

BRAKE SYSTEM

SECTION **BR**

MODIFICATION NOTICE:

- The master cylinder has been changed for models with ABS.
- The components of CL22VB front disc brake models and LT20B rear drum brake models have been introduced.
- The anti-lock brake system has been changed.
- The service data and specifications (SDS) have been changed.

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PRECAUTIONS

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

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER (Mechanically activated type)” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to NISSAN MODEL N15 is as follows (The composition varies according to the destination and optional equipment.):

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

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

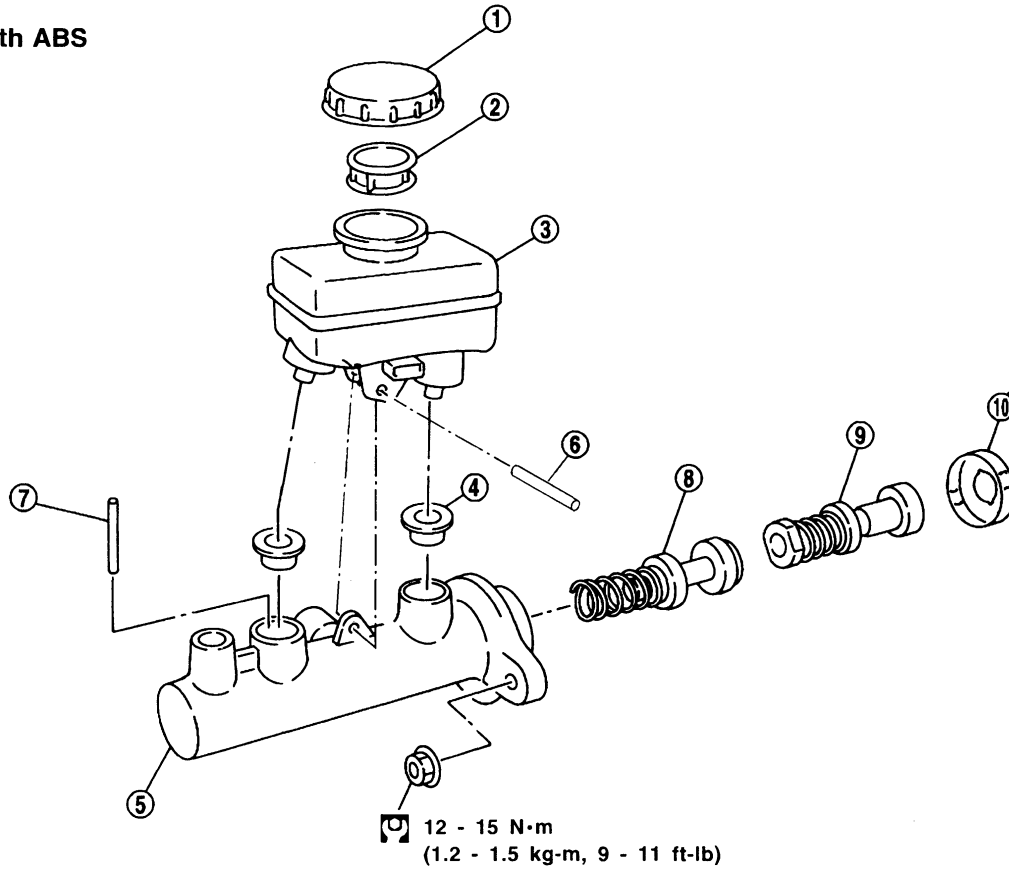
WARNING:

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

MASTER CYLINDER

SEC. 460

Models with ABS



SBR230E

- ① Reservoir cap
- ② Oil filter
- ③ Reservoir tank
- ④ Seal

- ⑤ Cylinder body
- ⑥ Spring pin
- ⑦ Stopper pin

- ⑧ Secondary piston assembly
- ⑨ Primary piston assembly
- ⑩ Stopper cap

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Removal

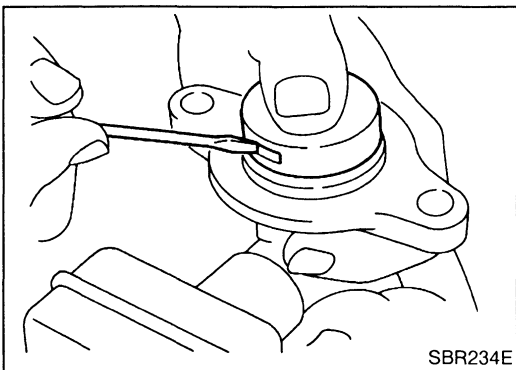
CAUTION:

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

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

Disassembly

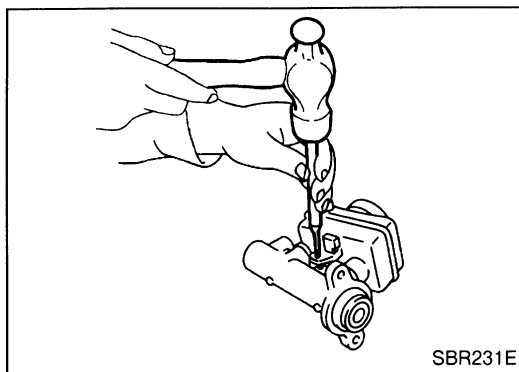
1. Bend claws of stopper cap outward and remove stopper cap.



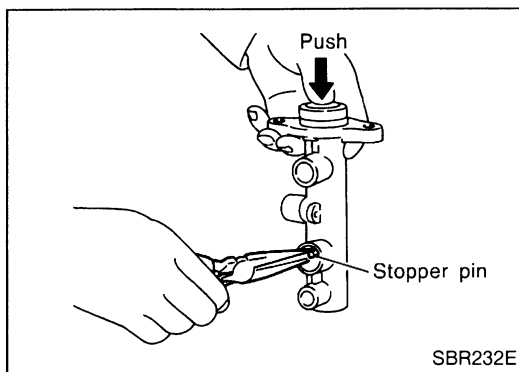
SBR234E

MASTER CYLINDER

Disassembly (Cont'd)



2. Drive out spring pin from cylinder body.
3. Draw out reservoir tank and seals.



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

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

Inspection

Check for the following items.

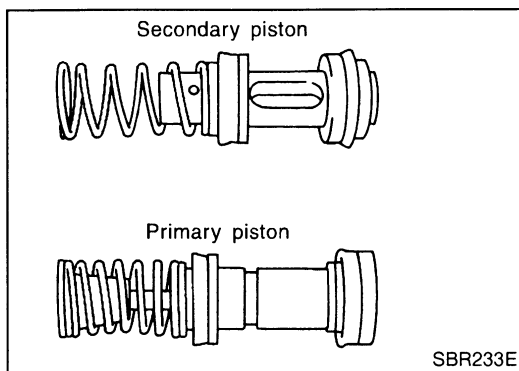
Replace any part if damaged.

Master cylinder:

- Pin holes or scratches on inner wall.

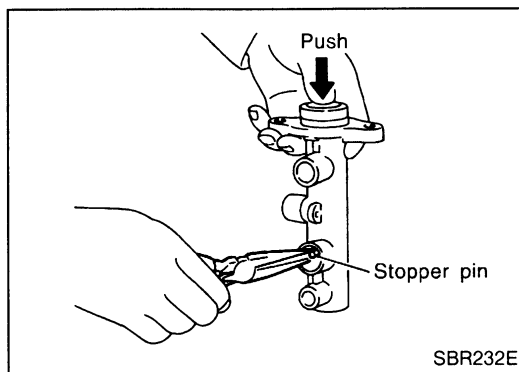
Piston:

- Deformation of or scratches on piston cups.

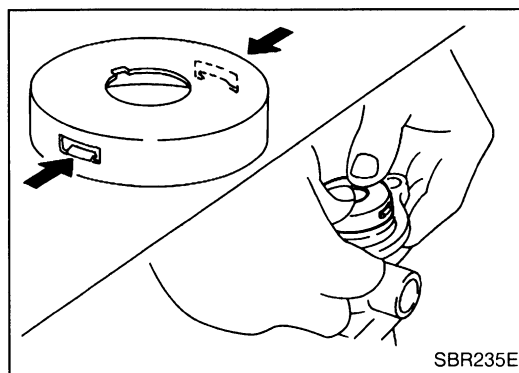


Assembly

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

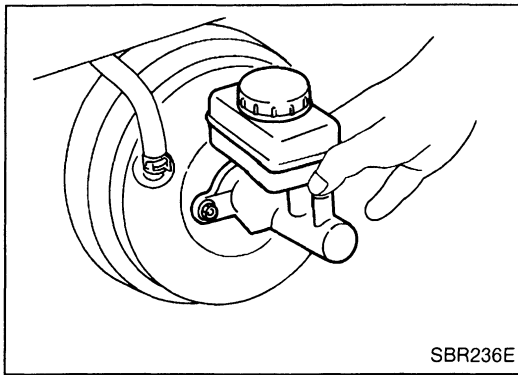


2. Install stopper pin while piston is pushed into cylinder.
3. Push reservoir tank seals and reservoir tank into cylinder body.
4. Install spring pin.



5. Install stopper cap.

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



Installation

CAUTION:

- Refill with new brake fluid “DOT 3” or “DOT4”.
 - Never reuse drained brake fluid.
 - Do not mix different types of brake fluids (DOT3, DOT4).
1. Place master cylinder onto brake booster and secure mounting nuts lightly.
 2. Torque mounting nuts.
⚙️: 12 - 15 N·m (1.2 - 1.5 kg-m, 9 - 11 ft-lb)
 3. Fill up reservoir tank with new brake fluid.
 4. Plug all ports on master cylinder with fingers to prevent air suction while releasing brake pedal.
 5. Have driver depress brake pedal slowly several times until no air comes out of master cylinder.
 6. Fit brake lines to master cylinder.
 7. Tighten flare nuts.
⚙️: 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
 8. Bleed air from brake system. Refer to “Bleeding Procedure”, “AIR BLEEDING”.

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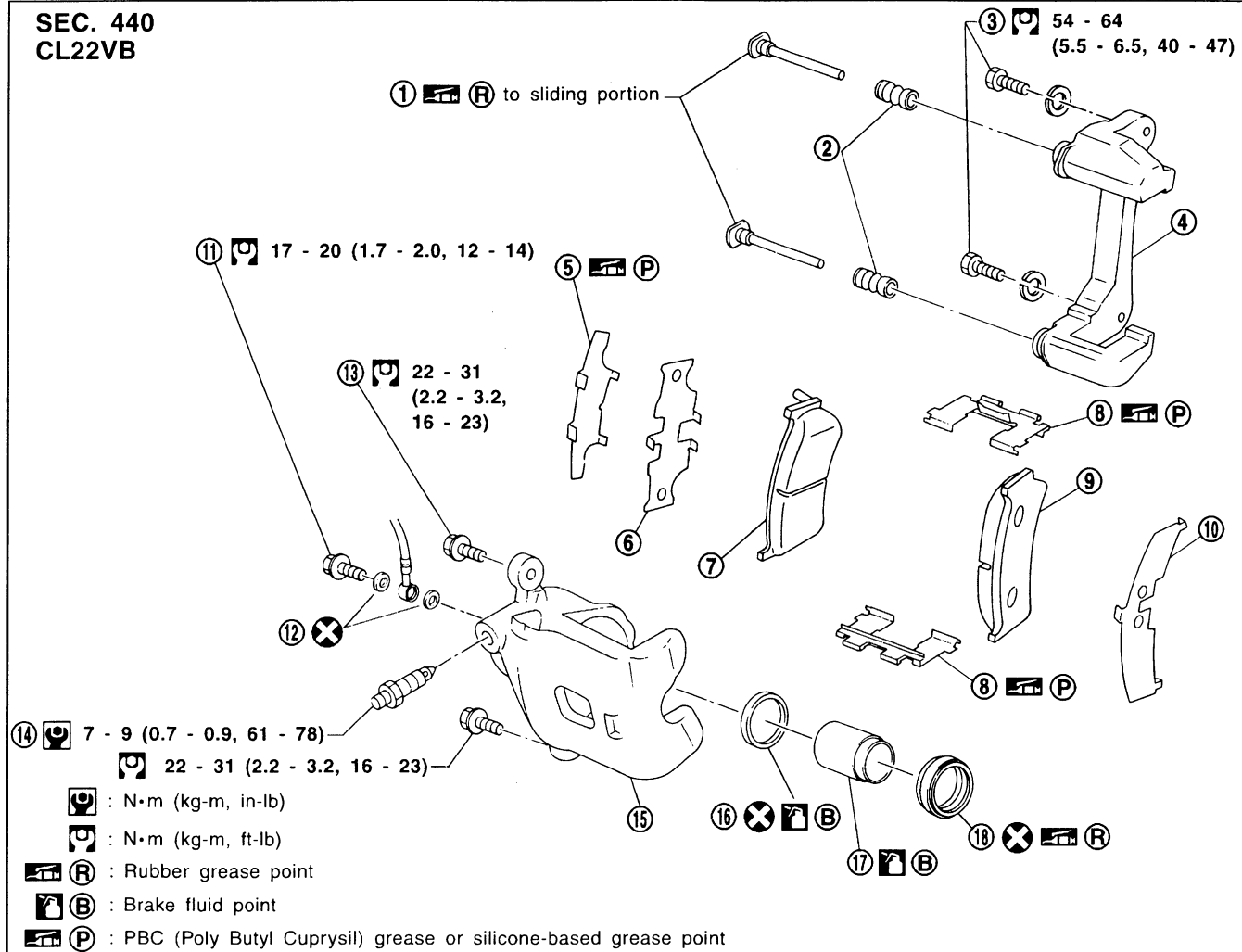
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FRONT DISC BRAKE

SEC. 440
CL22VB

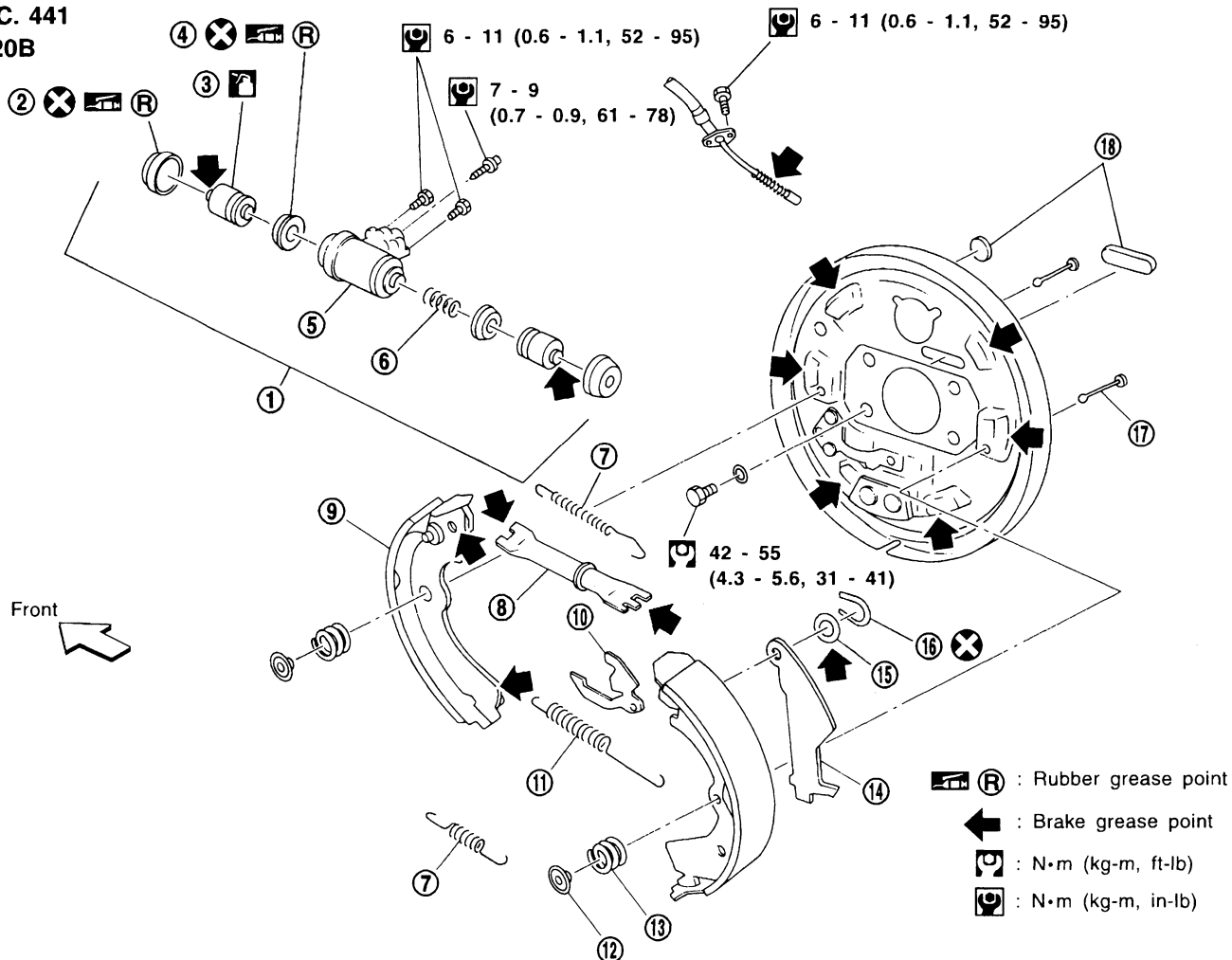


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- | | | |
|-----------------------------|-------------------|-----------------|
| ① Main pin | ⑦ Inner pad | ⑬ Main pin bolt |
| ② Pin boot | ⑧ Pad retainer | ⑭ Bleed valve |
| ③ Torque member fixing bolt | ⑨ Outer pad | ⑮ Cylinder body |
| ④ Torque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

REAR DRUM BRAKE

SEC. 441
LT20B



SBR034E

- ① Wheel cylinder assembly
- ② Boot
- ③ Piston
- ④ Piston cup
- ⑤ Cylinder body
- ⑥ Spring

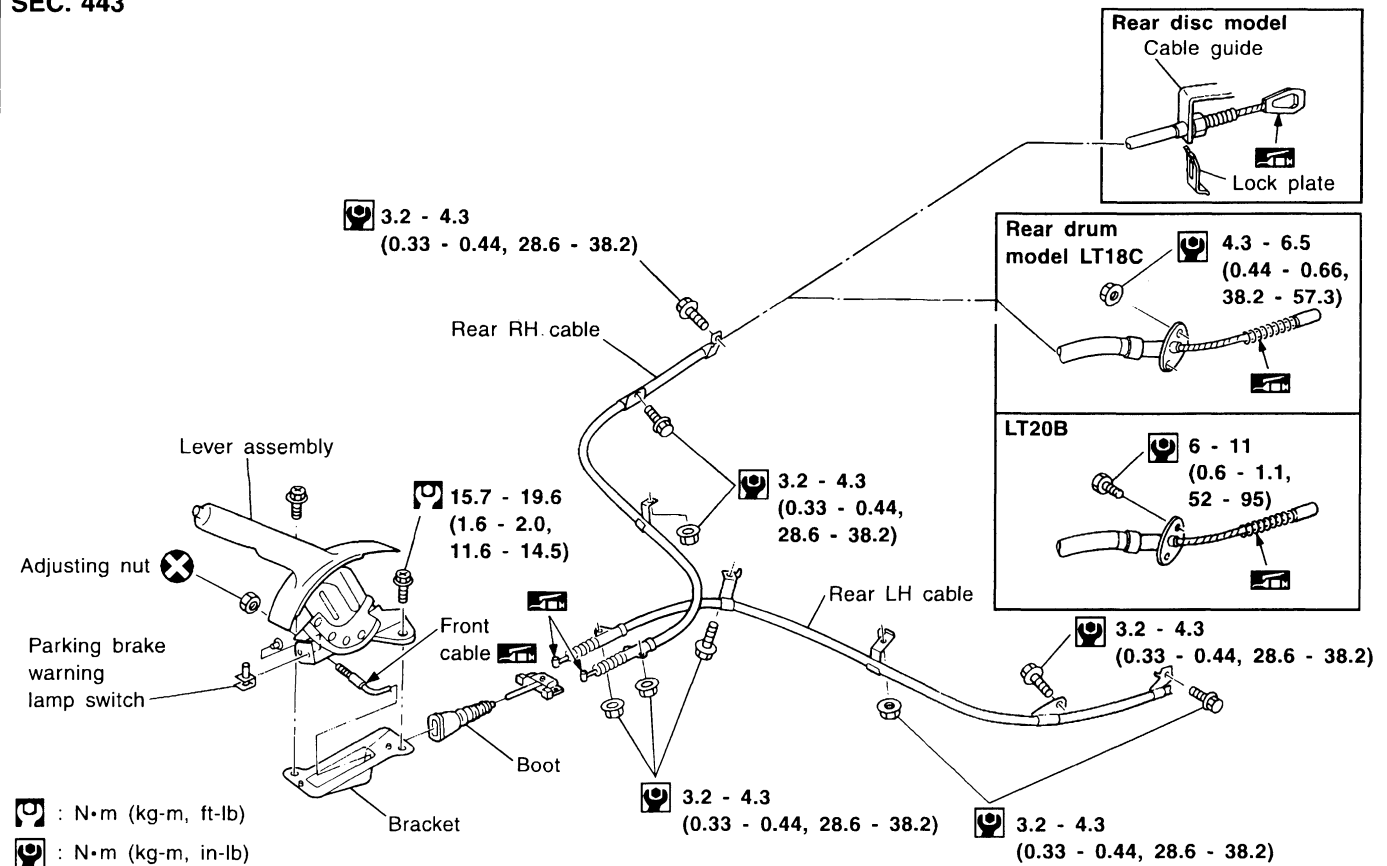
- ⑦ Return spring
- ⑧ Adjuster
- ⑨ Shoe
- ⑩ Adjuster lever
- ⑪ Adjuster spring
- ⑫ Retainer

