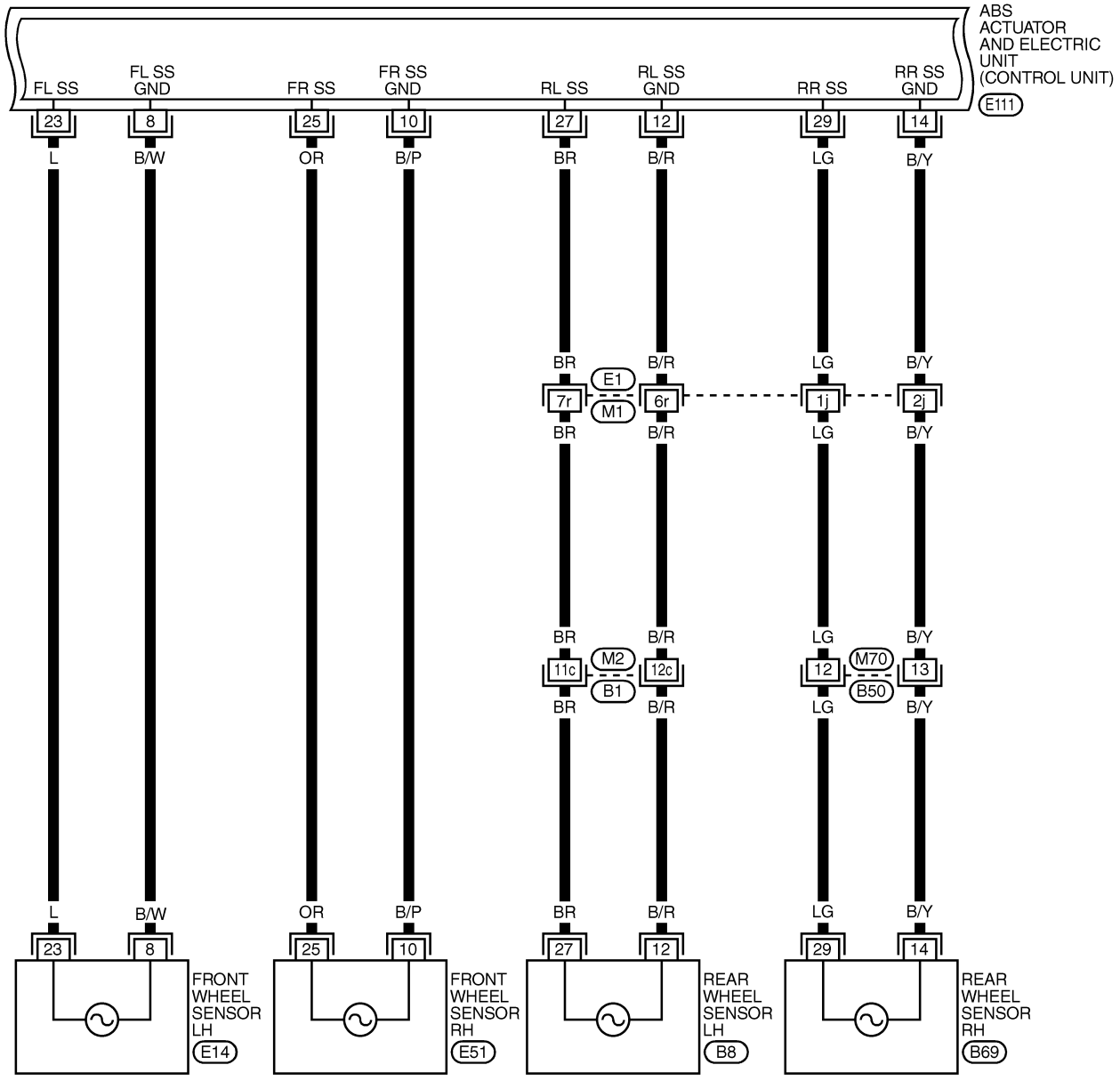


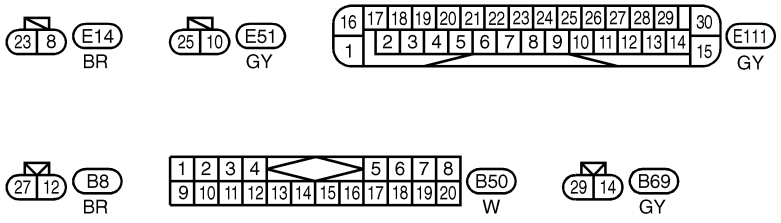


REFER TO THE FOLLOWING.
E1 -SUPER MULTIPLE JUNCTION (SMJ)
M10 -FUSE BLOCK-JUNCTION BOX (J/B)

MBR626A

BR-ABS-03

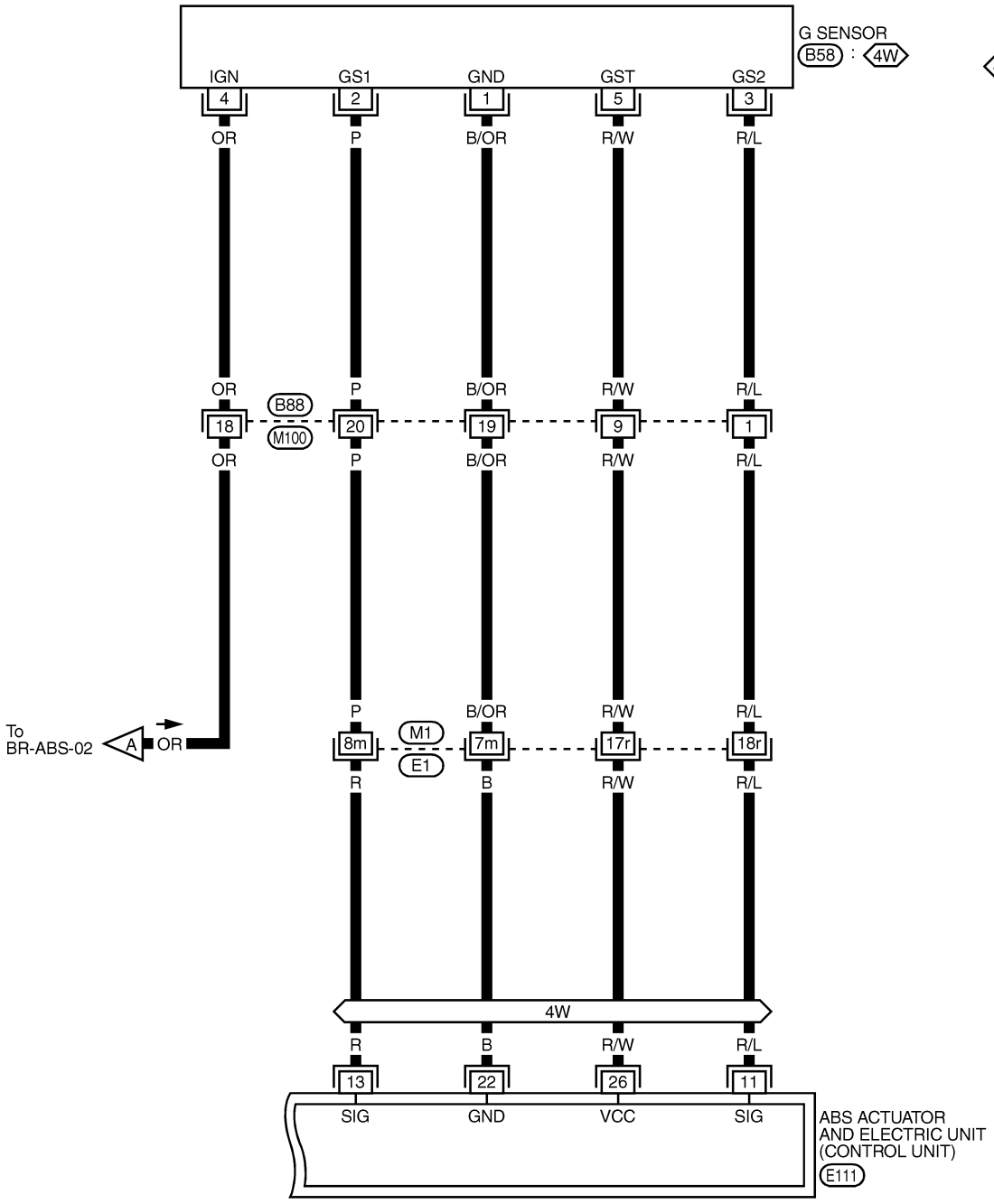


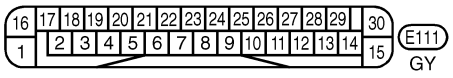


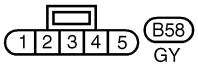
REFER TO THE FOLLOWING.
E1 , B1 -SUPER MULTIPLE JUNCTION(SMJ)

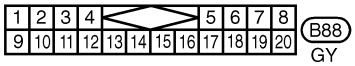
MBR479A

BR-ABS-04









REFER TO THE FOLLOWING.

E1 -SUPER MULTIPLE JUNCTION (SMJ)

MBR584A

Self-diagnosis

NABR0095

FUNCTION

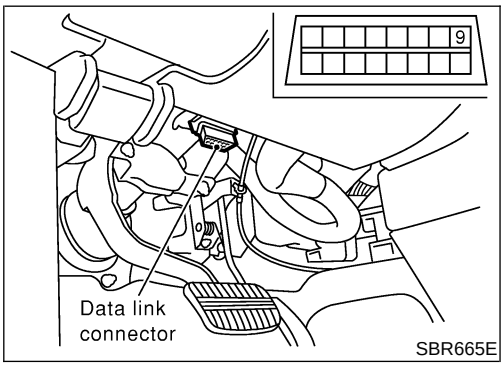
NABR0095S01

- 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.

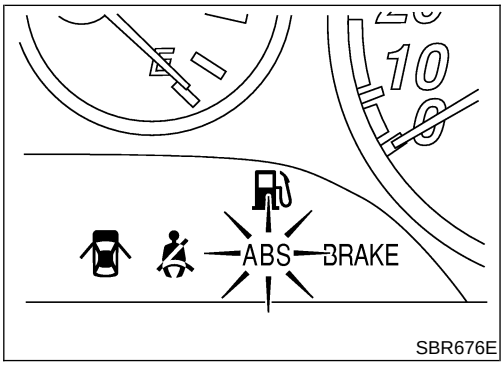
SELF-DIAGNOSIS PROCEDURE

NABR0095S02

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.



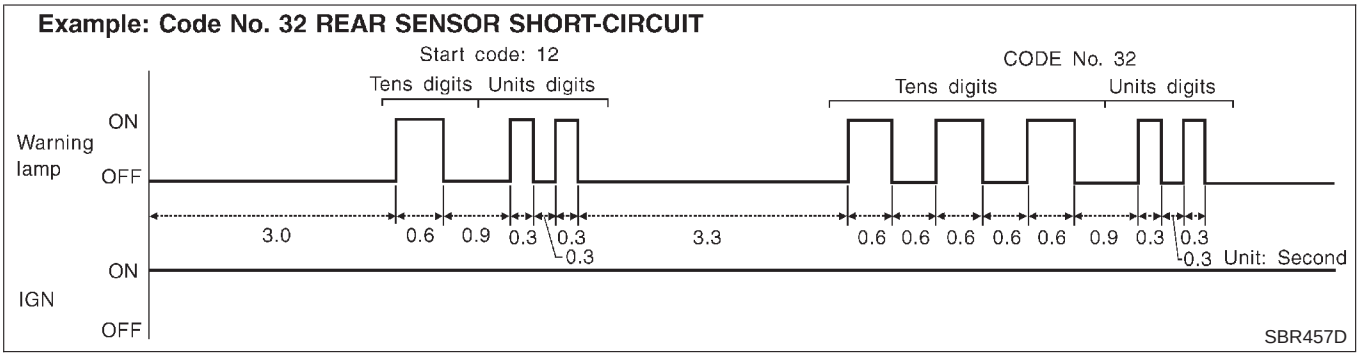
5. After 3.0 seconds, the warning lamp starts flashing to indicate the malfunction code No. (See NOTE.)
6. Verify the location of the malfunction with the malfunction code chart. Refer to BR-54. Then make the necessary repairs following the diagnostic procedures.
7. After the malfunctions are repaired, erase the malfunction codes stored in the control unit. Refer to BR-42.
8. Rerun the self-diagnostic results mode to verify that the malfunction codes have been erased.
9. Disconnect the check terminal from the ground. The self-diagnostic results mode is now complete.
10. Check warning lamp for deactivation after driving vehicle over 30 km/h (19 MPH) for at least one minute.
11. After making certain that warning lamp does not come on, test the ABS in a safe area to verify that it functions properly.

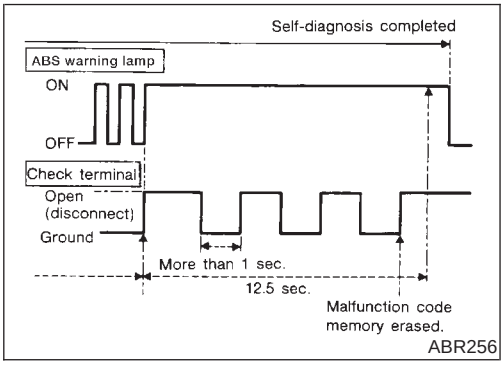
NOTE:
The indication terminates after 5 minutes.
However, when the ignition switch is turned from OFF to ON, the indication starts flashing again.

HOW TO READ SELF-DIAGNOSTIC RESULTS (MALFUNCTION CODES)

=NABR0095S03

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 chart is given on page BR-54.





HOW TO ERASE SELF-DIAGNOSTIC RESULTS (MALFUNCTION CODES)

NABR0095S04

1. Disconnect the check terminal from ground (ABS warning lamp will stay lit).
2. Within 12.5 seconds, ground the check terminal three times. Each terminal ground must last more than 1 second. The ABS warning lamp goes out after the erase operation has been completed.
3. Perform self-diagnosis again. Refer to BR-41. Only the start-code should appear, no malfunction codes.

CONSULT-II

=NABR0128

CONSULT-II APPLICATION TO ABS

NABR0128S03

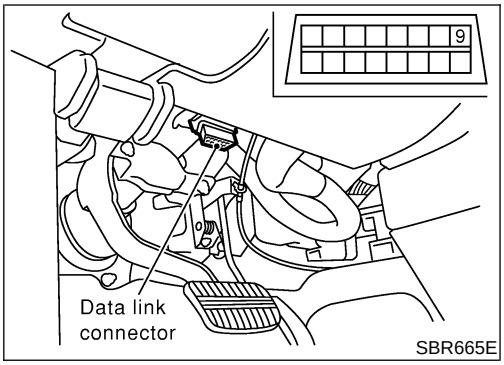
ITEM	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
Front right wheel sensor	×	×	—
Front left wheel sensor	×	×	—
Rear right wheel sensor	×	×	—
Rear left wheel sensor	×	×	—
DECEL G-sensor 1	×	×	×
DECEL G-sensor 2	×	×	×
ABS sensor	×	—	—
Stop lamp switch	—	×	—
Front right inlet solenoid valve	×	×	×
Front 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 (ABS MOTOR 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

NABR0128S04

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



SBR665E

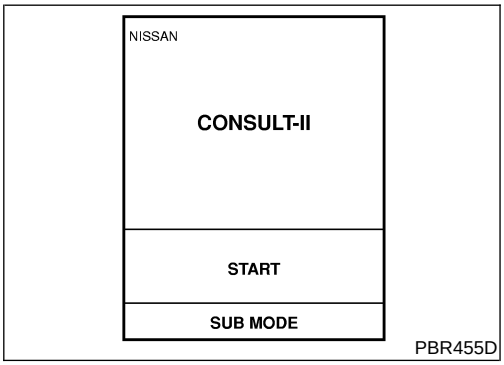
CONSULT-II Inspection Procedure

=NABR0129

SELF-DIAGNOSIS PROCEDURE

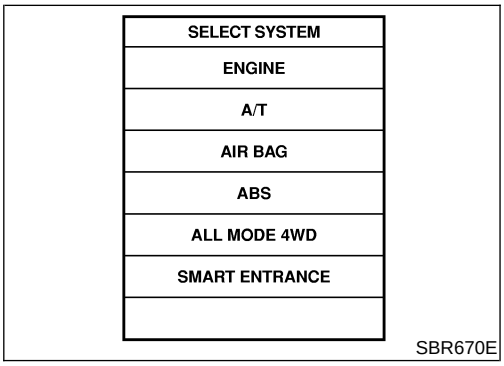
NABR0129S01

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



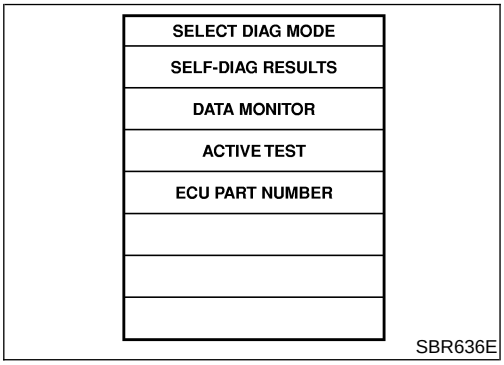
PBR455D

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



SBR670E

6. Touch “ABS”.

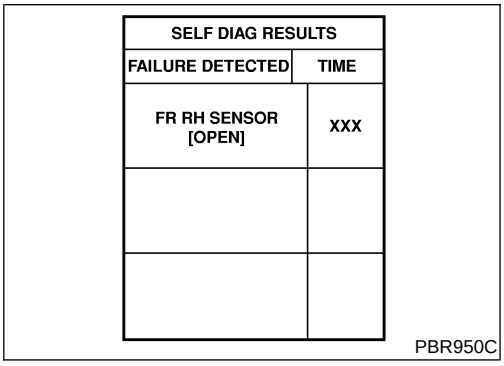


SBR636E

7. Touch “SELF-DIAG RESULTS”.

- The screen shows the detected malfunction and how many times the ignition switch has been turned ON since the malfunction.

8. Make the necessary repairs following the diagnostic procedures.



PBR950C

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

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

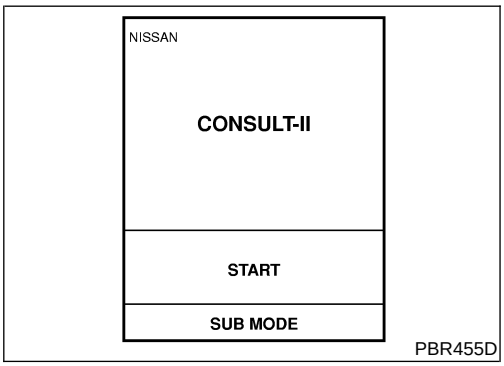
SELF-DIAGNOSTIC RESULTS MODE

NABR0129S07

Diagnostic item	Diagnostic item is detected when ...	Reference Page
FR RH SENSOR★1 [OPEN]	• Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.)	BR-56
FR LH SENSOR★1 [OPEN]	• Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.)	BR-56
RR RH SENSOR★1 [OPEN]	• Circuit for rear right sensor is open. (An abnormally high input voltage is entered.)	BR-56
RR LH SENSOR★1 [OPEN]	• Circuit for rear left sensor is open. (An abnormally high input voltage is entered.)	BR-56
FR RH SENSOR★1 [SHORT]	• Circuit for front right wheel sensor is shorted. (An abnormally low input voltage is entered.)	BR-56
FR LH SENSOR★1 [SHORT]	• Circuit for front left wheel sensor is shorted. (An abnormally low input voltage is entered.)	BR-56
RR RH SENSOR★1 [SHORT]	• Circuit for rear right sensor is shorted. (An abnormally low input voltage is entered.)	BR-56
RR LH SENSOR★1 [SHORT]	• Circuit for rear left sensor is shorted. (An abnormally low input voltage is entered.)	BR-56
ABS SENSOR★1 [ABNORMAL SIGNAL]	• Teeth damage on sensor rotor or improper installation of wheel sensor. (Abnormal wheel sensor signal is entered.)	BR-56
FR RH IN ABS SOL [OPEN, SHORT]	• Circuit for front right inlet solenoid valve is open. (An abnormally low output voltage is entered.)	BR-59
FR LH IN ABS SOL [OPEN, SHORT]	• Circuit for front left inlet solenoid valve is open. (An abnormally low output voltage is entered.)	BR-59
FR RH OUT ABS SOL [OPEN, SHORT]	• Circuit for front right outlet solenoid valve is open. (An abnormally low output voltage is entered.)	BR-59
FR LH OUT ABS SOL [OPEN, SHORT]	• Circuit for front left outlet solenoid valve is open. (An abnormally low output voltage is entered.)	BR-59
RR IN ABS SOL [OPEN, SHORT]	• Circuit for rear inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	BR-59
RR OUT ABS SOL [OPEN, SHORT]	• Circuit for rear outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	BR-59
ABS ACTUATOR RELAY [ABNORMAL]	• Actuator solenoid valve relay is ON, even if control unit sends off signal. • Actuator solenoid valve relay is OFF, even if control unit sends on signal.	BR-59
ABS MOTOR RELAY [ABNORMAL]	• Circuit for ABS motor relay is open or shorted. • Circuit for actuator motor is open or shorted. • Actuator motor relay is stuck.	BR-61
BATTERY VOLT [VB-LOW]	• Power source voltage supplied to ABS control unit is abnormally low.	BR-63
CONTROL UNIT	• Function of calculation in ABS control unit has failed.	BR-67
FR & RR G-SEN [ABNORMAL]	• DECEL G sensor output is abnormally higher or lower than specifications.	BR-65
FR & RR G-SEN TEST [ABNORMAL]	• Output voltage is always constant due to G sensor malfunction.	BR-65
G-SEN TEST [ABNORMAL]	• G sensor malfunction is detected during self-diagnosis.	BR-65

★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-41. Check to ensure that the ABS warning lamp goes out while the vehicle is being driven.

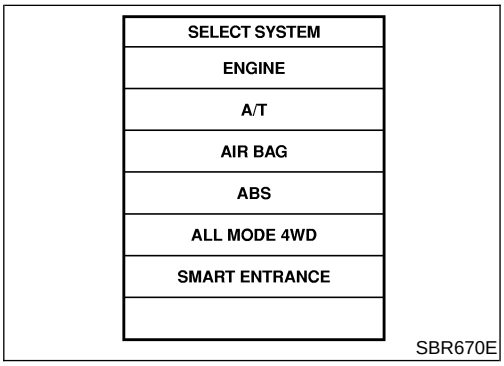


PBR455D

DATA MONITOR PROCEDURE

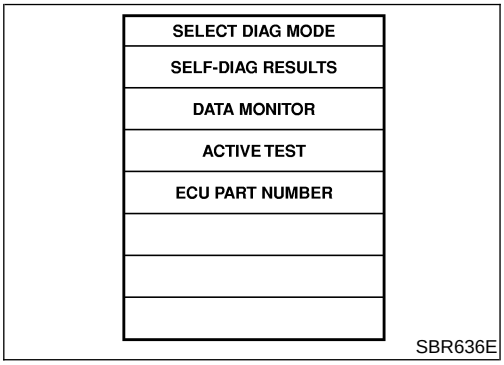
NABR0129S03

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



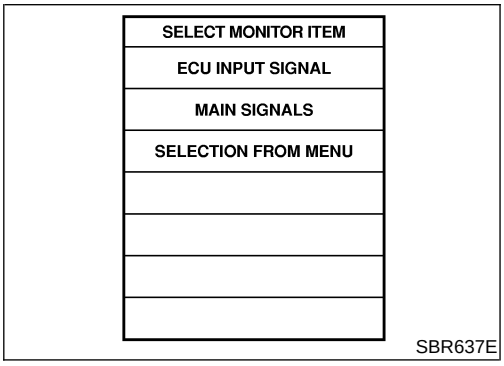
SBR670E

5. Touch "ABS".



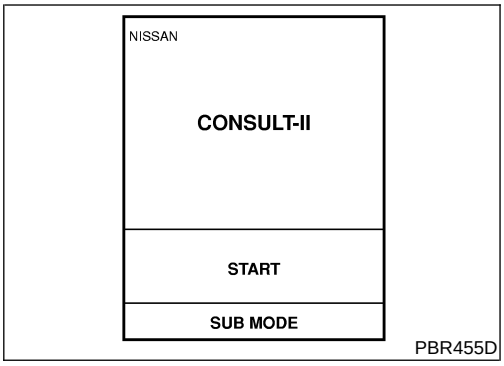
SBR636E

6. Touch "DATA MONITOR".



SBR637E

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



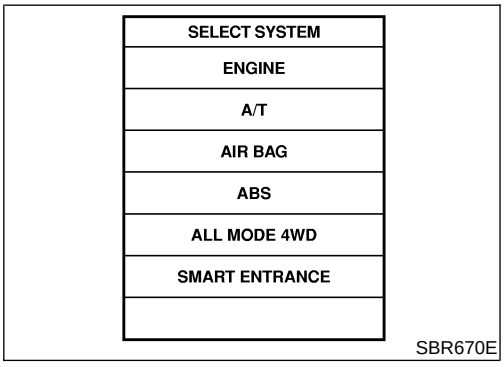
PBR455D

ACTIVE TEST PROCEDURE

=NABR0129S04

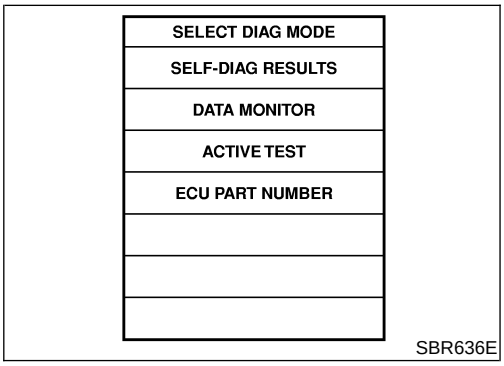
- When conducting Active test, vehicle must be stationary.
- When ABS warning lamp stays on, never conduct Active test.

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



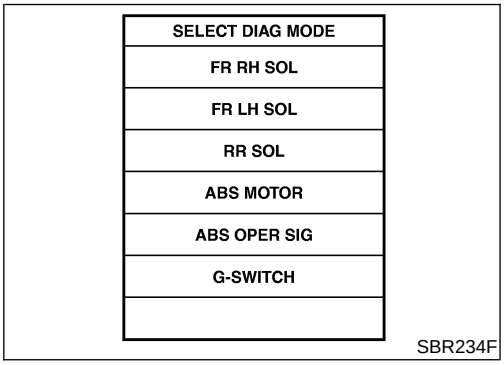
SBR670E

5. Touch "ABS".



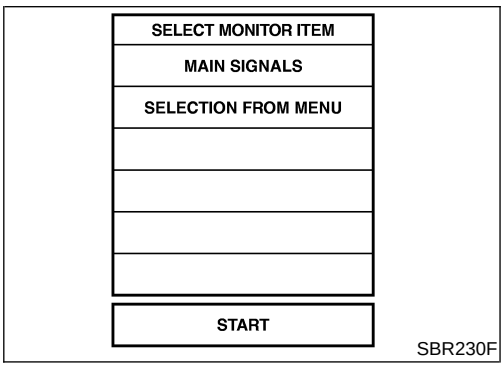
SBR636E

6. Touch "ACTIVE TEST".



SBR234F

7. Select active test item by touching screen.



SBR230F

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

CONSULT-II Inspection Procedure (Cont'd)

DATA MONITOR MODE

NABR0129S08

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
FR & RR 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 RR IN SOL RR OUT SOL	1. Drive vehicle at speeds over 30 km/h (19 MPH) for at least 1 minute. 2. Engine is running.	Operating conditions for each solenoid valve are indicated. ABS is not operating: OFF
MOTOR RELAY		ABS is not operating: OFF ABS is operating: ON
ACTUATOR RELAY	Ignition switch is ON or engine is running.	Ignition switch ON (Engine stops): OFF Engine running: ON
WARNING LAMP		ABS warning lamp is turned on: ON ABS warning lamp is turned off: OFF
BATTERY VOLT		Power supply voltage for control unit
ABS OPER SIG		ABS is not operating: OFF ABS is operating: ON

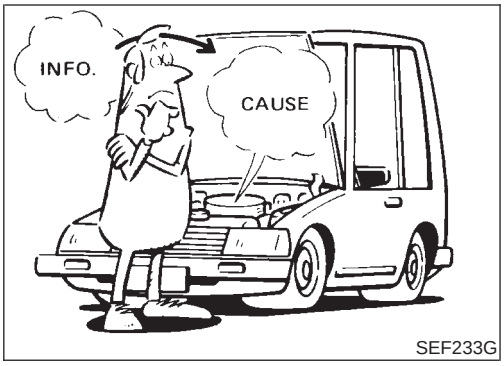
ACTIVE TEST MODE

NABR0129S09

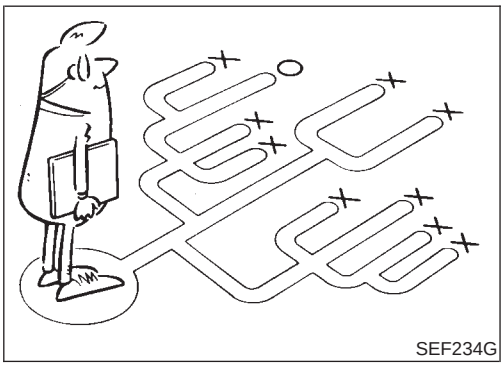
TEST ITEM	CONDITION	JUDGEMENT		
FR RH SOLENOID FR LH SOLENOID RR SOLENOID	Engine is running.	Brake fluid pressure control operation		
			IN SOL	OUT SOL
		UP (Increase):	OFF	OFF
		KEEP (Hold):	ON	OFF
		DOWN (Decrease):	ON	ON
ABS MOTOR		ABS actuator motor ON: Motor runs (ABS motor relay ON) OFF: Motor stops (ABS motor relay OFF)		
ABS OPER SIG	Ignition switch is ON or engine is running.	ON: Set ABS OPER SIG "ON" (ABS is operating.) OFF: Set ABS OPER SIG "OFF" (ABS is not operating.)		
G SENSOR	Ignition switch is ON.	G SENSOR ON: Set G SENSOR MONITOR "ON" (G sensor circuit is closed.) OFF: Set G SENSOR MONITOR "OFF" (G sensor circuit is open.)		

NOTE:

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



SEF233G


SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

NABR0098

INTRODUCTION

NABR0098S01

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 incidents: such as air leaks in booster lines, lack of brake fluid, or other incidents with the brake system.

It is much more difficult to diagnose an incident that occurs intermittently rather than continuously. Most intermittent incidents 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 incidents, so a road test should be performed.