- ⑬ Shoe hold-down spring
- ⑭ Toggle lever
- ⑮ Washer
- ⑯ Retainer ring
- ⑰ Shoe hold-down pin
- ⑱ Plug

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PARKING BRAKE CONTROL

SEC. 443



SBR029E

ANTI-LOCK BRAKE SYSTEM

Purpose

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

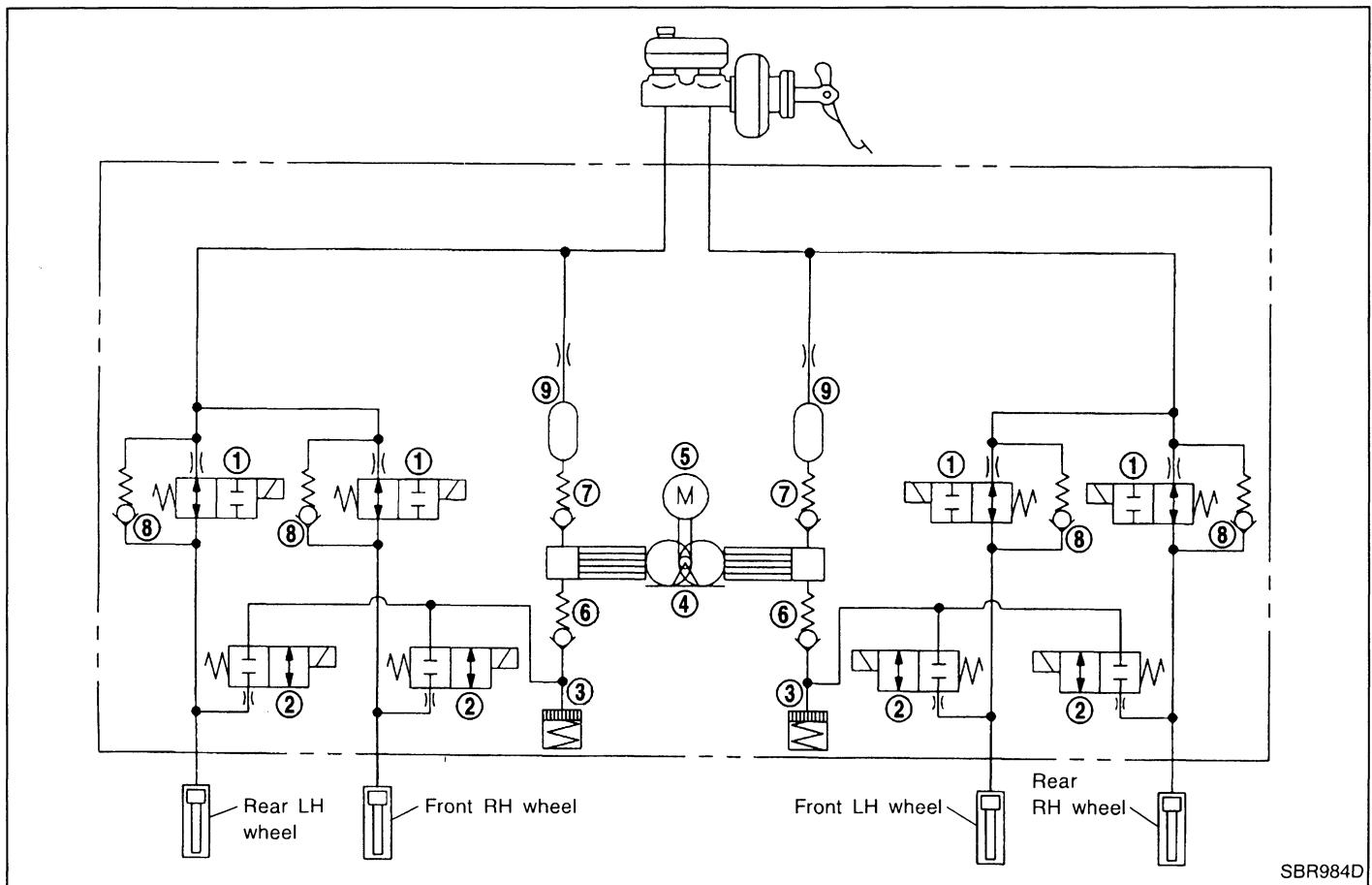
The ABS:

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

Operation

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

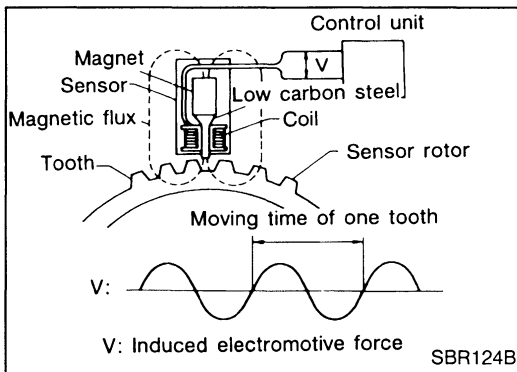
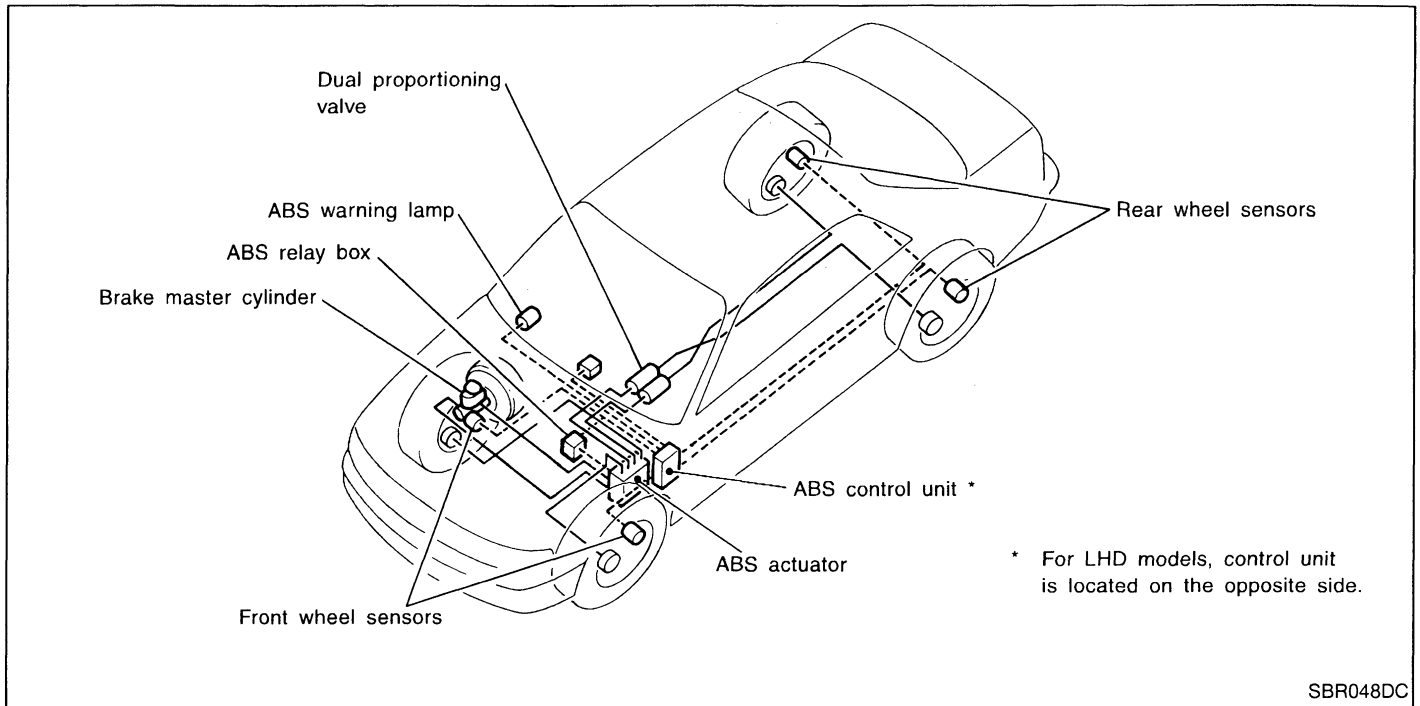
ABS Hydraulic Circuit



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

ANTI-LOCK BRAKE SYSTEM

System Components



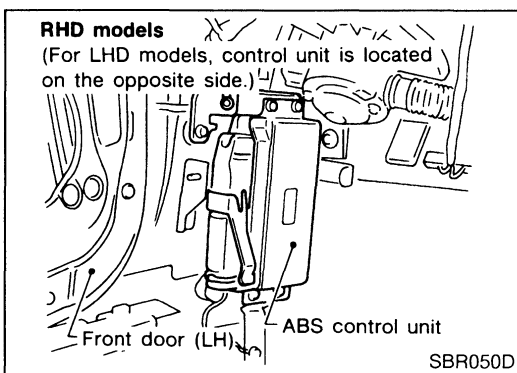
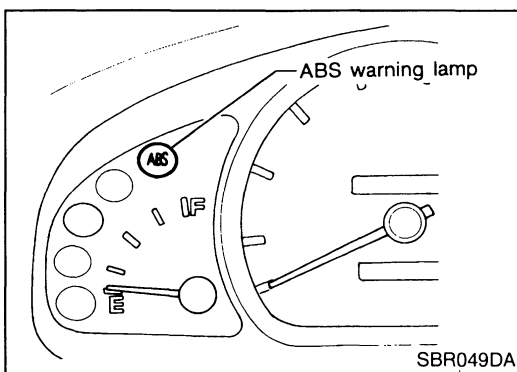
System Description

SENSOR

The sensor unit consists of a gear-shaped sensor rotor and a sensor element. The element contains a bar magnet around which a coil is wound. The sensor is installed on the back side of the brake rotor. Sine-wave current is generated by the sensor as the wheel rotates. The frequency and voltage increase(s) as the rotating speed increases.

CONTROL UNIT

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



ANTI-LOCK BRAKE SYSTEM

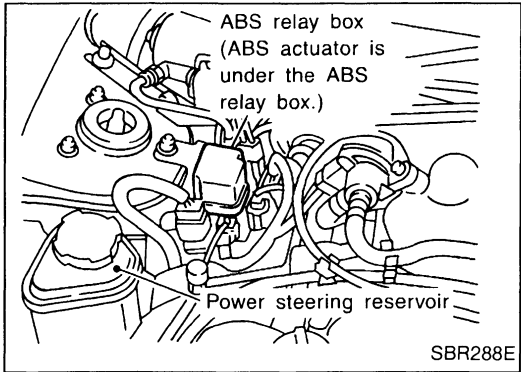
System Description (Cont'd)

ACTUATOR

The actuator contains:

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

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



ABS actuator operation

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

ANTI-LOCK BRAKE SYSTEM

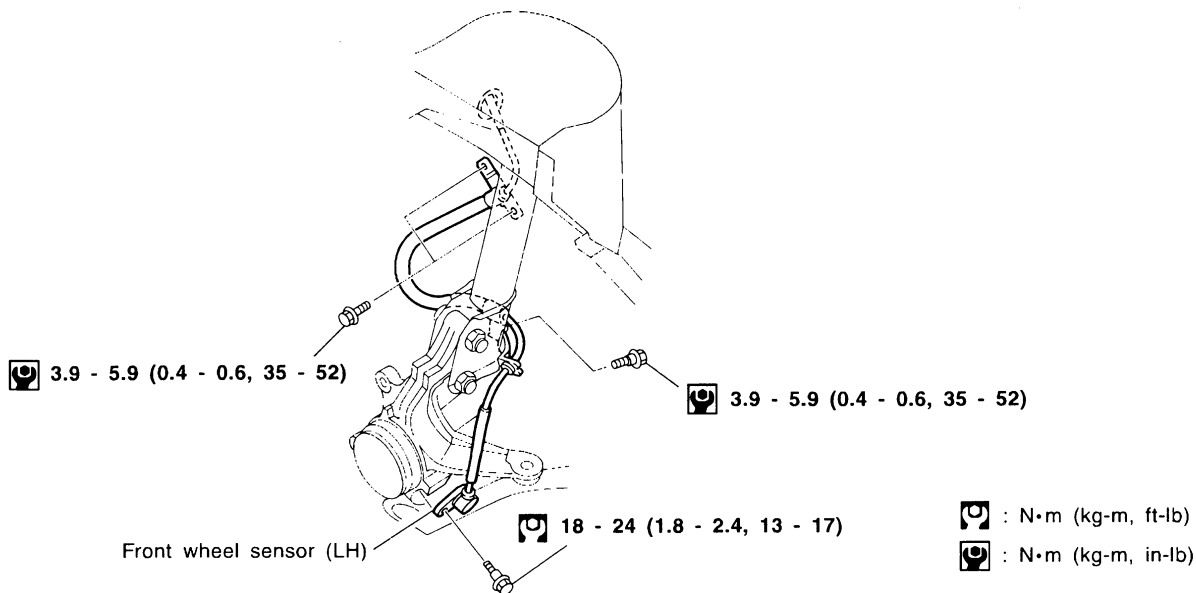
Removal and Installation

CAUTION:

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

FRONT WHEEL SENSOR

SEC. 476

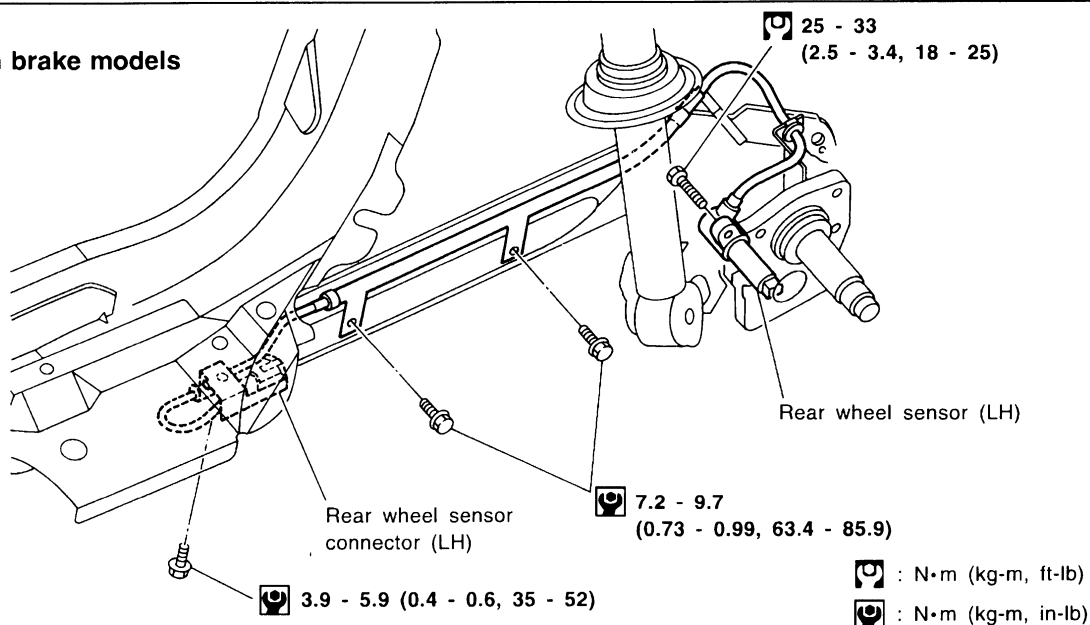


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REAR WHEEL SENSOR

SEC. 476

Rear drum brake models



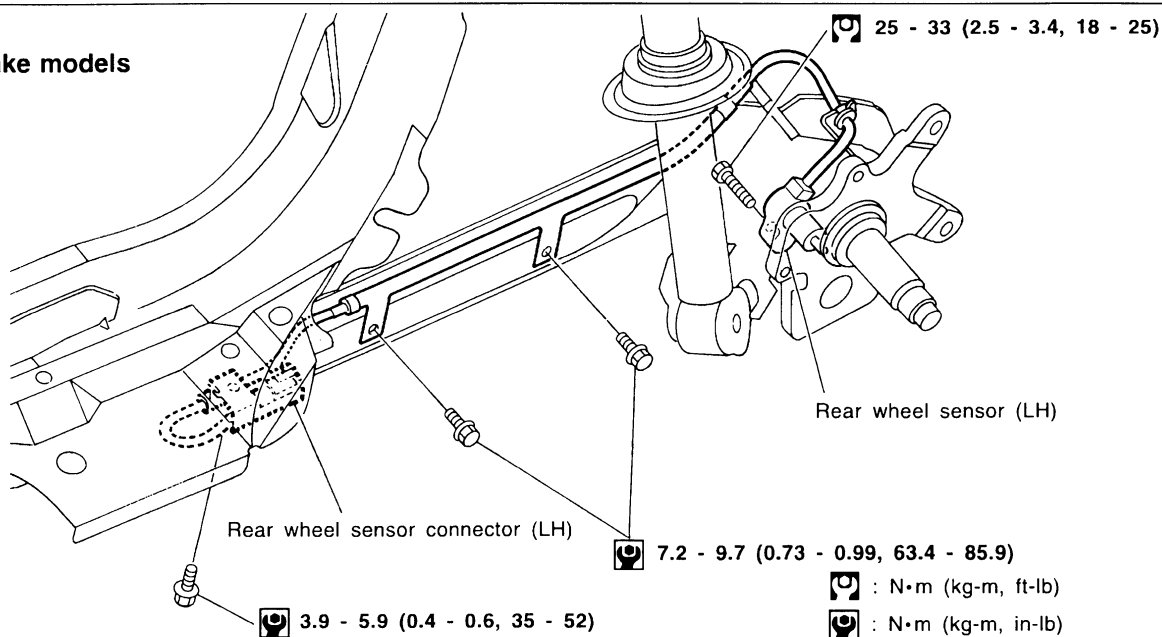
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ANTI-LOCK BRAKE SYSTEM

Removal and Installation (Cont'd)

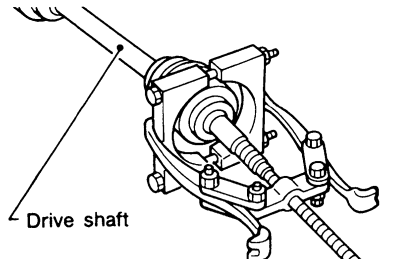
SEC. 476

Rear disc brake models



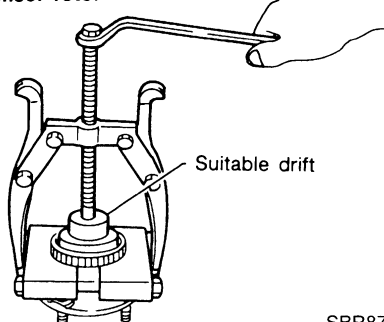
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Front sensor rotor



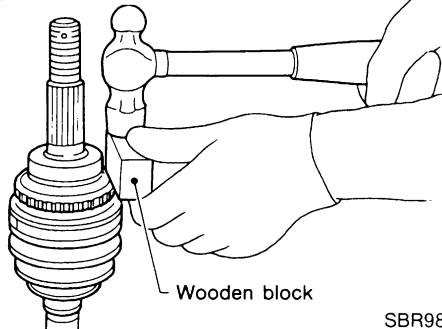
SBR984C

Rear sensor rotor



SBR873CA

Front sensor rotor



SBR985C

SENSOR ROTOR

Removal

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

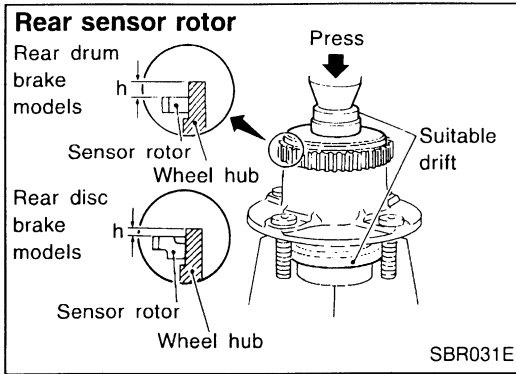
Installation

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

- Always replace sensor rotor with new one.

ANTI-LOCK BRAKE SYSTEM

Removal and Installation (Cont'd)



- Pay attention to the dimension of rear sensor rotor as shown in figure.

h: Rear disc brake models

4.5 - 5.5 mm (0.177 - 0.217 in)

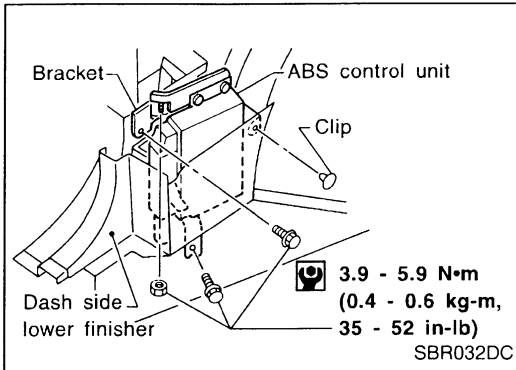
Rear drum brake models

22 - 23 mm (0.87 - 0.91 in)

CONTROL UNIT

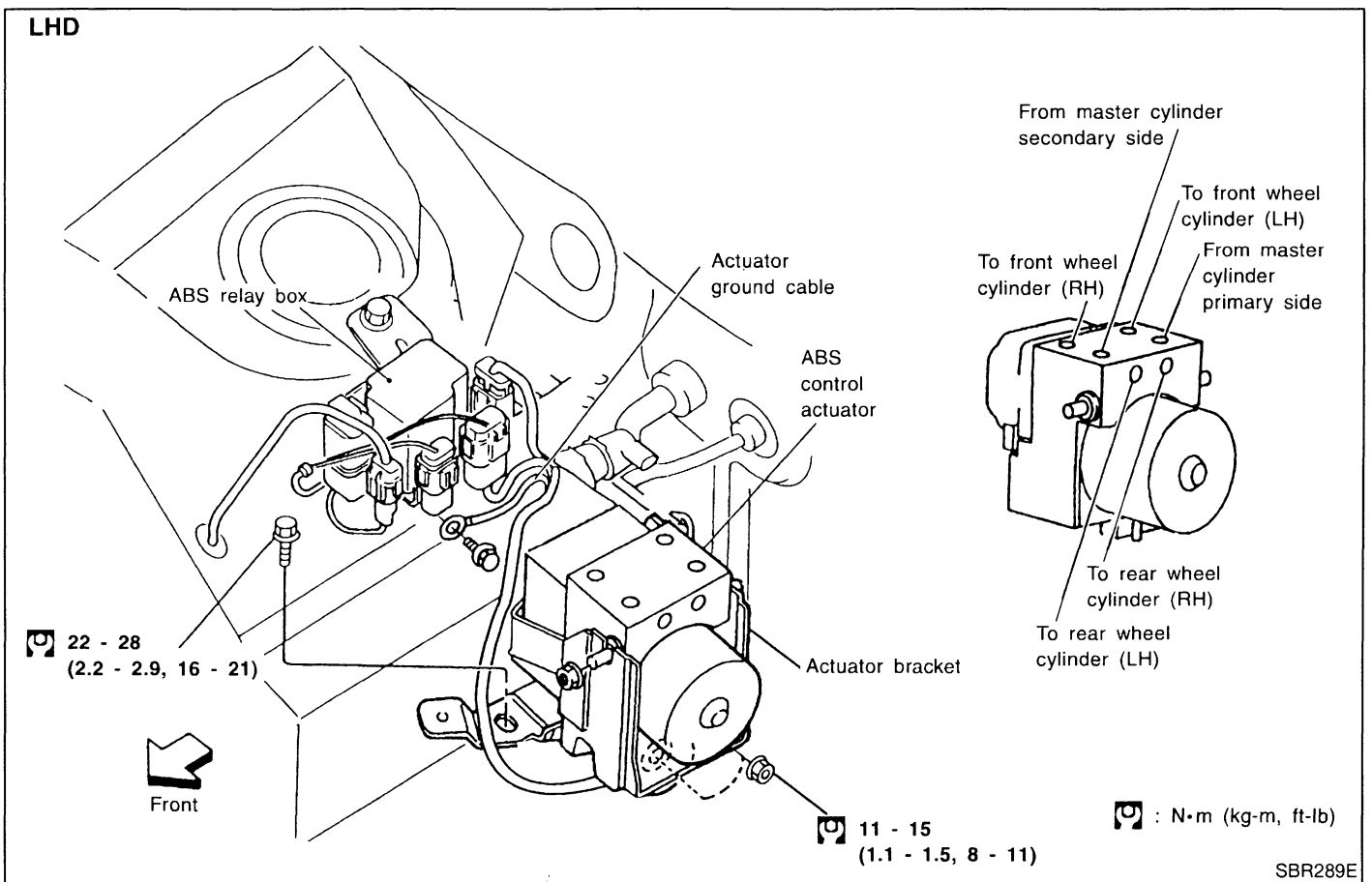
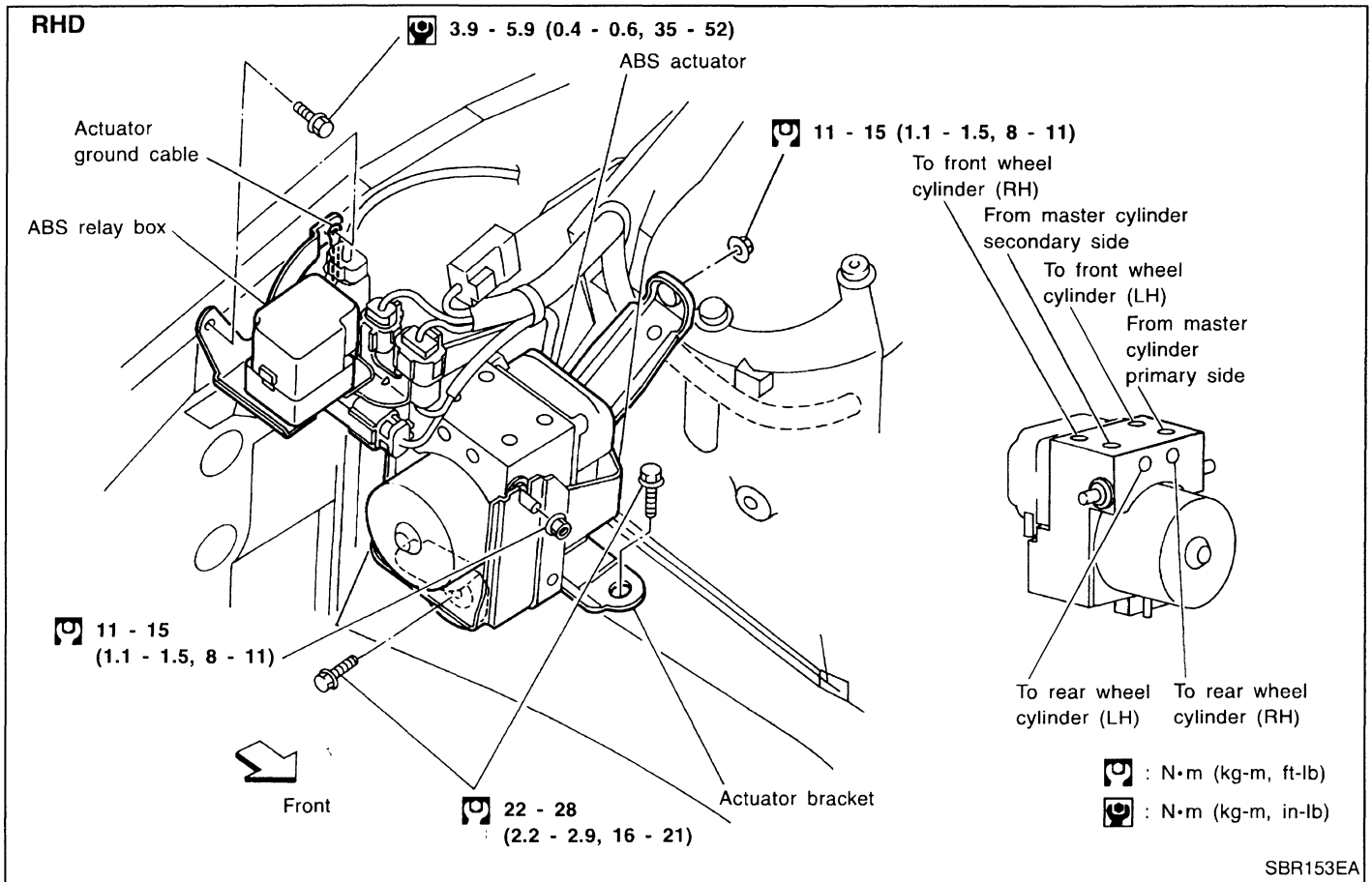
Location: Front passenger side dash side lower.

- Make sure that the sensor shield ground cable is secured with mounting bolt.



ANTI-LOCK BRAKE SYSTEM

Removal and Installation (Cont'd) ABS ACTUATOR

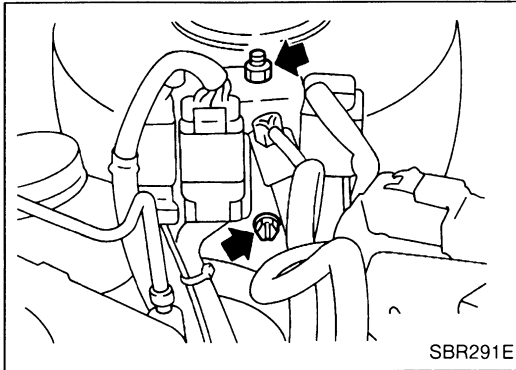
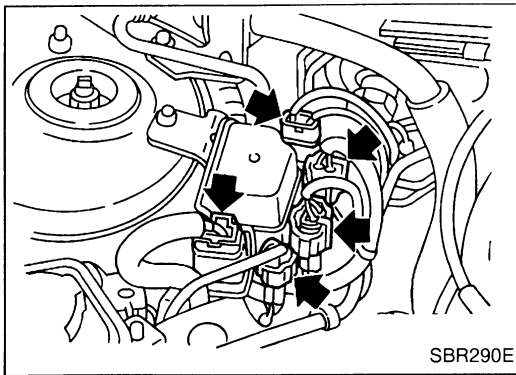


ANTI-LOCK BRAKE SYSTEM

Removal and Installation (Cont'd)

Removal

1. Disconnect battery cable.
2. Drain brake fluid. Refer to "Changing Brake Fluid", "CHECK AND ADJUSTMENT".
3. Discharge air conditioner refrigerant. Refer to HA section ["HFC-134a (R-134a) Service Procedure", "SERVICE PROCEDURES"].
4. Disconnect all connectors from ABS relay unit.



5. Remove ABS relay box with bracket.
6. Remove air conditioner low-pressure tubes. Refer to HA section ("Refrigerant Lines", "SERVICE PROCEDURES").
7. Disconnect and separate brake line and move away control actuator.

It is not necessary to remove these lines from vehicle.

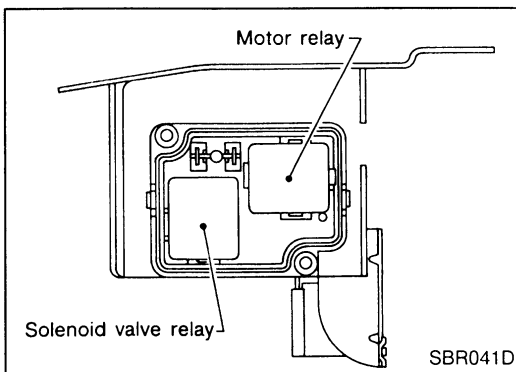
8. Remove ABS actuator.

Installation

CAUTION:

After installation, pay attention to the following points.

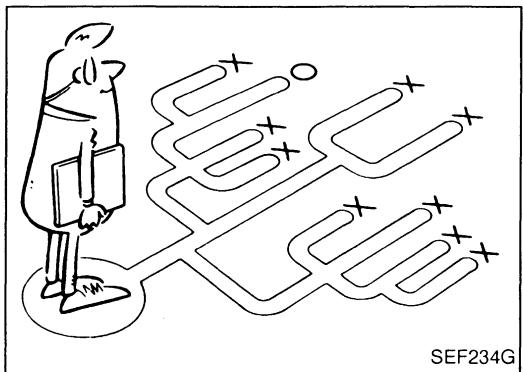
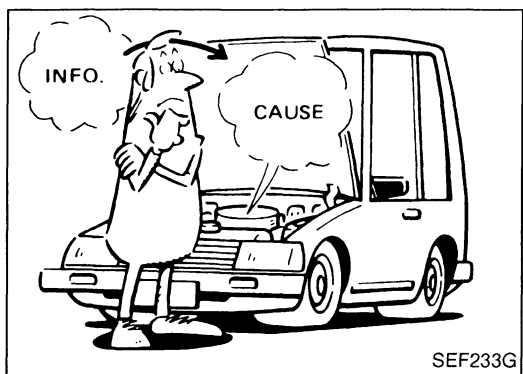
- Refill brake fluid and bleed air. Refer to "CHECK AND ADJUSTMENT" and "AIR BLEEDING".
- Charge air conditioner refrigerant. Refer to HA section ["HFC-134a (R-134a) Service Procedure", "SERVICE PROCEDURES"].
- Installation procedure is basically the reverse order of removal.



ABS RELAYS

Removal and installation

1. Disconnect battery cable.
2. Remove ABS relay cover.



How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

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

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

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

Before performing 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; especially for intermittent problems. By talking to the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot brake problems on an ABS controlled vehicle.

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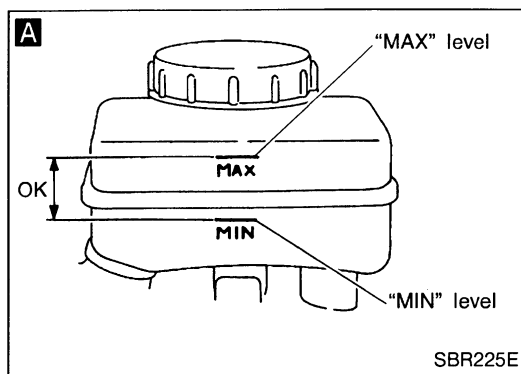
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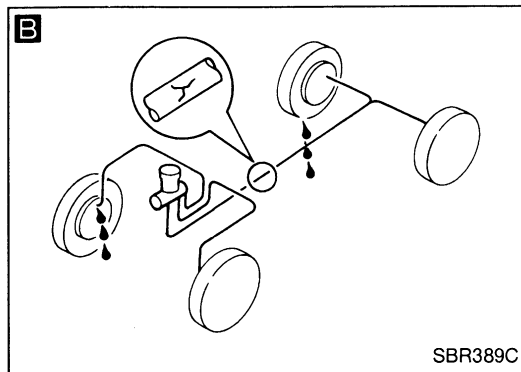
Preliminary Check



A

Check brake fluid level in reservoir tank.

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

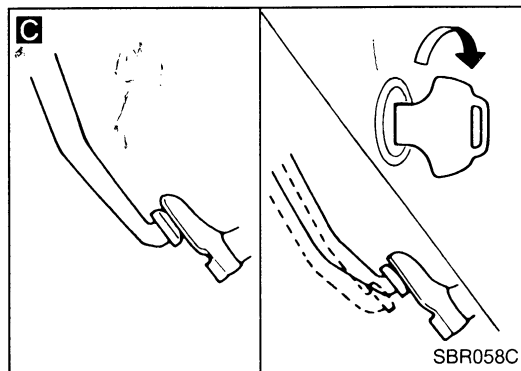


B

Check brake line for leakage.

NG → Repair.

OK



C

Check brake booster for operation and air tightness.

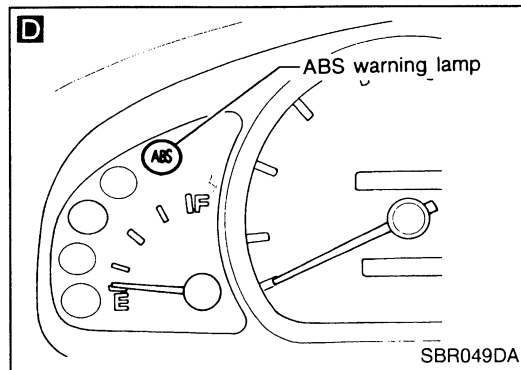
NG → Replace.

OK

Check brake pads and rotor.

NG → Replace.

OK



A

Check brake fluid level in reservoir tank.

NG → Fill up brake fluid.

OK

D

Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

NG → Check fuse, warning lamp bulb and warning lamp circuit.

OK

Check warning lamp for deactivation.
When ignition switch is turned on, warning lamp turns on, then deactivates after one second.

NG → Go to Self-diagnosis, BR-28.

OK

E

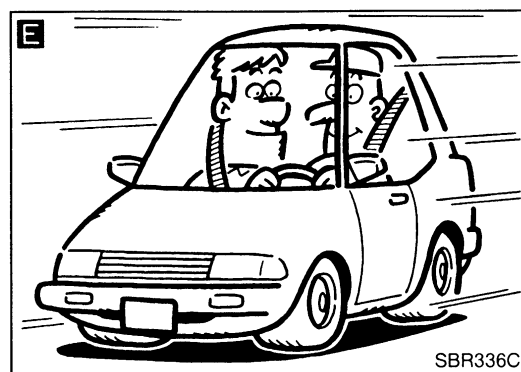
Drive vehicle at 30 km/h (19 MPH) for at least one minute.

Ensure that warning lamp remains off while driving.

NG → Go to Self-diagnosis, BR-28.