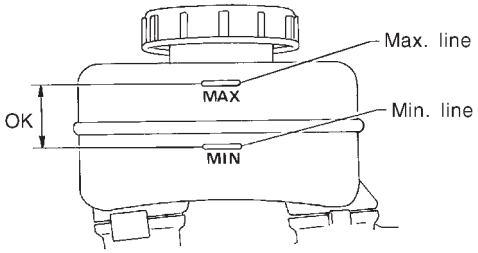
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with an ABS complaint. The customer is a very good source of information on such incidents; especially intermittent ones. By talking to the customer, find out what symptoms are present and under what conditions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

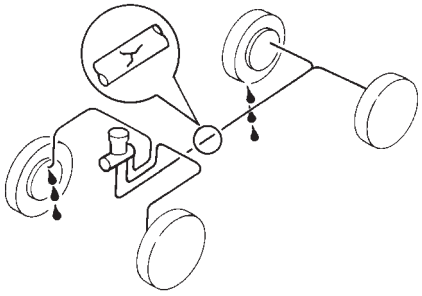
Also check related Service bulletins for information.

Preliminary Check

NABR0099

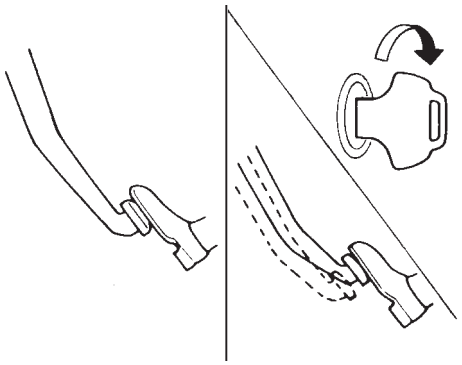
1	CHECK BRAKE FLUID	
Check brake fluid for contamination. **Has brake fluid been contaminated?**		
Yes	▶	Replace. GO TO 2.
No	▶	GO TO 2.

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

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

4	CHECK BRAKE BOOSTER OPERATION

Check brake booster for operation and air tightness.
Refer to "On-vehicle Service", "BRAKE BOOSTER", BR-19.



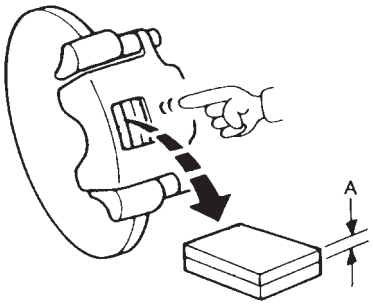
SBR058C

Is brake booster airtight and functioning properly?

Yes	▶	GO TO 5.
No	▶	Replace. GO TO 5.

5	CHECK BRAKE PAD AND ROTOR

Check brake pad and rotor.
Refer to (BR-22, BR-24).



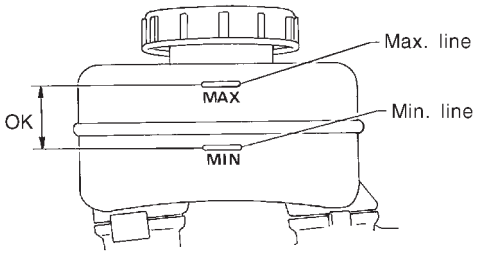
SBR059C

Are brake pads and rotors functioning properly?

Yes	▶	GO TO 6.
No	▶	Replace.

6	RECHECK BRAKE FLUID LEVEL

Check brake fluid level in reservoir tank again.



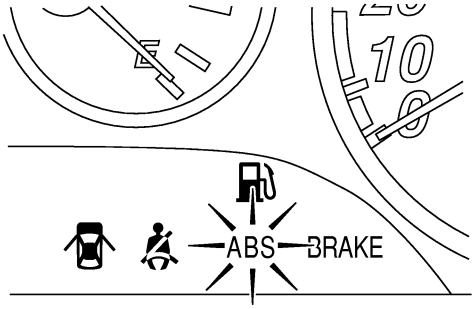
SBR451D

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

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

7	CHECK WARNING LAMP ACTIVATION

Check warning lamp activation.



SBR677E

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?

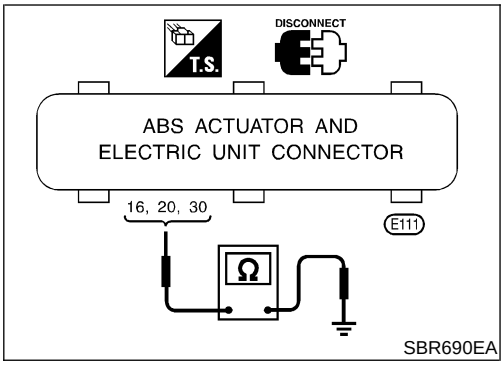
Yes	▶	GO TO 9.
No	▶	Go to Self-diagnosis (BR-41, BR-44).

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-41, BR-44).



Ground Circuit Check

=NABR0130

ABS ACTUATOR AND ELECTRIC UNIT GROUND

NABR0130S01

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

Continuity should exist.

Malfunction Code/Symptom Chart

NABR0150

Code No. (No. of warning lamp flashes)	Malfunctioning part	Reference Page
12	Self-diagnosis could not detect any malfunctions.	—
17 ★4	G sensor and circuit	BR-65
18 ★1	Sensor rotor	BR-56
21 ★1	Front right sensor (open-circuit)	BR-56
22 ★1	Front right sensor (short-circuit)	BR-56
25 ★1	Front left sensor (open-circuit)	BR-56
26 ★1	Front left sensor (short-circuit)	BR-56
31 ★1	Rear right sensor (open-circuit)	BR-56
32 ★1	Rear right sensor (short-circuit)	BR-56
35 ★1	Rear left sensor (open-circuit)	BR-56
36 ★1	Rear left sensor (short-circuit)	BR-56
41	Actuator front right outlet solenoid valve	BR-59
42	Actuator front right inlet solenoid valve	BR-59
45	Actuator front left outlet solenoid valve	BR-59
46	Actuator front left inlet solenoid valve	BR-59
55	Actuator rear outlet solenoid valve	BR-59
56	Actuator rear inlet solenoid valve	BR-59
57 ★2	Power supply (Low voltage)	BR-63
61 ★3	Actuator motor or motor relay	BR-61
63	Solenoid valve relay	BR-59
64	FR & RR G sensor	BR-65
65	FR & RR G sensor input signal abnormal	BR-65
66	FR & RR G sensor test abnormal	BR-65
71	Control unit	BR-67
ABS works frequently	—	BR-68
Unexpected pedal action	—	BR-68
Long stopping distance	—	BR-70
ABS does not work	—	BR-70
Pedal vibration and noise	—	BR-71
Warning lamp does not come on when ignition switch is turned ON.	Fuse, warning lamp bulb or warning lamp circuit Control unit	BR-72
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-74
Vehicle vibrates excessively when ABS is operating.	ABS control unit to TCM circuit	BR-77

★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-44. Check to ensure that the ABS warning lamp goes out while the vehicle is being driven.

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

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

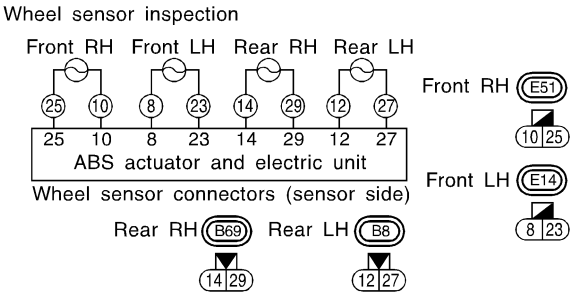
Wheel Sensor or Rotor

DIAGNOSTIC PROCEDURE

NABR0132

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

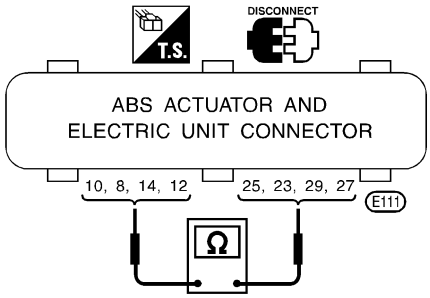
NOTE:
Wheel position should be distinguished by code No. except code No. 18 (sensor rotor).

1	INSPECTION START
Wheel sensor inspection  SBR691E	
▶	GO TO 2.	

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

3	CHECK WHEEL SENSOR ELECTRICAL

1. Disconnect ABS actuator and electric unit connector.
2. Check resistance between ABS actuator and electric unit connector E111 terminals.
   Code No. 21 or 22 (Front RH wheel)
   Terminals 10 and 25
   Code No. 25 or 26 (Front LH wheel)
   Terminals 8 and 23
   Code No. 31 or 32 (Rear RH wheel)
   Terminals 14 and 29
   Code No. 35 or 36 (Rear LH wheel)
   Terminals 12 and 27



SBR692EB

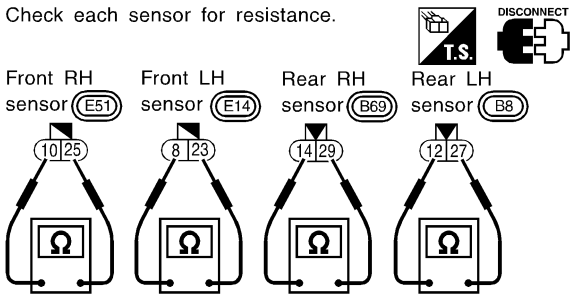
Resistance:
Front 0.9 - 1.1 kΩ
Rear 1.44 - 1.76 kΩ

Is front resistance 0.9 - 1.1 kΩ and rear resistance 1.44 - 1.76 kΩ?

Yes	▶	GO TO 5.
No	▶	GO TO 4.

4	CHECK WHEEL SENSOR

Check each sensor for resistance.



SBR693E

Resistance:
Front 0.9 - 1.1 kΩ
Rear 1.44 - 1.76 kΩ

Is front resistance 0.9 - 1.1 kΩ and rear resistance 1.44 - 1.76 kΩ?

Yes	▶	**Check the following.** If NG, repair harness or connectors. ● Harness connectors E111, E14, E51, B8, B69 ● 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?**		
Yes	▶	GO TO 7.
No	▶	Check wheel bearing. Refer to AX-19, AX-4, "Front wheel bearing" and "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.)

ABS Actuator Solenoid Valve or Solenoid Valve Relay

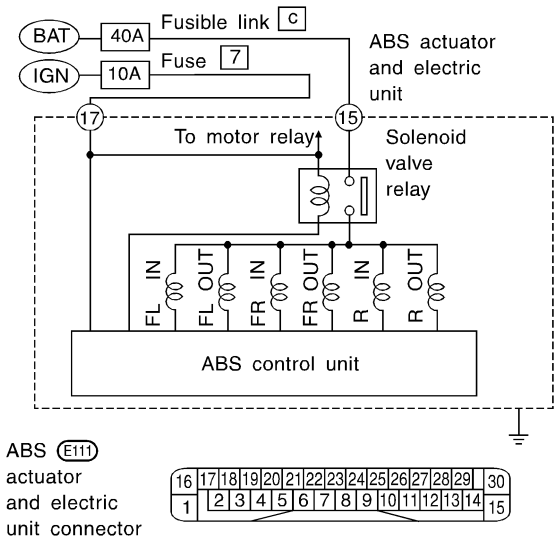
DIAGNOSTIC PROCEDURE

=NABR0133

Malfunction code No. 41, 45, 55, 42, 46, 56, 63

1	INSPECTION START

Solenoid valve relay inspection



ABS (E111) actuator and electric unit connector

SBR243F

	▶	GO TO 2.

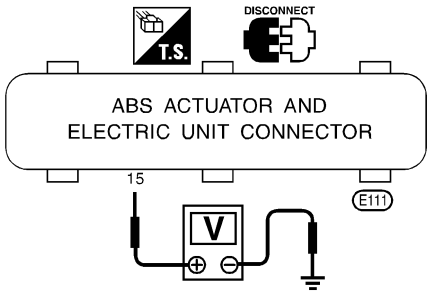
2	CHECK FUSIBLE LINK	
Check 40A fusible link **c**. For fusible link layout, refer to EL-11, “POWER SUPPLY ROUTING”.		
Is fusible link OK?		
Yes	▶	GO TO 3.
No	▶	GO TO 6.

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” in “Ground Circuit Check”, BR-53.		
Is ground circuit OK?		
Yes	▶	GO TO 5.
No	▶	Repair harness or connector.

5	CHECK SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Disconnect ABS actuator and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector E111 terminal 15 and ground.



SBR695EB

Does battery voltage exist?

Yes	▶	Replace ABS actuator and electric unit.
No	▶	**Check the following.** If NG, repair harness or connectors. ● Harness connector E111 ● Harness for open or short between ABS actuator and electric unit and fusible link

6	REPLACE FUSIBLE LINK

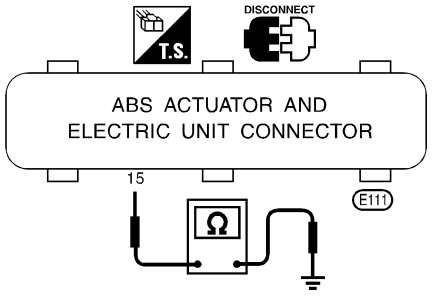
Replace fusible link.

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

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

7	CHECK SOLENOID VALVE RELAY POWER SUPPLY CIRCUIT FOR SHORT

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between ABS actuator and electric unit connector E111 terminal 15 and ground.



SBR696EB

Continuity should not exist.

Does continuity exist?

Yes	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E111 ● Harness for open or short between ABS actuator and electric unit and fusible link
No	▶	Replace ABS actuator and electric unit.

Motor Relay or Motor

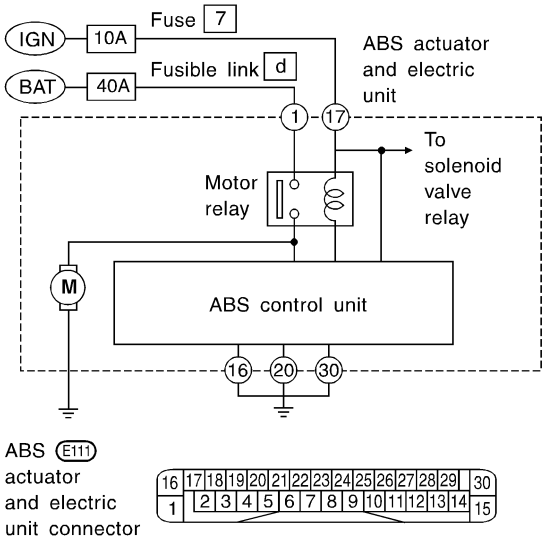
DIAGNOSTIC PROCEDURE

=NABR0134

Malfunction code No. 61

1	INSPECTION START

ABS motor relay inspection



SBR067F

▶	GO TO 2.

2	CHECK FUSIBLE LINK

Check 40A fusible link **d**. For fusible link layout, refer to EL-11, “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.

Does warning lamp activate again?

Yes	▶	GO TO 4.
No	▶	**INSPECTION END**

4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT

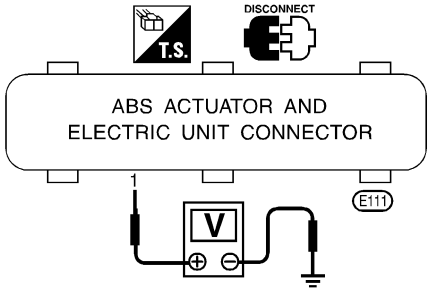
Refer to “ABS ACTUATOR AND ELECTRIC UNIT GROUND” in “Ground Circuit Check”, BR-53.

Is ground circuit OK?

Yes	▶	GO TO 5.
No	▶	Repair harness or connector.

5	CHECK MOTOR RELAY POWER SUPPLY CIRCUIT

1. Disconnect ABS actuator and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector E111 terminal 1 and ground.



SBR698EB

Does battery voltage exist?

Yes	▶	Replace ABS actuator and electric unit.
No	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E111 ● Harness for open or short between ABS actuator and electric unit and fusible link

6	REPLACE FUSIBLE LINK

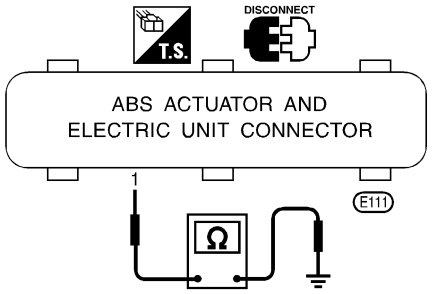
Replace fusible link.

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

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

7	CHECK ABS ACTUATOR MOTOR POWER SUPPLY CIRCUIT FOR SHORT

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between ABS actuator and electric unit connector E111 terminal 1 and ground.



SBR699EB

Continuity should not exist.

Does continuity exist?

Yes	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E111 ● Harness for open or short between ABS actuator and electric unit and fusible link
No	▶	Replace ABS actuator and electric unit.

Low Voltage

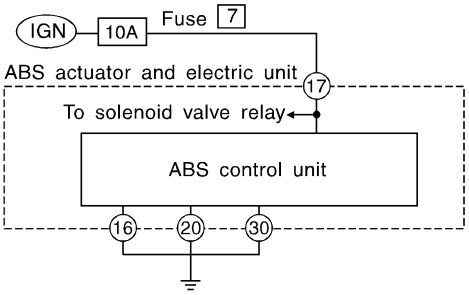
DIAGNOSTIC PROCEDURE

NABR0135

Malfunction code No. 57

1	INSPECTION START

ABS actuator and electric unit power supply and ground circuit inspection



SBR068F

▶ GO TO 2.

2	CHECK FUSE

Check 10A fuse No. 7. For fuse layout, refer to EL-11, “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.

Does warning lamp activate again?

Yes	▶	GO TO 4.
No	▶	**INSPECTION END**

4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT

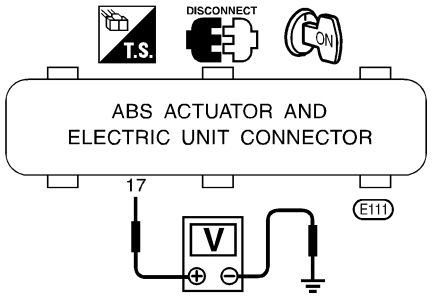
Refer to “ABS ACTUATOR AND ELECTRIC UNIT GROUND” in “Ground Circuit Check”, BR-53.

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 E111 terminal 17 and ground.



SBR701EB

Does battery voltage exist when ignition switch is turned ON?

Yes	▶	Replace ABS actuator and electric unit.
No	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E111 ● Harness for open or short between ABS actuator and electric unit and fuse

6	REPLACE FUSE

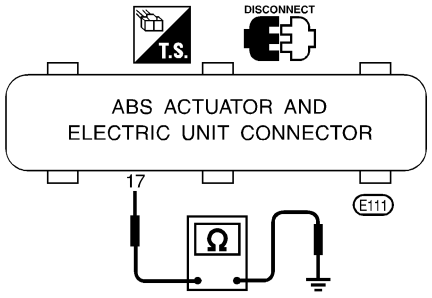
Replace fuse.

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

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

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

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between ABS actuator and electric unit connector E111 terminal 17 and ground.



SBR702EB

Does continuity exist?

Yes	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E111 ● Harness for open or short between ABS actuator and electric unit and fuse
No	▶	Replace ABS actuator and electric unit.

G Sensor and Circuit

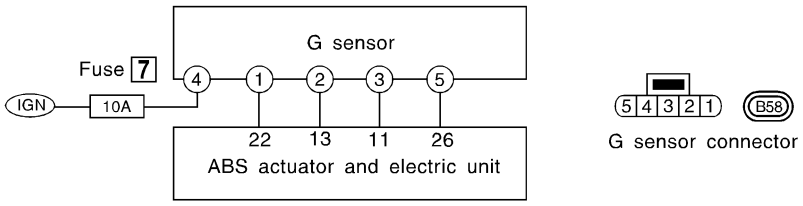
DIAGNOSTIC PROCEDURE

=NABR0151

Malfunction code No. 17, 64, 65, 66, 68

1	INSPECTION START

G sensor inspection



SBR069F

▶ GO TO 2.

2	CHECK CONNECTOR

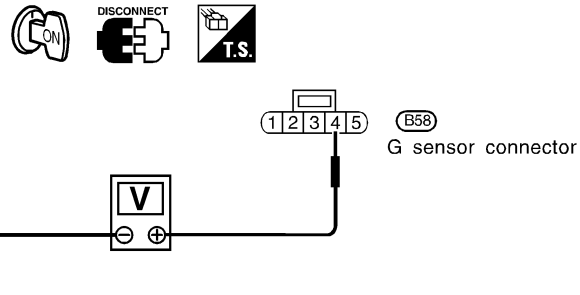
1. Disconnect ABS actuator and electric unit and G sensor connectors. Check terminals for damage or loose connection. Then reconnect connectors.
2. Carry out self-diagnosis again.

Does warning lamp active again?

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

3	CHECK G SENSOR POWER SUPPLY CIRCUIT

1. Disconnect G sensor connector B58.
2. Check voltage between G sensor connector terminals 4 and ground.



SBR244F

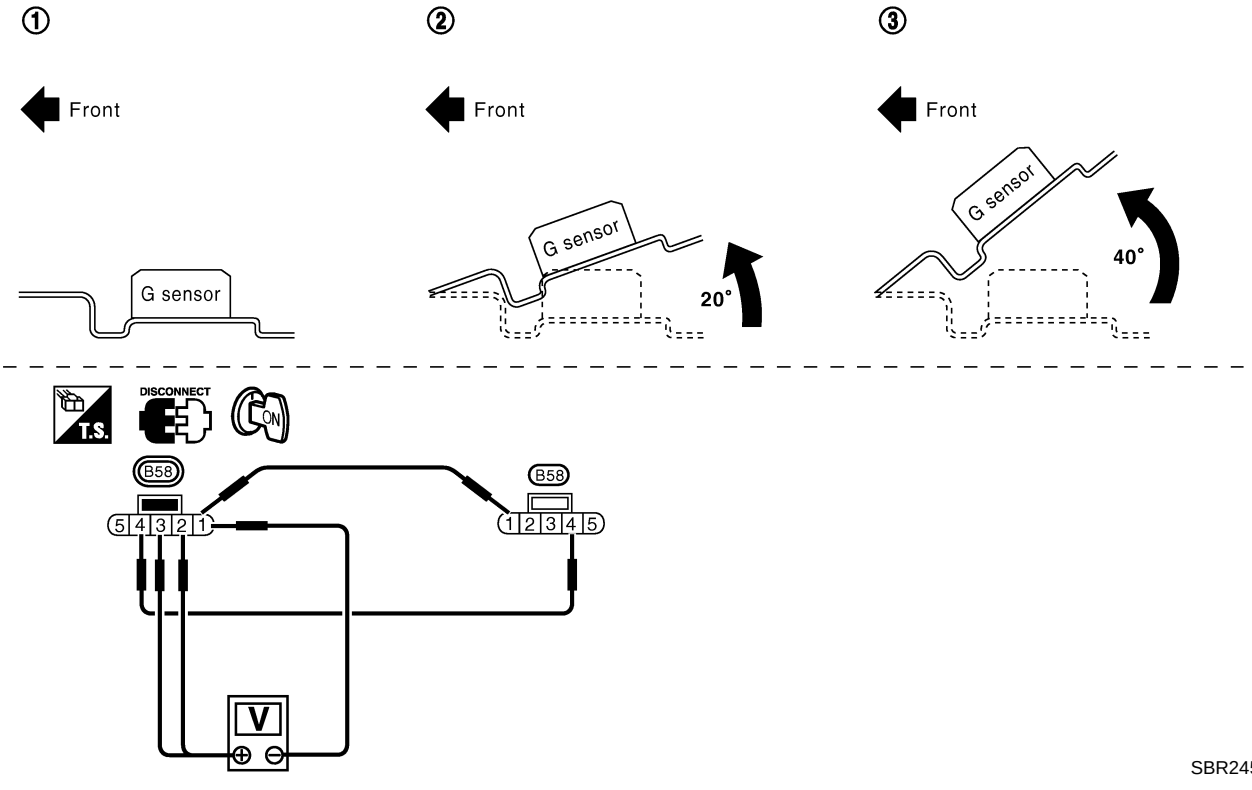
Does battery voltage exist?

Yes	▶	GO TO 4.
No	▶	**Check the following. If NG, repair harness or connectors.** ● Harness connectors E111, B58 ● Harness for open or short between G sensor and ABS actuator and electric unit.

4	CHECK G SENSOR ELECTRICAL

1. Connect G sensor body side terminal and sensor side terminal with suitable harness.
2. Check voltage between terminals 1 and 2, 1 and 3 under the following conditions.

G sensor condition



SBR245F

G sensor condition	Voltage between terminals 1 and 2	Voltage between terminals 1 and 3
1	Approx. 5V	Approx. 5V
2	Approx. 10V	Approx. 10V
3	Approx. 5V	Approx. 10V

MTBL0661

Is voltage OK?

Yes	▶	Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector. Then retest.
No	▶	Replace G sensor.

Control Unit

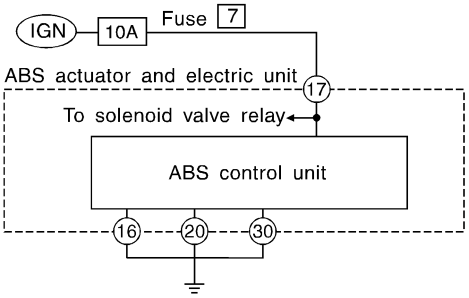
DIAGNOSTIC PROCEDURE

=NABR0137

Malfunction code No. 71

1	INSPECTION START

ABS actuator and electric unit power supply and ground circuit inspection



SBR071F

	▶	GO TO 2.

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

3	CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT	
Check voltage. Refer to “5. CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT” in “DIAGNOSTIC PROCEDURE”, “Low Voltage”, BR-63.		
Does battery voltage exist when ignition switch is turned ON?		
Yes	▶	GO TO 4.
No	▶	Repair.

4	CHECK WARNING LAMP INDICATION	
Does warning lamp indicate code No. 71 again?		
Yes or No		
Yes	▶	Replace ABS actuator and electric unit.
No	▶	Inspect the system according to the code No.

1. ABS Works Frequently

NABR0138

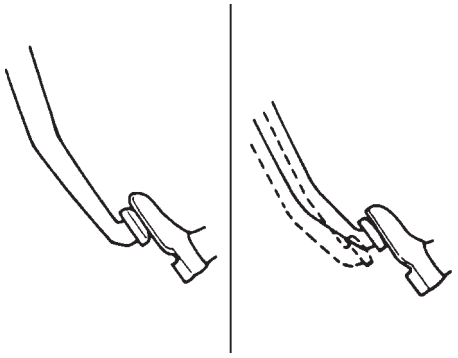
1	CHECK BRAKE FLUID PRESSURE	
Check brake fluid pressure distribution. Refer to BR-12, “Inspection”, “PROPORTIONING VALVE”. **Is brake fluid pressure distribution normal?**		
Yes	▶	GO TO 2.
No	▶	Repair. Then perform Preliminary Check. Refer to BR-50.

2	CHECK WHEEL SENSOR	
1. Check wheel sensor connector for terminal damage or loose connections. 2. Perform wheel sensor mechanical check. Refer to “7. CHECK SENSOR ROTOR” in “DIAGNOSTIC PROCEDURE”, “Wheel Sensor or Rotor”, BR-56. **Is wheel sensor mechanism OK?**		
Yes	▶	GO TO 3.
No	▶	Repair.

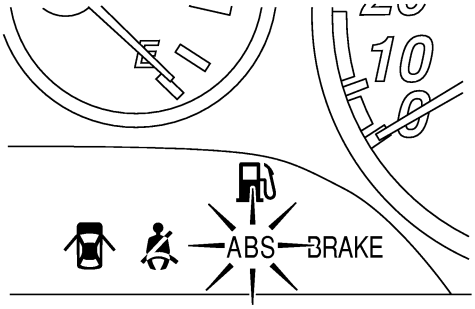
3	CHECK FRONT AXLE	
Check front axles for excessive looseness. Refer to AX-4, “Front Wheel Bearing”. **Is front axle installed properly?**		
Yes	▶	Go to “3. CHECK WARNING LAMP INDICATION” in “2. Unexpected Pedal Action”, BR-68.
No	▶	Repair.

2. Unexpected Pedal Action

NABR0139

1	CHECK BRAKE PEDAL STROKE	
Check brake pedal stroke.  SBR540A **Is brake pedal stroke excessively large?**		
Yes	▶	Perform Preliminary Check. Refer to BR-50.
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-50.

3	CHECK WARNING LAMP INDICATION	
Ensure warning lamp remains off while driving.  SBR677E **Is warning lamp turned off?**		
Yes	▶	GO TO 4.
No	▶	Carry out self-diagnosis. Refer to BR-41, BR-44.

4	CHECK WHEEL SENSOR	
1. Check wheel sensor connector for terminal damage or loose connection. 2. Perform wheel sensor mechanical check. Refer to "7. CHECK SENSOR ROTOR" in "DIAGNOSTIC PROCEDURE", "Wheel Sensor or Rotor", BR-56. **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

=NABR0140

1	CHECK MECHANICAL BRAKE SYSTEM PERFORMANCE	
Disconnect ABS actuator and electric unit connector and check whether stopping distance is still long. **Does brake system function properly when brake pedal is depressed?**		
Yes	▶	Perform Preliminary Check and air bleeding (if necessary).
No	▶	Go to “3. CHECK WARNING LAMP INDICATION” in “2. Unexpected Pedal Action”, BR-68.

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

4. ABS Does Not Work

NABR0141

1	CHECK WARNING LAMP INDICATION	
Does the ABS warning lamp activate? **Yes or No**		
Yes	▶	Carry out self-diagnosis. Refer to BR-41, BR-44.
No	▶	Go to “3. CHECK WARNING LAMP INDICATION” in “2. Unexpected Pedal Action”, BR-68.

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

5. Pedal Vibration and Noise

NABR0142

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

2	CHECK SYMPTOM
1. Apply brake. 2. Start engine. **Does the symptom appear only when engine is started?**	
Yes ▶	Carry out self-diagnosis. Refer to BR-41, BR-44.
No ▶	Go to “3. CHECK WARNING LAMP INDICATION” in “2. Unexpected Pedal Action”, BR-68.