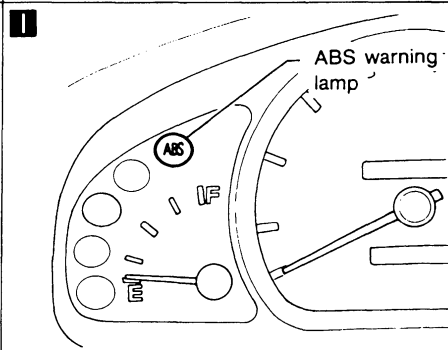
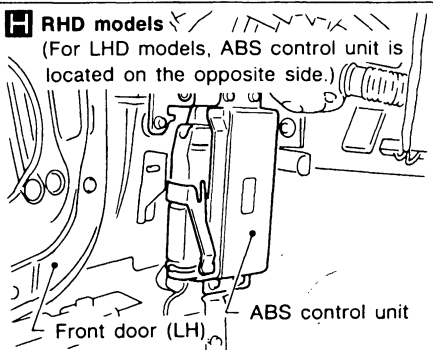
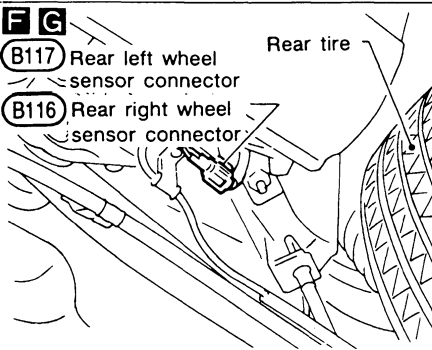
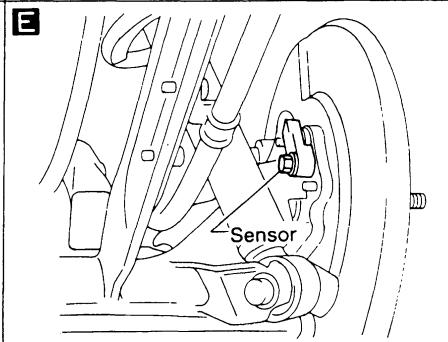
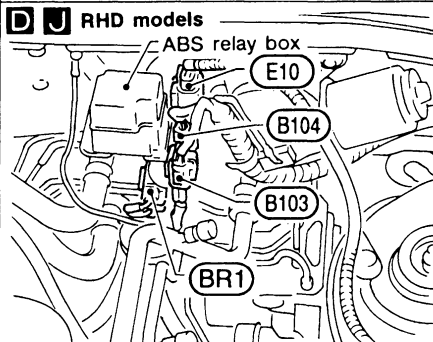
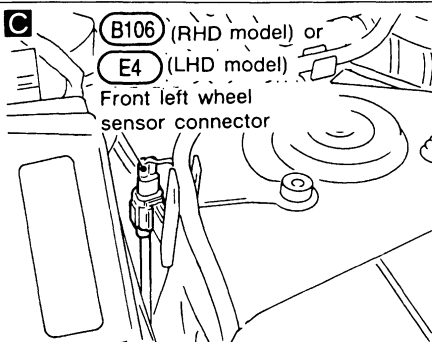
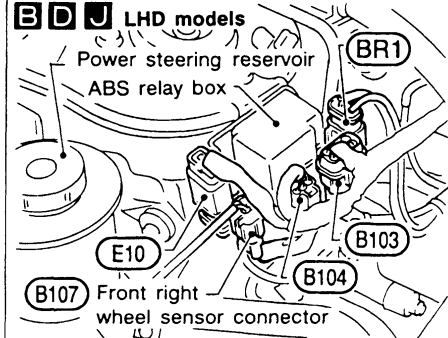
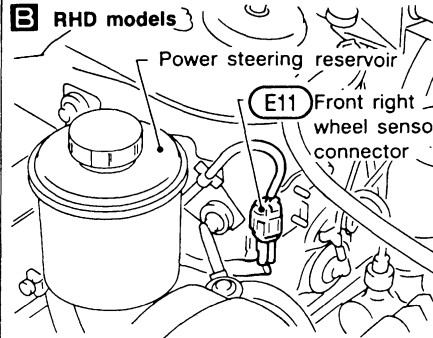
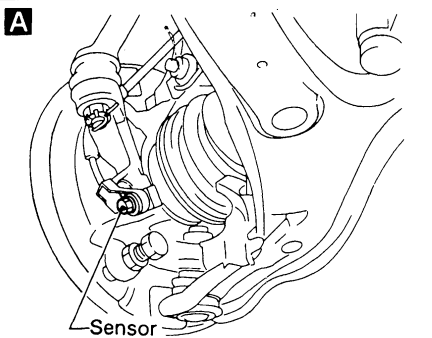
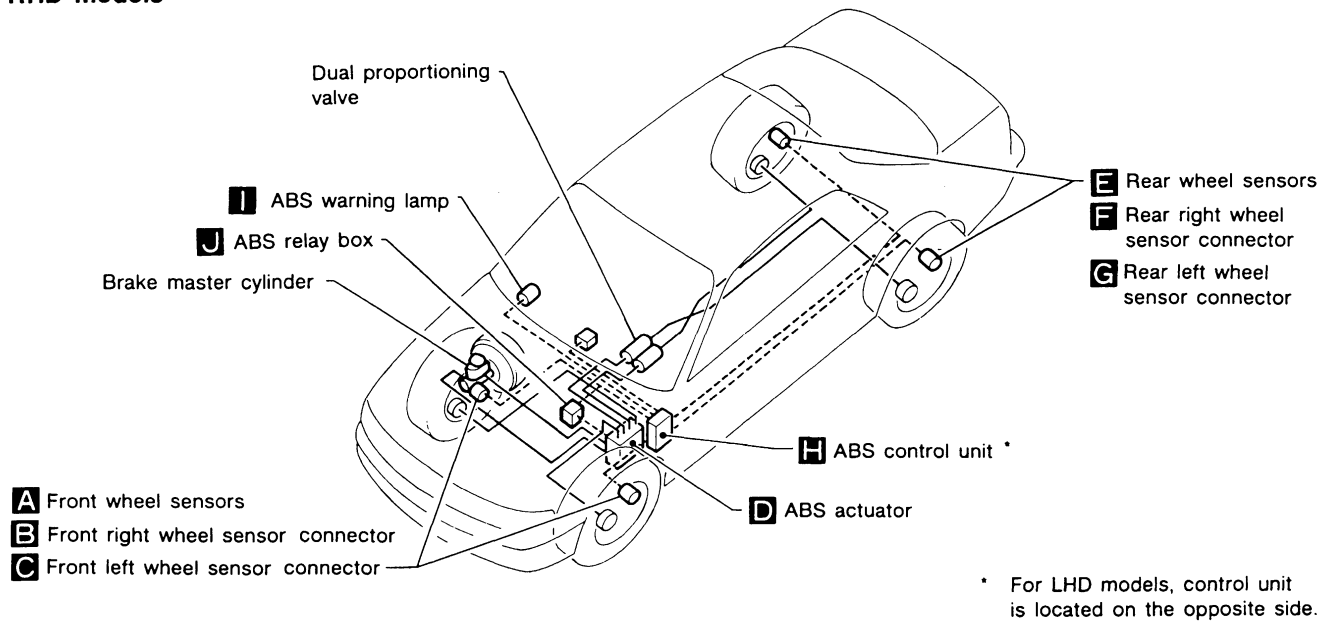
OK

END

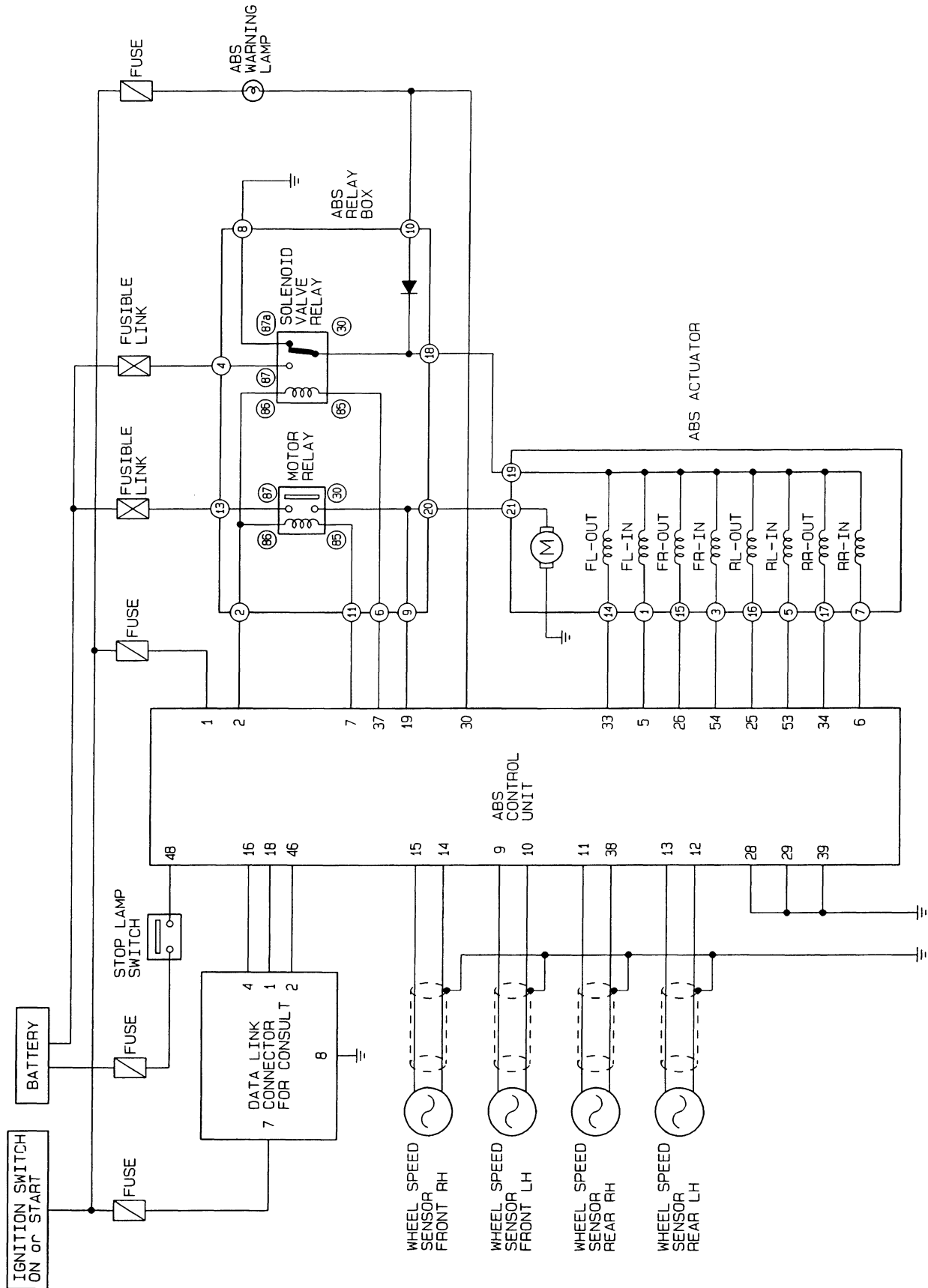


Component Parts and Harness Connector Location

RHD models

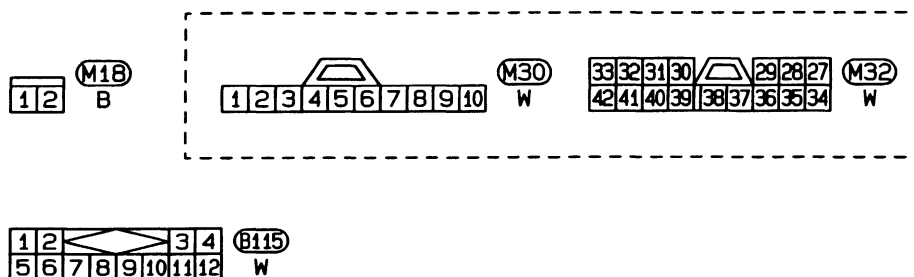
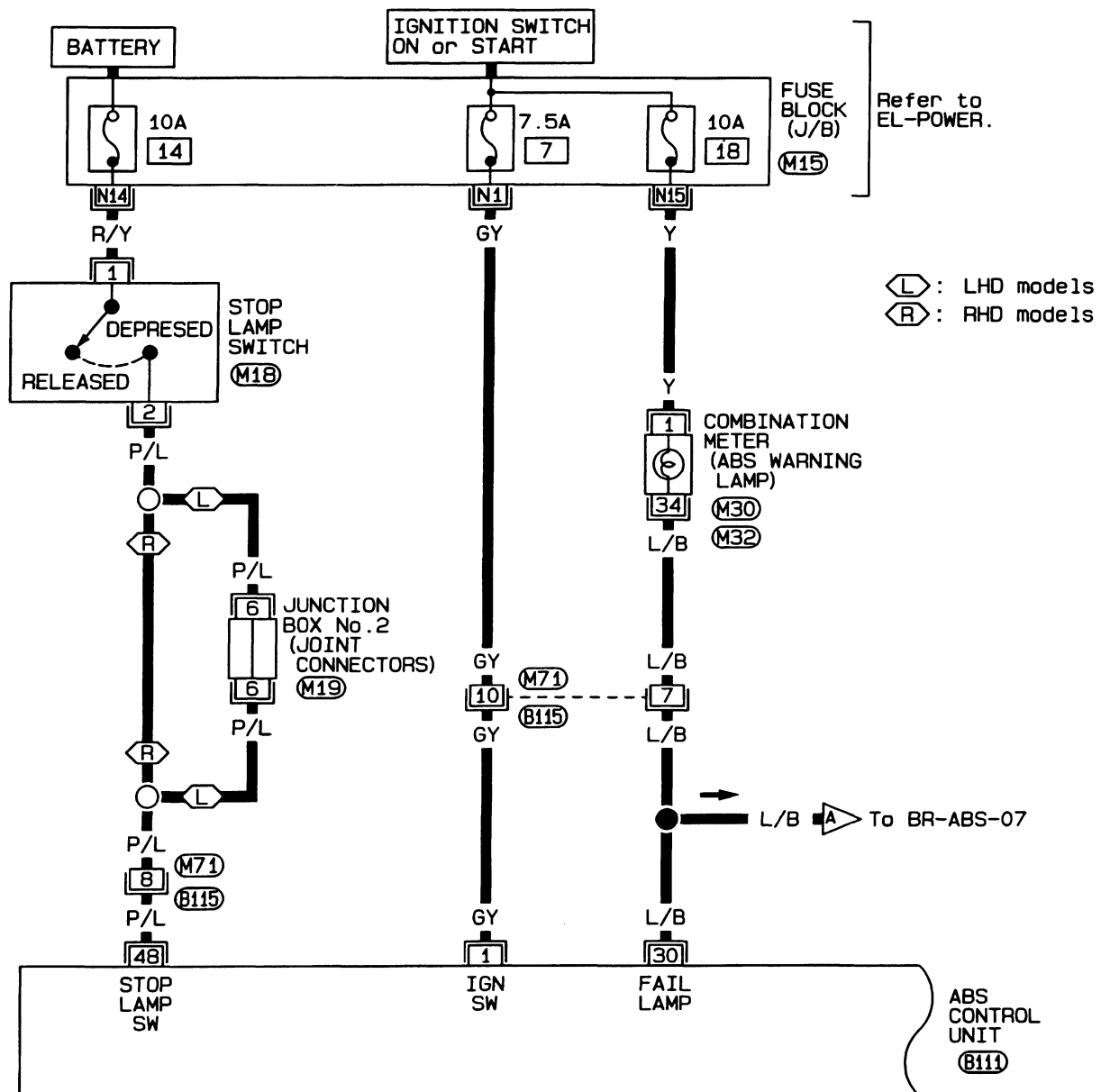


Schematic



Wiring Diagram — ABS —

BR-ABS-01



Refer to last page
(Foldout page) .

(M15)

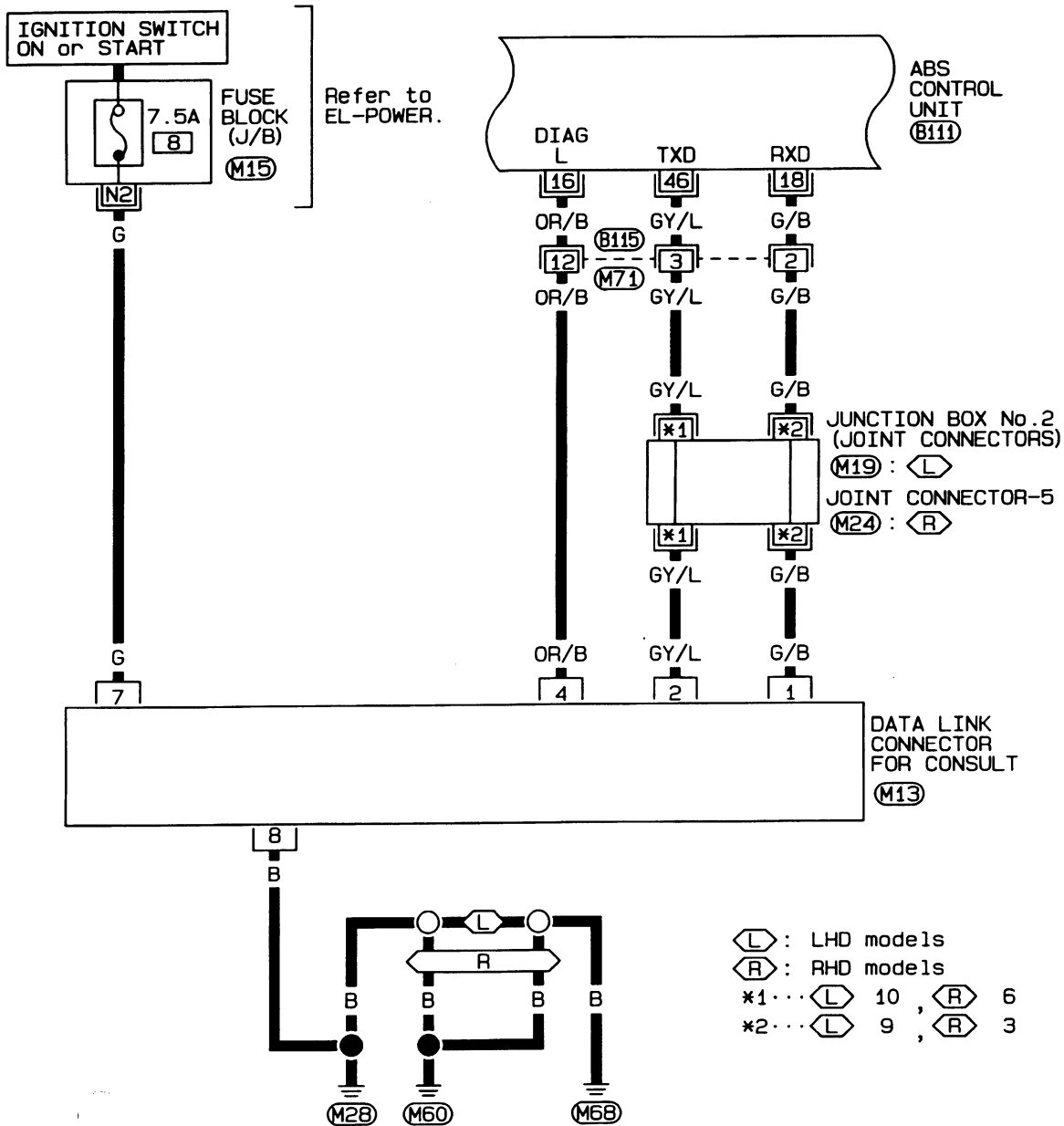
(M19)

(B111)

TROUBLE DIAGNOSES

Wiring Diagram — ABS — (Cont'd)

BR-ABS-02



1	2	3	4	5	6	7	(M13)
8	9	10	11	12	13	14	GY

1	1	1	2	2	2	3	3	3	(M24)
4	4	4	5	5	5	6	6	6	OR

1	2	3	4	(B115)
5	6	7	8	W

Refer to last page (Foldout page).

(M15)

(M19)

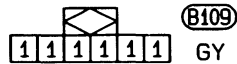
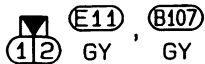
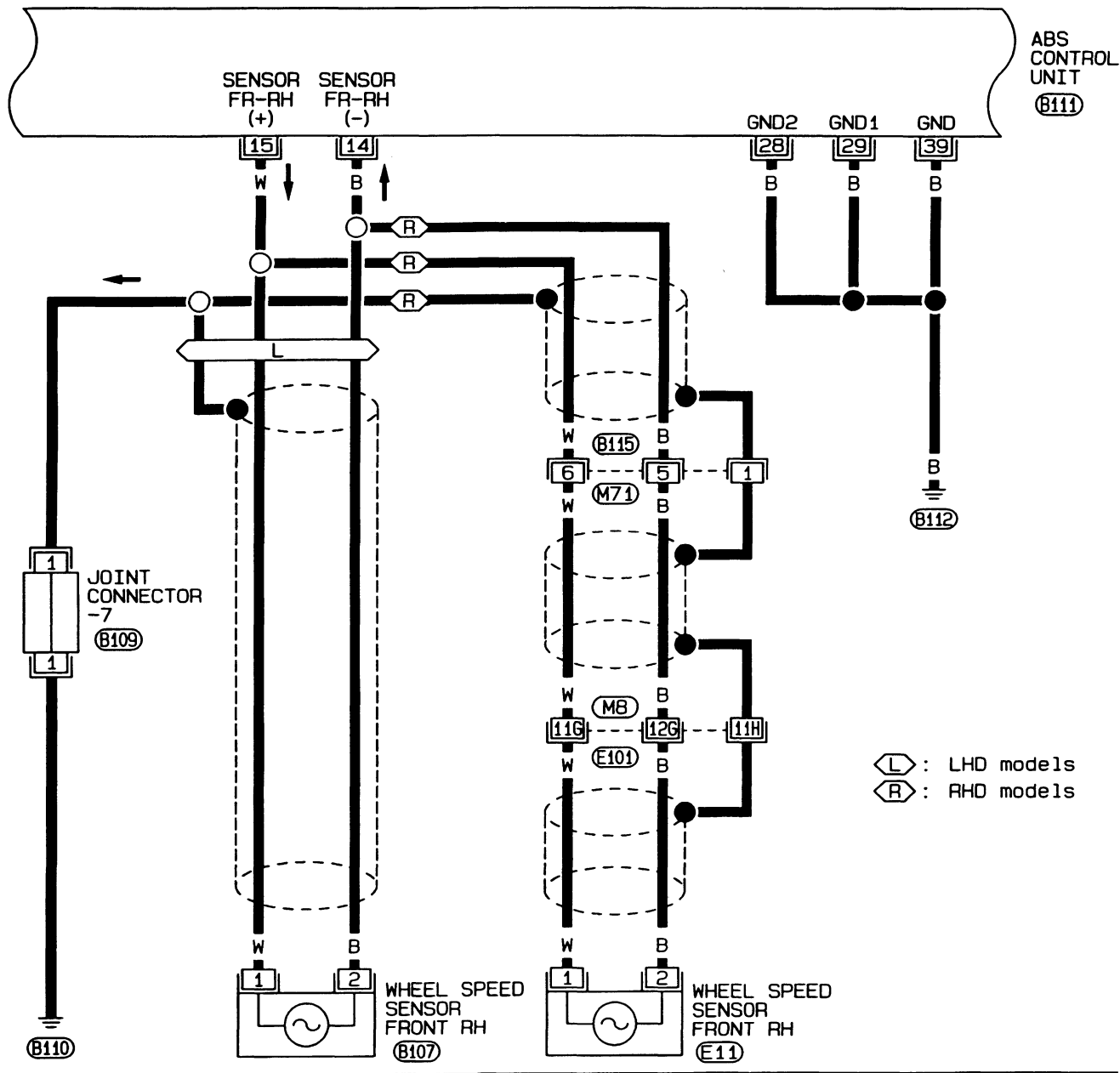
(B11)

TROUBLE DIAGNOSES

Wiring Diagram — ABS — (Cont'd)

RHD MODELS

BR-ABS-03



Refer to last page (Foldout page).

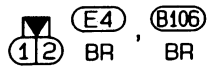
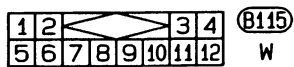
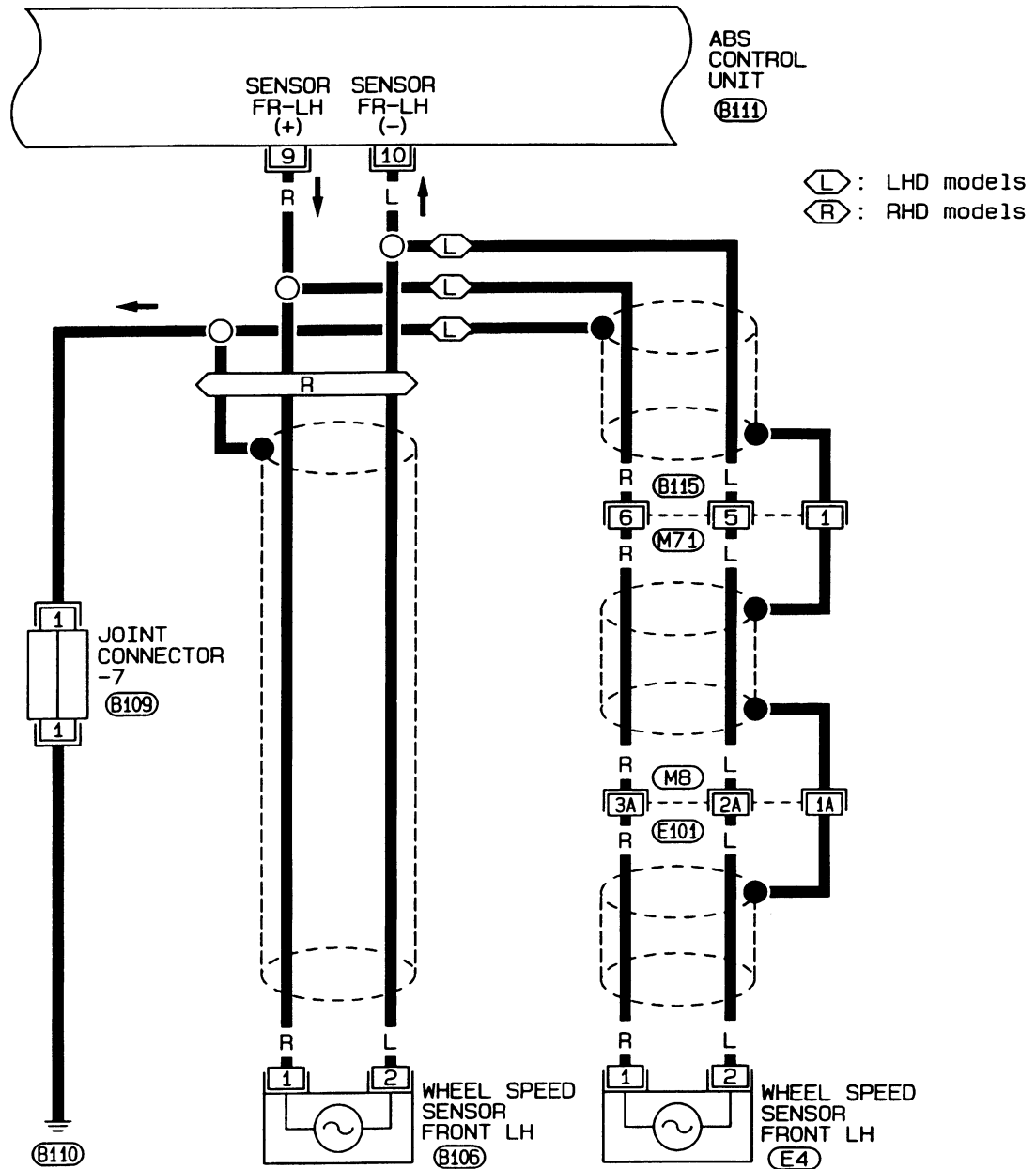
M8, E101
B111

TROUBLE DIAGNOSES

Wiring Diagram — ABS — (Cont'd)

LHD MODELS

BR-ABS-04



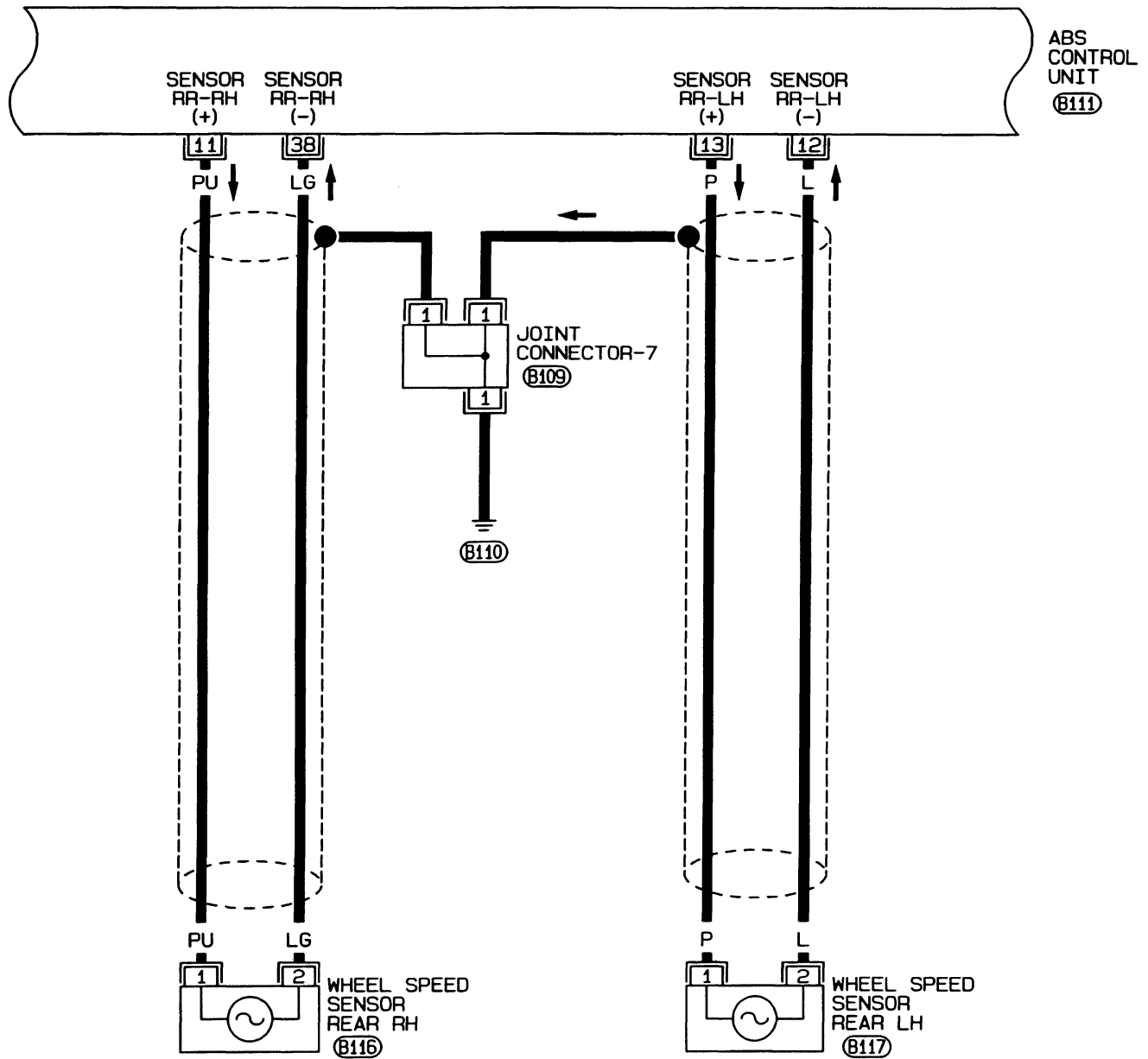
Refer to last page (Foldout page).

(MB), (E101)
(B111)

TROUBLE DIAGNOSES

Wiring Diagram — ABS — (Cont'd)

BR-ABS-05



①② ⑧116 ⑧117
GY BR

⑧109
1 1 1 1 1 1 GY

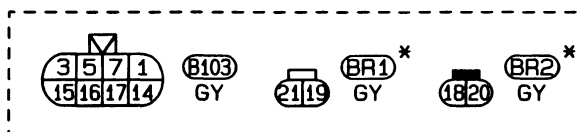
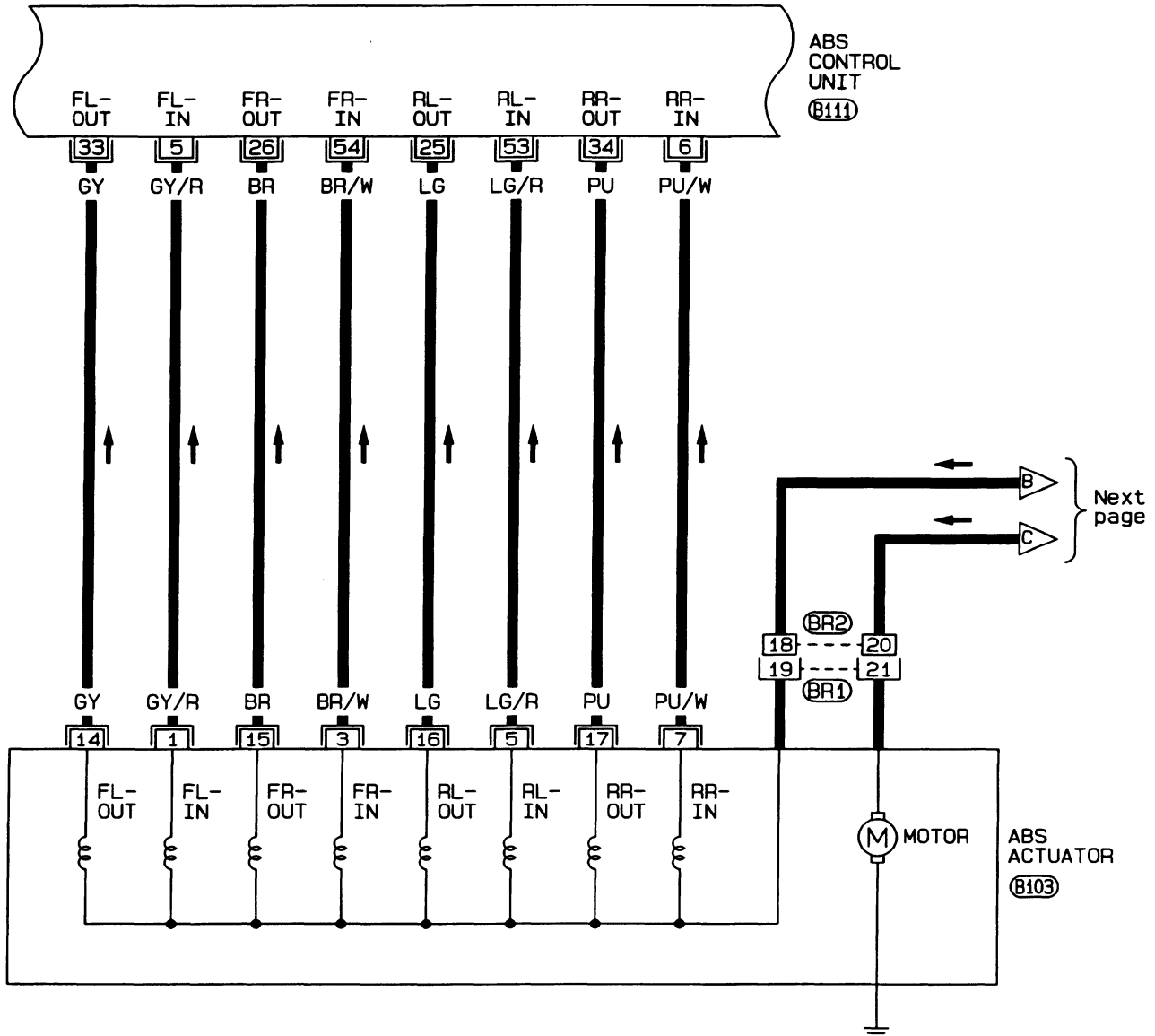
Refer to last page
(Foldout page).

⑧111

TROUBLE DIAGNOSES

Wiring Diagram — ABS — (Cont'd)

BR-ABS-06



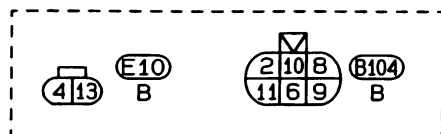
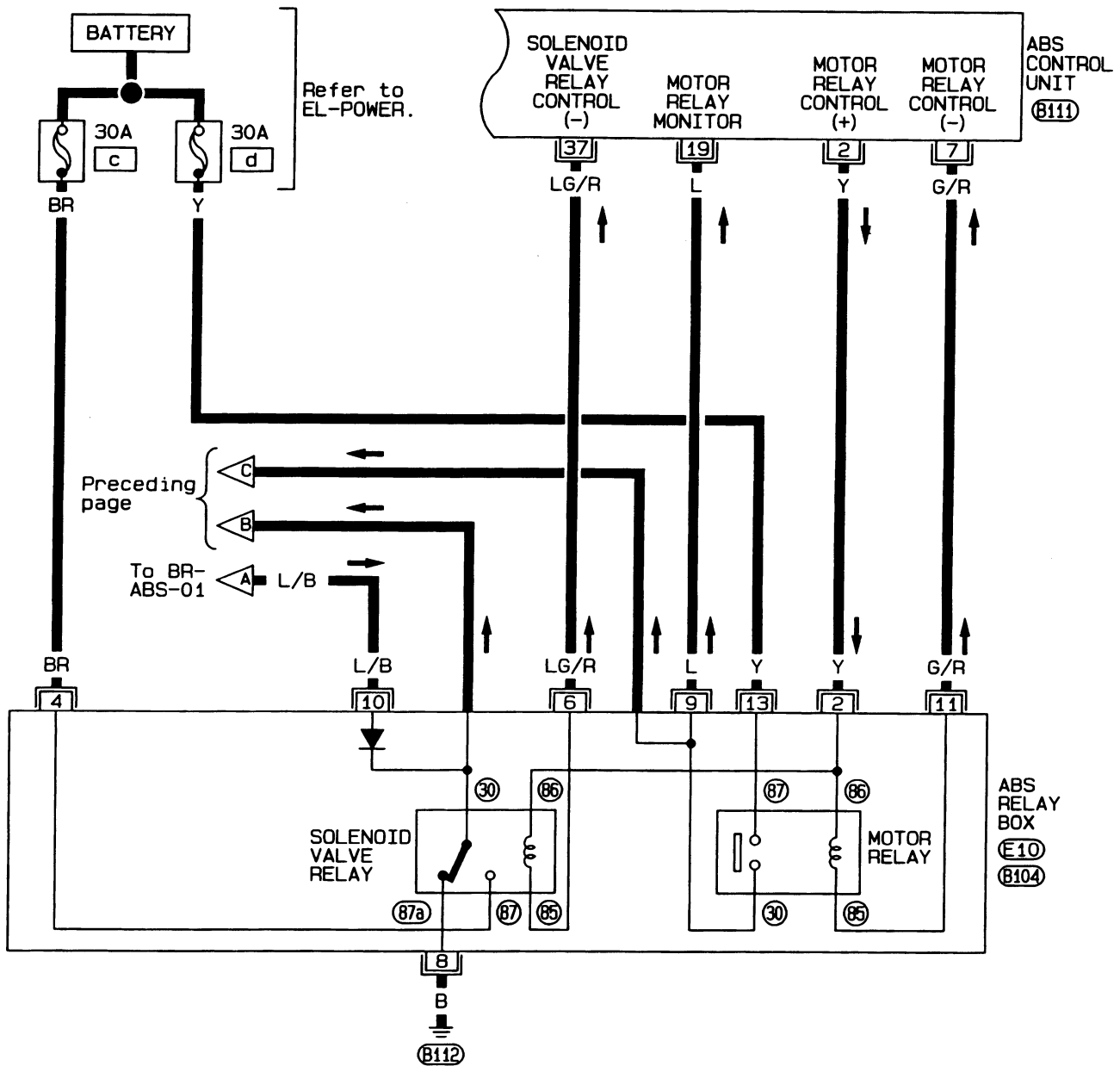
Refer to last page
(Foldout page).

(B111)

* : This connector is not shown in "HARNESS LAYOUT", EL section.

Wiring Diagram — ABS — (Cont'd)

BR-ABS-07



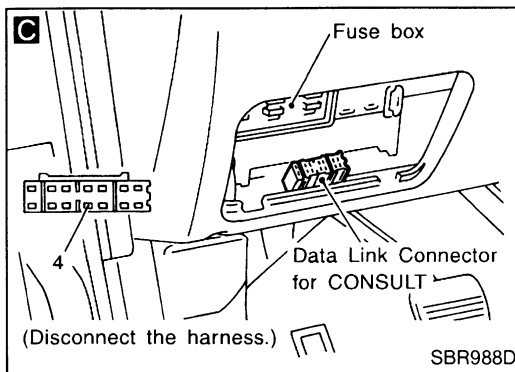
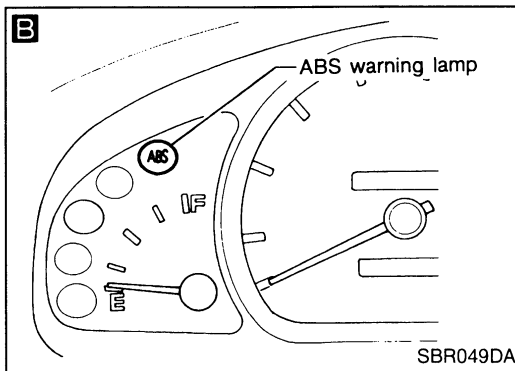
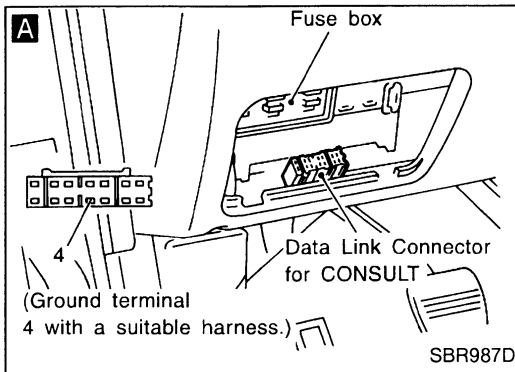
Refer to last page
(Foldout page) .