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

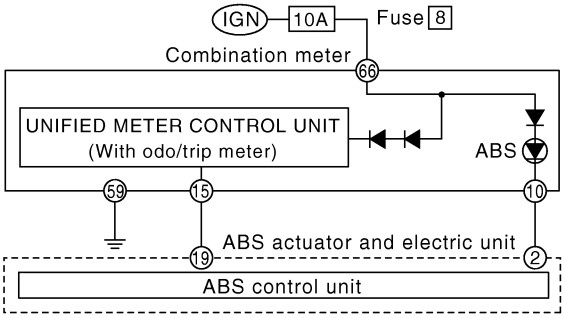
- Applying brake gradually when shifting or operating clutch.
- Low friction (slippery) road.
- High speed cornering.
- Driving over bumps and pot holes.
- Engine speed is over 5,000 rpm with vehicle stopped.

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

NABR0143

1	INSPECTION START

Warning lamp circuit inspection



SBR072F

	▶	GO TO 2.

2	CHECK FUSE

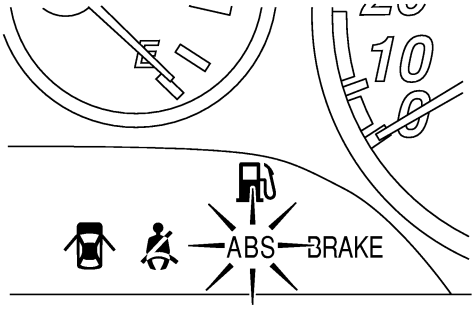
Check 10A fuse No. 8. For fuse layout, refer to EL-11, “POWER SUPPLY ROUTING”.

Is fuse OK?

Yes	▶	GO TO 3.
No	▶	Replace fuse.

3	CHECK WARNING LAMP ACTIVATE

Disconnect ABS actuator and electric unit connector.



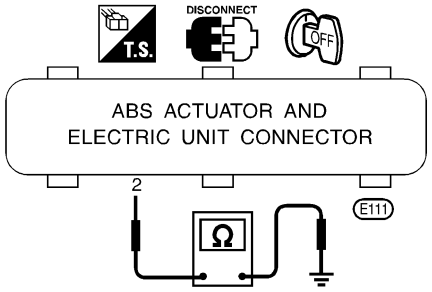
SBR677E

Does the warning lamp activate?

Yes	▶	Replace ABS actuator and electric unit.
No	▶	GO TO 4.

4	CHECK HARNESS FOR SHORT

1. Disconnect ABS actuator and electric unit connector and combination meter connector M24.
2. Check continuity between ABS actuator and electric unit connector E111 terminal 2.



SBR708EB

Continuity should not exist.

Does continuity exist?

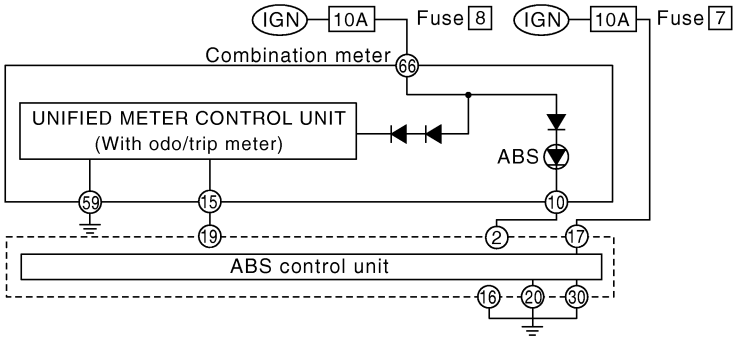
Yes	▶	Repair harness or connectors.
No	▶	**Check combination meter.** Refer to EL-139, "WARNING LAMPS".

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

=NABR0144

1	INSPECTION START

ABS control unit inspection



SBR073F

▶ GO TO 2.

2	CHECK FUSE

Check 10A fuse No. 7. For fuse layout, refer to EL-11, “POWER SUPPLY ROUTING”.

Is fuse OK?

Yes	▶	GO TO 3.
No	▶	GO TO 8.

3	CHECK HARNESS CONNECTOR

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

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

Yes	▶	GO TO 4.
No	▶	**INSPECTION END**

4	CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT

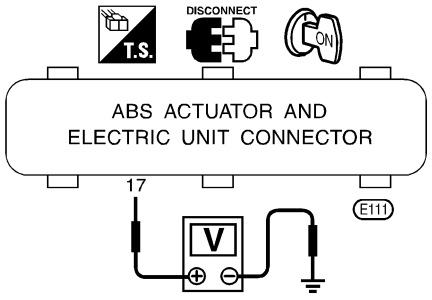
Refer to “ABS ACTUATOR AND ELECTRIC UNIT GROUND” in “Ground Circuit Check”, BR-53.

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 E111 terminal 17 and ground.



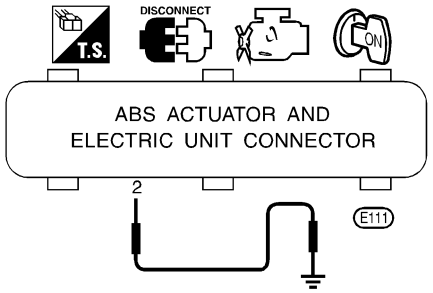
SBR701EB

Does battery voltage exist when ignition switch is turned ON?

Yes	▶	GO TO 6.
No	▶	**Check the following.** If NG, repair harness or connector. ● Harness connector E111 ● 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 E111 terminal 2 and ground.



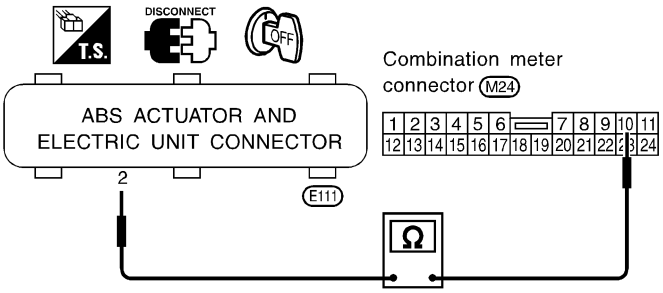
SBR713EB

Does the warning lamp deactivate?

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

7	CHECK ABS WARNING LAMP CONTROL CIRCUIT FOR OPEN

1. Disconnect combination meter connector M24.
2. Check continuity between combination meter connector M24 terminal 10 and ABS actuator and electric unit connector E111 terminal 2.
   NOTE:
   Connect positive lead of multimeter to1combination meter connector M24 terminal 10 and negative lead to ABS actuator and electric unit connector E111 terminal 2.



SBR710EB

Continuity should exist.

Does continuity exist?

Yes	▶	**Check combination meter.** Refer to EL-139, "WARNING LAMPS".
No	▶	Repair harness or connectors.

8	REPLACE FUSE

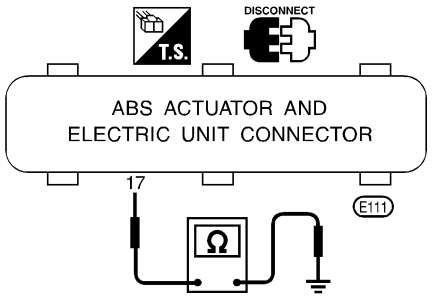
Replace fuse.

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

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

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

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between ABS actuator and electric unit connector E111 terminal 17 and ground.



SBR702EB

Continuity should not exist.

Does continuity exist?

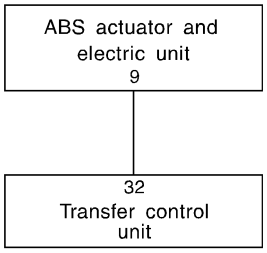
Yes	▶	**Check the following.** If NG, repair harness or connector. • Harness connector E111 • Harness for open or short between ABS actuator and electric unit and fuse
No	▶	Replace ABS actuator and electric unit.

8. Vehicle Vibrates Excessively When ABS Is Operating

=NABR0145

- While ABS is operating, brake pedal vibrates slightly. This is not a problem.
- If vehicle vibration is greater in the AUTO mode than in the 2WD mode, there is the possibility of failure in the communication line between the ABS control unit and transfer control unit. Check and locate the cause of the problem.

1	INSPECTION START
Inspection for excessive vibration of vehicle	



SBR711E

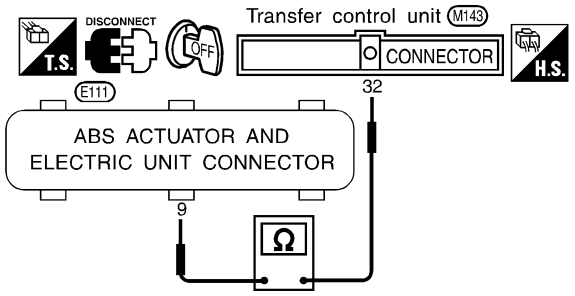
▶	GO TO 2.

2	CARRY OUT SELF-DIAGNOSIS
Perform self-diagnosis for the ABS actuator and electric unit and transfer control unit.	
Are there any malfunctions?	
Yes ▶	GO TO 3.
No ▶	GO TO 4.

3	INSPECTION OR REPAIR
Inspect or repair the system according to the self-diagnostic item.	
OK ▶	GO TO 4.

4	CHECK CIRCUIT

1. Disconnect connectors from ABS actuator and electric unit and transfer control unit. Check terminals for damage or loose connection.
2. Check continuity between ABS actuator and electric unit connector terminal 9 and transfer control unit connector terminal 32.



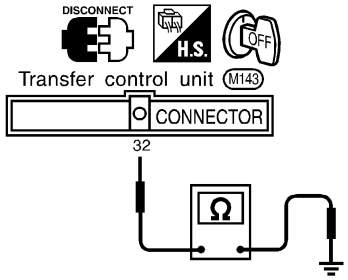
SBR712EA

Does continuity exist?

Yes	▶	GO TO 5.
No	▶	**Check the following.** ● Harness connectors E111, M143 ● Harness for open or short between ABS actuator and electric unit and transfer control unit If NG, repair harness or connectors.

5	CHECK ABS OPERATING SIGNAL CIRCUIT

1. Reconnect only ABS actuator and electric unit connector.
2. Check continuity between transfer control unit connector terminal 32 and ground.
   Continuity should not exist.



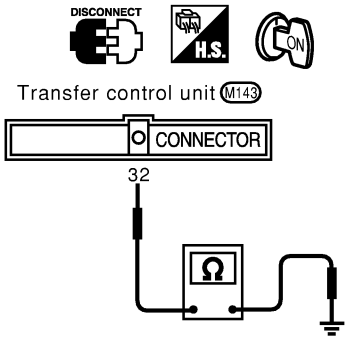
SBR510E

Does continuity exist?

Yes	▶	Replace ABS actuator and electric unit.
No	▶	GO TO 6.

6	CHECK ABS OPERATING SIGNAL

1. Connect CONSULT-II to Data Link Connector.
2. Turn ignition switch "ON". Set CONSULT-II in the active test mode to output an ABS operating signal.
   (Refer to "ACTIVE TEST PROCEDURE", "CONSULT-II Inspection Procedure", BR-47.)
3. An ABS operating signal lasts for 10 seconds. During the time the signal is being output, check resistance between transfer control unit connector terminal 32 and ground.
   Resistance: 0.5Ω, max.



ACTIVE TEST	
ABS OPER SIG	OFF
MONITOR	
ABS OPER SIG	OFF

SBR680E

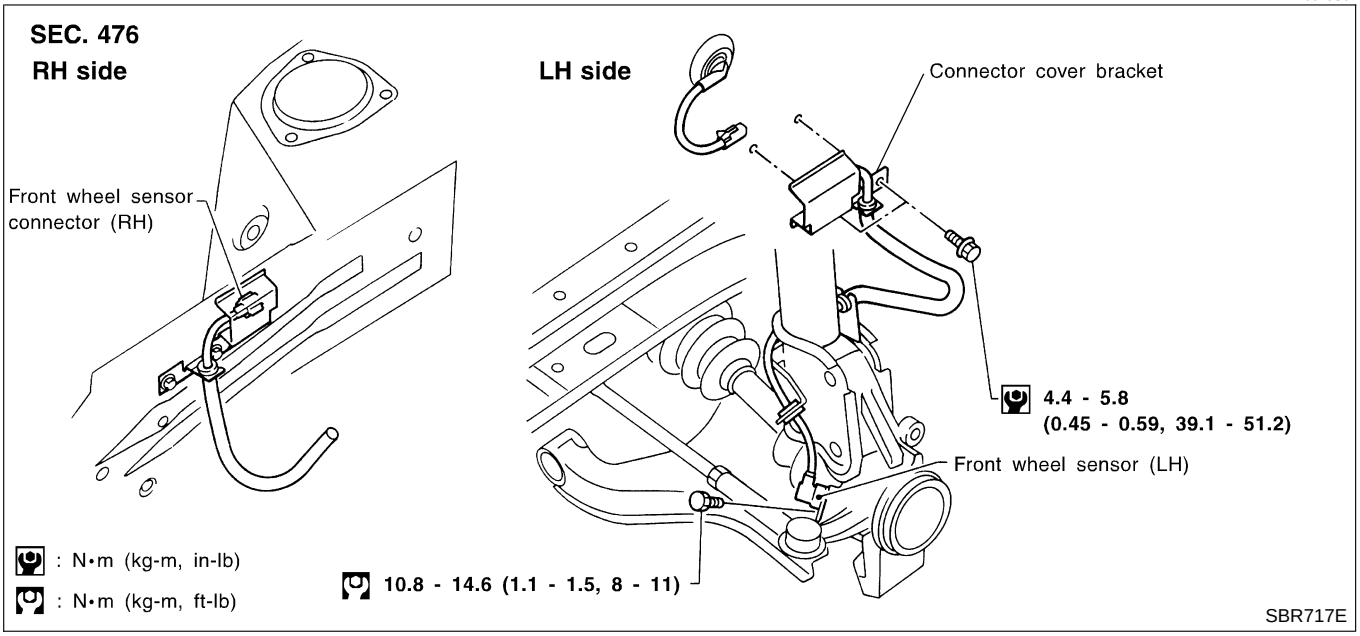
Is resistance within specifications?

Yes	▶	CHECK transfer control unit. Refer to TF-123, "ABS OPERATION SIGNAL".
No	▶	Replace ABS actuator and electric unit.

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.

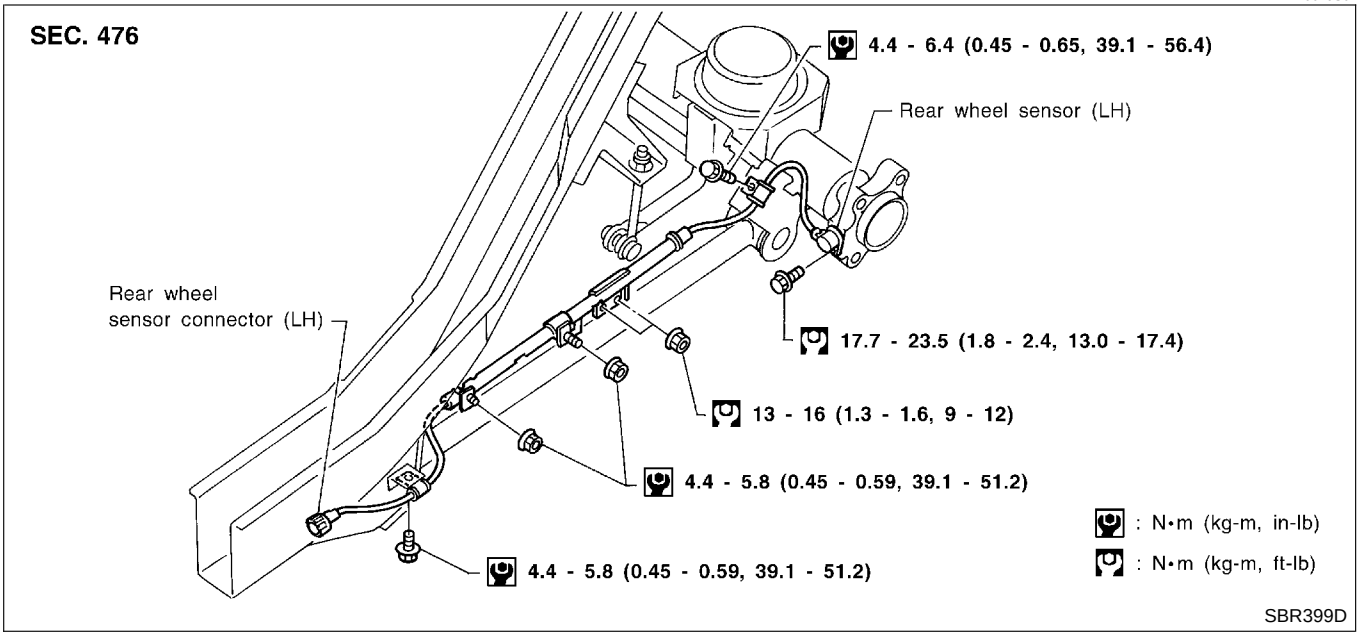
Front Wheel Sensor

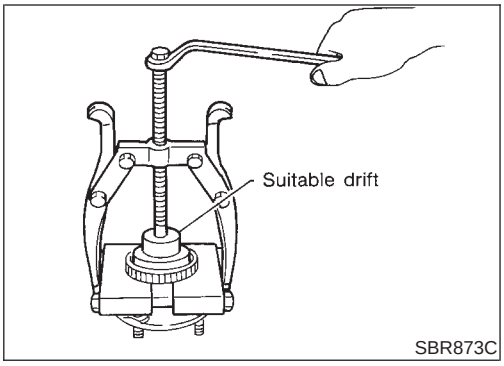
NABR0079S01



Rear Wheel Sensor

NABR0079S02





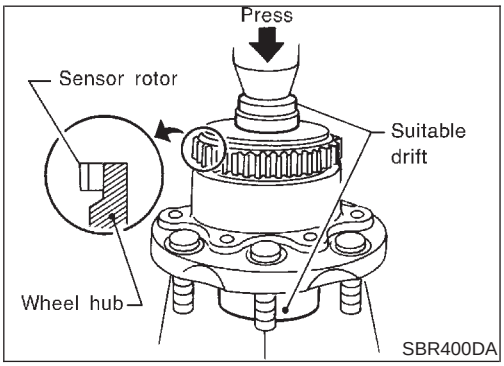
Front Sensor Rotor

NABR0079S03

REMOVAL

NABR0079S0301

1. Remove the front wheel hub. Refer to AX-9, “Disassembly”.
2. Remove the sensor rotor using suitable puller, drift and bearing replacer.

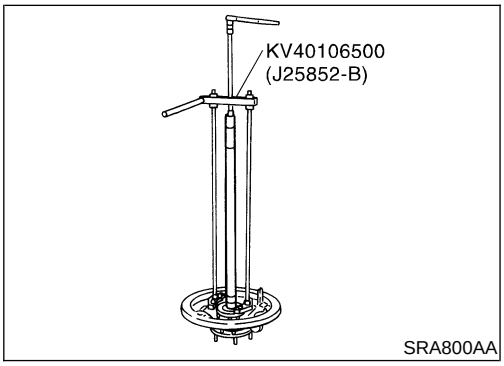


INSTALLATION

NABR0079S0302

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.



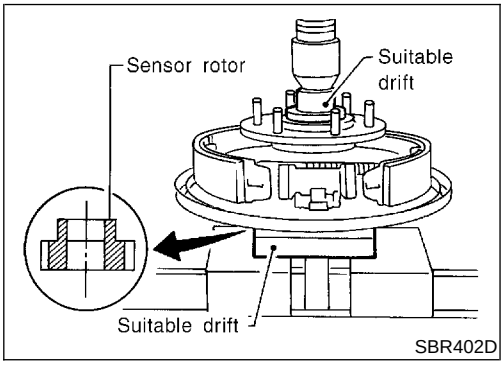
Rear Sensor Rotor

NABR0079S04

REMOVAL

NABR0079S0401

- Remove the sensor rotor using Tool.

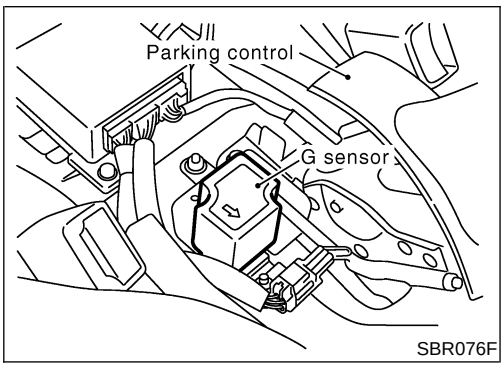


INSTALLATION

NABR0079S0402

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.



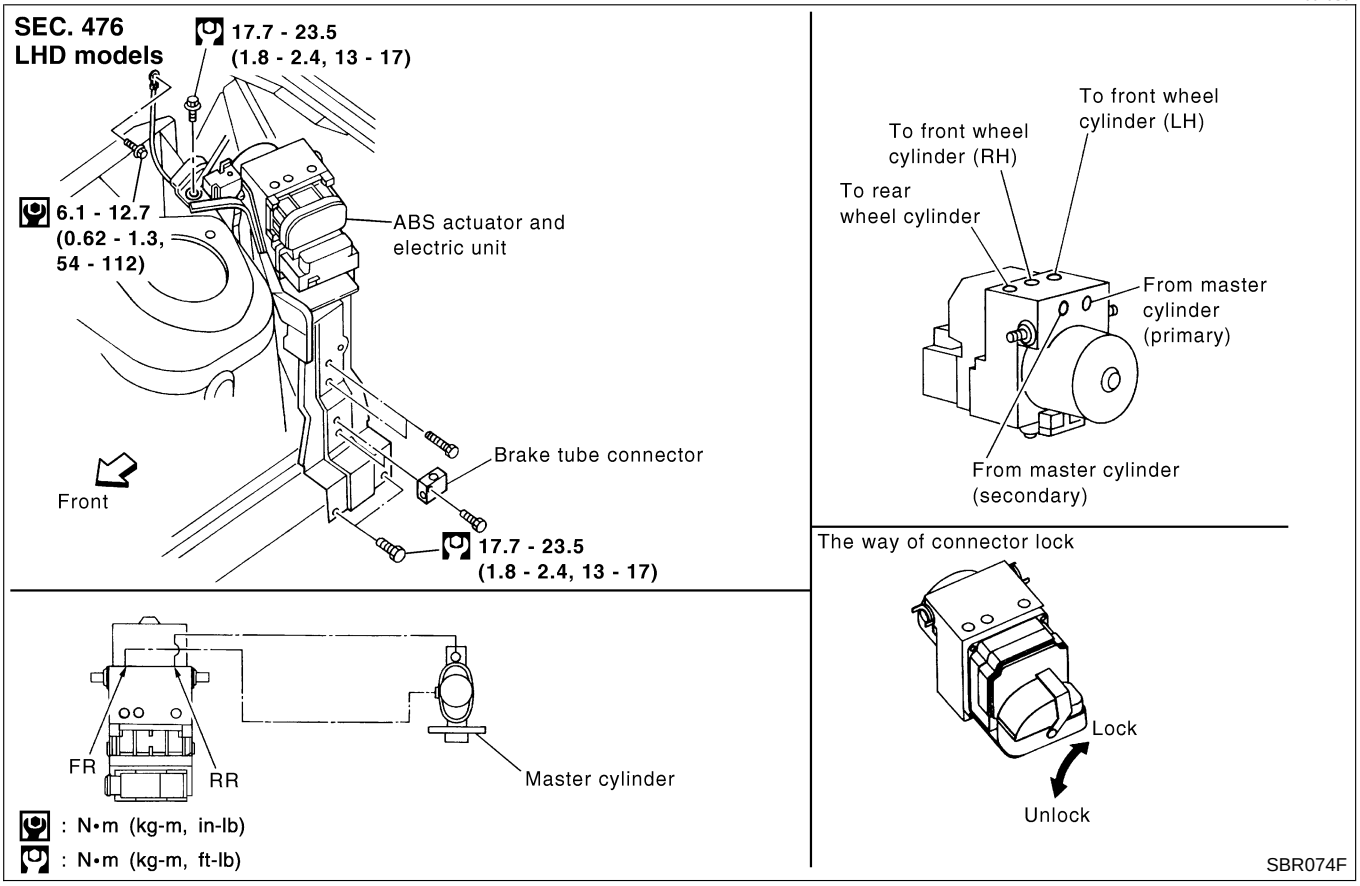
G Sensor

NABR0079S06

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

ABS Actuator and Electric Unit

NABR0079S07



REMOVAL

NABR0079S0701

1. Disconnect battery cable.
2. Drain brake fluid. Refer to “Changing Brake Fluid”, BR-8.
3. Remove mounting bracket fixing bolts and nuts.
4. Disconnect connector, brake pipes and remove fixing nuts and actuator ground cable.

INSTALLATION

NABR0079S0702

CAUTION:

After installation, refill brake fluid. Then bleed air. Refer to “Bleeding Brake System”, BR-9.

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.

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

NABR0208

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS composition which is available to NISSAN MODEL R50 is as follows (The composition varies according to optional equipment.):

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

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.**
- **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 with yellow and/or orange harness connector (and with yellow harness protector or yellow insulation tape before the harness connectors).**

Precautions for SRS “Air Bag” and “SEAT BELT PRE-TENSIONER” Service

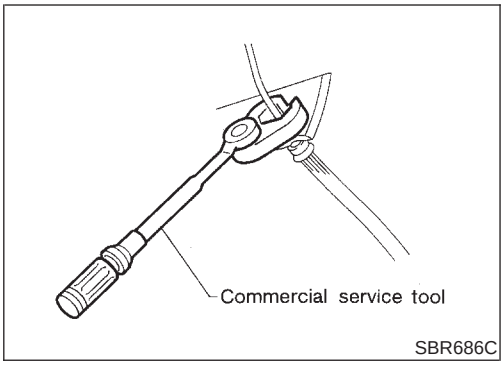
NABR0209

- Do not use electrical test equipment to check SRS circuits unless instructed to in this Service Manual.
- Before servicing the SRS, turn ignition switch “OFF”, disconnect both battery cables and wait at least 3 minutes.
  For approximately 3 minutes after the cables are removed, it is still possible for the air bag and seat belt pre-tensioner to deploy. Therefore, do not work on any SRS connectors or wires until at least 3 minutes have passed.
- Diagnosis sensor unit must always be installed with their arrow marks “⇐” pointing towards the front of the vehicle for proper operation. Also check diagnosis sensor unit for cracks, deformities or rust before installation and replace as required.
- The spiral cable must be aligned with the neutral position since its rotations are limited. Do not attempt to turn steering wheel or column after removal of steering gear.
- Handle air bag module carefully. Always place driver and passenger air bag modules with the pad side facing upward and place side air bag module standing with stud bolt side setting bottom.
- Conduct self-diagnosis to check entire SRS for proper function after replacing any components.
- After air bag inflates, the front instrument panel assembly should be replaced if damaged.

Precautions for Brake System

NABR0153

- Recommended fluid is brake fluid “DOT 3”.
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas such as body. If brake fluid is splashed, wipe it off and flush area with water immediately.
- Never use mineral oils such as gasoline or kerosene to clean. They will ruin rubber parts and cause improper operation.



- Using a flare nut torque wrench, securely tighten brake tube flare nuts.
- Brake system is an important safety part. If a brake fluid leak is detected, always disassemble the affected part. If a malfunction is detected, replace part with a new one.
- Before working, turn ignition switch OFF and disconnect electrical connectors of ABS actuator and electric unit (control unit) or battery terminals.
- When installing brake piping, be sure to check torque.

Precautions for Brake Control

NABR0154

- During VDC/TCS/ABS operation, brake pedal lightly vibrates and a mechanical noise may be heard. This is normal.
- Just after starting vehicle after ignition switch ON, brake pedal may vibrate or motor operating noise may be heard from engine compartment. This is a normal status of operation check.
- Stopping distance may be longer than that of vehicles without ABS when vehicle drives on rough, gravel, or snow-covered (fresh, deep snow) roads.
- When an error is indicated by ABS or another warning lamp, collect all necessary information from customer (what symptoms are present under what conditions) and check for simple causes before starting diagnostic servicing. Besides electrical system inspection, check booster operation, brake fluid level, and oil leaks.
- If tire size and type are used in an improper combination, or brake pads are not Genuine NISSAN parts, stopping distance or steering stability may deteriorate.
- If there is a radio, antenna, or antenna lead-in wire (including wiring) near control module, VDC/TCS/ABS function may have a malfunction or error.
- If aftermarket parts (car stereo, CD player, etc.) have been installed, check for incidents such as harness pinches, open circuits, and improper wiring.

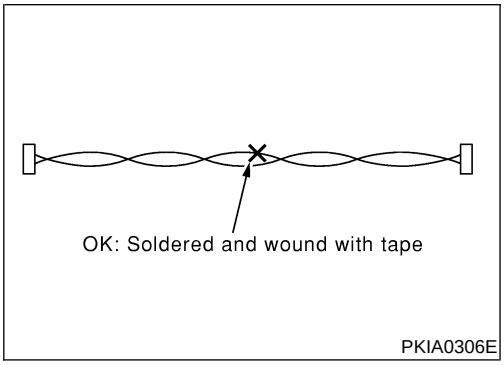
Diagnosis Precaution

NABR0155

CAN SYSTEM

NABR0155S01

- Do not apply voltage of 7.0V or higher to terminal to be measured.
- Maximum open terminal voltage of tester in use shall be 7.0V or lower.
- Before checking harnesses, turn ignition switch to OFF and disconnect battery negative cable.



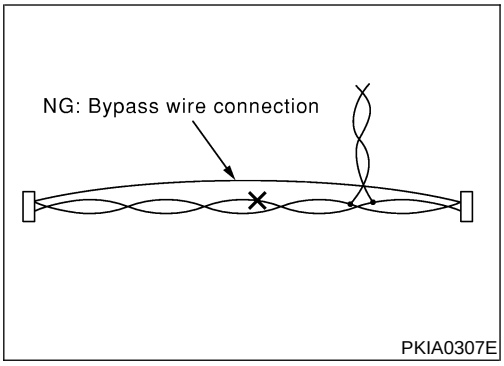
Precaution for Harness Repair

NABR0156

CAN SYSTEM

NABR0156S01

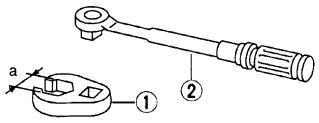
- Area to be repaired shall be soldered, and wrapped with a tape [be sure that fraying of twisted wire shall be within 110 mm (4.33 in)].



- Do not make a bypass connection to repaired area. (If it is done, branch part will be removed and characteristics of twisted wire will be lost.)