(B111)

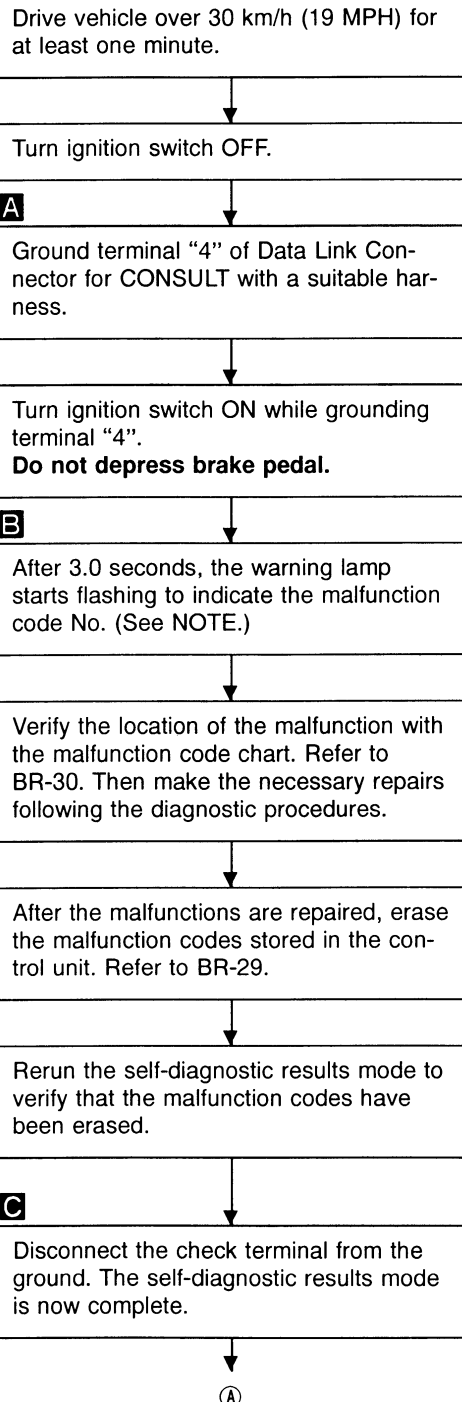
Self-diagnosis

FUNCTION

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



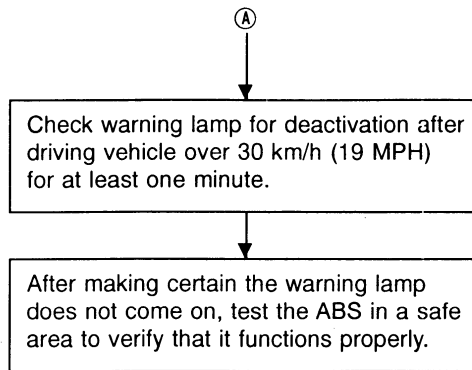
SELF-DIAGNOSIS PROCEDURE



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

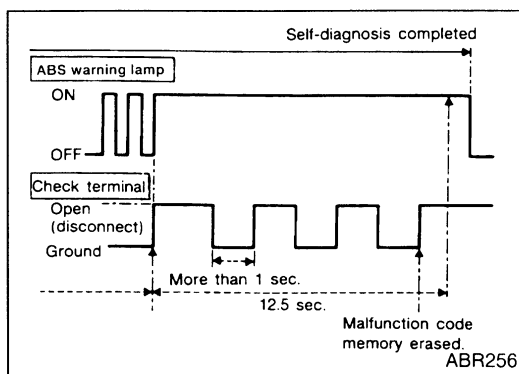
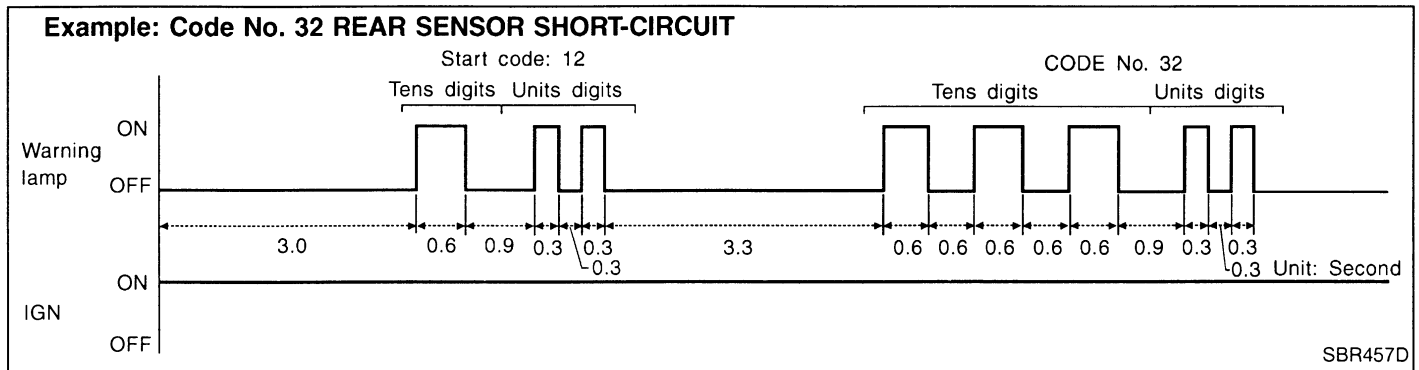
TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)



HOW TO READ SELF-DIAGNOSTIC RESULTS (Malfunction codes)

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



HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)

1. Disconnect the check terminal from ground (ABS warning lamp will stay lit).
2. Within 12.5 seconds, ground the check terminal 3 times. Each terminal grounding 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-28. Only the start code should appear, no malfunction codes.

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

MALFUNCTION CODE/SYMPTOM CHART

Code No. (No. of LED flashes)	Malfunctioning part	Diagnostic procedure
12	Self-diagnosis could not detect any malfunctions.	—
45	Actuator front left outlet solenoid valve	1
46	Actuator front left inlet solenoid valve	1
41	Actuator front right outlet solenoid valve	1
42	Actuator front right inlet solenoid valve	1
51	Actuator rear right outlet solenoid valve	1
52	Actuator rear right inlet solenoid valve	1
55	Actuator rear left outlet solenoid valve	1
56	Actuator rear left inlet solenoid valve	1
25	Front left sensor (open-circuit)	2
26	Front left sensor (short-circuit)	2
21	Front right sensor (open-circuit)	2
22	Front right sensor (short-circuit)	2
35	Rear left sensor (open-circuit)	2
36	Rear left sensor (short-circuit)	2
31	Rear right sensor (open-circuit)	2
32	Rear right sensor (short-circuit)	2
18	Sensor rotor	2
61	Actuator motor or motor relay	3
63	Solenoid valve relay	4
57	Power supply (low voltage)	5
71	Control unit	6
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	8
Warning lamp stays on during Self-diagnosis.	Control unit	—
Warning lamp does not come on when ignition switch is turned ON.	Fuse, warning lamp bulb or warning lamp circuit Control unit	7
Warning lamp does not come on during Self-diagnosis.	Control unit	—
Pedal vibration and noise	—	9
Long stopping distance	—	10
Unexpected pedal action	—	11
ABS does not work.	—	12
ABS works frequently.	—	13

TROUBLE DIAGNOSES

CONSULT

CONSULT APPLICATION TO ABS

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

X: Applicable

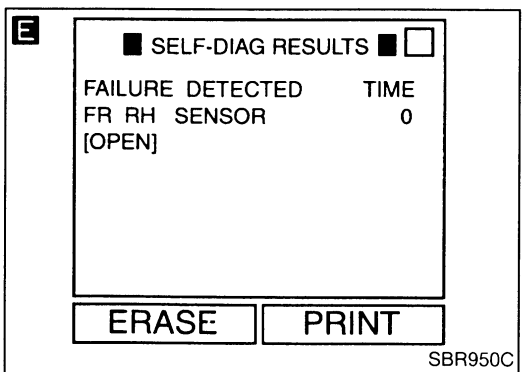
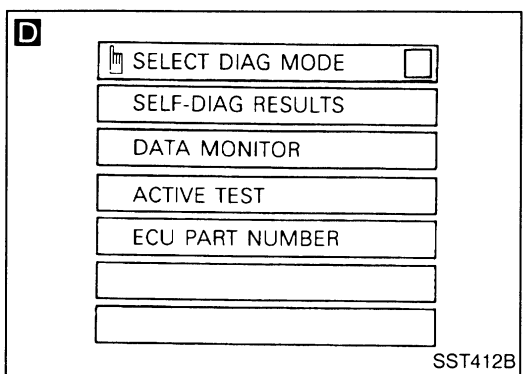
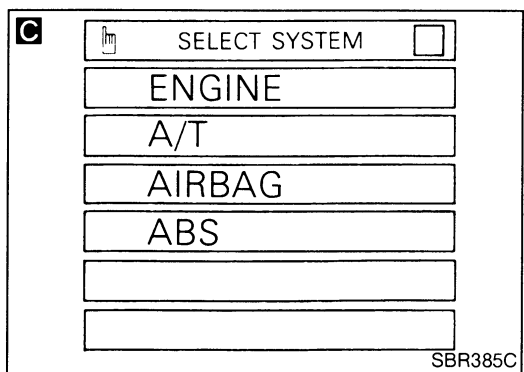
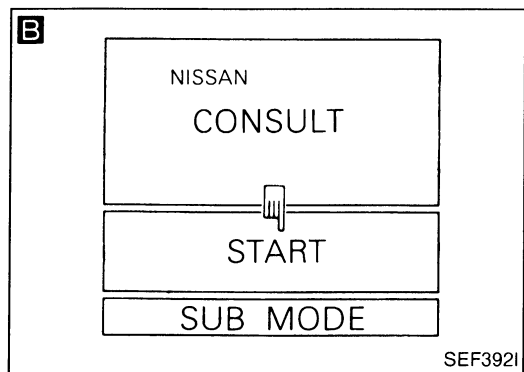
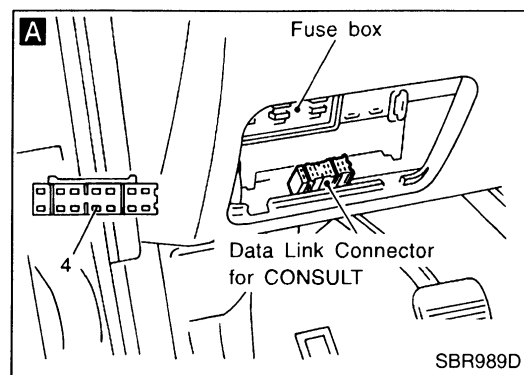
—: Not applicable

ECU (ABS control unit) part number mode

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

TROUBLE DIAGNOSES

CONSULT Inspection Procedure SELF-DIAGNOSIS PROCEDURE



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

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

- B** 1) Stop vehicle with engine running and touch "START" on CONSULT screen.
- C** 2) Touch "ABS".
- D E** 3) Touch "SELF-DIAG RESULTS".
- The screen shows maximum three malfunctions.
 - Does the screen show the detected malfunction?

WARNING LAMP INSPECTION

Check warning lamp and the circuit and repair if necessary.

MALFUNCTION REPAIR

Make the necessary repairs following the diagnostic procedures.

E

After repairing the malfunctions, start engine. Then erase the self-diagnostic results stored in the control unit by touching "ERASE".

Are the self-diagnostic results erased?

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

Does the warning lamp activate?

End

Note: "SELF-DIAG RESULTS" screen shows the detected malfunction and the times of ignition switch ON and OFF after it occurred.

TROUBLE DIAGNOSES

CONSULT Inspection Procedure (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

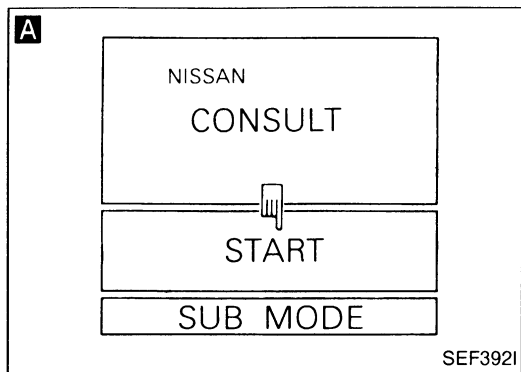
Diagnostic item	Diagnostic item is detected when ...	Diagnostic procedure	
FR RH SENSOR [OPEN]*1	● Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.)	2	GI
FR LH SENSOR [OPEN]*1	● Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.)	2	MA
RR RH SENSOR [OPEN]*1	● Circuit for rear right sensor is open. (An abnormally high input voltage is entered.)	2	EM
RR LH SENSOR [OPEN]*1	● Circuit for rear left sensor is open. (An abnormally high input voltage is entered.)	2	LC
FR RH SENSOR [SHORT]*1	● Circuit for front right wheel sensor is shorted. (An abnormally low input voltage is entered.)	2	
FR LH SENSOR [SHORT]*1	● Circuit for front left wheel sensor is shorted. (An abnormally low input voltage is entered.)	2	EC
RR RH SENSOR [SHORT]*1	● Circuit for rear right sensor is shorted. (An abnormally low input voltage is entered.)	2	FE
RR LH SENSOR [SHORT]*1	● Circuit for rear left sensor is shorted. (An abnormally low input voltage is entered.)	2	
ABS SENSOR [ABNORMAL SIGNAL]	● Teeth damage on sensor rotor or improper installation of wheel sensor. (Abnormal wheel sensor signal is entered.)	2	CL
FR RH IN ABS SOL [OPEN]	● Circuit for front right inlet solenoid valve is open. (An abnormally low output voltage is entered.)	1	MT
FR LH IN ABS SOL [OPEN]	● Circuit for front left inlet solenoid valve is open. (An abnormally low output voltage is entered.)	1	
RR RH IN ABS SOL [OPEN]	● Circuit for rear right inlet solenoid valve is open. (An abnormally low output voltage is entered.)	1	AT
RR LH IN ABS SOL [OPEN]	● Circuit for rear left inlet solenoid valve is open. (An abnormally low output voltage is entered.)	1	
FR RH IN ABS SOL [SHORT]	● Circuit for front right inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1	FA
FR LH IN ABS SOL [SHORT]	● Circuit for front left inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1	RA
RR RH IN ABS SOL [SHORT]	● Circuit for rear right inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1	
RR LH IN ABS SOL [SHORT]	● Circuit for rear left inlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1	BR
FR RH OUT ABS SOL [OPEN]	● Circuit for front right outlet solenoid valve is open. (An abnormally low output voltage is entered.)	1	ST
FR LH OUT ABS SOL [OPEN]	● Circuit for front left outlet solenoid valve is open. (An abnormally low output voltage is entered.)	1	
RR RH OUT ABS SOL [OPEN]	● Circuit for rear right outlet solenoid valve is open. (An abnormally low output voltage is entered.)	1	RS
RR LH OUT ABS SOL [OPEN]	● Circuit for rear left outlet solenoid valve is open. (An abnormally low output voltage is entered.)	1	BT
FR RH OUT ABS SOL [SHORT]	● Circuit for front right outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1	
FR LH OUT ABS SOL [SHORT]	● Circuit for front left outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1	HA
RR RH OUT ABS SOL [SHORT]	● Circuit for rear right outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1	
RR LH OUT ABS SOL [SHORT]	● Circuit for rear left outlet solenoid valve is shorted. (An abnormally high output voltage is entered.)	1	EL
ABS ACTUATOR RELAY [ABNORMAL]	● Actuator solenoid valve relay is ON, even control unit sends off signal. ● Actuator solenoid valve relay is OFF, even control unit sends on signal.	4	IDX
ABS MOTOR [ABNORMAL]	● Circuit for actuator motor is open or shorted. ● Actuator motor relay is stuck.	3	
BATTERY VOLT [VB-LOW]	● Power source voltage supplied to ABS control unit is abnormally low.	5	
CONTROL UNIT	● Function of calculation in ABS control unit has failed.	6	

*1: Be sure to confirm the ABS warning lamp illuminates when the ignition switch is turned ON after repairing the shorted sensor circuit, but the lamp goes out when driving the vehicle over 30 km/h (19 MPH) for one minute in accordance with SELF-DIAGNOSIS PROCEDURE.

TROUBLE DIAGNOSES

CONSULT Inspection Procedure (Cont'd)

DATA MONITOR PROCEDURE



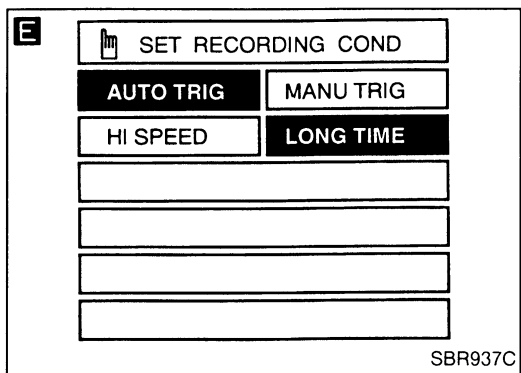
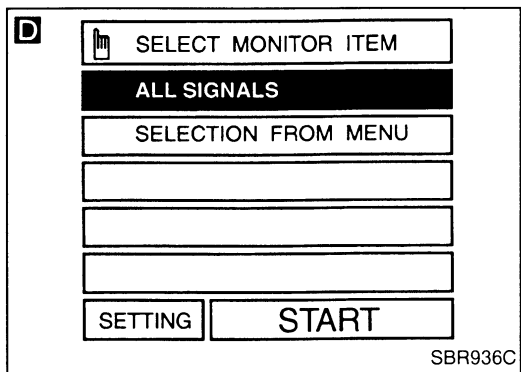
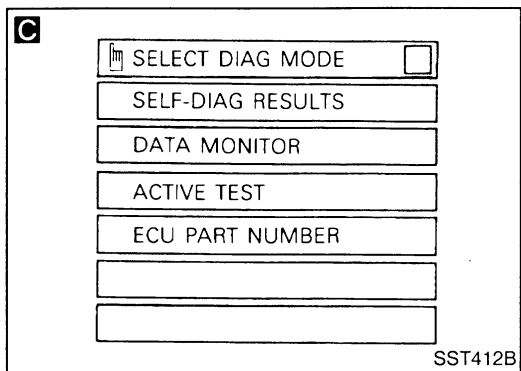
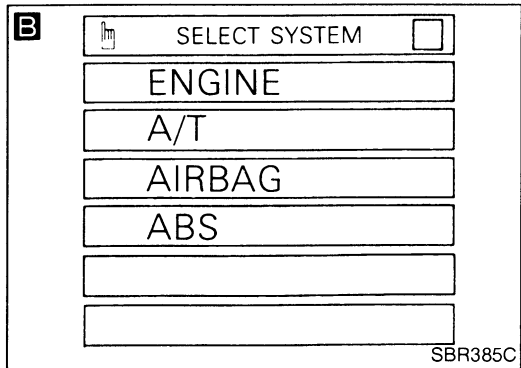
1. Turn ignition switch OFF.
2. Connect CONSULT to Data Link Connector for CONSULT.
3. Turn ignition switch ON.



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



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



TROUBLE DIAGNOSES

CONSULT Inspection Procedure (Cont'd)

ACTIVE TEST PROCEDURE

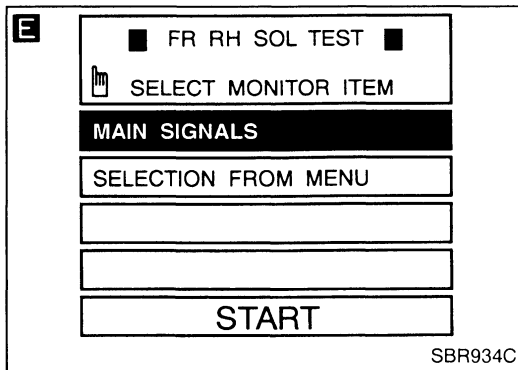
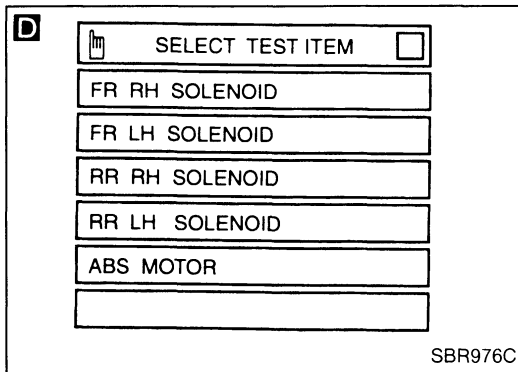
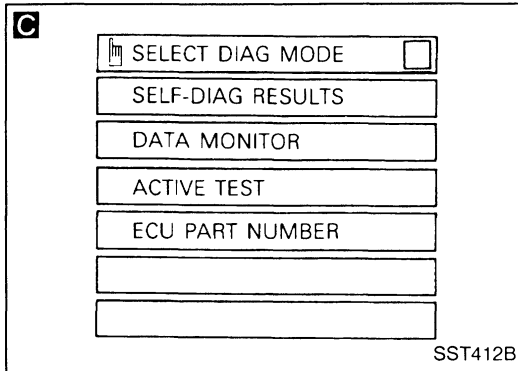
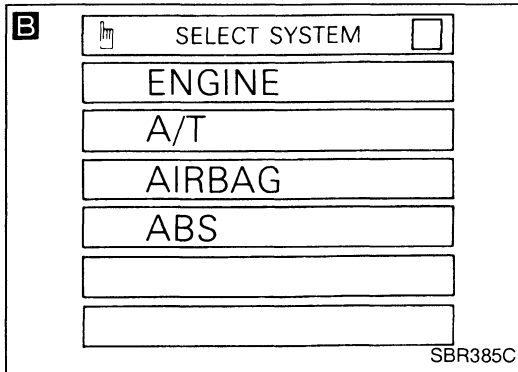
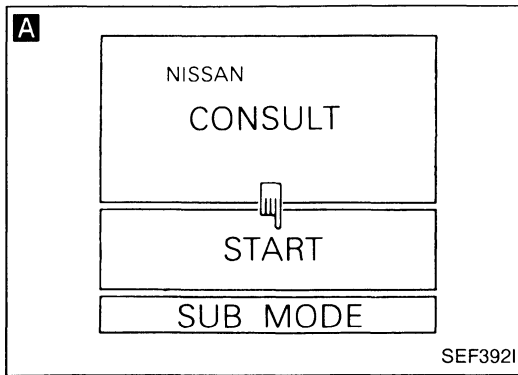
- When conducting Active test, vehicle must be stationary.
- When ABS warning lamp stays on, never conduct Active test.

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

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

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

Carry out the active test by touching screen key.



GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

RS

BT

HA

EL

IDX

TROUBLE DIAGNOSES

CONSULT Inspection Procedure (Cont'd)

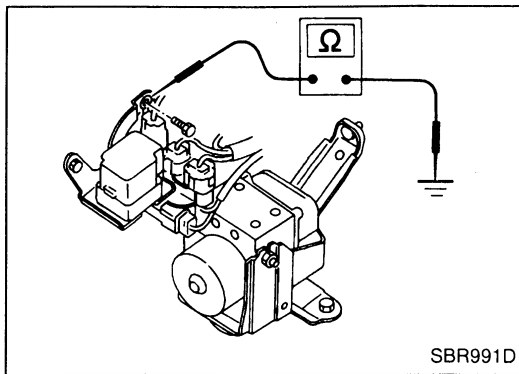
DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
FR RH SENSOR FR LH SENSOR RR RH SENSOR RR LH SENSOR	Drive vehicle. (Each wheel is rotating.)	Displays computed vehicle speed from wheel sensor signal. Almost the same speed as speedometer.
STOP LAMP SW	Turn ignition switch ON and depress brake pedal.	Depress the pedal: ON Release the pedal: OFF
FR RH IN SOL FR RH OUT SOL FR LH IN SOL FR LH OUT SOL RR RH IN SOL RR RH OUT SOL RR LH IN SOL RR LH OUT SOL	Ignition switch is turned ON or engine is running.	Operating conditions for each solenoid valve are indicated. ABS is not operating: OFF
ACTUATOR RLY	Ignition switch is turned ON or engine is running.	Displays ON/OFF condition of ABS actuator relay. When turning ignition switch ON, ABS actuator relay is operated.
MOTOR RELAY		ABS is not operating: OFF ABS is operating: ON
WARNING LAMP		Warning lamp is turned on: ON Warning lamp is turned off: OFF
BATTERY VOLT		Power supply voltage for control unit

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT
FR RH SOLENOID FR LH SOLENOID RR RH SOLENOID RR LH SOLENOID	Ignition switch is turned ON.	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 OFF: Motor stops

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

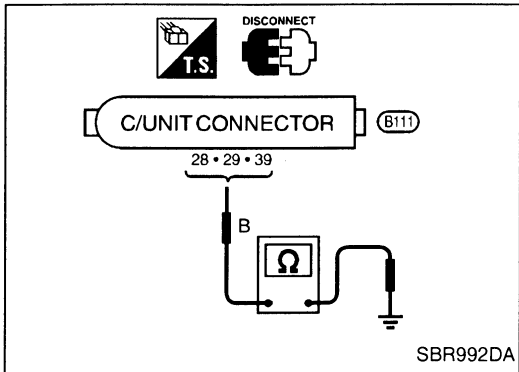


Ground Circuit Check

ACTUATOR MOTOR GROUND

- Check resistance between actuator motor ground terminal and body ground.

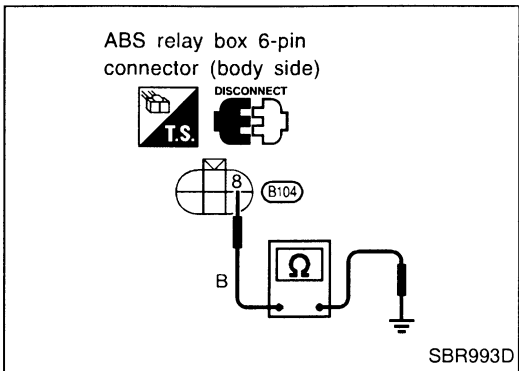
Resistance: 0Ω



CONTROL UNIT GROUND

- Check resistance between the terminals and ground.

Resistance: 0Ω



ABS RELAY BOX GROUND

- Check resistance between ABS relay box harness 6-pin connector (body side) terminal ⑧ and ground.

Resistance: 0Ω

GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

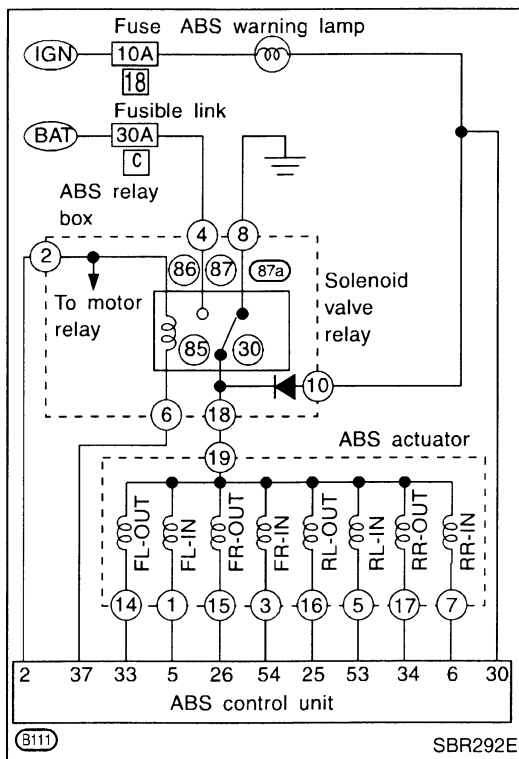
RS

BT

HA

EL

IDX



Diagnostic Procedure 1 (ABS actuator solenoid valve)

Malfunction code No. 41, 45, 51, 55, 42, 46, 52, 56

1. Disconnect connectors from control unit, ABS actuator and ABS relay box. Check terminals for damage or loose connections. Then reconnect connectors.
2. Carry out Self-diagnosis again.
Does warning lamp activate again?

No → Inspection end.

Yes

A

ABS ACTUATOR SOLENOID VALVE CHECK

1. Disconnect connectors from control unit and ABS relay box.
2. Check resistance between control unit connector terminals and ABS relay box 2-pin connector (ABS actuator side) terminal ⑱.

OK → (Go to next page.)

Code No.	Control unit	ABS relay box	Resistance
41	②⑥	⑱	3.4 - 6.9Ω
45	③③	⑱	
51	③④	⑱	
55	②⑤	⑱	
42	⑤④	⑱	6.5 - 13.2Ω
46	⑤	⑱	
52	⑥	⑱	
56	⑤③	⑱	

NG

B

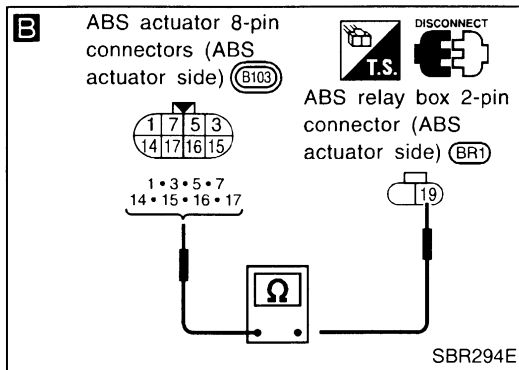
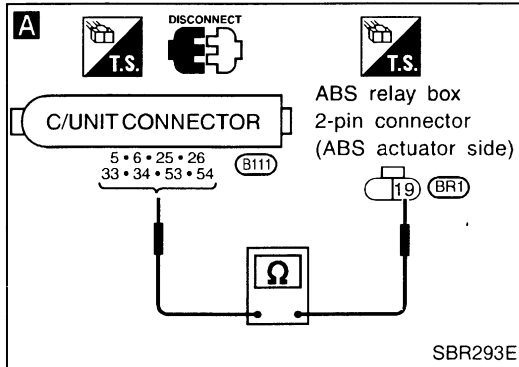
1. Disconnect ABS actuator 8-pin connector.
2. Check resistance between ABS actuator 8-pin connector (ABS actuator side) terminals and ABS relay box 2-pin connector (ABS actuator side) terminal ⑱.

OK → Repair harness and connector between control unit connector terminal and ABS actuator 8-pin connector terminal.

Code No.	ABS actuator	ABS relay box	Resistance
41	⑱	⑱	3.4 - 6.9Ω
45	⑭	⑱	
51	⑰	⑱	
55	⑱	⑱	
42	③	⑱	6.5 - 13.2Ω
46	①	⑱	
52	⑦	⑱	
56	⑤	⑱	

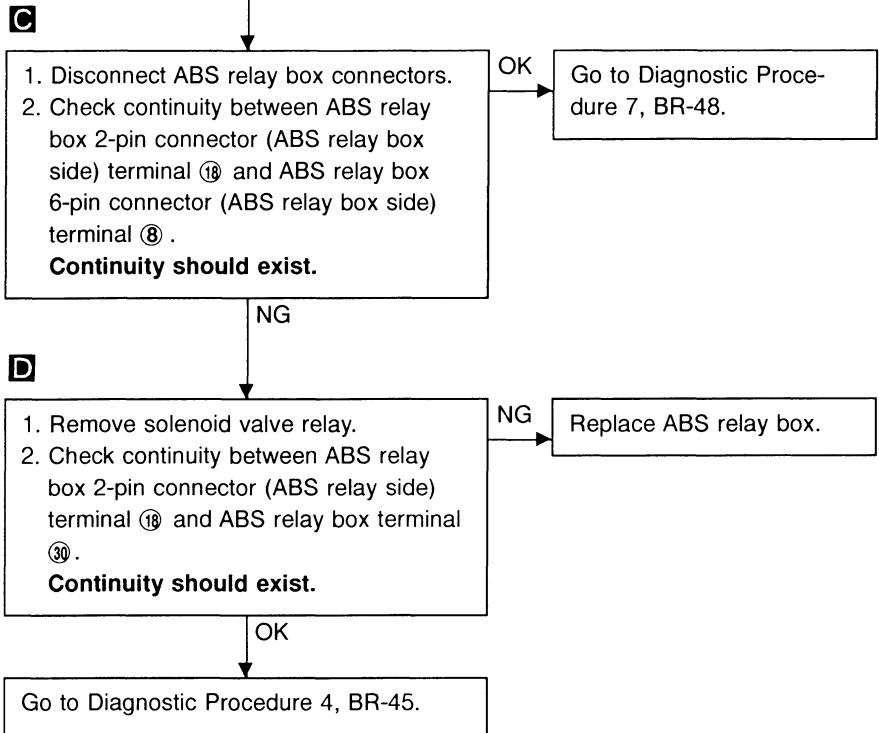
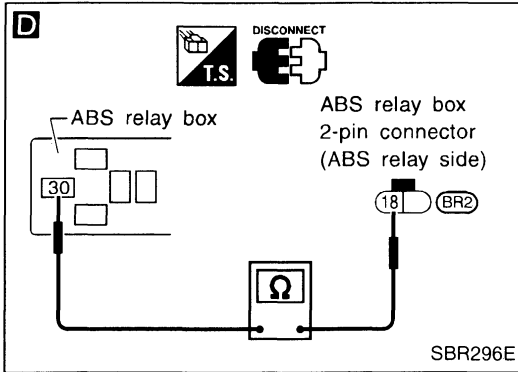
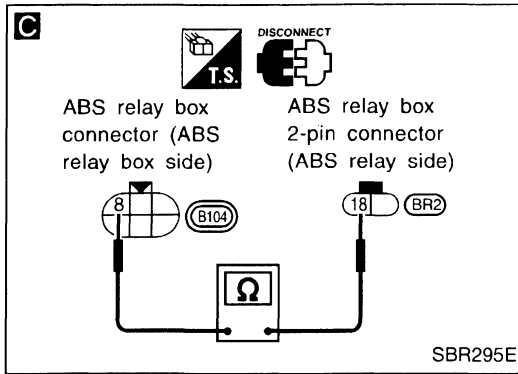
NG

Replace ABS actuator.



TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEM

Diagnostic Procedure 1 (ABS actuator solenoid valve) (Cont'd)



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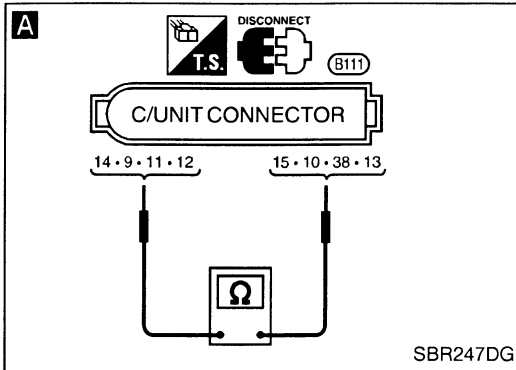
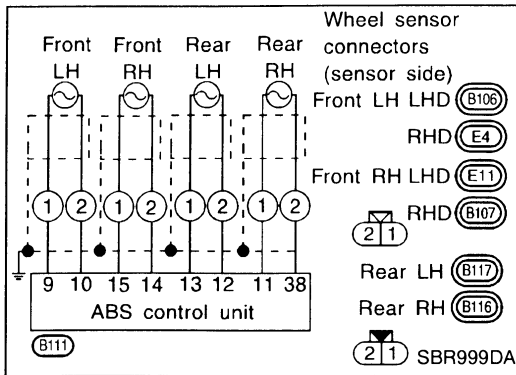
EL

IDX

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEM

Diagnostic Procedure 2 (Wheel sensor or rotor)

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



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

No → Inspection end.

Yes

WHEEL SENSOR ELECTRICAL CHECK

OK → (See next page.)

1. Disconnect control unit connector.
2. Check resistance between control unit connector terminals.
Code No. 21 or 22 (Front RH wheel) Terminals ⑭ and ⑮
Code No. 25 or 26 (Front LH wheel) Terminals ⑨ and ⑩
Code No. 31 or 32 (Rear RH wheel) Terminals ⑪ and ⑳
Code No. 35 or 36 (Rear LH wheel) Terminals ⑫ and ⑬
Resistance: 0.6 - 3.25 kΩ

NG

Note

CHECK WHEEL SENSOR.

Note

NG → Replace wheel sensor.

Check resistance for each sensor.
Resistance: 0.6 - 3.25 kΩ

OK

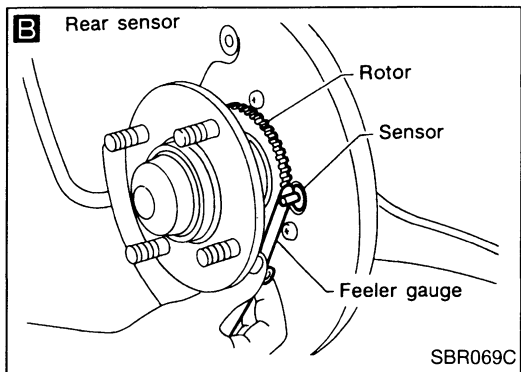
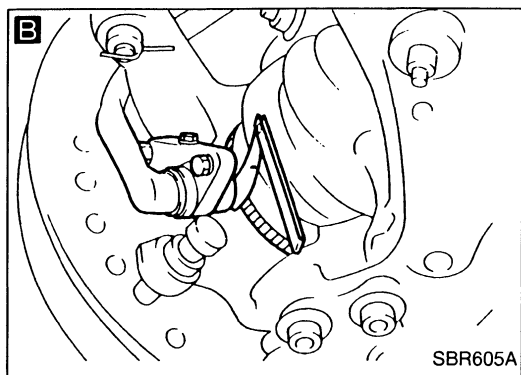
Note

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

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

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEM

Diagnostic Procedure 2 (Wheel sensor or rotor) (Cont'd)



Note

WHEEL SENSOR MECHANICAL CHECK

Check for inflation pressure, wear and size of each tire.

OK

Note

Check wheel bearing axial end play.

OK

Note

Check clearance between sensor and rotor.

Clearance:

Front

0.7 - 1.8 mm
(0.028 - 0.071 in)

Rear

Disc type

0.2 - 1.1 mm
(0.008 - 0.043 in)

Drum type

0.6 - 1.5 mm
(0.024 - 0.059 in)

OK

Note

Check sensor rotor for teeth damage.

OK

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

Note

Adjust tire pressure or replace tire(s).

Note

Clean sensor fixing portion, or replace sensor.

Note

Replace sensor rotor.

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

GI

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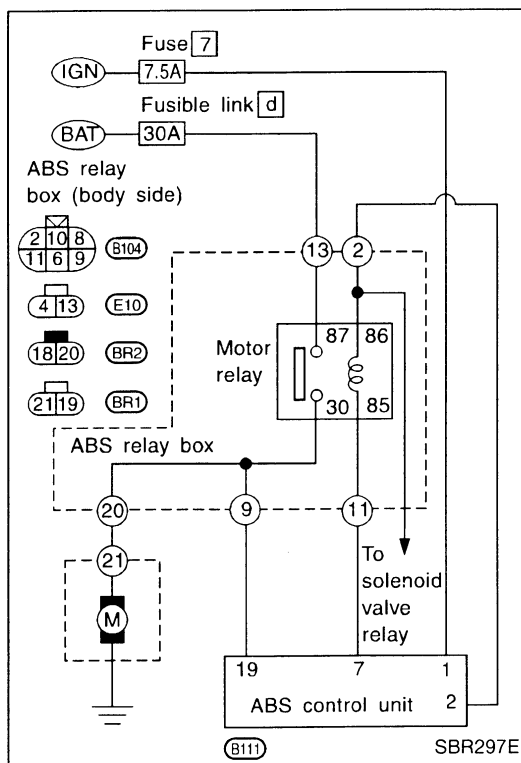
RS

BT

HA

EL

IDX



Diagnostic Procedure 3 (Motor relay or motor)

Malfunction code No. 61

MOTOR POWER SUPPLY CIRCUIT

Check fusible link **d** for ABS relay box. For fusible link layout, refer to EL section ("POWER SUPPLY ROUTING").

NG (Go to ⑧ on BR-44.)

OK

1. Disconnect connectors from control unit and ABS relay box. Check terminals for damage or loose connections. Then reconnect connectors.
2. Carry out Self-diagnosis again.
Does warning lamp activate again?

No Inspection end.

Yes

- A**
1. Disconnect ABS relay box 2-pin connector.
 2. Check voltage between connector (body side) terminal **13** and ground.
Battery voltage should exist.

NG Repair harness and connectors.

OK

CIRCUIT CHECK

1. Disconnect ABS relay box 6-pin connector and control unit connector.
2. Check continuity between control unit connector terminals and ABS relay box 6-pin connector (body side) terminals.

NG Repair harness and connectors.

Control unit	ABS relay box
②	②
⑦	⑪
⑱	⑨

Continuity should exist.

OK

MOTOR RELAY CHECK

Check actuator motor relay applying battery voltage.

NG Replace motor relay.

Condition	Continuity between ⑩ and ⑧
Battery voltage not applied between ⑩ and ⑧.	No
Battery voltage applied between ⑩ and ⑧.	Yes

While applying battery voltage to relay terminals, insert fuse into the circuit.

OK

MOTOR GROUND CHECK

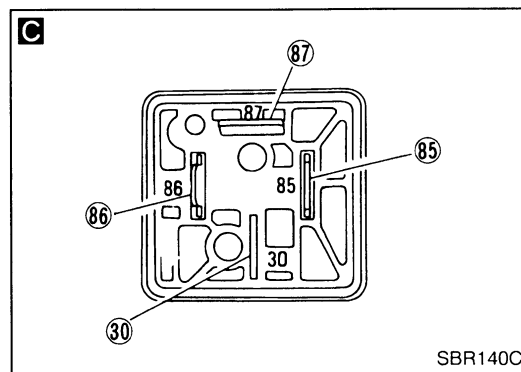
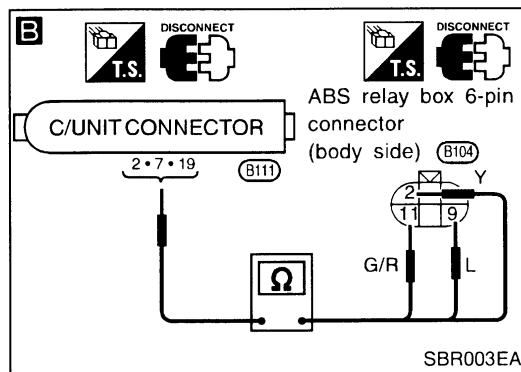
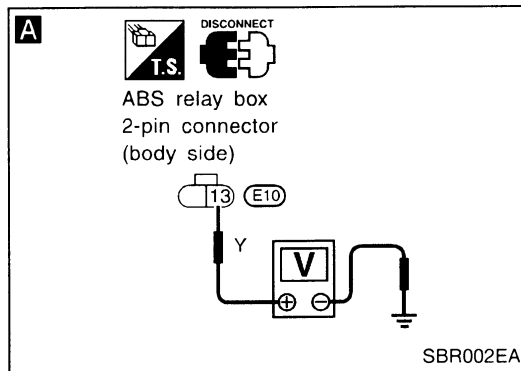
Refer to "ACTUATOR MOTOR GROUND" in Ground Circuit Check, BR-37.

NG Repair harness and terminals.