Commercial Service Tools

NABR0157

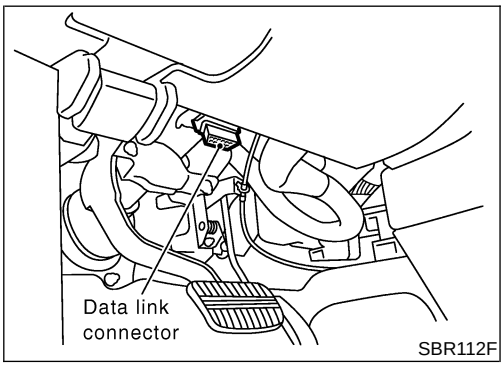
Tool name	Description	
1. Flare nut crowfoot 2. Torque wrench	 S-NT360	Removing and installing each brake piping **a: 10 mm (0.39 in)/12 mm (0.47 in)**

Adjustment of Steering Angle Sensor Neutral Position

NABR0158

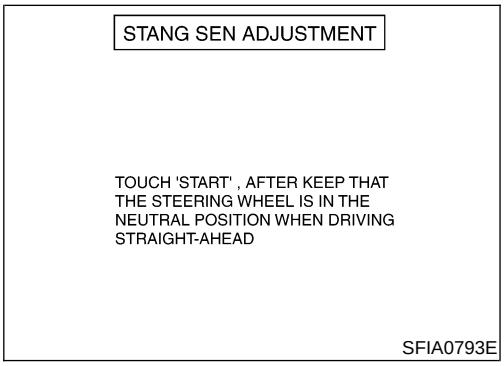
- After replacing ABS actuator and electric unit (control unit), steering angle sensor, steering components and suspension components, or after adjusting wheel alignment, make sure to adjust neutral position of steering angle sensor before running vehicle.

CAUTION:
To adjust neutral position of steering angle sensor, make sure to use CONSULT-II. (Adjustment cannot be done without CONSULT-II.)



SBR112F

1. Stop vehicle with front wheels in straight-ahead position.
2. Connect CONSULT-II and CONSULT-II CONVERTER to data link connector on vehicle, and turn ignition switch ON (do not start engine).
3. Touch “ABS”, “WORK SUPPORT” and “ST ANGLE SENSOR ADJUSTMENT” on CONSULT-II screen in this order.



SFIA0793E

4. Touch “START”.

CAUTION:
Do not touch steering wheel while adjusting steering angle sensor.

5. After approximately 10 seconds, touch “END”. (After approximately 60 seconds, it ends automatically.)
6. Turn ignition switch OFF, then turn it ON again.

CAUTION:
Be sure to carry out above operation.

7. Run vehicle with front wheels in straight-ahead position, then stop.
8. Select “DATA MONITOR”, “CONTROL MODULE INPUT ITEM”, and “STEERING ANGLE SIGNAL” on CONSULT-II screen. Then check that “STEERING ANGLE SIGNAL” is within 0±3.5 deg. If value is more than specification, repeat steps 1 to 5.
9. Erase memory of ABS actuator and electric unit (control unit) and ECM.
10. Turn ignition switch to OFF.

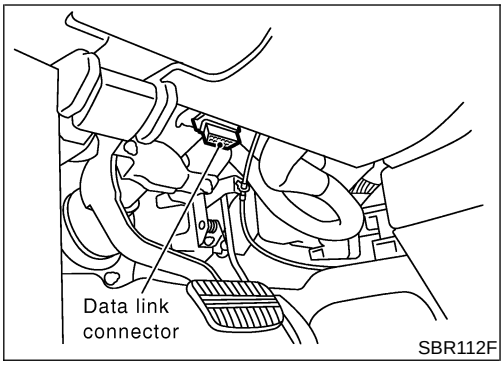
Calibration of Decel G Sensor

NABR0203

- After removing/installing or replacing ABS actuator and electric unit (control unit), suspension components, or after adjusting wheel alignment or replacing yaw rate/side/decel G sensor, make sure to calibrate decel G sensor before running vehicle.

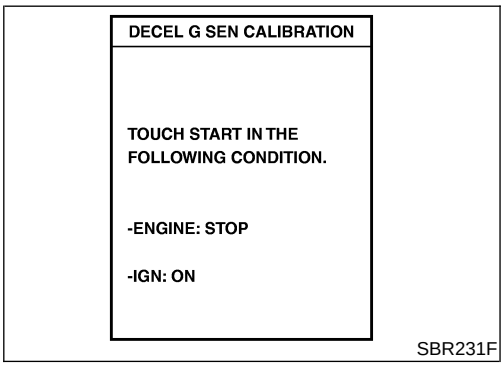
CAUTION:
To calibrate decel G sensor, make sure to use CONSULT-II. (Adjustment cannot be done without CONSULT-II.)

Calibration of Decel G Sensor (Cont'd)



SBR112F

1. Stop vehicle horizontally with front wheels in straight-ahead position.
2. Connect CONSULT-II and CONSULT-II CONVERTER to data link connector on vehicle, and turn ignition switch ON (do not start engine).
3. Touch "ABS", "WORK SUPPORT" and "DECEL G SEN CALIBRATION" on CONSULT-II screen in this order.



SBR231F

4. Touch "START".

CAUTION:
The vehicle should be set horizontal and stationary.

5. After approximately 10 seconds, touch "END". (After approximately 60 seconds, it ends automatically.)
6. Turn ignition switch OFF, then turn it ON again.

CAUTION:
Be sure to carry out above operation.

7. Run vehicle with front wheels in straight-ahead position, then stop.
8. Select "DATA MONITOR", "CONTROL MODULE INPUT ITEM", and "DECEL G SEN" on CONSULT-II screen. Then check that "DECEL G SEN" is within ±0.08G. If value is more than specification, repeat steps 1 to 5.
9. Erase memory of ABS actuator and electric unit (control unit) and ECM.
10. Turn ignition switch to OFF.

Fail-Safe

NABR0199S01

ABS SYSTEM

NABR0199S0101

If a malfunction occurs in electrical system, ABS warning lamp, VDC OFF indicator lamp, and SLIP indicator lamp in combination meter turn ON. In this condition, the fail-safe function puts VDC/TCS/ABS and EBD into one of the following conditions.

1. Only EBD operates. Same condition as that of models without VDC/TCS/ABS.
2. VDC/TCS/ABS and EBD do not operate. All 4 wheels operate as normal brakes.

NOTE:
In step 1 shown above, self-diagnosis when ignition switch is turned ON and when vehicle starts at initial time is carried out. ABS self-diagnosis noise may be heard as usual.

VDC/TCS SYSTEM

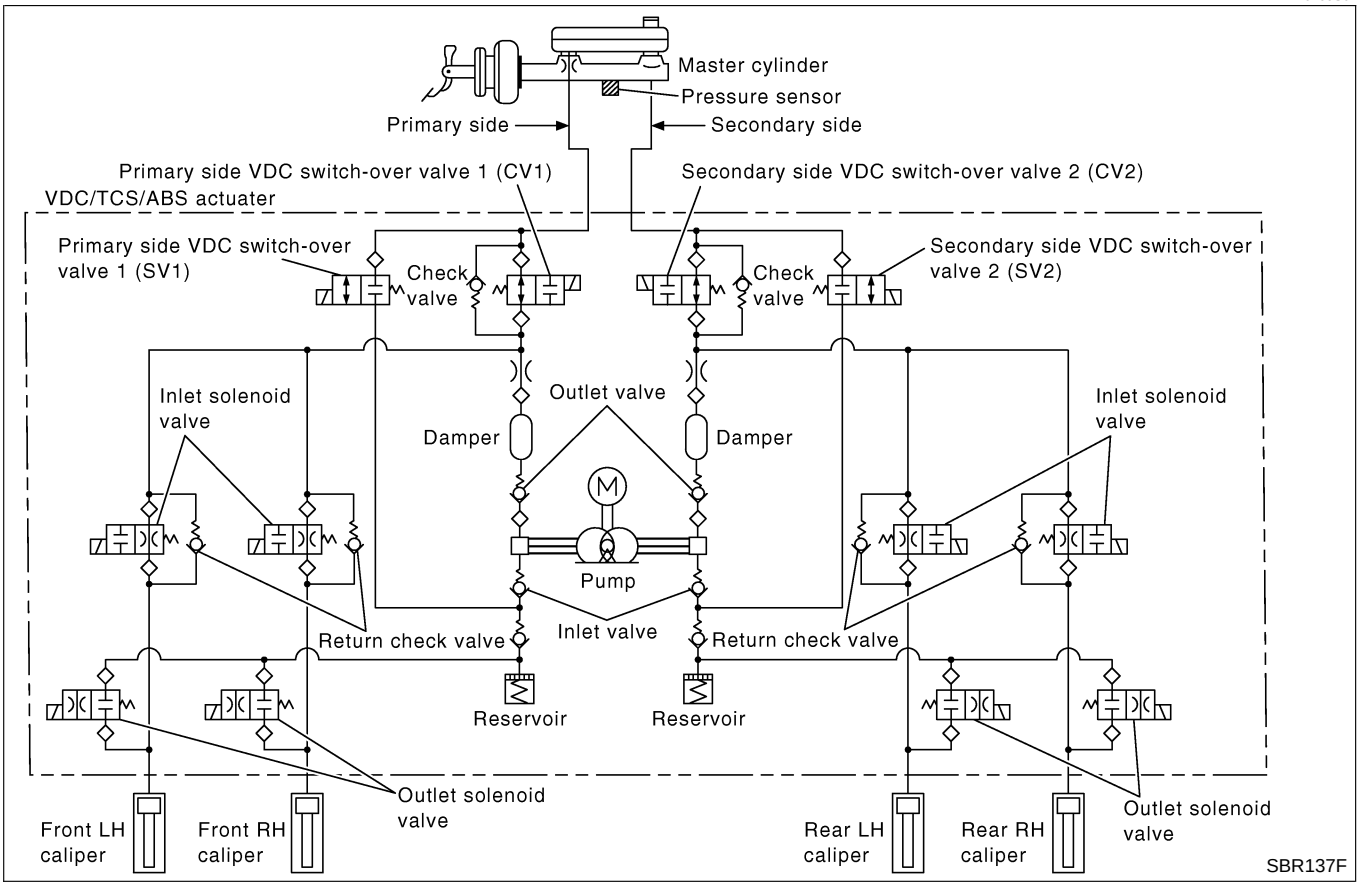
NABR0199S0102

If a malfunction occurs in electrical system, VDC OFF indicator lamp and SLIP indicator lamp in combination meter turn on. In this condition, VDC/TCS will be deactivated and it becomes equal to that of models without VDC/TCS. However, ABS is controlled normally.
If a malfunction occurs in throttle control system, VDC/TCS control will be deactivated and only ABS control will operate normally.

CAUTION:
If fail-safe mode is initiated, carry out self-diagnosis for VDC/TCS/ABS control system.

Hydraulic Circuit Diagram

NABR0199S02



ABS Function

NABR0199S03

1. During ABS operation, brake pedal lightly vibrates and a mechanical noise may be heard. This is normal.
2. When starting engine, or just after starting vehicle, brake pedal may vibrate or motor operating noises may be heard from engine compartment. This is a normal status of operation check.
3. Stopping distance may be longer than that of vehicles without ABS when vehicle drives on rough, gravel, or snow-covered (fresh, deep snow) roads.
4. EBD is integrated in VDC/TCS/ABS system.

TCS Function

NABR0199S04

1. ABS actuator and electric unit (control unit) detects a spin at drive wheels by comparing wheel speed signals from all 4 wheels. At this time, output from control unit controls brake fluid pressure to both LH and RH rear wheels while cutting fuel to engine and closing throttle valve to reduce engine torque. Furthermore, throttle position is continuously controlled to insure appropriate engine torque at all times.
2. Depending on road circumstances, driver may have a sluggish feel. This is normal, because optimum traction has highest priority under TCS operation.
3. When vehicle is passing through a road where surface friction coefficient varies, downshifting or depressing accelerator pedal fully may activate TCS temporarily.
4. During TCS operation, it informs driver of system operation by flashing SLIP indicator lamp.

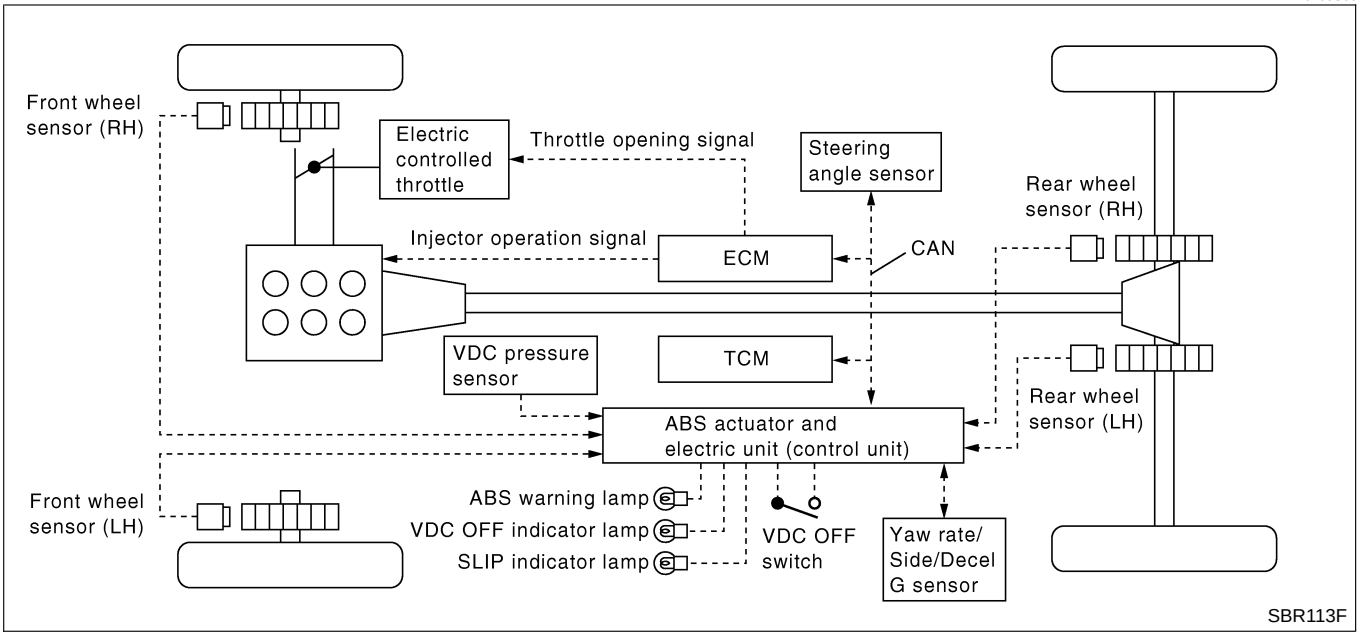
VDC Function

NABR0199S05

1. In addition to TCS/ABS function, VDC detects driver's steering operation amount and brake pedal travel from steering angle sensor and pressure sensor. Using information from yaw rate/side G-sensor and wheel sensor, VDC judges driving condition (conditions of under steer and over steer) to improve stability by controlling brake application to 4 wheels and engine output.
2. SLIP indicator lamp flashes to inform driver of VDC operation.
3. During VDC operation, body and brake pedal lightly vibrate and mechanical noises may be heard. This is normal.
4. If vehicle is rotated on turn table, or rolled and rocked on ship, ABS warning lamp, VDC OFF indicator lamp, and SLIP indicator lamp may turn ON. In this case, start engine on normal road again. If ABS warning lamp, VDC OFF indicator lamp, and SLIP indicator lamp turn OFF after restart, it is normal.
5. When driving in steep slope such as bank, ABS warning lamp, VDC OFF indicator lamp, and SLIP indicator lamp may turn ON. In this case, start engine on normal road again. If ABS warning lamp, VDC OFF indicator lamp, and SLIP indicator lamp turn OFF after restart, it is normal.

System Diagram

NABR0199S06



System Description

NABR0204

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

CAN Communication Unit

NABR0205

Body type	Wide/Wagon		
Axle	4WD (All-mode)	4WD (Part time)	2WD
Engine	VQ35DE		
Transmission	A/T		
Brake control	VDC		
CAN communication unit			
ECM	X	X	X
TCM	X	X	X
Transfer control unit	X		
Steering angle sensor	X	X	X
ABS actuator and electric unit (control unit)	X	X	X
Combination meter	X	X	X
CAN communication type (Reference page)	Type 1 (BR-91)	Type 2 (BR-93)	

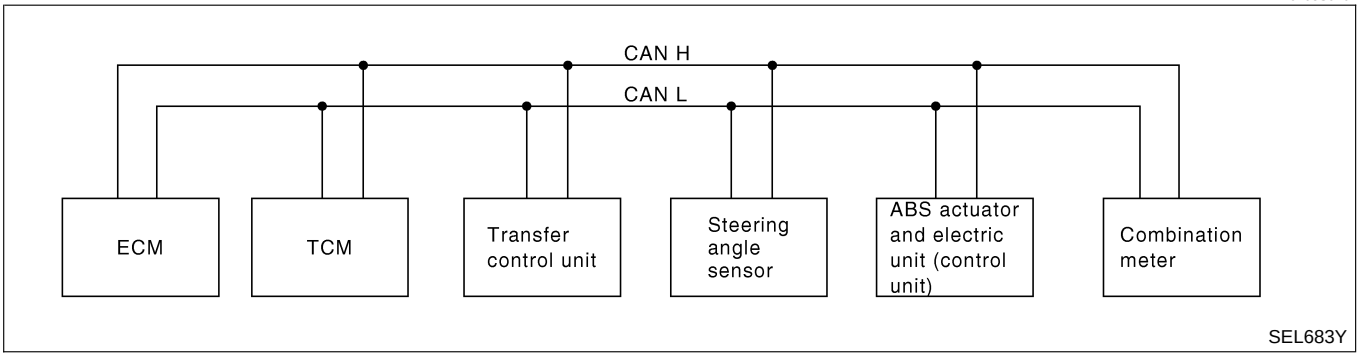
X: Applicable

TYPE 1 (ALL-MODE 4WD MODELS)

System Diagram

NABR0205S01

NABR0205S0101



Input/Output Signal Chart

=NABR0205S0102

T: Transmit R: Receive

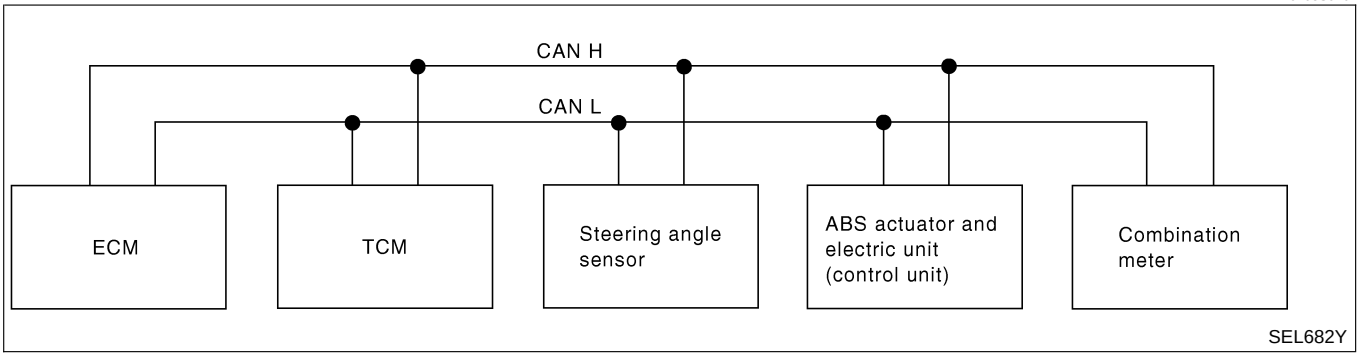
Signals	ECM	TCM	Transfer control unit	Steering angle sensor	ABS actuator and electric unit (control unit)	Combination meter
Engine speed signal	T		R		R	R
Accelerator pedal position signal	T		R		R	
Closed throttle position signal	T	R				
Wide open throttle position signal	T	R				
VDC operation signal	R		R		T	
TCS operation signal	R		R		T	
ABS operation signal	R		R		T	
Output shaft revolution signal	R	T	R			
ETC fail signal	T		R			
During shifting signal	R	T	R		R	
Steering wheel angle sensor signal				T	R	
Wheel speed sensor signal			R		T	
Stop lamp switch signal		R				T
MIL signal	T					R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R
Vehicle speed signal					T	R
	R					T
Lock-up prohibition signal	T	R				
Lock-up signal	R	T				
Neutral range switch signal		R				T
Parking range switch signal		R				T
Overdrive control switch signal		R				T
A/C compressor feedback signal	T					R
Fuel level sensor signal	R					T
A/T position indicator signal		T				R
O/D OFF indicator signal		T				R

TYPE 2 (EXCEPT ALL-MODE 4WD MODELS)

System Diagram

=NABR0205S02

NABR0205S0201



Input/Output Signal Chart

NABR0205S0202

T: Transmit R: Receive

Signals	ECM	TCM	Steering angle sensor	ABS actuator and electric unit (control unit)	Combination meter
Engine speed signal	T			R	R
Accelerator pedal position signal	T			R	
Closed throttle position signal	T	R			
Wide open throttle position signal	T	R			
VDC operation signal	R			T	
TCS operation signal	R			T	
ABS operation signal	R			T	
Steering wheel angle sensor signal			T	R	
MIL signal	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal				T	R
	R				T
Stop lamp switch signal		R			T
Lock-up prohibition signal	T	R			
Lock-up signal	R	T			
Neutral range switch signal		R			T
Parking range switch signal		R			T
Overdrive control switch signal		R			T
A/C compressor feedback signal	T				R
Fuel level sensor signal	R				T
A/T position indicator signal		T			R
O/D OFF indicator signal		T			R

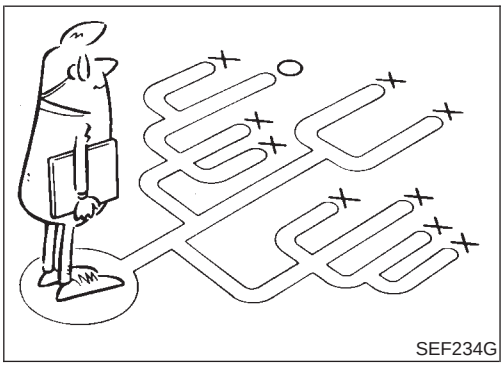
How to Proceed with Diagnosis

NABR0165

BASIC CONCEPT

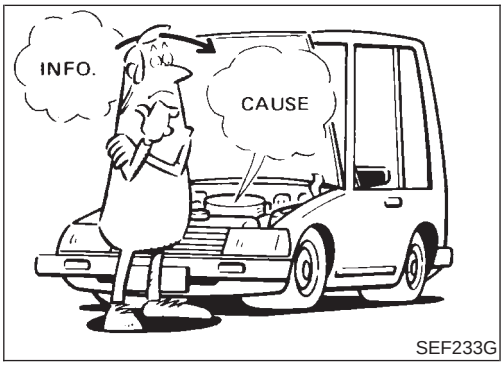
NABR0165S01

- Most important point to perform diagnosis is to understand systems (control and mechanism) in vehicle thoroughly.


SEF234G

- It is also important to clarify customer complaints before inspection.
  First of all, reproduce symptom, and understand it fully.
  Ask customer about his/her complaints carefully. In some cases, it will be necessary to check symptom by driving vehicle with customer.

NOTE:
Customers are not professionals. Do not assume “maybe customer means...” or “maybe customer mentioned this symptom”.

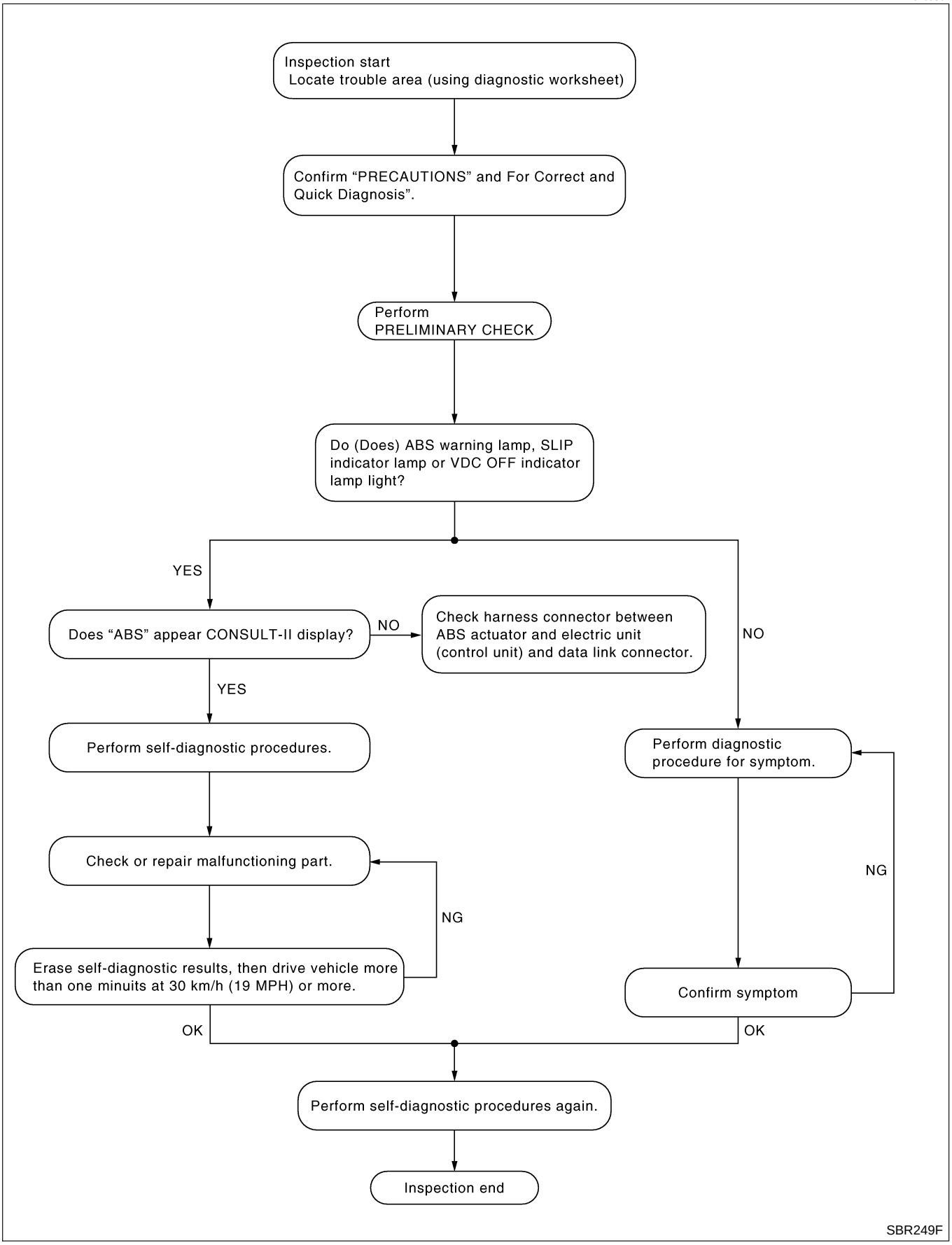


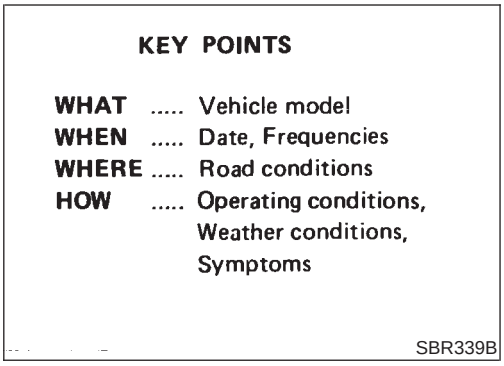
SEF233G

- It is essential to check symptoms right from beginning in order to repair a malfunction completely.
  For an intermittent malfunction, it is important to reproduce symptom based on interview with customer and past examples. Do not perform inspection on ad hoc basis. Most intermittent malfunctions are caused by poor contacts. In this case, it will be effective to shake suspected harness or connector by hand. When repairs are performed without any symptom check, no one can judge if malfunction has actually been eliminated.
- After diagnosis, make sure to carry out “erase memory”. Refer to BR-108.
- For an intermittent malfunction, move harness or harness connector by hand to check poor contact or false open circuit.
- Always read “GI General Information” to confirm general precautions.

DIAGNOSIS FLOWCHART

NABR0165S02





ASKING COMPLAINTS

NABR0165S03

- Complaints against malfunction vary depending on each person. It is important to clarify customer complaints.
- Ask customer about what symptoms are present and under what conditions. Use information to reproduce symptom while driving.
- It is also important to use diagnosis sheet so as not to miss information.

EXAMPLE OF DIAGNOSIS SHEET

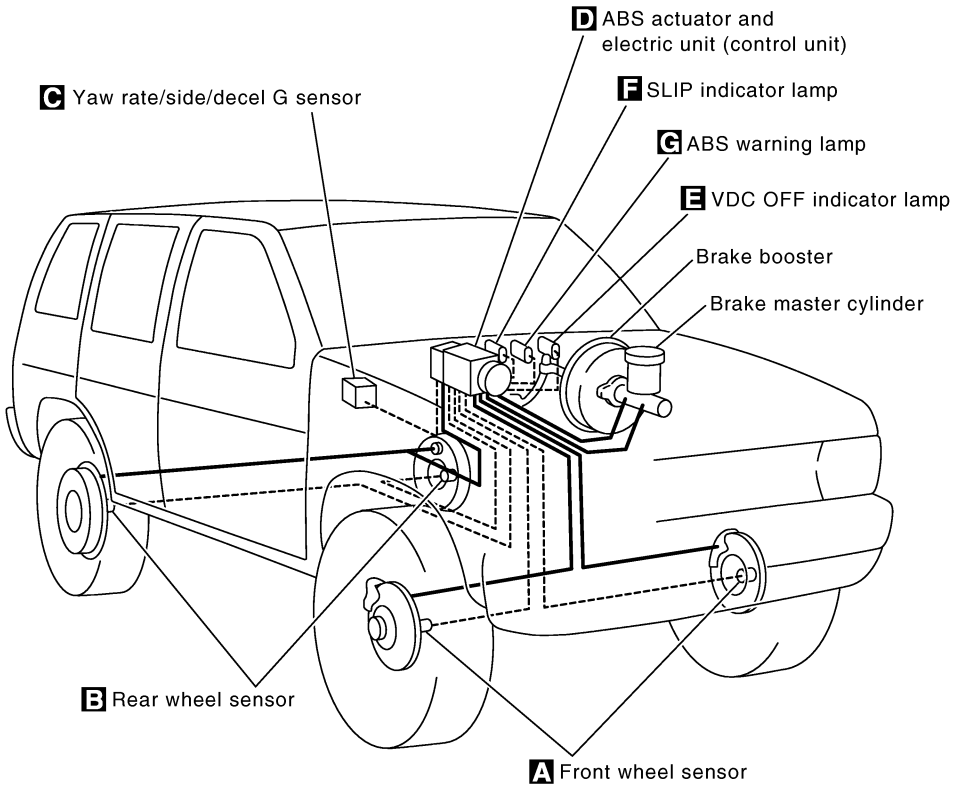
NABR0165S04

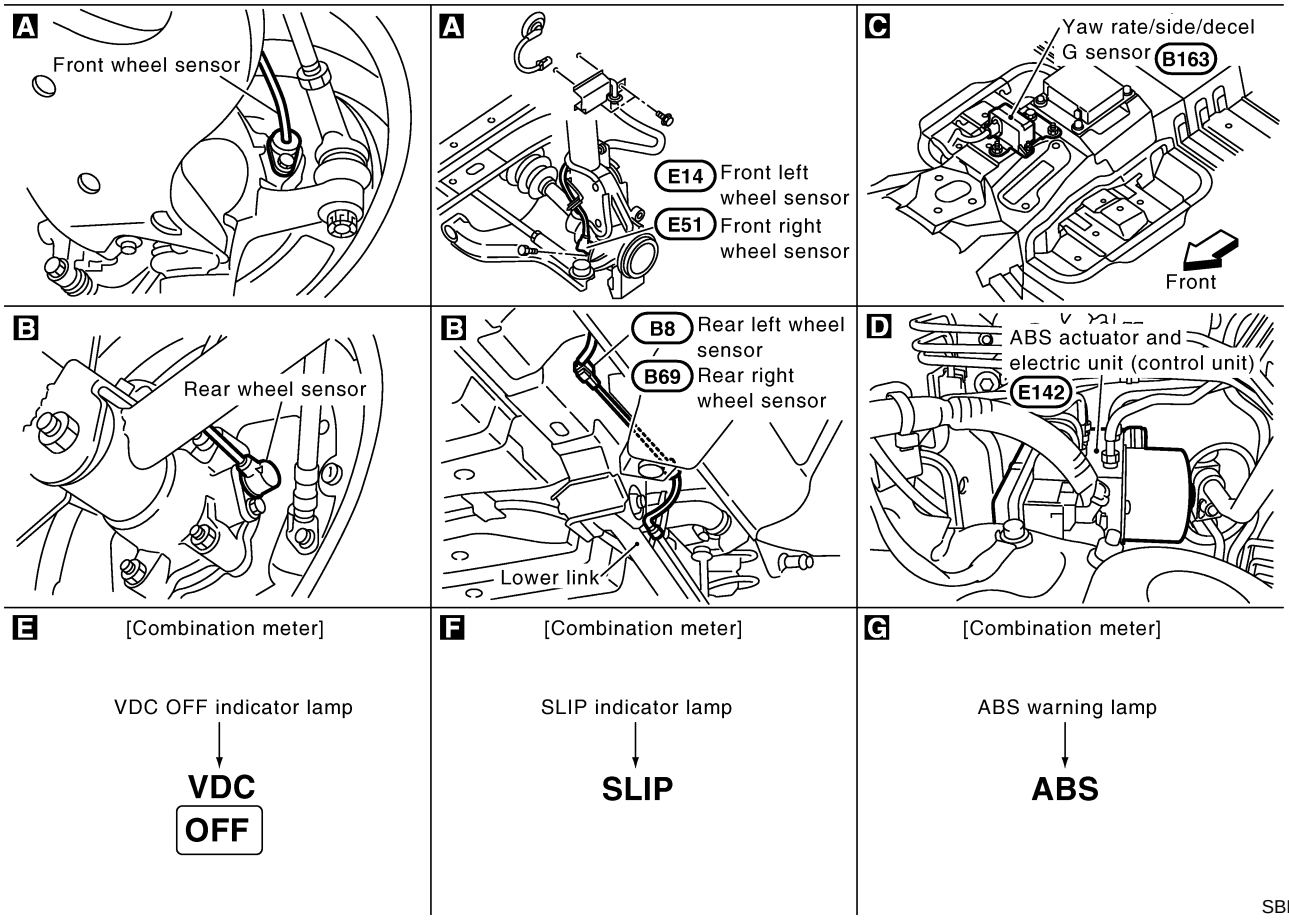
Customer name MR/MS	Model & Year	VIN	
Engine #	Trans.	Mileage	
Incident Date	Manuf. Date	In Service Date	
Symptoms	☐ Noise and vibration (from engine compartment) ☐ Noise and vibration (from axle)	☐ Warning / Indicator activate	☐ Firm pedal operation Large stroke pedal operation
	☐ VDC/TCS dose not work (Rear wheels slip when accelerating)	☐ ABS dose not work. (wheels slip when braking)	☐ Lack of sense of acceleration
Engine conditions	☐ When starting ☐ After starting		
Road conditions	☐ Low friction road (☐Snow ☐Gravel ☐Other) ☐ Bumps / potholes		
Driving conditions	☐ Full-acceleration ☐ High speed cornering ☐ Vehicle speed: Greater than 10 km/h (6 MPH) ☐ Vehicle speed: 10 km/h (6 MPH) or less ☐ Vehicle is stopped		
Applying brake conditions	☐ Suddenly ☐ Gradually		
Other conditions	☐ Operation of electrical equipment ☐ Shift change ☐ Other descriptions		

SFIA0029E

Component Installation Location

NABR0166

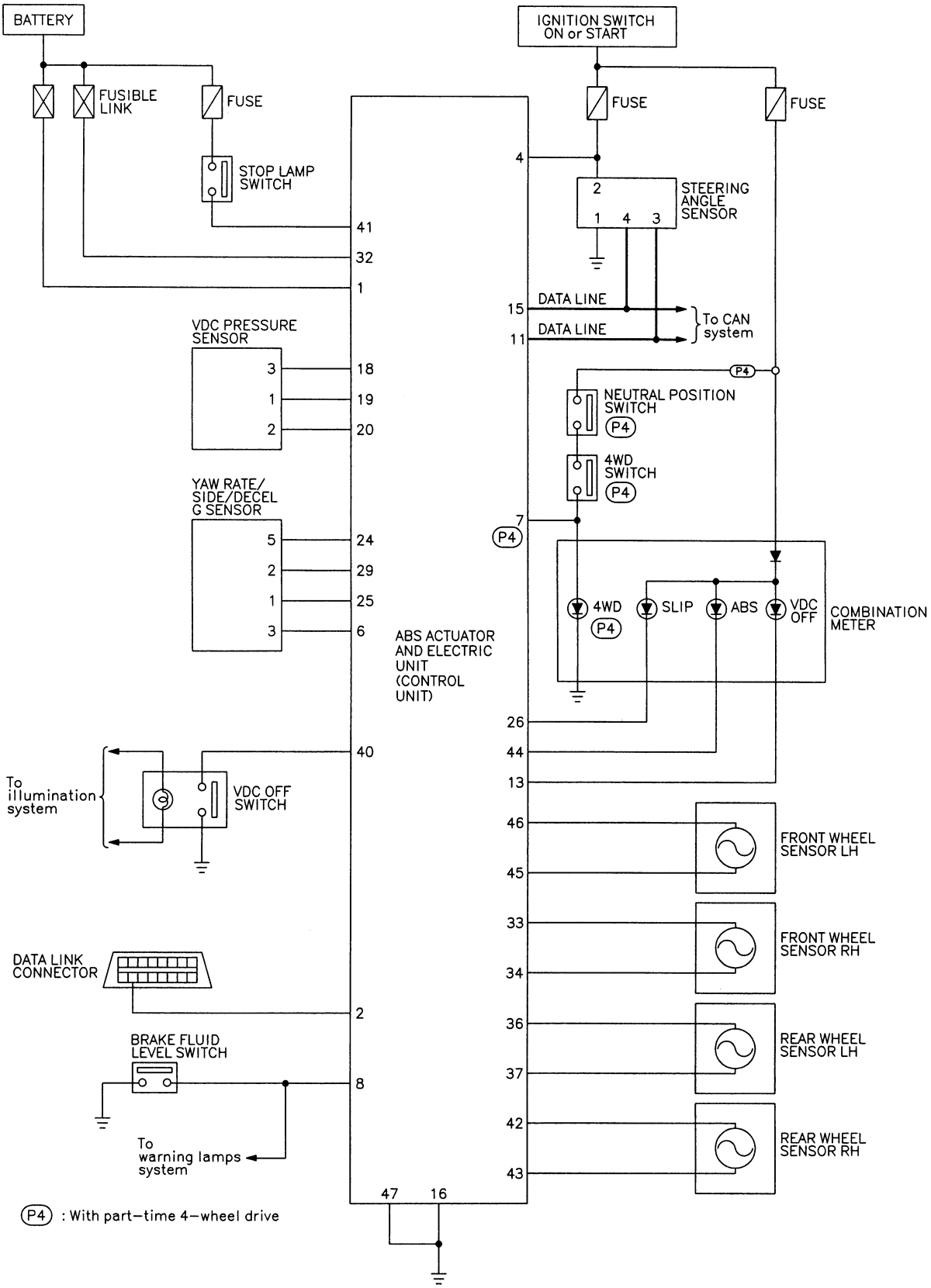




SBR114F

Schematic

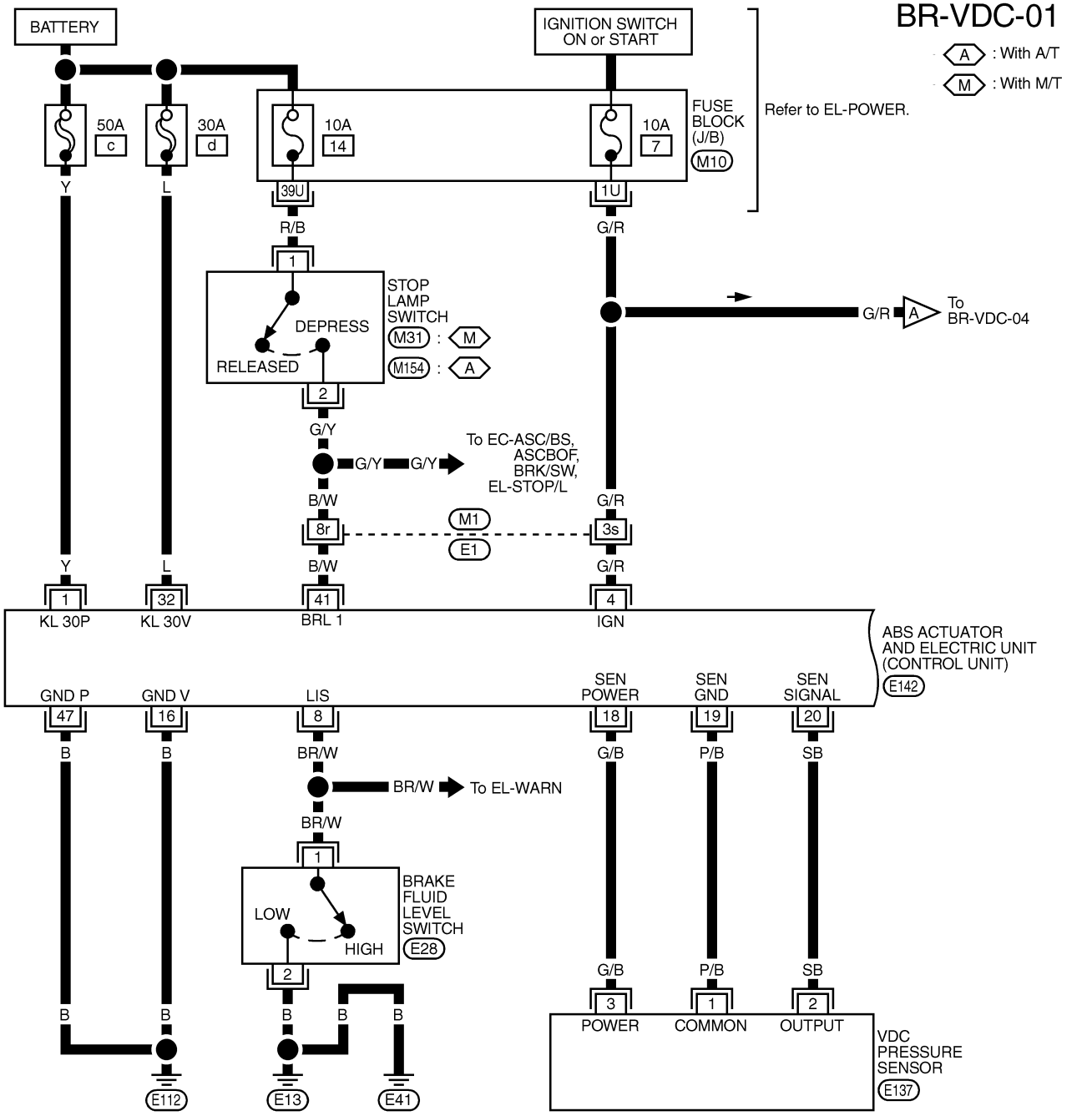
NABR0167

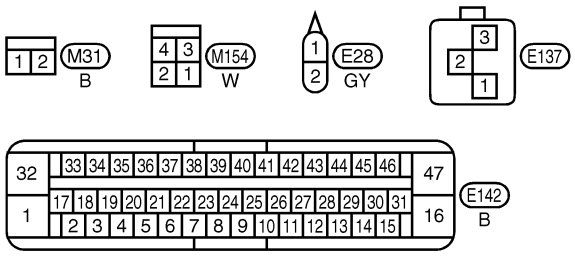


MBR627A

Wiring Diagram — VDC —

NABR0168



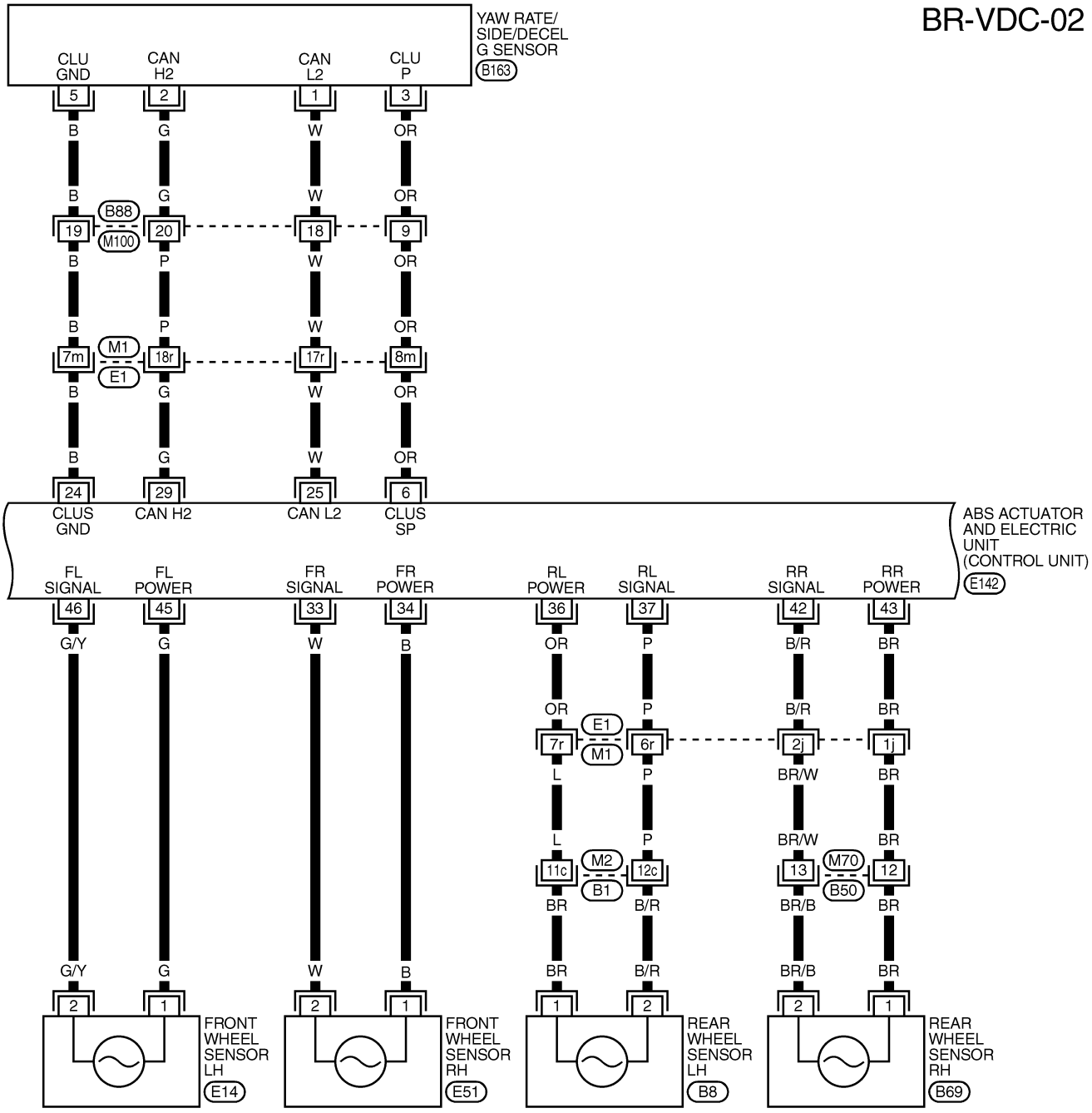


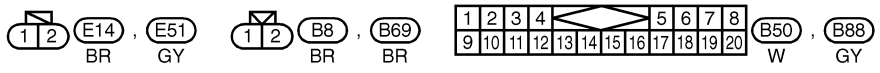
REFER TO THE FOLLOWING.
E1 -SUPER MULTIPLE JUNCTION (SMJ)
M10 -FUSE BLOCK-JUNCTION BOX (J/B)

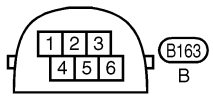
MBR628A

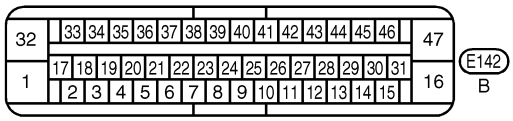
Wiring Diagram — VDC — (Cont'd)

BR-VDC-02





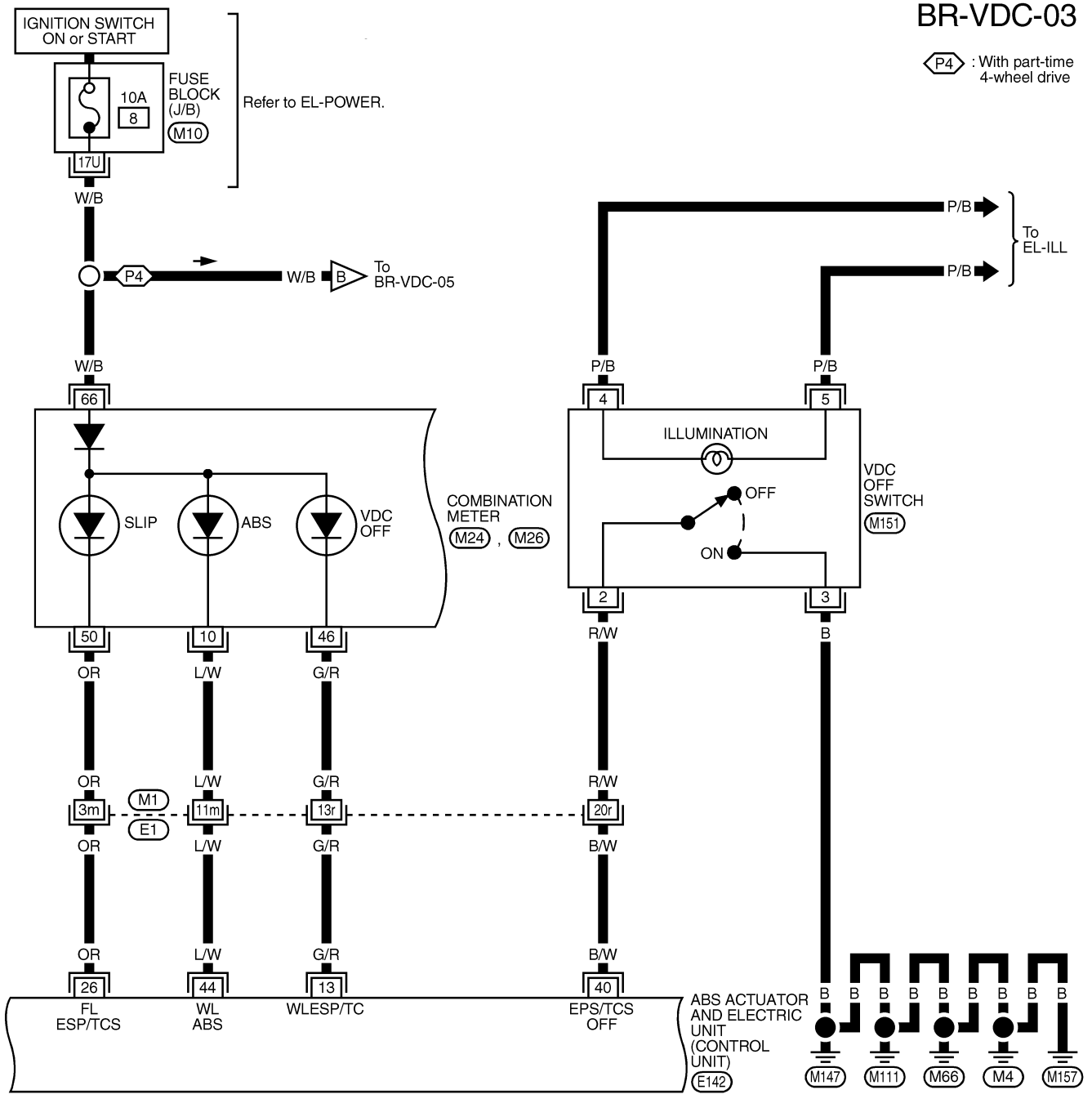


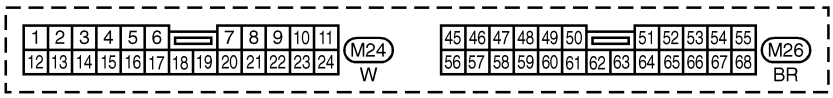


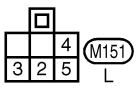
REFER TO THE FOLLOWING.
E1 , B1 -SUPER MULTIPLE JUNCTION (SMJ)

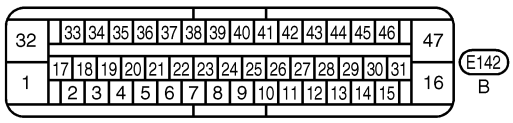
MBR629A

BR-VDC-03









REFER TO THE FOLLOWING.
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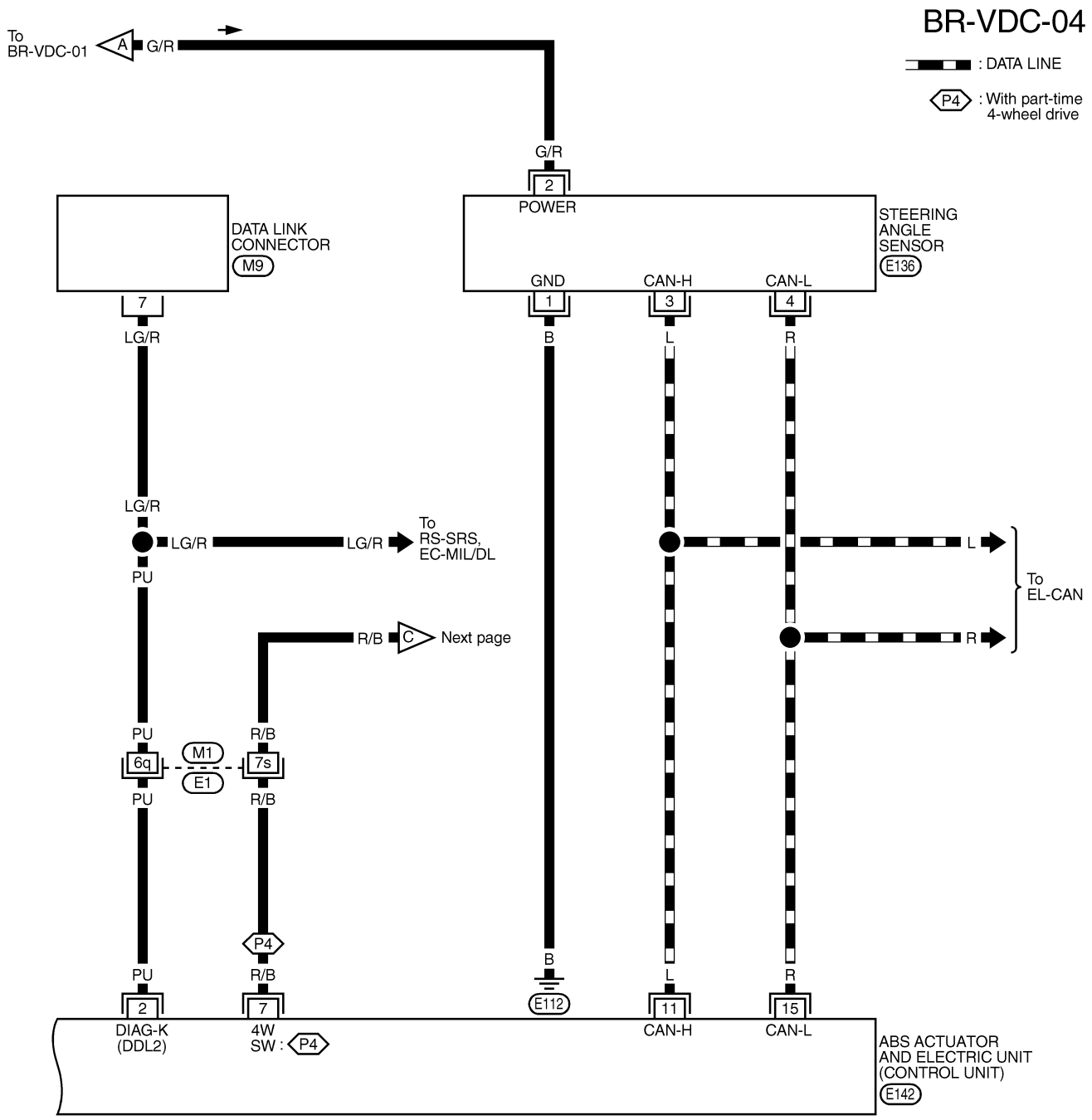
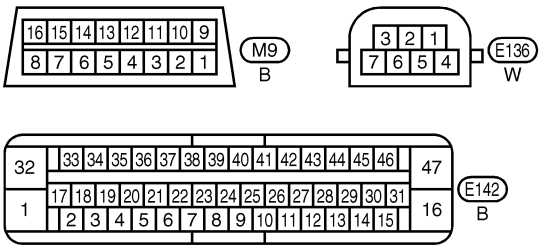
M10 -FUSE BLOCK-JUNCTION BOX (J/B)

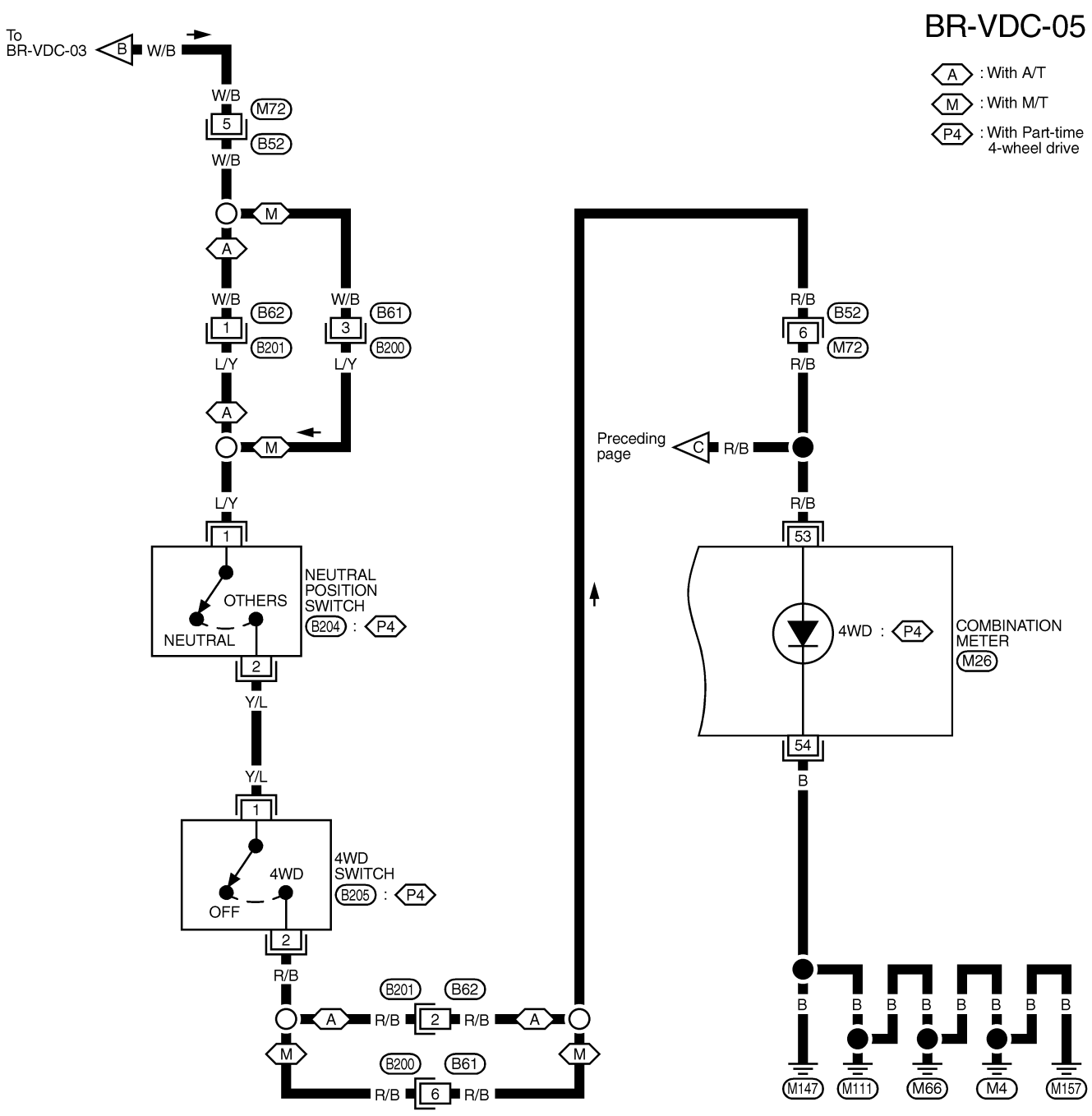
MBR630A

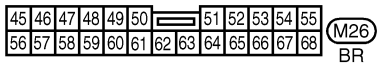


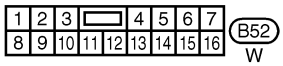


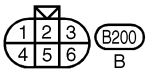
REFER TO THE FOLLOWING.
E1 -SUPER MULTIPLE JUNCTION (SMJ)

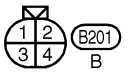
MBR631A


BR-VDC-05
A : With A/T
M : With M/T
P4 : With Part-time 4-wheel drive
To BR-VDC-03
B
W/B
M72
B52
M
A
B62
B201
B61
B200
L/Y
C
Preceding page
R/B
B52
M72
53
54
NEUTRAL POSITION SWITCH
B204 : P4
OTHERS
NEUTRAL
4WD SWITCH
B205 : P4
4WD
OFF
4WD : P4
COMBINATION METER
M26
Y/L
B
M147
M111
M66
M4
M157

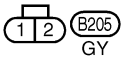

45 46 47 48 49 50 51 52 53 54 55
56 57 58 59 60 61 62 63 64 65 66 67 68
M26
BR


1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
B52
W


1 2 3
4 5 6
B200
B


1 2
3 4
B201
B


1
2
B204
B


1 2
B205
GY

MBR632A

Control Unit Input/Output Signal Standard

NABR0169

STANDARDS BY CONSULT-II

NABR0169S01

CAUTION:

Items displayed are data calculated by the control unit and may indicate normal operation even if output circuit (harness) is open or shorted.

Monitor item	Display content	Data monitor		Note: Error inspection checklist
		Condition	Reference value in normal operation	
GEAR	A/T gear position	Vehicle running	1 to 4	—
SLCT LVR POSI	A/T shift position	Select shift position	Shift position: P, R, N or D	Refer to AT section.
FR LH SENSOR FR RH SENSOR RR LH SENSOR RR RH SENSOR	Wheel speed	Vehicle stopped	0 [km/h (MPH)]	Wheel sensor circuit [Inspection 1] Refer to BR-119.
		Vehicle running (Note 1)	Almost in accordance with speedometer display (within ±10%)	
ACCEL POS SIG	Throttle actuator opening/closing is displayed (linked with accelerator pedal)	Accelerator pedal not depressed (ignition switch is ON)	0%	Communication circuit between ABS actuator and electric unit (control unit) and ECM
		Depress accelerator pedal (ignition switch is ON)	0 to 100%	
ENGINE SPEED·	With engine running	With engine stopped	0 rpm	Engine speed signal circuit
		Engine running	Almost in accordance with tachometer display	
STR ANGLE SIG	Steering angle detected by steering angle sensor	Straight-ahead	Approx. 0 deg	Steering angle sensor and circuit [Inspection 5] Refer to BR-123.
		Steering wheel turned	–756 to 756 deg	
YAW RATE SEN	Yaw rate detected by yaw rate sensor	Vehicle stopped	Approx. 0 d/s	Yaw rate sensor and circuit [Inspection 6] Refer to BR-124.
		Vehicle running	–100 to 100 d/s	
SIDE G-SENSOR	Transverse G detected by side G-sensor	Vehicle stopped	Approx. 0 m/s^2	Side G-sensor and circuit [Inspection 6] Refer to BR-124.
		Vehicle running	–16.7 to 16.7 m/s^2	
DECEL G-SEN	Longitudinal acceleration detected by Decel G-Sen	Vehicle stopped	Approx. 0 G	Decel G sensor and circuit
		During driving	±1.7 G	
PRESS SENSOR	Brake fluid pressure detected by pressure sensor	With ignition switch turned ON and brake pedal released	Approx. 0 bar	Pressure sensor and circuit [Inspection 4] Refer to BR-122.
		With ignition switch turned ON and brake pedal depressed	0 to 170 bar	
BATTERY VOLT	Battery voltage supplied to ABS actuator and electric unit (control unit)	Ignition switch ON	10 to 16V	ABS actuator and electric unit (control unit) power supply and ground circuits [Inspection 10] Refer to BR-130.

Monitor item	Display content	Data monitor		Note: Error inspection checklist
		Condition	Reference value in normal operation	
STOP LAMP SW	Brake pedal operation	Brake pedal depressed	ON	Stop lamp switch circuit [Inspection 9] Refer to BR-129.
		Brake pedal not depressed	OFF	
OFF SW	OFF switch ON/OFF status	VDC OFF switch ON (When VDC OFF indicator lamp is ON)	ON	VDC OFF switch circuit
		VDC OFF switch OFF (When VDC OFF indicator lamp is OFF)	OFF	
ABS WARN LAMP	ABS warning lamp ON condition (Note 2)	ABS warning lamp ON	ON	ABS warning lamp harness
		ABS warning lamp OFF	OFF	
MOTOR RELAY	Operation status of motor and motor relay	Ignition switch ON or engine running (ABS not operated)	OFF	ABS motor, motor relay, and motor circuit [Inspection 8] Refer to BR-128.
		Ignition switch ON or engine running (ABS operated)	ON	
ACTUATOR RLY	Actuator relay operation status	Vehicle stopped (Ignition switch ON)	OFF	ABS actuator relay and circuit [Inspection 8] Refer to BR-128.
		Vehicle stopped (Engine running)	ON	
OFF LAMP	VDC OFF indicator lamp status (Note 3)	When VDC OFF indicator lamp is ON	ON	VDC OFF indicator lamp circuit
		When VDC OFF indicator lamp is OFF	OFF	
SLIP LAMP	SLIP indicator lamp status (Note 4)	When SLIP indicator lamp is ON	ON	SLIP indicator lamp circuit
		When SLIP indicator lamp is OFF	OFF	
FR IN SOL FR OUT SOL RR IN SOL RR OUT SOL	Solenoid valve operation	Actuator (solenoid) is active ("ACTIVE TEST" with CONSULT-II) or actuator relay is inactive (in fail-safe mode).	ON	Solenoid and circuit [Inspection 7] Refer to BR-126.
		When actuator (solenoid) is not active and actuator relay is active (ignition switch ON).	OFF	
FLUID LEV SW	ON/OFF status of brake fluid level sensor	When brake fluid level sensor ON	ON	Brake fluid level sensor, brake warning lamp, and circuit [Inspection 13] Refer to BR-133.
		When brake fluid level sensor OFF	OFF	
EBD FAIL SIG ABS FAIL SIG TCS FAIL SIG VDC FAIL SIG	System fail signal status	Malfunctions condition (When system failed)	OFF	EBD system ABS system TCS system VDC system

Control Unit Input/Output Signal Standard (Cont'd)

Monitor item	Display content	Data monitor		Note: Error inspection checklist
		Condition	Reference value in normal operation	
CV1 CV2 SV1 SV2	VDC switch-over solenoid valve status	When the actuator (switch-over solenoid valve) is active ("Active test" with CONSULT-II) or the actuator relay is inactive (when fail-safe mode).	ON	Switch-over solenoid valve and circuit
		When the actuator (switch-over solenoid valve) is inactive or the actuator relay is active (ignition switch ON).	OFF	

Note 1: Confirm tire pressure is normal.

Note 2: ON/OFF timing of ABS warning lamp

ON: For approximately 1 seconds after ignition switch is turned ON, or when a malfunction is detected.

OFF: Approximately 1 seconds after ignition switch is turned ON (when system is in normal operation) and VDC/TCS function is not activated.

(Note 3): ON/OFF timing of VDC OFF indicator lamp

ON: For approximately 1 seconds after ignition switch is turned ON, or when a malfunction is detected and VDC OFF switch is ON.

OFF: Approximately 1 seconds after ignition switch is turned ON (when system is in normal operation.) And when VDC OFF switch is OFF.

Note 4: SLIP indicator lamp ON/OFF timing

ON: For approximately 1 seconds after ignition switch is turned ON, or when a malfunction is detected and VDC/TCS function is activated while driving.

OFF: Approximately 1 seconds after ignition switch is turned ON (when system is in normal operation) and VDC/TCS function is not activated.

Flashing: VDC/TCS function is active during driving

CONSULT-II Functions

NABR0170

CONSULT-II MAIN FUNCTION

NABR0170S01

In a diagnosis function (main function), there are "WORK SUPPORT", "SELF-DIAGNOSTIC RESULTS", "DATA MONITOR", "CAN DIAG SUPPORT MNTR", "ACTIVE TEST", "FUNCTION TEST", "ECU PART NUMBER".

Diagnostic test mode	Function	Reference
WORK SUPPORT	This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT-II.	Refer to BR-87.
SELF-DIAGNOSTIC RESULTS	Self-diagnostic results can be read and erased quickly.	Refer to BR-108.
DATA MONITOR	Input/Output data in the ABS actuator and electric unit (control unit) can be read.	Refer to BR-111.
CAN DIAG SUPPORT MNTR	The results of transmit/receive diagnosis of communication can be read.	—
ACTIVE TEST	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ABS actuator and electric unit (control unit) and also shifts some parameters in a specified range.	Refer to BR-114.

Diagnostic test mode	Function	Reference
FUNCTION TEST	Conducted by CONSULT-II instead of a technician to determine whether each system is "OK" or "NG".	—
ECU PART NUMBER	ABS actuator and electric unit (control unit) part number can be read.	—

SELF-DIAGNOSIS

=NABR0170S02

Description

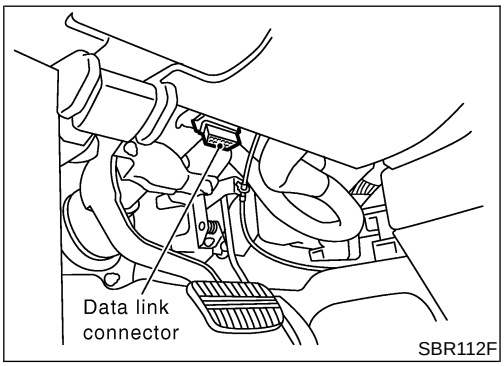
NABR0170S0201

If a malfunction is detected in system, ABS warning lamp, VDC OFF indicator lamp, and SLIP indicator lamp on meter turn on. In this case, perform self-diagnosis as follows:

Operation Procedure

NABR0170S0202

1. Perform Refer to BR-118 using information from customer.



2. After ignition switch is turned OFF, connect CONSULT-II and CONSULT-II CONVERTER to data link connector (data link connector is on lower instrument cover).
3. Start engine and drive at approximately 30 km/h (19 MPH) for approximately 1 minute.
4. After stopping vehicle, with engine still idling, touch "START", "ABS", and "SELF-DIAG RESULTS" on CONSULT-II screen in this order.

CAUTION:

Just after starting engine, or turning ignition switch ON, "ABS" may not be displayed on system selection screen even if "START" is touched. In this case, start self-diagnosis again from step 2. If it cannot be shown after several attempts, VDC/TCS/ABS control unit may have malfunctioned. Repair or replace control unit.

5. Self-diagnosis result is displayed. (If necessary, touch "PRINT" to print self-diagnosis result.)

- When "NO FAILURE" is shown, check ABS warning lamp, VDC OFF indicator lamp, SLIP indicator lamp. Refer to BR-116.
- CONSULT-II self-diagnosis results are displayed without regard to occurrence timing. In some cases later ones (timing value is small) appear on next screen.

6. Go to appropriate "Inspection" chart according to "Display Item List", and repair or replace as necessary.
7. Start engine and drive at approximately 30 km/h (19 MPH) for approximately 1 minute.

CAUTION:

Check again to make sure that there is no malfunction on other parts.

8. Turn ignition switch OFF to prepare for erasing memory.
9. Start engine and touch "START", "ABS", "SELF-DIAGNOSIS RESULTS", and "ERASE MEMORY" on CONSULT-II screen in this order to erase memory.

CAUTION:

If memory cannot be erased, go to step 6.

10. Drive vehicle at approximately 30 km/h (19 MPH) and check that ABS warning lamp, VDC OFF indicator lamp, and SLIP indicator lamp stay off.

Display Item List

NABR0170S0203

Malfunction system	Malfunction detecting condition	Check system
FR LH SENSOR-1	Circuit of front LH wheel sensor is open	Wheel sensor and circuit [Inspection 1] Note 1 Refer to BR-119.
RR RH SENSOR-1	Circuit of rear RH wheel sensor is open	
FR RH SENSOR-1	Circuit of front RH wheel sensor is open	
RR LH SENSOR-1	Circuit of rear LH wheel sensor is open	
FR LH SENSOR-2	Circuit of front LH wheel sensor is shorted, or sensor power voltage is unusual. Control unit cannot identify sensor pulses, because of large gap between wheel sensor and sensor rotor.	
RR RH SENSOR-2	Circuit of rear RH wheel sensor is shorted, or sensor power voltage is unusual. Control unit cannot identify sensor pulses, because of large gap between wheel sensor and sensor rotor.	
FR RH SENSOR-2	Circuit of front RH wheel sensor is shorted, or sensor power voltage is unusual. Control unit cannot identify sensor pulses, because of large gap between wheel sensor and sensor rotor.	
RR LH SENSOR-2	Circuit of rear LH wheel sensor is shorted, or sensor power voltage is unusual. Control unit cannot identify sensor pulses, because of large gap between wheel sensor and sensor rotor.	
STOP LAMP SW	Stop lamp switch circuit is open.	Stop lamp switch and circuit [Inspection 9] Refer to BR-129.
PRESS SEN CIRCUIT	VDC pressure sensor signal line is open or shorted, or VDC pressure sensor is malfunctioning.	VDC pressure sensor and circuit [Inspection 4] Refer to BR-122.
ST ANGLE SEN CIRCUIT	Neutral position of steering angle sensor is dislocated, or steering angle sensor is malfunctioning.	Steering angle sensor and circuit [Inspection 5] Refer to BR-123.
YAW RATE SENSOR	Yaw rate sensor has generated an error, or yaw rate sensor signal line is open or shorted.	Yaw rate/Side G-sensor and circuit [Inspection 6] Refer to BR-124.
FR LH IN ABS SOL	Circuit of front LH IN ABS solenoid is open or shorted, or control line is open or shorted to power supply or ground.	Solenoid and circuit [Inspection 7] Refer to BR-126.
FR LH OUT ABS SOL	Circuit of front LH OUT ABS solenoid is open or shorted, or control line is open or shorted to power supply or ground.	
RR RH IN ABS SOL	Circuit of rear RH IN ABS solenoid is open or shorted, or control line is open or shorted to power supply or ground.	
RR RH OUT ABS SOL	Circuit of rear RH OUT ABS solenoid is open or shorted, or control line is open or shorted to power supply or ground.	
FR RH IN ABS SOL	Circuit of front RH IN ABS solenoid is open or shorted, or control line is open or shorted to power supply or ground.	
FR RH OUT ABS SOL	Circuit of front RH OUT ABS solenoid is open or shorted, or control line is open or shorted to power supply or ground.	
RR LH IN ABS SOL	Circuit of rear LH IN ABS solenoid is open or shorted, or control line is open or shorted to power supply or ground.	
RR LH OUT ABS SOL	Circuit of rear LH OUT ABS solenoid is open or shorted, or control line is open or shorted to power supply or ground.	

CONSULT-II Functions (Cont'd)

Malfunction system	Malfunction detecting condition	Check system
CV1	Front side of VDC switch-over solenoid valve (cut valve) is open circuit or shorted, or the control line is open or shorted to the power supply or the ground.	VDC switch-over valve and circuit [Inspection 7] Refer to BR-126.
CV2	Rear side of VDC switch-over solenoid valve (cut valve) is open circuit or sorted, or the control line is open or shorted to the power supply or the ground.	
SV1	Front side of VDC switch-over solenoid valve (suction valve) is open circuit or shorted, or the control line is open or shorted to the power supply or the ground.	
SV2	Rear side of VDC switch-over solenoid valve (suction valve) is open circuit or shorted, or the control line is open or shorted to the power supply or the ground.	
PUMP MOTOR (note)	During actuator motor operation with ON, when actuator motor turns OFF or when control line for actuator motor relay is open.	Actuator motor, motor relay, and circuit [Inspection 8] Refer to BR-128.
	During actuator motor operation with OFF, when actuator motor turns ON or when control line for relay is shorted to ground.	
LOW POWER VOLTAGE	ABS actuator and electric unit (control unit) power voltage is too low.	ABS actuator and electric unit (control unit) power supply and ground circuits [Inspection 10] Refer to BR-130.
ST ANGLE SEN SIGNAL	Neutral position correction of steering angle sensor is not finished.	Neutral position adjustment of steering angle sensor [Inspection 12] Refer to BR-133.
ST ANG SEN COM CIR	CAN communication line or steering angle sensor has generated an error.	Steering angle sensor and CAN communication line [Inspection 14] Refer to BR-134.
SIDE G-SEN CIRCUIT	Side G-sensor is malfunctioning, or signal line of side G-sensor is open or shorted.	Yaw rate/Side G-sensor and circuit [Inspection 6] Refer to BR-124.
CONTROLLER FAILURE	Internal malfunction of ABS actuator and electric unit (control unit)	ABS actuator and electric unit (control unit) [Inspection 3] Refer to BR-121.
CAN COMM CIRCUIT	• CAN communication line is open or shorted. • ABS actuator and electric unit (control unit) internal malfunction • Battery voltage for EMC is suddenly interrupted for approximately 0.5 seconds or more.	Communication line between ABS actuator and electric unit (control unit) and other control units [Inspection 14] Note 2 Refer to BR-134.
BR FLUID LEVEL LOW	• Brake fluid level drops or communication line between ABS actuator and electric unit (control unit) and brake fluid level sensor is open or shorted.	• Communication line between ABS actuator and electric unit (control unit) and brake fluid sensor, and brake warning lamp • Reservoir tank fluid level [Inspection 13] Refer to BR-133.
VARIANT CODING	• V coding is not functioning.	The ABS actuator and electric unit (control unit) and circuit

Note 1. If wheel sensor 2 for each wheel is indicated, check control unit power supply voltage in addition to wheel sensor circuit check.

Note 2. If multiple malfunctions are detected including CAN communication line [U1000], perform diagnosis for CAN communication line first.

DATA MONITOR

NABR0170S03

- For details of data monitor function, refer to "CONSULT-II Instruction Manual".

Operation Procedure

NABR0170S0301

1. Turn ignition switch OFF.
2. Connect CONSULT-II to DDL2 data link connector.
3. Turn ignition switch ON.
4. Touch "START" on display.
5. Touch "ABS" on display.

NOTE:
Just after starting engine, or turning ignition switch ON, "ABS" may not be displayed on system selection screen even if "START" is touched. In this case, start self-diagnosis again from step 2.

6. Touch "DATA MONITOR".
7. Return to monitor item selection screen, and touch any of "CONTROL UNIT INPUT ITEM", "MAIN ITEM" or "ITEM MENU SELECTION". Refer to BR-112.
8. Touch "START".
9. Screen of data monitor is displayed.

Display Item List

=NABR0170S0302

Item (Unit)	Monitor item selection			Remarks
	ECU input signals	Main item (Monitor item selector)	Selection from menu	
GEAR	×	×	×	Gear position judged by PNP switch signal is displayed.
FR RH SENSOR (km/h (MPH))	×	×	×	Wheel speed calculated by front RH wheel sensor signal is displayed.
FR LH SENSOR (km/h (MPH))	×	×	×	Wheel speed calculated by front LH wheel sensor signal is displayed.
RR RH SENSOR (km/h (MPH))	×	×	×	Wheel speed calculated by rear RH wheel sensor signal is displayed.
RR LH SENSOR (km/h (MPH))	×	×	×	Wheel speed calculated by rear LH wheel sensor signal is displayed.
BATTERY VOLT (V)	×	×	×	Voltage supplied to ABS actuator and electric unit (control unit) is displayed.
SLCT LVR POSI	×	×	×	Shift position judged by PNP switch signal.
ACCEL POS SIG (%)	×	—	×	Throttle actuator opening/closing status judged by CAN communication signal is displayed.
ENGINE SPEED (rpm)	×	×	×	Engine speed judged by CAN communication signal is displayed.
STR ANGLE SIG (deg)	×	—	×	Steering angle detected by steering angle sensor is displayed.
YAW RATE SEN (d/s)	×	×	×	Yaw rate detected by yaw rate sensor is displayed.
SIDE G-SENSOR (m/s^2)	×	—	×	Transverse acceleration detected by side G-sensor is displayed.
PRESS SENSOR (bar)	×	—	×	Brake fluid pressure detected by pressure sensor is displayed.
STOP LAMP SW (ON/OFF)	×	×	×	Stop lamp switch (ON/OFF) status is displayed.
OFF SW (ON/OFF)	×	×	×	VDC OFF switch (ON/OFF) status is displayed.
ABS WARN LAMP (ON/OFF)	—	×	×	ABS warning lamp (ON/OFF) status is displayed.
SLIP LAMP (ON/OFF)	—	×	×	SLIP indicator lamp (ON/OFF) status is displayed.
FR LH IN SOL (ON/OFF)	—	×	×	Front LH IN ABS solenoid (ON/OFF) status is displayed.
FR LH OUT SOL (ON/OFF)	—	×	×	Front LH OUT ABS solenoid (ON/OFF) status is displayed.
RR RH IN SOL (ON/OFF)	—	×	×	Rear RH IN ABS solenoid (ON/OFF) status is displayed.

Item (Unit)	Monitor item selection			Remarks
	ECU input signals	Main item (Monitor item selector)	Selection from menu	
RR RH OUT SOL (ON/OFF)	—	×	×	Rear RH OUT ABS solenoid (ON/OFF) status is displayed.
FR RH IN SOL (ON/OFF)	—	×	×	Front RH IN ABS solenoid (ON/OFF) status is displayed.
FR RH OUT SOL (ON/OFF)	—	×	×	Front RH OUT ABS solenoid (ON/OFF) status is displayed.
RR LH IN SOL (ON/OFF)	—	×	×	Rear LH IN ABS solenoid (ON/OFF) status is displayed.
RR LH OUT SOL (ON/OFF)	—	×	×	Rear LH OUT ABS solenoid (ON/OFF) status is displayed.
OFF LAMP (ON/OFF)	—	×	×	OFF Lamp (ON/OFF) status is displayed.
MOTOR RELAY (ON/OFF)	—	×	×	ABS motor relay (ON/OFF) status is displayed.
ACTUATOR RLY	—	×	×	ABS actuator relay (ON/OFF) status is displayed.
DECEL G-SEN	×	×	×	
FLUID LEV SW (ON/OFF)	×	—	—	Brake fluid level sensor (ON/OFF) status is displayed.

×: Applicable
—: Not applicable

ACTIVE TEST

=NABR0170S04

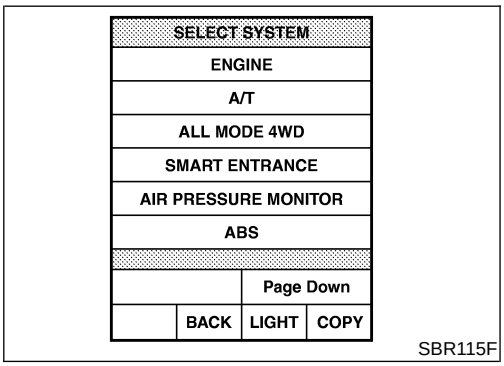
Operation Procedure

NABR0170S0401

CAUTION:

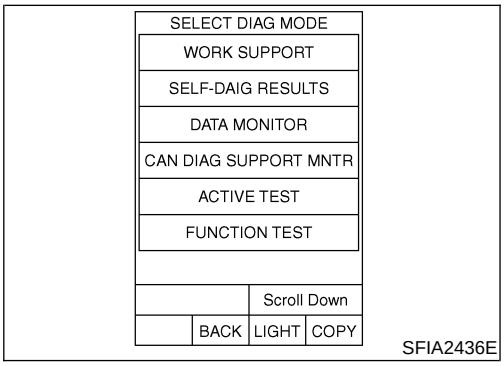
- **Do not perform active test while driving the vehicle.**
- **Make sure to completely bleed air from brake system.**
- **Active test cannot be performed when ABS warning lamp is on.**

1. Connect the CONSULT-II connector to the vehicle-side data link connector and start the engine.
2. Touch "START" on the display.



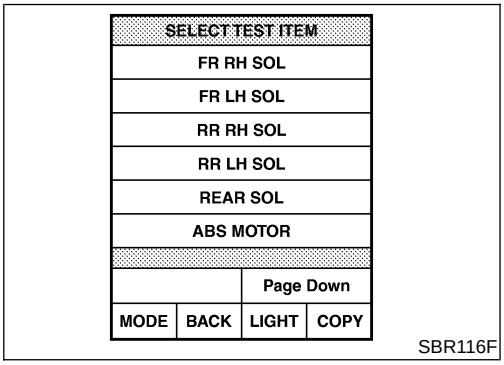
SBR115F

3. Touch "ABS" and "ACTIVE TEST".



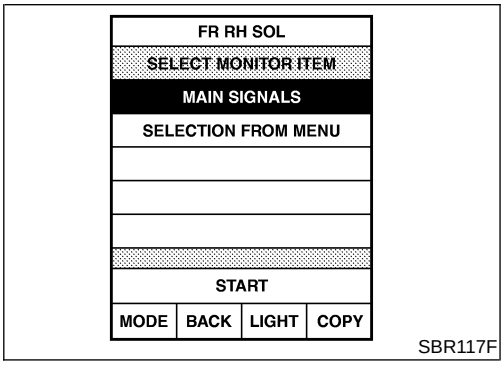
SFIA2436E

4. Test item selection screen is displayed.
5. Touch necessary test item.

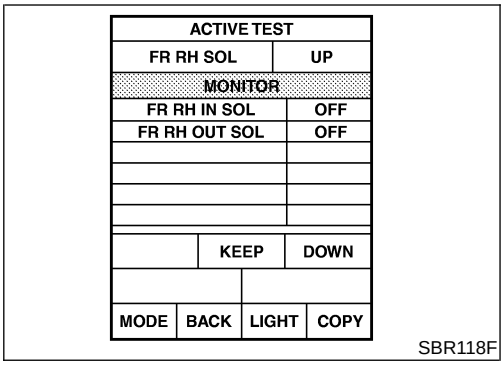


SBR116F

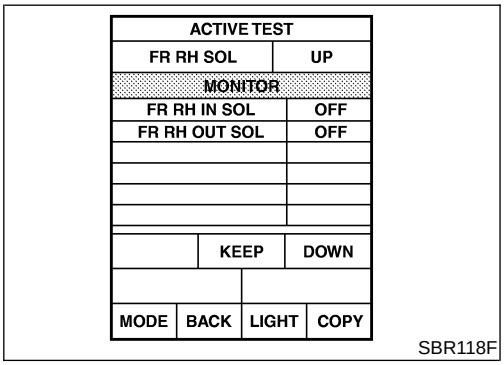
6. Touch "START" with "MAIN SIGNALS" line inverted.



SBR117F



SBR118F



SBR118F

7. Active test screen is displayed.

Solenoid Valve

NABR0170S0402

1. To perform active test of ABS functions, select major items for each test item. To perform active test of VDC/TCS functions, select item menu for each test item.
2. For ABS solenoid valve, touch "UP", "KEEP", and "DOWN". For ABS solenoid valve (ACT), touch "UP," "ACT UP," and "ACT KEEP". Use screen monitor to check that solenoid valve operates as shown in Solenoid Valve Operation Chart. Refer to "Solenoid Valve Operation Chart".

Solenoid Valve Operation Chart

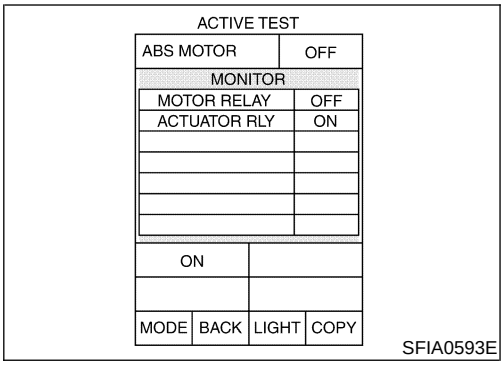
NABR0170S0403

Operation		ABS solenoid valve			ABS solenoid valve (ACT)		
		UP	KEEP	DOWN	UP	ACT UP	ACT KEEP
Front RH ABS S/V	FR RH IN SOL	OFF	ON	ON	OFF	OFF	OFF
	FR RH OUT SOL	OFF	OFF	ON*	OFF	OFF	OFF
Front LH ABS S/V	FR LH IN SOL	OFF	ON	ON	OFF	OFF	OFF
	FR LH OUT SOL	OFF	OFF	ON*	OFF	OFF	OFF
Rear RH ABS S/V	RR RH IN SOL	OFF	ON	ON	OFF	OFF	OFF
	RR RH OUT SOL	OFF	OFF	ON*	OFF	OFF	OFF
Rear LH ABS S/V	RR LH IN SOL	OFF	ON	ON	OFF	OFF	OFF
	RR LH OUT SOL	OFF	OFF	ON*	OFF	OFF	OFF

*: ON for 1 to 2 seconds after the touch, and then OFF

NOTE:

- If active test is performed with brake pedal depressed, pedal stroke may change. This is normal.
- "TEST STOP" is displayed approximately 10 seconds after operation starts.
- After "TEST STOP" is displayed, to perform test again, repeat step 6.



SFIA0593E

ABS Motor

NABR0170S0404

Touch "ON" and "OFF" on the screen. Check that ABS motor relay operates as shown in table below.

Operation	ON	OFF
ACTUATOR RLY	ON	ON
MOTOR RELAY	ON	OFF

NOTE:

- If active test is performed with brake pedal depressed, pedal stroke may change. This is normal.
- "TEST STOP" is displayed approximately 10 seconds after operation starts.

For Fast and Accurate Diagnosis

NABR0171

PRECAUTIONS FOR DIAGNOSIS

NABR0171S01

- Before performing diagnosis, always read General Information (GI) to confirm general precautions.
- If ABS actuator and electric unit (control unit), steering angle sensor, steering system parts, suspension system parts, or tires have been replaced, or if alignment has been adjusted, be sure to adjust neutral position of steering angle sensor before driving.
- When replacing ABS actuator and electric unit (control unit), be sure labels on control units are the same color.
- After diagnosis is finished, be sure to erase memory. Refer to BR-108.
- When checking continuity and voltage between units, be sure to check for disconnection, looseness, bend, or collapse of connector terminals. If any non-standard condition is found, repair or replace connector terminals.
- For intermittent symptoms, possible cause is malfunction in harness, harness connector, or terminals. Move harness, harness connector, and terminals to check for poor connections.
- If a circuit tester is used for the check, be careful not to forcibly extend any connector terminal.
- To use CONSULT-II to perform self-diagnosis of ABS actuator and electric unit (control unit), active tests, or work support, first stop work, then connect CONSULT-II and select "ABS".
- CONSULT-II self-diagnosis results are displayed without regard to occurrence timing. In some cases later ones (timing value is small) appear on the next screen.
- While self-diagnosis results of CONSULT-II shows an error, if CONSULT-II active test is performed, an engine system error may be indicated. In this case, start engine to resume the normal screen.
- VDC/TCS/ABS system electronically controls brake operation and engine output. The following symptoms may be caused by normal operations:

Symptom	Symptom description	Result
Motor operation noise	This is noise of motor inside VDC/TCS/ABS actuator. Slight noise may occur during VDC, TCS, and ABS operation.	Normal
	When the vehicle speed goes over 20 km/h (12 MPH), motor and valve operating noise may be heard. It happens only once after turning ignition switch ON. This is a normal status of the system operation check.	

Symptom	Symptom description	Result
System operation check noise	When the engine starts, slight "click" noise may be heard from engine compartment. This is normal and is part of system operation check.	Normal
VDC/TCS operation (SLIP lamp ON)	TCS may activate momentarily if wheel speed changes when driving over location where friction coefficient varies, when downshifting, or when fully depressing accelerator pedal.	Normal Cancel the VDC/TCS function for the inspection on a chassis dynamometer.
	For inspection of speedometer or other instruments, press VDC OFF SW to turn VDC/TCS function off.	
	When accelerator pedal is depressed on a chassis dynamometer (fixed front-wheel type), vehicle speed will not increase. This is not normal. It is result of TCS being activated by stationary front wheels. Warning lamp may also illuminate to indicate "sensor system error". This is also normal, and is the result of the stationary front wheels being detected. To be certain, restart engine, and drive vehicle at 30 km/h or above. Check that warning lamp does not illuminate.	
ABS operation (Longer stopping distance)	On roads with low friction coefficients, such as snowy roads or gravel roads, vehicles with ABS may require a longer stopping distance. Therefore, when driving on such roads, avoid overconfidence and keep speed sufficiently low.	Normal
Insufficient feeling of acceleration	Depending on road conditions, driver may feel that feeling of acceleration is insufficient. This is because traction control, which controls the engine and brakes to achieve optimal traction, has the highest priority (for safety). As a result, there may be times when acceleration is slightly less than usual for the same accelerator pedal operation.	Normal

ON and OFF Timing for ABS Warning Lamp, VDC OFF Indicator Lamp, and SLIP Indicator Lamp

NABR0171S0101

×: ON —: OFF

Condition	ABS warning lamp	VDC OFF indicator lamp	SLIP indicator lamp	Remarks
Ignition SW OFF	—	—	—	—
For Approx. 1 seconds after ignition SW is turned ON	×	×	×	—
Approx. 1 seconds after ignition switch ON	—	—	—	Turns OFF 2 seconds after engine starts.
VDC OFF SW is turned ON. (VDC function is OFF.)	—	×	—	—
There is a VDC/TCS/ABS error.	×	×	×	—
	×	×	×	There is a ABS actuator and electric unit (control unit) error. (Power or ground malfunction)
When VDC/TCS is not functioning normally.	—	×	×	—

Basic Inspection

NABR0172

BASIC INSPECTION 1: BRAKE FLUID LEVEL AND LEAK INSPECTION

NABR0172S01

1. Check fluid level in the brake reservoir tank. If fluid level is low, refill the brake fluid.
2. Check for leakage in brake piping and around VDC/TCS/ABS actuator. If leakage or seepage is found, check as follows.

- If VDC/TCS/ABS actuator connector is loose, tighten piping to specified torque. Then inspect again and confirm that there is no leakage.
- If connection flare nuts or screws of VDC/TCS/ABS actuator are damaged, replace damaged parts. Then inspect again and confirm that there is no leakage.
- If there is leakage or seepage at any location other than VDC/TCS/ABS actuator connections, wipe away leakage or seepage with clean cloth. Then inspect again and confirm that there is no leakage.
- If there is leakage from VDC/TCS/ABS actuator, wipe away leakage or seepage with clean cloth. Then inspect again. If there is leakage or seepage, replace VDC/TCS/ABS actuator unit.

CAUTION:

ABS actuator body cannot be disassembled.

3. Check brake disc rotor and pads.

BASIC INSPECTION 2: INSPECTION FOR LOOSENESS OF POWER SYSTEM TERMINALS

NABR0172S02

Check battery for looseness on the battery positive/negative terminals and ground connection. If looseness is detected, tighten the piping to the specified torque. Check that the battery voltage does not drop and the alternator is normal.

BASIC INSPECTION 3: INSPECTION OF ABS WARNING LAMP, VDC OFF INDICATOR LAMP AND SLIP INDICATOR LAMP

NABR0172S03

1. Check that ABS warning lamp illuminates for approximately 1 seconds when ignition switch is turned ON. If it does not illuminate, inspect ABS warning lamp and circuit, and inspect combination meter.
2. Check that VDC OFF indicator lamp illuminates for approximately 1 seconds when ignition switch is turned ON. If it does not illuminate, inspect VDC OFF indicator lamp and circuit, and inspect combination meter.
3. Check that SLIP indicator lamp illuminates for approximately 1 seconds when ignition switch is turned ON. If it does not turn on, check SLIP indicator lamp and circuit.
4. With engine running, turn VDC OFF switch ON and OFF. Check that VDC OFF indicator lamp turns ON and OFF. If indicator lamp does not turn ON and OFF according to switch operation, inspect VDC OFF switch and circuit.

Inspection 1 Wheel Sensor System

NABR0173

INSPECTION PROCEDURE

NABR0173S01

First use CONSULT-II self-diagnosis results to determine positions of malfunctioning wheel sensors. Then inspect parts and determine which parts to replace.

1	STARTING INSPECTION

Perform self-diagnosis.

SELF-DIAG RESULTS	
DTCRESULTS	TIME
RR RH SENSOR-1 [C1101]	0

SFIA0625E

OK or NG

OK	▶	Inspection is completed.
NG	▶	GO TO 2.

2	CHECKING CONNECTOR

Disconnect control unit connector E142 and connector E14 (FR-LH), E51 (FR-RH), B8 (RR-LH), B69 (RR-RH) of wheel sensor where malfunction was detected. Check for deformation of terminals and incomplete joining of connectors. Then reconnect connector. Also check that interference with other parts has not cut wheel sensor cables.

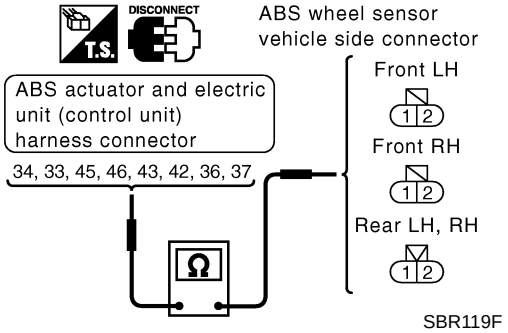
Drive vehicle at 30 km/h (19 MPH) or above for at least 1.0 minute. Did ABS warning lamp turn OFF?

YES	▶	Inspection is completed.
NO	▶	GO TO 3.

3	CHECKING WHEEL SENSOR CIRCUIT

1. Disconnect control unit connector E142.
2. Disconnect wheel sensor connector E14 (FR-LH), E51 (FR-RH), B8 (RR-LH), B69 (RR-RH).
3. Check resistance between terminals. (Check resistance when steering wheel is turned right and left, and when sensor harness inside wheel house is moved.)

	Power system		Signal system		GND system
Wheel	Control unit	Wheel sensor	Control unit	Wheel sensor	Control unit
Front RH wheel	34 (B)	1 (B)	33 (W)	2 (W)	16 (B), 47 (B)
Front LH wheel	45 (G)	1 (G)	46 (G/Y)	2 (G/Y)	
Rear RH wheel	43 (BR)	1 (BR)	42 (B/R)	2 (BR/B)	
Rear LH wheel	36 (OR)	1 (BR)	37 (P)	2 (B/R)	



SBR119F

Resistance value
Power system: 0 - 0.5 Ω
Signal system: 0 - 0.5 Ω
GND system: ∞Ω

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair harness and connectors between control unit and wheel sensor.

4	TIRE INSPECTION

Check air pressure, wear, and size.

Are air pressure, wear, and size within standards?

YES	▶	GO TO 5.
NO	▶	Adjust air pressure or replace tire.

5	SENSOR ROTOR INSPECTION

Check for damage to sensor rotor teeth and surface of rubber.

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace sensor rotor.

6	POWER SUPPLY CHECK FOR CONTROL UNIT SENSOR

1. Disconnect wheel sensor connector E14 (FR-LH), E51 (FR-RH), B8 (RR-LH), B69 (RR-RH).
2. Check voltage between wheel sensor harness connector E14 terminal 1 (G), E51 terminal 1 (B), B8 terminal 1 (BR), B69 terminal 1 (BR) and ground.
   Voltage: 8V or more

OK	▶	Replace wheel sensor.
NG	▶	Replace control unit.

Inspection 2 Engine System

NABR0174

Inspection Procedure

1	CHECKING SELF-DIAGNOSIS RESULTS (1)	
Check self-diagnosis results.		
Self-diagnosis results CONSULT-II display items Engine system 2 Engine system 3 Engine system 4 Engine system 5 Engine system 6		
MTBL1338		
Do self-diagnosis results indicate anything other than the above?		
YES	▶	Perform repair or replacement for the item indicated.
NO	▶	GO TO 2.

2	CHECKING SELF-DIAGNOSIS RESULTS (2)	
1. Perform ECM self-diagnosis. Repair or replace items indicated, then perform ECM self-diagnosis again. 2. Perform ABS actuator and electric unit (control unit) self-diagnosis again.		
OK or NG		
OK	▶	Inspection is completed.
NG	▶	Repair or replace the items indicated. Then perform self-diagnosis again.

Inspection 3 VDC/TCS/ABS Control Unit System

NABR0176

Inspection Procedure

1	CHECKING SELF-DIAGNOSIS RESULTS	
Check self-diagnosis results.		
Self-diagnosis results CONSULT-II display items ABS controller		
MTBL1339		
Does anything other than “ABS CONTROLLER” appear on self-diagnosis display?		
YES	▶	Repair or replace the items indicated. Then perform self-diagnosis again.
NO	▶	Replace ABS actuator and electric unit (control unit). Then perform ABS actuator and electric unit (control unit) self-diagnosis again.

Inspection 4 VDC Pressure Sensor System

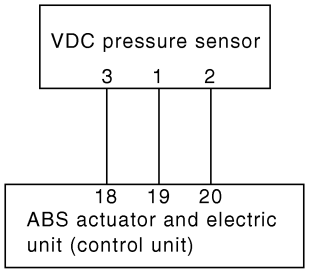
NABR0177

Inspection Procedure

1	CHECKING SELF-DIAGNOSIS RESULTS (1)

Check self-diagnosis results.

Self-diagnosis results
CONSULT-II display items
Pressure sensor system



SBR120F

Does “PRESSURE SENSOR” appear on self-diagnosis display?

YES	▶	GO TO 2.
NO	▶	Inspection is completed.

2	CHECKING SELF-DIAGNOSIS RESULTS (2)

1. Disconnect VDC pressure sensor connector E137 and ABS actuator and electric unit (control unit) connectors E142. Then reconnect them securely.
2. Perform ABS actuator and electric unit (control unit) self-diagnosis again.

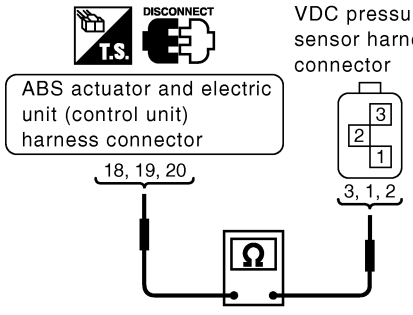
OK or NG

OK	▶	Poor connection of connectors. Repair or replace suspect connector. Perform self-diagnosis again.
NG	▶	GO TO 3.

3	CHECKING PRESSURE SENSOR CIRCUIT

1. Disconnect VDC pressure sensor connector E137 and ABS actuator and electric unit (control unit) connectors E142.
2. Check continuity between ABS actuator and electric unit (control unit) harness connector E142 and VDC pressure sensor harness connector E137.

ABS actuator and electric unit (control unit) (Harness connector E142)	VDC pressure sensor (Harness connector E137)	Continuity
18 (G/B)	3 (G/B)	Yes
19 (P/B)	1 (P/B)	Yes
20 (SB)	2 (SB)	Yes



SBR121F

OK or NG

OK	▶	GO TO 4.
NG	▶	Open or short in harness. Repair or replace the suspect harness.

4	CHECKING PRESSURE SENSOR

Check VDC pressure sensor value on "DATA MONITOR".

Condition	Data monitor display
Brake pedal depressed	Positive value
When brake pedal is released.	Approx. 0 bar

MTBL1340

OK or NG

OK	▶	Inspection is completed.
NG	▶	VDC pressure sensor malfunction. Replace VDC pressure sensor.

Inspection 5 Steering Angle Sensor System

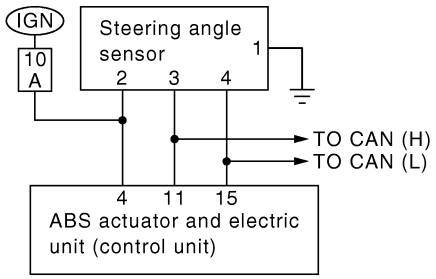
NABR0178

Inspection Procedure

1	CHECKING SELF-DIAGNOSIS RESULTS (1)

Check self-diagnosis results.

Self-diagnosis results
CONSULT-II display items
Steering angle sensor system



SBR122F

Also perform Inspection 1 for the CAN communication system.

Does "STEERING ANGLE SENSOR" appear on self-diagnosis display?

YES	▶	GO TO 2.
NO	▶	Inspection is completed.

2	CHECKING SELF-DIAGNOSIS RESULTS (2)

1. Disconnect steering angle sensor connector E136 and ABS actuator and electric unit (control unit) connectors E142. Then reconnect them securely.
2. Perform ABS actuator and electric unit (control unit) self-diagnosis again.

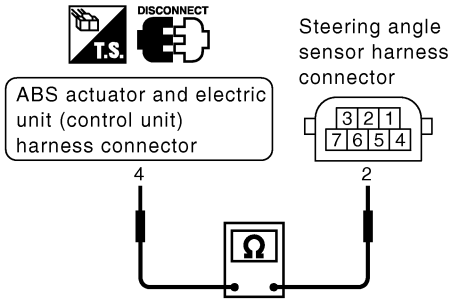
OK or NG

OK	▶	Poor connection of connectors. Repair or replace suspect connector. Perform self-diagnosis again.
NG	▶	GO TO 3.

3	CHECKING STEERING ANGLE SENSOR CIRCUIT

1. Disconnect ABS actuator and electric unit (control unit) harness connector E142 and steering angle sensor harness connector E136.
2. Check continuity between ABS actuator and electric unit (control unit) harness connector E142 and steering angle sensor harness connector E136.

ABS actuator and electric unit (control unit) (Harness connector E142)	Steering angle sensor (Harness connector E136)	Continuity
4 (G/R)	2 (G/R)	Yes



SBR125F

OK or NG

OK	▶	GO TO 4.
NG	▶	Open or short in harness. Repair or replace the suspect harness.

4	DATA MONITOR CHECK

Execute "DATA MONITOR" for "STEERING ANGLE SIGNAL". Check that results are normal.

Steering condition	Data monitor
Driving straight	-5 deg to +5 deg
Turned 90° to right	Approx. +90 deg
Turned 90° to left	Approx. -90 deg

MTBL1341

OK or NG

OK	▶	Perform ABS actuator and electric unit (control unit) self-diagnosis again.
NG	▶	Replace spiral cable (steering angle sensor) and adjust neutral position of steering angle sensor. Refer to BR-87.

Inspection 6 Yaw Rate/Side/Decel G Sensor System

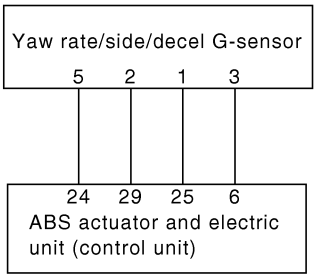
NABR0179

Inspection Procedure

1 CHECKING SELF-DIAGNOSIS RESULTS (1)

Check self-diagnosis results.

Self-diagnosis results
CONSULT-II display items
Yaw rate sensor system Side G-sensor system



SBR126F

CAUTION:
If vehicle is on turn-table at entrance to parking garage, or on other moving surface, VDC OFF indicator lamp may illuminate and CONSULT-II self-diagnosis may indicate yaw rate sensor system malfunction. However, in this case there is no malfunction in yaw rate sensor system. Take vehicle off of turn-table or other moving surface, and start engine. Results will return to normal.

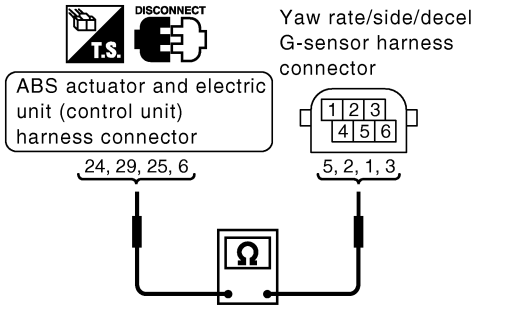
Do "YAW RATE SENSOR SYSTEM" and "SIDE G-SENSOR SYSTEM" appear on self-diagnosis display?

YES	▶	GO TO 2.
NO	▶	Inspection is completed.

2 CHECKING SELF-DIAGNOSIS RESULTS (2)

1. Disconnect yaw rate/side/decel G-sensor harness connector B163 and ABS actuator and electric unit (control unit) harness connector E142.
2. Check continuity between ABS actuator and electric unit (control unit) harness connector E142 and yaw rate/side/decel G-sensor connector B163.

ABS actuator and electric unit (control unit) (Harness connector E142)	Yaw rate/side/decel G-sensor (Harness connector B163)	Continuity
6 (OR)	3 (OR)	Yes
24 (B)	5 (B)	Yes
25 (W)	1 (W)	Yes
29 (G)	2 (G)	Yes



SBR127F

OK or NG

OK	▶	GO TO 3.
NG	▶	Open or short in harness. Repair or replace the suspect harness.

3	CHECKING YAW RATE/SIDE G-SENSOR CIRCUIT

Check "DATA MONITOR" for yaw rate/side/decel G-sensor. Check that results are normal.

Vehicle condition	Yaw rate sensor (Data monitor)	Side G-sensor (Data monitor)	Decel G-sensor (Data monitor)
Stopped	-75 to +75 deg/s	-1 to +1 m/s^2	±0.08 G
Turning right	Negative value	Negative value	Negative value
Turning left	Positive value	Positive value	Positive value

MTBL1342

OK or NG

OK	▶	Perform ABS actuator and electric unit (control unit) self-diagnosis again.
NG	▶	Malfunction of yaw rate/side/decel G-sensor. Replace sensor and perform ABS actuator and electric unit (control unit) self-diagnosis again.

Inspection 7 Solenoid Valve, VDC Switch-over Solenoid Valve and Circuit

NABR0200

Inspection procedure

1	SELF-DIAGNOSIS RESULT CHECK 1

Check the self-diagnosis results.

Self-diagnosis results
CONSULT-II indication item
FR LH IN ABS SOL
FR LH OUT ABS SOL
RR RH IN ABS SOL
RR RH OUT ABS SOL
FR RH IN ABS SOL
FR RH OUT ABS SOL
RR LH IN ABS SOL
RR LH OUT ABS SOL
CV1
CV2
SV1
SV2

SBR149F

Are any self-diagnosis result items above indicated?

	▶	GO TO 2.

2	SELF-DIAGNOSIS RESULT CHECK 2

1. Disconnect the ABS actuator and electric unit (control unit) connector. Securely connect them again.
2. Perform the self-diagnosis again.

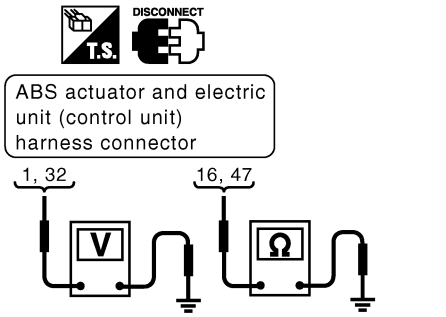
OK or NG

OK	▶	GO TO 3.
NG	▶	Repair or replace the poorly connected connector.

3 **SOLENOID VALVE LINE CHECK**

1. Disconnect the ABS actuator and electric unit (control unit) connector.
2. Check for the power supply voltage between the ABS actuator and electric unit (control unit) connector E142 and the ground.
3. Check the continuity of the ground.

ABS actuator and electric unit (control unit) (Harness connector E142)	Ground	Continuity	Voltage valve
1 (Y), 32 (L)	–	–	Battery voltage (approx. 12V)
16 (B), 47 (B)	–	Yes	–



SBR150F

OK or NG

OK	▶	Perform the ABS actuator and electric unit (control unit) self-diagnosis again.
NG	▶	Replace the VDC/TCS/ABS actuator assembly.

Inspection 8 ABS Actuator Relay or ABS Motor Relay Power System

=NABR0201

Inspection procedure

1	SELF-DIAGNOSIS RESULT CHECK 1

Check the self-diagnosis results.

Self-diagnosis results
CONSULT-II indication item
PUMP MOTOR ACTUATOR RLY (NOTE)

MTBL1279

Are “PUMP MOTOR” and “ACTUATOR RLY” (NOTE) indicated in the self-diagnosis results?

▶	GO TO 2. **NOTE:** “ACTUATOR RLY” on the CONSULT-II self-diagnosis results indicates the malfunction of the actuator relay and circuit.

2	SELF-DIAGNOSIS RESULT CHECK 2

1. Disconnect the ABS actuator and electric unit (control unit) connector. Securely connect them again.
2. Perform the self-diagnosis again.

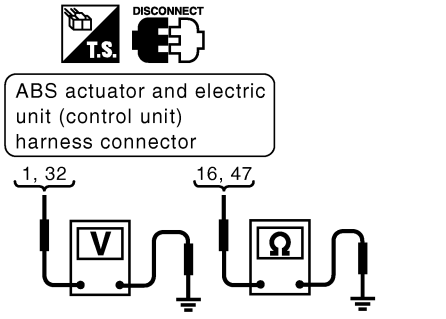
OK or NG

OK	▶	GO TO 3.
NG	▶	Repair or replace the poorly connected connector.

3	SOLENOID VALVE LINE CHECK

1. Disconnect the ABS actuator and electric unit (control unit) connector.
2. Check for the power supply voltage between the ABS actuator and electric unit (control unit) connector E142 and the ground.
3. Check the continuity of the ground.

ABS actuator and electric unit (control unit) (Harness connector E142)	Ground	Continuity	Voltage valve
1 (Y), 32 (L)	–	–	Battery voltage (approx. 12V)
16 (B), 47 (B)	–	Yes	–



SBR150F

OK or NG

OK	▶	Perform the ABS actuator and electric unit (control unit) self-diagnosis again.
NG	▶	Replace the VDC/TCS/ABS actuator assembly.

Inspection 9 Stop Lamp Switch and Circuit

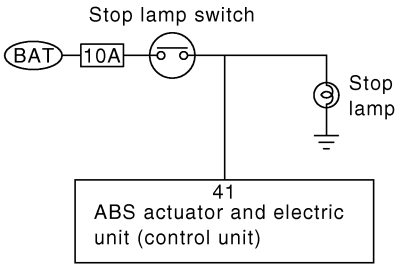
NABR0181

Inspection Procedure

1	CHECKING SELF-DIAGNOSIS RESULTS

Check self-diagnosis results.

Self-diagnosis results
CONSULT-II display items
Stop lamp switch system



SBR128F

Does "STOP LAMP SW SYSTEM" appear in self-diagnosis results display?

YES	▶	GO TO 2.
NO	▶	Inspection is completed.

2	CHECKING STOP LAMP

1. Disconnect stop lamp switch connector M31 (M/T models) or M154 (A/T models) and ABS actuator and electric unit (control unit) connector E142.
2. Reconnect connectors securely.
3. Start engine.
4. Repeat pumping brake pedal carefully several times, then perform self-diagnosis again.

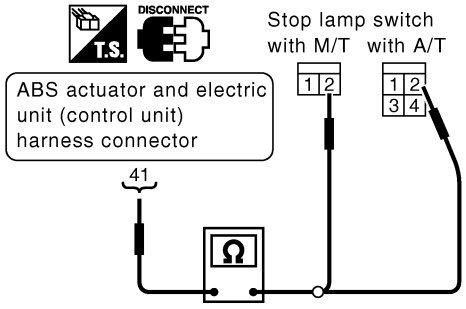
Do any self-diagnosis items appear?

YES	▶	GO TO 3.
NO	▶	Poor connection. Repair or replace the applicable connector.

3	CHECKING STOP LAMP SWITCH CIRCUIT

1. Disconnect stop lamp switch connector M31 (M/T models) or M154 (A/T models) and ABS actuator and electric unit (control unit) connector E142.
2. Check continuity between stop lamp switch harness connector M31 (M/T models) or M154 (A/T models) and ABS actuator and electric unit (control unit) harness connector E142.

ABS actuator and electric unit (control unit) (Harness connector E142)	Stop lamp switch (Harness connector M31 or M154)	Continuity
41 (B/W)	2 (G/Y)	Yes



SBR129F

OK or NG

OK	▶	Perform ABS actuator and electric unit (control unit) self-diagnosis again.
NG	▶	Open or short in harness between ABS actuator and electric unit (control unit) and stop lamp switch

Inspection 10 ABS Actuator and Electric Unit (Control Unit) Power Circuit

NABR0182

Inspection Procedure

1	CHECKING SELF-DIAGNOSIS RESULT

Check self-diagnosis results.

Self-diagnosis results
CONSULT-II display items
Low battery voltage

MTBL1343

Does “LOW BATTERY VOLTAGE” appear in self-diagnosis results display?

YES	▶	GO TO 2.
NO	▶	Inspection is completed.

2	STARTING INSPECTION

1. Disconnect ABS actuator and electric unit (control unit) connector E142. Then reconnect it securely.
2. Perform self-diagnosis.

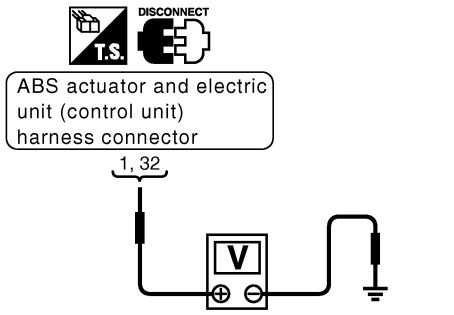
Do any self-diagnosis items appear?

YES	▶	GO TO 3.
NO	▶	Poor connection. Repair or replace the applicable connector.

3	CHECKING ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT) POWER SYSTEM (1)

1. Disconnect ABS actuator and electric unit (control unit) connector E142.
2. Turn ignition switch ON (but do not start engine). Check voltage between ABS actuator and electric unit (control unit) harness connector E142 and ground.

ABS actuator and electric unit (control unit) (Harness connector E142)	Ground	Voltage
1 (Y), 32 (L)	–	Battery voltage (Approx. 12V)



SBR135F

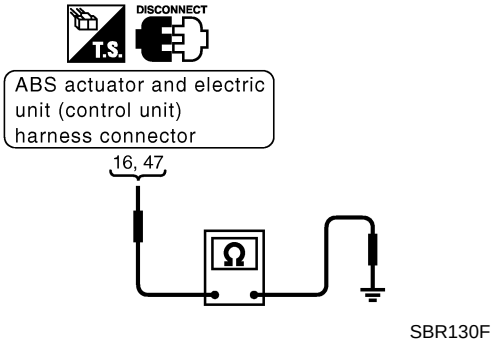
OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 5.

4 CHECKING ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT) GROUND CIRCUIT

Check ABS actuator and electric unit (control unit) ground circuit.

ABS actuator and electric unit (control unit) (Harness connector E142)	Ground	Continuity
16 (B)	–	Yes
47 (B)		



SBR130F

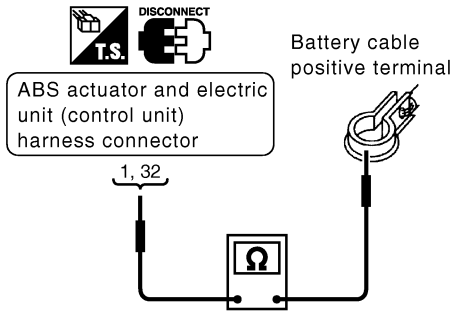
OK or NG

OK	▶	Perform ABS actuator and electric unit (control unit) self-diagnosis again.
NG	▶	• Poor installation of ABS actuator and electric unit (control unit), or harness malfunction

5 CHECKING ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT) POWER SYSTEM (2)

1. Check fuse 50A or 30A.
2. Check continuity between battery positive terminal and ABS actuator and electric unit (control unit) connector E142.

ABS actuator and electric unit (control unit) (Harness connector E142)	Battery positive terminal	Continuity
1 (Y), 32 (L)	–	Yes



SBR136F

OK or NG

OK	▶	Check for non-standard conditions in battery (terminal looseness, low voltage, etc.) and alternator.
NG	▶	• Replace fuse 50A or 30A. • Open or short in harness.

Inspection 11 When “SHIFT POSITION ERROR” Appears in Self-Diagnosis Results Display

=NABR0183

Inspection Procedure

1	CHECKING SELF-DIAGNOSIS RESULTS

Check self-diagnosis results.

Self-diagnosis results
CONSULT-II display items
Shift position error

MTBL1344

Does “SHIFT POSITION ERROR” appear in self-diagnosis results display?

YES	▶	GO TO 2.
NO	▶	Inspection is completed.

2	DATA MONITOR CHECK

1. Connect CONSULT-II. Start engine.
2. In “DATA MONITOR” select “ITEM MENU” and then check P position.

Selector lever position	P POSI SIG (data monitor)
P position	ON
Other than P position.	OFF

MTBL1345

OK or NG

OK	▶	Perform ABS actuator and electric unit (control unit) self-diagnosis again.
NG	▶	GO TO 3.

3	CHECKING PARK/NEUTRAL POSITION SWITCH

Perform the park/neutral position switch inspection. Refer to AT-263.

Do any self-diagnosis items appear?

YES	▶	Repair the indicated items and perform ABS actuator and electric unit (control unit) self-diagnosis again.
NO	▶	Perform ABS actuator and electric unit (control unit) self-diagnosis again.

Inspection 12 When "ST ANG SEN COM CIR" Appears on Self-Diagnosis Results Display

=NABR0180

Inspection Procedure

1	CHECKING SELF-DIAGNOSIS RESULTS (1)	
Check self-diagnosis results. Self-diagnosis results CONSULT-II display items ST ANG SEN COM CIR MTBL1347 **Does anything besides "ST ANG SEN COM CIR" appear on self-diagnosis results display?**		
YES	▶	Inspect and repair the indicated items. Then perform self-diagnosis again.
NO	▶	Perform adjustment of steering angle sensor neutral position. Then GO TO 2.

2	CHECKING SELF-DIAGNOSIS RESULTS (2)	
Turn ignition switch OFF, and ON to erase self-diagnosis results, and perform ABS actuator and electric unit (control unit) self-diagnosis again. **Does anything appear on self-diagnosis results display?**		
YES	▶	Replace steering angle sensor. Then perform adjustment of neutral position and perform self-diagnosis again.
NO	▶	Inspection is completed.

Inspection 13 Brake Fluid Level of Reservoir Tank

NABR0202

Inspection procedure

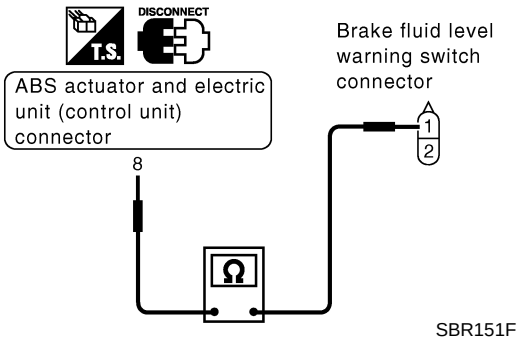
1	SELF-DIAGNOSIS RESULT CHECK 1	
Check the self-diagnosis results. Self-diagnosis results CONSULT-II indication item BR FLUID LEVEL LOW MTBL1294 **Does the brake warning light turn on?**		
Yes	▶	Check the pad for wear. Check the brake fluid for leakage.
No	▶	GO TO 2.

2	SELF-DIAGNOSIS RESULT CHECK 2	
1. Disconnect connectors for the brake fluid level warning switch and the ABS actuator and electric unit (control unit). 2. Securely connect connectors. Perform the ABS actuator and electric unit (control unit) self-diagnosis again. **Is the same self-diagnosis item indicated again?**		
Yes	▶	Poor connection of connector. Repair or replace the poorly connected connector.
No	▶	GO TO 3.

3	CIRCUIT CHECK BETWEEN BRAKE FLUID LEVEL WARNING SWITCH AND ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)	

1. Disconnect connectors for the brake fluid level warning switch and the ABS actuator and electric unit (control unit).
2. Check for continuity between the brake fluid level warning switch (harness connector E28) and the ABS actuator and electric unit (control unit) (harness connector B142).

ABS actuator and electric unit (control unit) (harness connector)	Brake fluid level warning switch (harness connector)	Continuity
8 (BR/W)	1 (BR/W)	Yes



OK or NG

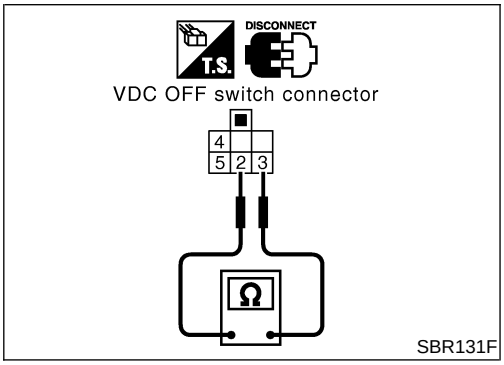
OK	▶	Perform the ABS actuator and electric unit (control unit) self-diagnosis again.
NG	▶	Repair or replace the disconnected harness.

Inspection 14 CAN Communications System

NABR0185

Inspection Procedure

1	CHECK CONNECTOR	
1. Turn ignition switch OFF, disconnect the ABS actuator and electric unit (control unit) connector, and check the terminal for deformation, disconnection, looseness, and so on. If there is a malfunction, repair or replace the terminal. 2. Reconnect connector to perform self-diagnosis. **Is "CAN COMM CIRCUIT" displayed in the self-diagnosis display items?**		
Yes	▶	Print out the self-diagnostic results, and refer to EL-447.
No	▶	Connector terminal connection is loose, damaged, open, or shorted.



Inspecting Components

NABR0175

VDC OFF SWITCH

NABR0175S01

- Disconnect VDC OFF switch connector M151. Check continuity between terminal No. 2 and terminal No. 3.

No. 2 to No. 3:

Pressing the switch will establish continuity, releasing it will break continuity.

Symptom 1 ABS Works Frequently.

NABR0186

Inspection Procedure

1	STARTING INSPECTION	
Inspect wheel sensor system. ● Sensor mounting inspection ● Sensor pick-up inspection for iron chips ● Sensor rotor inspection (e.g. Number of teeth, damaged teeth) ● Sensor connector engagement inspection **OK or NG**		
OK	▶	GO TO 2.
NG	▶	Repair wheel sensor and rotor system.

2	CHECKING FOR LOOSENESS	
Check for looseness of front axle. **OK or NG**		
OK	▶	GO TO Refer to BR-135
NG	▶	Axle inspection and repair

Symptom 2 Unexpected Pedal Reaction

NABR0187

Inspection Procedure

1	BRAKE PEDAL STROKE INSPECTION	
Check brake pedal stroke. **Is stroke excessively long?**		
YES	▶	Check bleeding and brake system.
NO	▶	GO TO 2.

2	CHECKING PEDAL FORCE	
Check that brake is effective with pedal depressed. **Is pedal heavy, but effective?**		
YES	▶	Normal
NO	▶	GO TO 3.

3	CONNECTOR AND PERFORMANCE INSPECTION	
Disconnect actuator relay unit connector to deactivate ABS function. Check that brake is effective. **Is brake effective?**		
YES	▶	GO TO 4.
NO	▶	Brake line inspection

4	CHECKING ABS WARNING LAMP INDICATION	
Check that ABS warning lamp illuminates. **OK or NG**		
OK	▶	Execute self-diagnosis.
NG	▶	GO TO 5.

5	CHECKING WHEEL SENSORS	
Inspect wheel sensor system. ● Sensor mounting inspection ● Check sensor pick-up for adhering iron chips. ● Sensor rotor inspection (e.g. Number of teeth, damaged teeth) ● Sensor connector engagement inspection **OK or NG**		
OK	▶	Normal
NG	▶	Repair wheel sensor and rotor system.

Symptom 3 Long Stopping Distance

NABR0188

Inspection Procedure

1	STARTING INSPECTION	
Check that stopping distance increases only on snowy roads and gravel roads. **OK or NG**		
OK	▶	May be longer than for vehicles without ABS.
NG	▶	GO TO 2.

2	CHECKING PERFORMANCE	
Disconnect actuator relay box to deactivate ABS function. **Is stopping distance still long?**		
YES	▶	● Brake line air bleeding ● Brake line inspection
NO	▶	GO TO 3.

3	CHECKING ABS WARNING LAMP INDICATION	
Check that ABS warning lamp illuminates. **OK or NG**		
OK	▶	Perform self-diagnosis.
NG	▶	GO TO 4.

4	CHECKING WHEEL SENSORS	
Inspect wheel sensor system. ● Sensor mounting inspection ● Check sensor pick-up for adhering iron chips. ● Sensor rotor inspection (e.g. Number of teeth, damaged teeth) ● Sensor connector engagement inspection **OK or NG**		
OK	▶	Normal
NG	▶	Repair wheel sensor and rotor system.

Symptom 4 ABS Does Not Work.

NABR0189

Inspection Procedure

1	CHECKING ABS WARNING LAMP INDICATION	
Check that ABS warning lamp illuminates.		
OK or NG		
OK	▶	Perform self-diagnosis.
NG	▶	GO TO 2.

2	CHECKING WHEEL SENSORS	
Inspect wheel sensor system. ● Sensor mounting inspection ● Check sensor pick-up for adhering iron chips. ● Sensor rotor inspection (e.g. Number of teeth, damaged teeth) ● Sensor connector engagement inspection		
OK or NG		
OK	▶	Normal
NG	▶	Repair wheel sensor and rotor system.

Symptom 5 Pedal Vibration and Noise

NABR0190

Inspection Procedure

1	INSPECTION (1)	
Check brake system for pedal vibration or noise at engine start.		
OK or NG		
OK	▶	Perform self-diagnosis.
NG	▶	GO TO 2.

2	INSPECTION (2)	
Check for vibration during soft braking (just placing foot on pedal). **CAUTION:** **ABS may activate in conditions such as those listed below, when wheel speed changes.** ● **Gear shifting** ● **Turning at high speed** ● **Passing through gusts of wind**		
OK or NG		
OK	▶	GO TO 3.
NG	▶	Normal

3	INSPECTION (3)	
Does vibration occur during normal braking? **CAUTION:** **In addition to activation for sudden braking, ABS may activate in conditions such as those listed below.** ● **Roads with low surface μ** ● **Turning at high speed** ● **Passing through gusts of wind**		
OK or NG		
OK	▶	GO TO 4.
NG	▶	Normal

4	INSPECTION (4)	
Check for vibration when engine speed is increased while vehicle is stopped.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Normal **CAUTION:** **Vibration may occur when vehicle is stopped.**

5	INSPECTION (5)	
Check for vibration when switches of electrical components are operated.		
OK or NG		
OK	▶	Check for any wireless devices, antennas, or antenna lead near control unit (including wiring).
NG	▶	GO TO 6.

6	CHECKING ABS WARNING LAMP INDICATION	
Confirm ABS warning lamp turns on.		
OK or NG		
OK	▶	Execute self-diagnosis.
NG	▶	GO TO 7.

7	CHECKING WHEEL SENSORS	
Inspect wheel sensor system. ● Sensor mounting inspection ● Sensor pick-up inspection for iron chips (e.g. Number of teeth, damaged teeth) ● Sensor connector engagement inspection ● Inspection of wheel sensor circuit		
OK or NG		
OK	▶	Normal
NG	▶	Repair wheel sensor and rotor system.

Symptom 6 VDC OFF Indicator Lamp Does Not Illuminate.

NABR0191

Inspection Procedure

1	CHECKING VDC OFF INDICATOR LAMP POWER CIRCUIT	
Disconnect ABS actuator and electric unit (control unit) connector. Check that the voltage between ABS actuator and electric unit (control unit) harness terminal and ground is battery voltage (Approx. 12V).		
OK or NG		
OK	▶	Malfunction of ABS actuator and electric unit (control unit). Repair or replace control unit.
NG	▶	Malfunction in combination meter system. Inspect combination meter system.

Symptom 7 SLIP Indicator Lamp Does Not Illuminate.

NABR0192

Inspection Procedure

1	CHECKING FOR BURNED-OUT SLIP INDICATOR LAMP BULB	
Check that there is continuity between meter power terminal and SLIP indicator lamp terminal.		
OK or NG		
OK	▶	GO TO 2.
NG	▶	Open or short in SLIP indicator lamp or combination meter circuit

2	CHECKING SLIP INDICATOR LAMP POWER CIRCUIT	
Disconnect meter connector. Check that the voltage between meter harness terminal and ground is battery voltage (Approx. 12V).		
OK or NG		
OK	▶	GO TO 3.
NG	▶	• Fuse inspection • Check harness and connectors between fuse block and meter. • Inspect power system (battery, ignition switch circuit).

3	CHECKING SLIP INDICATOR LAMP HARNESS	
1. Disconnect ABS actuator and electric unit (control unit) and meter harness connectors. 2. Check for open circuit or short circuits in harness between meter and ABS actuator and electric unit (control unit).		
OK or NG		
OK	▶	GO TO 4.
NG	▶	Open or short in harness. Repair or replace the suspect harness.

4	CHECKING SLIP INDICATOR LAMP CONNECTOR	
Check ABS actuator and electric unit (control unit) and meter harness connectors.		
OK or NG		
OK	▶	Reconnect connectors and perform self-diagnosis. There is an intermediate connector in vehicle harness. Be sure to refer to vehicle wiring diagram when performing inspection.
NG	▶	Connector open, shorted or damaged. Repair or replace connector.

Symptom 8 Vehicle Behaves Jerkily During VDC/TCS/ABS Operation.

NABR0193

Inspection Procedure

1	CHECKING ENGINE SPEED SIGNAL	
On CONSULT-II, execute “DATA MONITOR” for ABS actuator and electric unit (control unit). **Is engine speed at idle 400 rpm or higher?**		
YES	▶	Normal
NO	▶	GO TO 2.

2	CHECKING SELF-DIAGNOSIS RESULTS (1)	
Perform ABS actuator and electric unit (control unit) self-diagnosis. **Does anything appear on self-diagnosis results display?**		
YES	▶	Inspect and repair items indicated. Then perform ABS actuator and electric unit (control unit) self-diagnosis again.
NO	▶	GO TO 3.

3	ECM SELF-DIAGNOSIS RESULT ITEM CHECK	
Perform the ECM self-diagnosis. **Is the result of self-diagnosis “CRANKSHAFT POSITION SENSOR”?**		
YES	▶	Repair or replace crankshaft position sensor system.
NO	▶	GO TO 4.

4	CHECKING SELF-DIAGNOSIS RESULTS (2)	
Disconnect ABS actuator and electric unit (control unit) and ECM connectors. Then reconnect them securely. Perform the self-diagnosis again. **OK or NG**		
OK	▶	Connector open, shorted or damaged. Repair or replace connector.
NG	▶	GO TO 5.

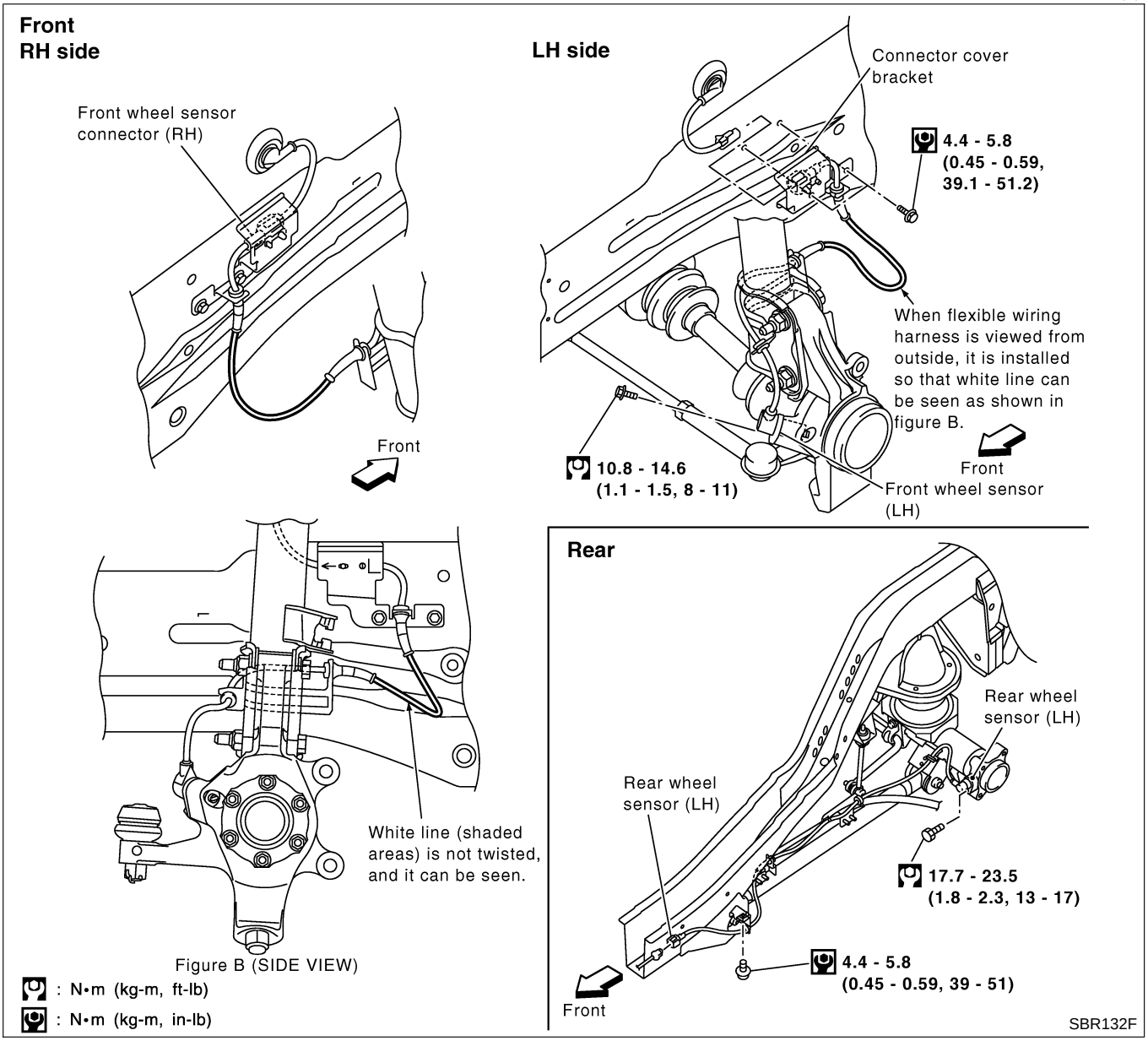
5	CHECKING SELF-DIAGNOSIS RESULTS (3)	
Perform the A/T self-diagnosis. **OK or NG**		
OK	▶	GO TO 6.
NG	▶	Repair or replace parts at location indicated.

6	CHECKING SELF-DIAGNOSIS RESULTS (4)	
Perform ABS actuator and electric unit (control unit) self-diagnosis again. **Does anything appear on self-diagnosis results display?**		
YES	▶	Repair or replace parts at location indicated.
NO	▶	GO TO 7.

7	CHECKING CIRCUIT BETWEEN ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT) AND ECM	
1. Disconnect ABS actuator and electric unit (control unit) and ECM connectors. 2. Check for open circuit or short circuits in engine speed signal harness between ABS actuator and electric unit (control unit) and ECM. 3. Check ABS actuator and electric unit (control unit) and ECM connectors.		
OK or NG		
OK	▶	Inspection is completed.
NG	▶	Reconnect connectors and perform ABS actuator and electric unit (control unit) self-diagnosis again.

Removal and Installation

NABR0194



REMOVAL

NABR0194S01

Pay attention to the following when removing sensor.

CAUTION:

- **As much as possible, avoid rotating sensor when removing it. Pull sensors out without pulling on sensor harness.**
- **Take care to avoid damaging sensor edges or rotor teeth. Remove wheel sensor first before removing front or rear wheel hub. This is to avoid damage to sensor wiring and loss of sensor function.**

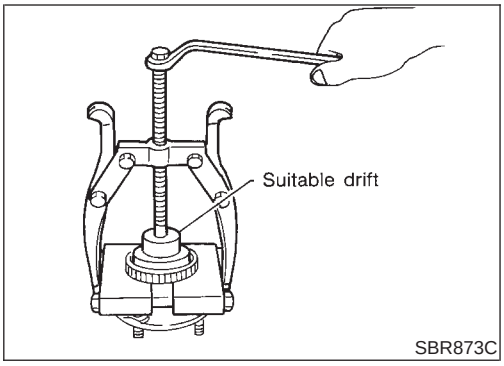
INSTALLATION

NABR0194S02

Pay attention to the following when installing sensor. Tighten installation bolts and nuts to specified torques.

- When installing, check that there is no foreign material such as iron chips on pick-up and mounting hole of the sensor. Check that no foreign material has been caught in the sensor rotor motor. Remove any foreign material and clean the mount.

- When installing front sensor, be sure to press rubber grommets in until they lock at the three locations shown in diagram (2 at shock absorbers and 1 at body panel). When installed, harness must not be twisted. White line on harness (shaded part) must be visible from left side.



Removal and Installation

NABR0196

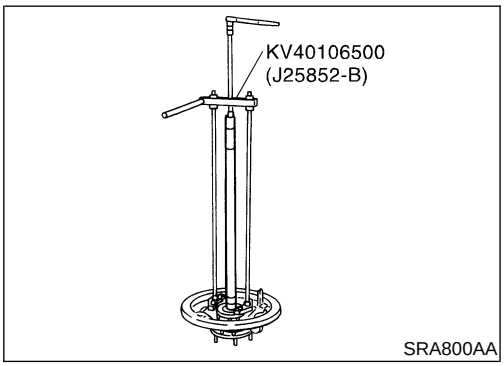
REMOVAL

NABR0196S01

Front

NABR0196S0101

1. Remove the front wheel hub. Refer to AX-7.
2. Remove the sensor rotor using suitable puller, drift and bearing replacer.



Rear

NABR0196S0102

- Remove the sensor rotor using Tool.

INSTALLATION

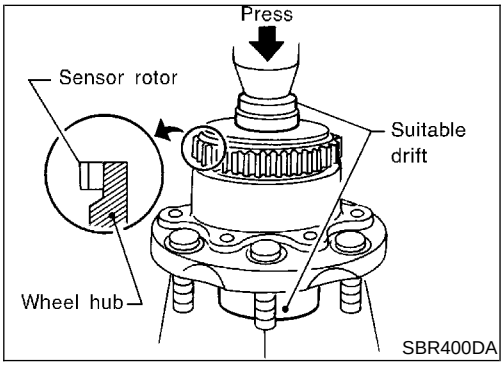
NABR0196S02

Front

NABR0196S0201

Install the sensor rotor using suitable drift and press.

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

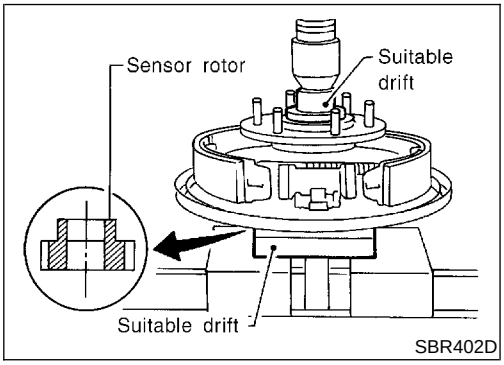


Rear

NABR0196S0202

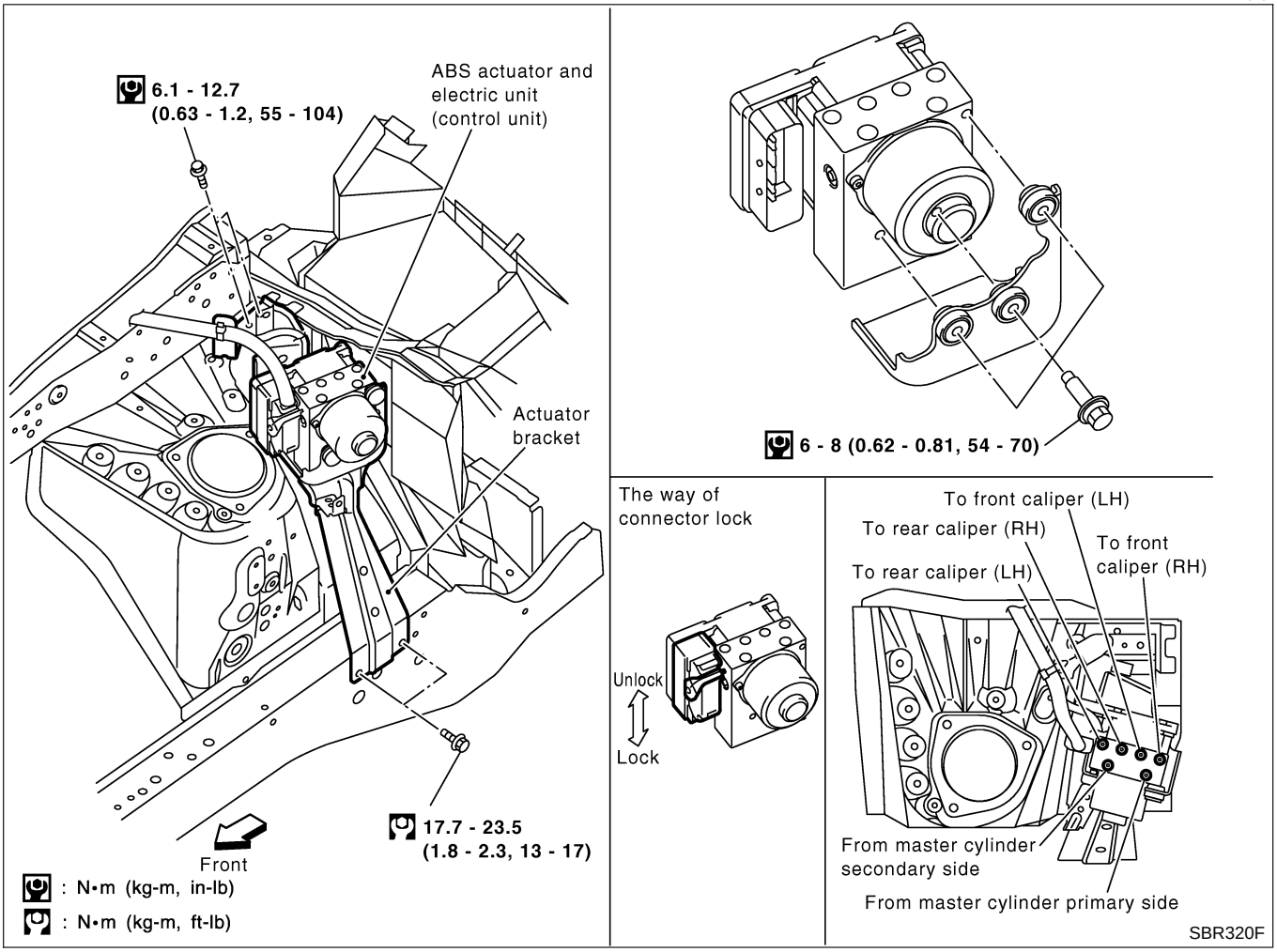
Install the sensor rotor using suitable drift and press.

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



Removal and Installation

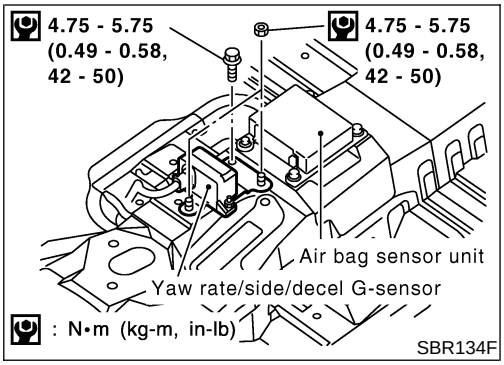
NABR0197



Pay attention to the following when removing actuator.

CAUTION:

- **Before servicing, disconnect battery cables.**
- **To remove brake tube, use a flare nut wrench to prevent flare nuts and brake tube from being damaged. To install, use a brake tube torque wrench (commercial service tool).**
- **Do not remove and install actuator by holding harness.**
- **After work is completed, bleed air from brake piping. Refer to BR-9.**
- **When replacing ABS actuator and electric unit (control unit), calibrate steering angle sensor neutral position and decel G sensor. Refer to BR-87.**



Removal and Installation

NABR0198

REMOVAL

NABR0198S01

1. Install center console. Refer to BT-22.
2. Remove harness connector.
3. Remove installation bolts. Remove yaw rate/side/decel G-sensor.

CAUTION:

Do not drop or strike the yaw rate/side/decel G-sensor, because it has little endurance to impact.

INSTALLATION

NABR0198S02

To install, follow procedure for removal in reverse order.

CAUTION:

Do not drop or strike the yaw rate/side/decel G-sensor, because it has little endurance to impact.

General Specifications

NABR0118

Unit: mm (in)

Applied model		Without VDC models	With VDC models
Front brake	Brake model	AD31VC	
	Cylinder bore diameter × number of pistons	44.45 (1.7500) × 2	
	Pad Length × width × thickness	132.0 × 52.5 × 11 (5.20 × 2.067 × 0.43)	
	Rotor outer diameter × thickness	300 × 28 (11.81 × 1.10)	
Rear brake	Brake model	LT30C	
	Cylinder bore diameter	22.23 (7/8)	
	Lining length × width × thickness	296 × 50 × 6.1 (11.65 × 1.97 × 0.240)	
	Drum inner diameter	295.0 (11.61)	
Master cylinder	Bore diameter	25.40 (1)	
Control valve	Valve model	Proportioning valve within master cylinder	
	Split point kPa (kg/cm^2, psi) × reducing ratio	2,942 (30, 427) × 0.2	
Brake booster	Booster model	M215T	C215T
	Diaphragm diameter	Pri: 230 (9.06) Sec: 205 (8.07)	
Recommended brake fluid		DOT 3	

Disc Brake

NABR0119

Unit: mm (in)

Brake model		AD31VC
Pad wear limit	Minimum thickness	2.0 (0.079)
Rotor repair limit	Minimum thickness	26.0 (1.024)

Drum Brake

NABR0120

Unit: mm (in)

Brake model		LT30C
Lining wear limit	Minimum thickness	1.5 (0.059)
Drum repair limit	Maximum inner diameter	296.5 (11.67)
	Out-of-round limit	0.03 (0.0012)

Brake Pedal

NABR0121

Unit: mm (in)

Transmission		M/T	A/T
Free height “H”*		165 - 175 (6.50 - 6.89)	175 - 185 (6.89 - 7.28)
Depressed height “D”* [under force of 490 N (50 kg, 110 lb) with engine running]		65 (2.56)	70 (2.76)
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 clevis	1.0 - 3.0 (0.039 - 0.118)	
	At pedal pad	1 - 3 (0.04 - 0.12)	

*: Measured from surface of metal panel to pedal pad

Parking Brake Control

NABR0084

Unit: notch

Control Type	Center lever
Lever stroke [under force of 196 N (20 kg, 44 lb)]	6 - 8
Lever stroke when warning switch comes on	1 or less