OK

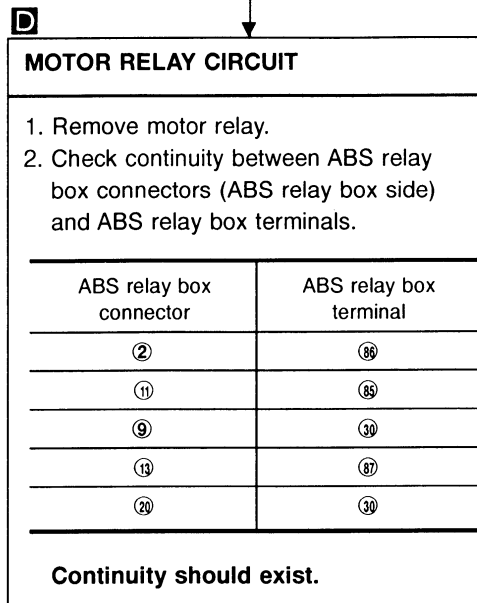
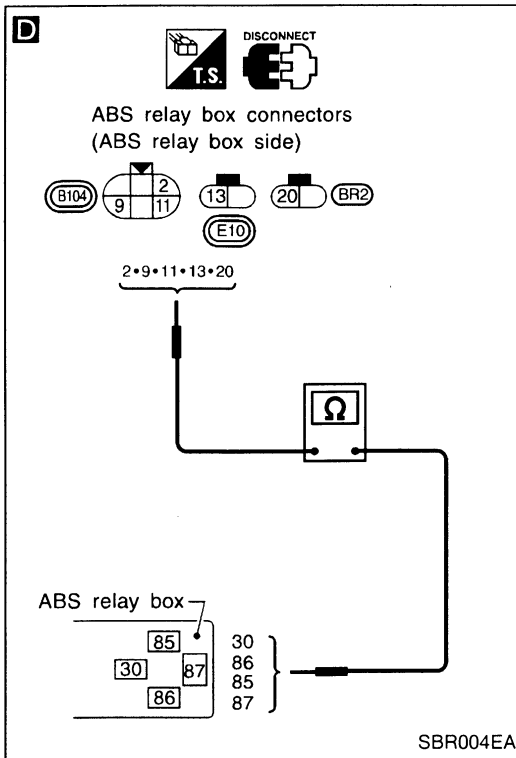
A

(Go to next page.)

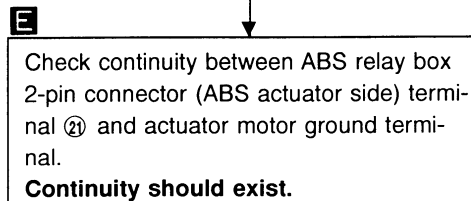
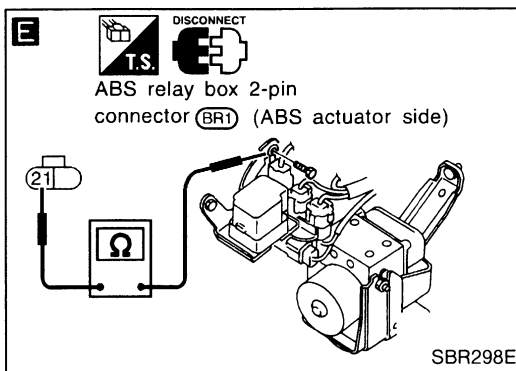


TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEM

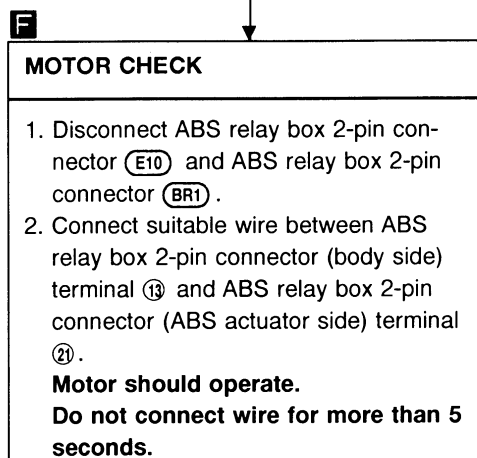
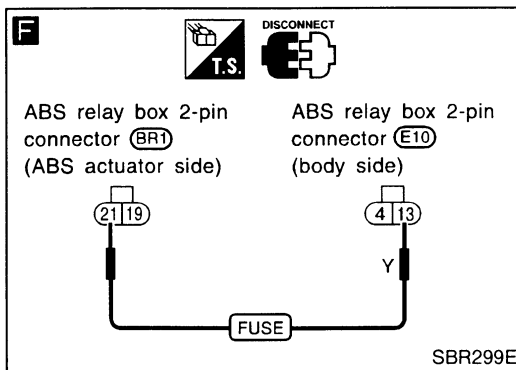
Diagnostic Procedure 3 (Motor relay or motor) (Cont'd)



NG → Replace ABS relay box.



NG → Repair harness and connectors.

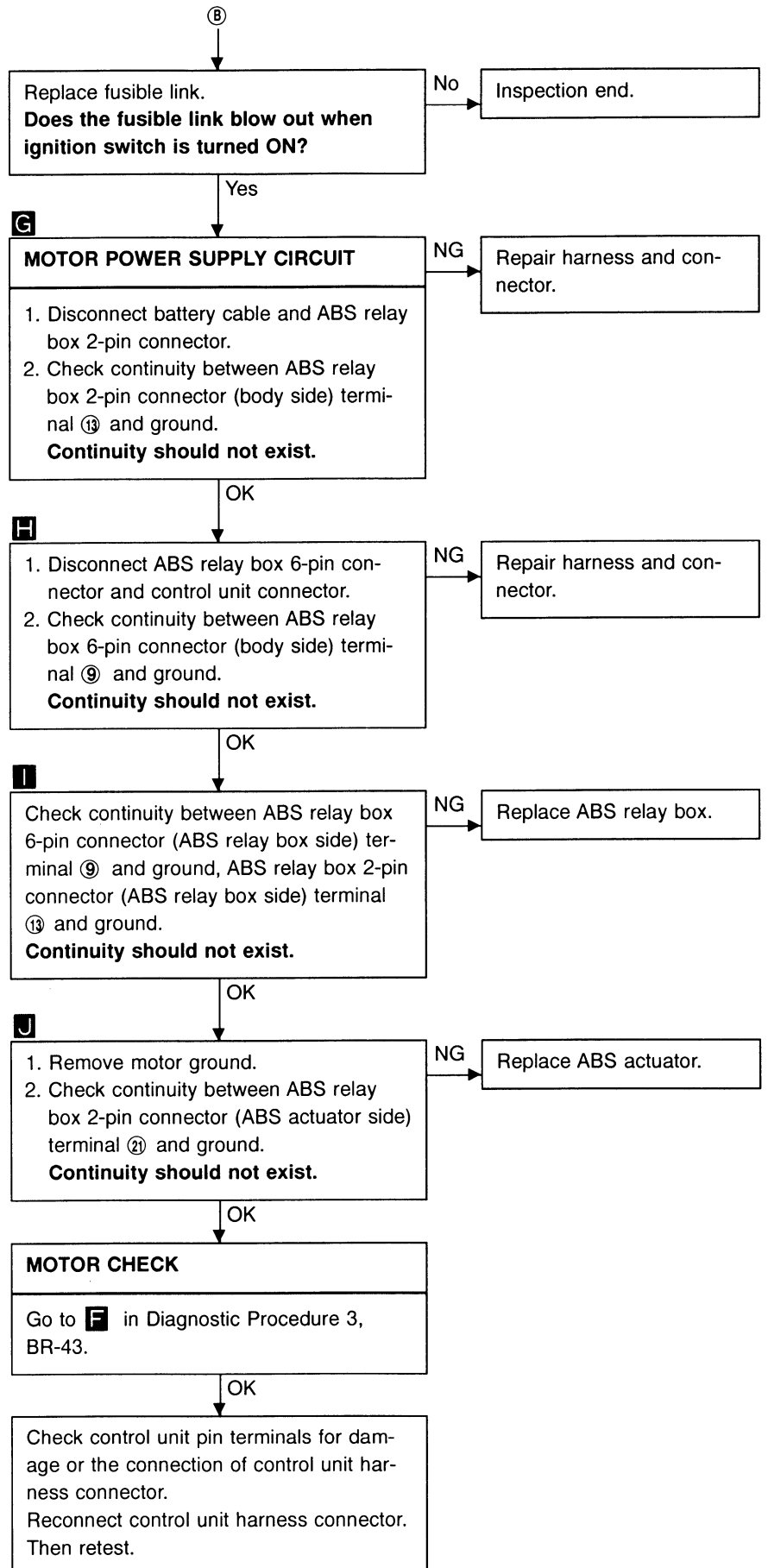
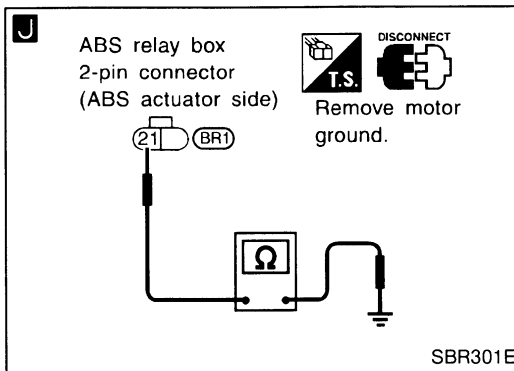
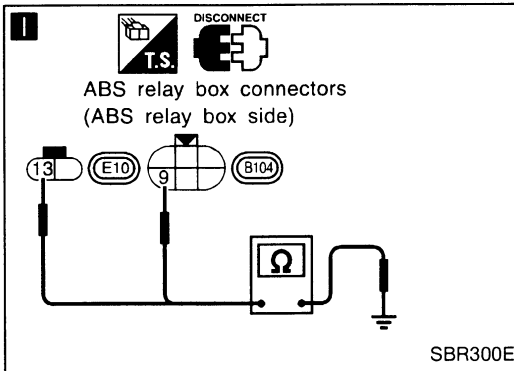
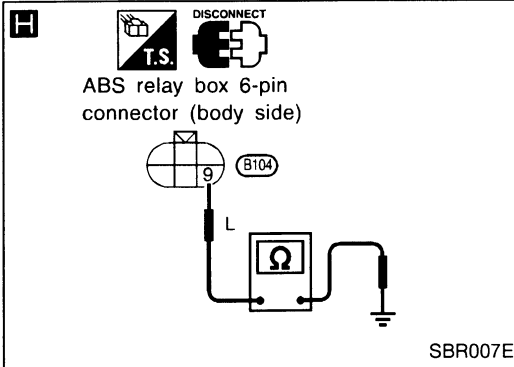
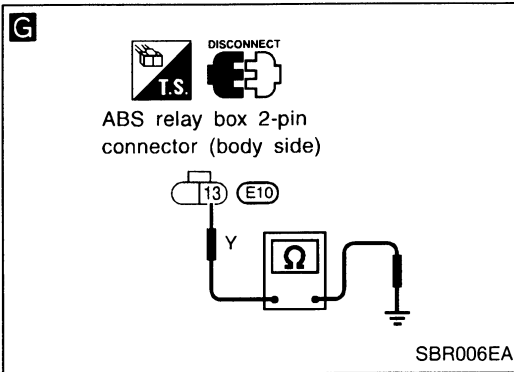


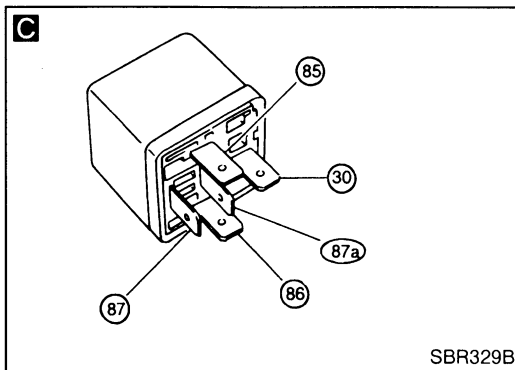
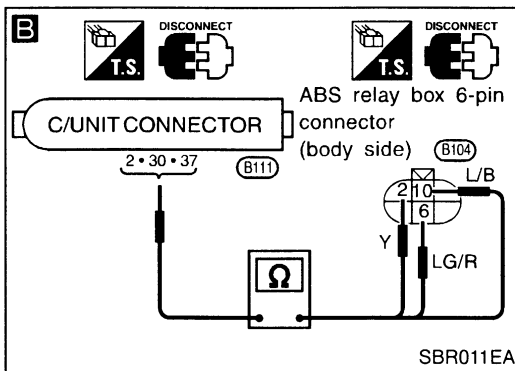
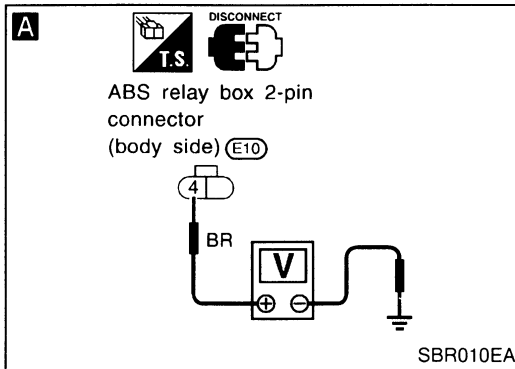
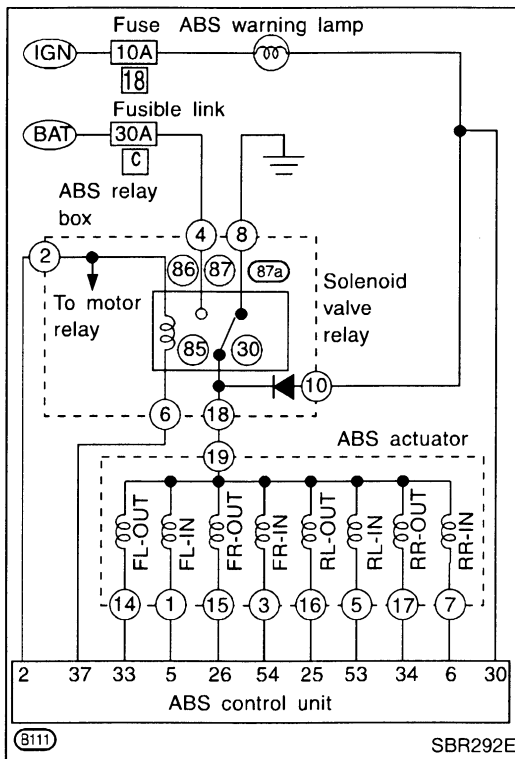
NG → Replace ABS actuator.

OK → Go to Diagnostic Procedure 5, BR-47.

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEM

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





Diagnostic Procedure 4 (Solenoid valve relay)

Malfunction code No. 63

SOLENOID VALVE POWER SUPPLY CHECK

Check fusible link [C]. For fusible link layout, refer to EL section ("POWER SUPPLY ROUTING").

NG → (A) (See next page.)

OK

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

No → Inspection end.

Yes

GROUND CIRCUIT CHECK

Refer to "CONTROL UNIT GROUND" and "ACTUATOR MOTOR GROUND" in Ground Circuit Check, BR-37.

NG → Repair harness and connectors.

OK

SOLENOID VALVE POWER SUPPLY CHECK

1. Disconnect connector from ABS relay box.
2. Check voltage between ABS relay box 2-pin connector (body side) terminal (4) and ground.
Battery voltage should exist.

NG → Repair harness and connector.

OK

CIRCUIT CHECK

1. Disconnect control unit connector.
2. Check continuity between control unit connector terminals and ABS relay box 6-pin connector (body side) terminals.

Control unit	ABS relay box
37	6
2	2
30	10

Continuity should exist.

NG → Repair harness and connectors.

OK

SOLENOID VALVE RELAY CHECK

Check solenoid valve relay applying battery voltage.

Condition	Continuity	
	between 30 and 87a	between 30 and 87
Battery voltage not applied between 85 and 86.	Yes	No
Battery voltage applied between 85 and 86.	No	Yes

While applying battery voltage to relay terminals, insert fuse into the circuit.

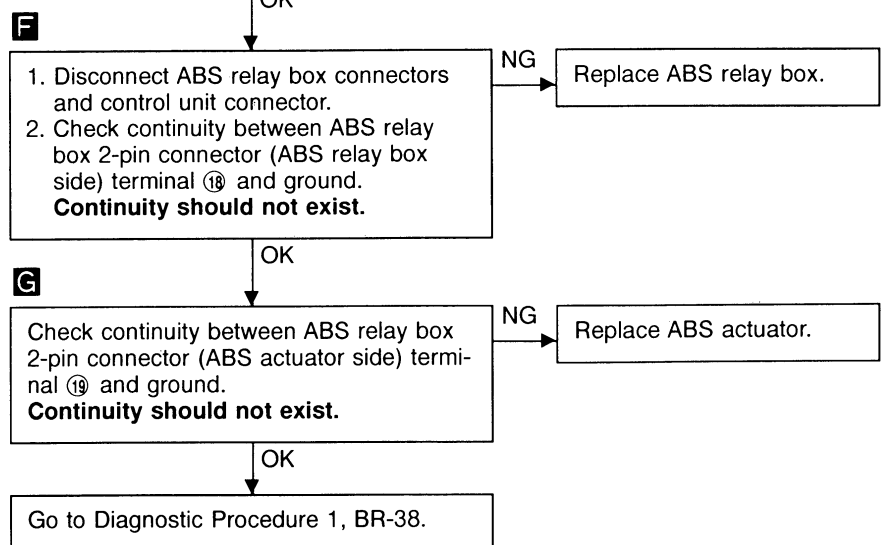
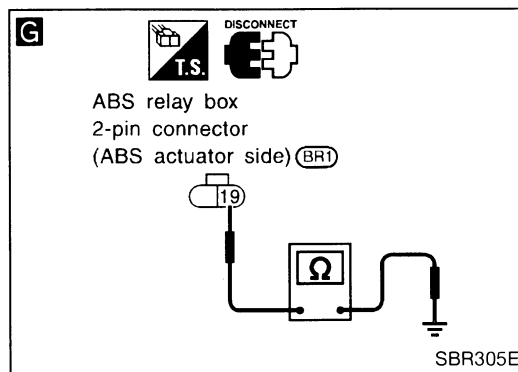
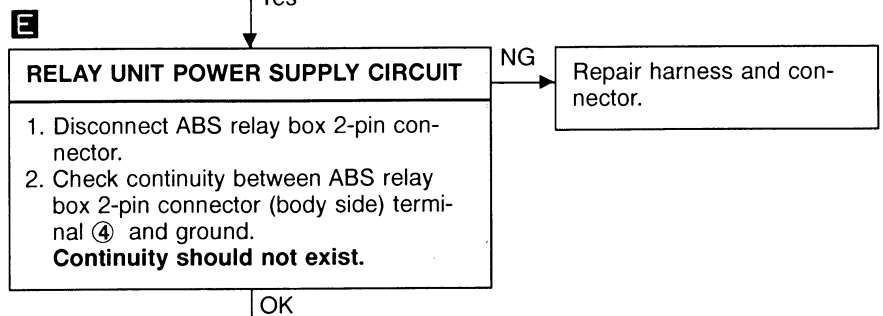
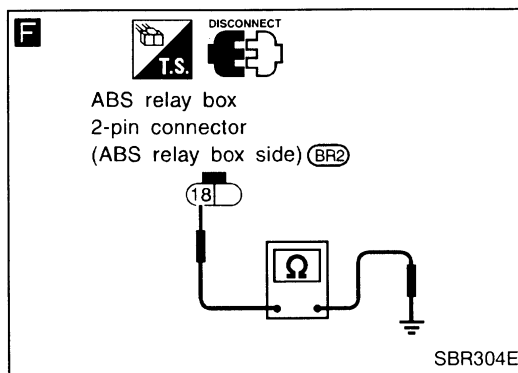
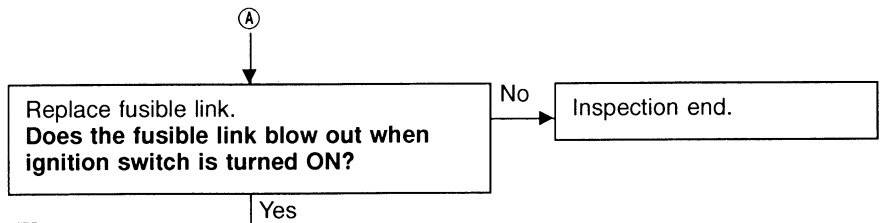
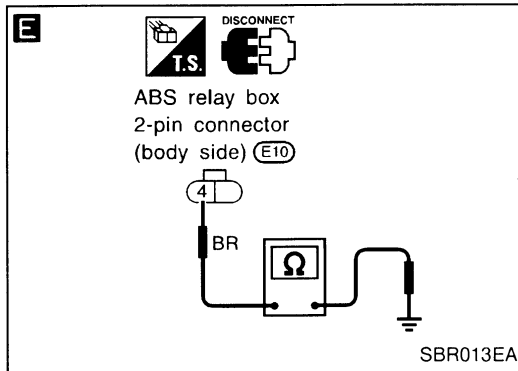
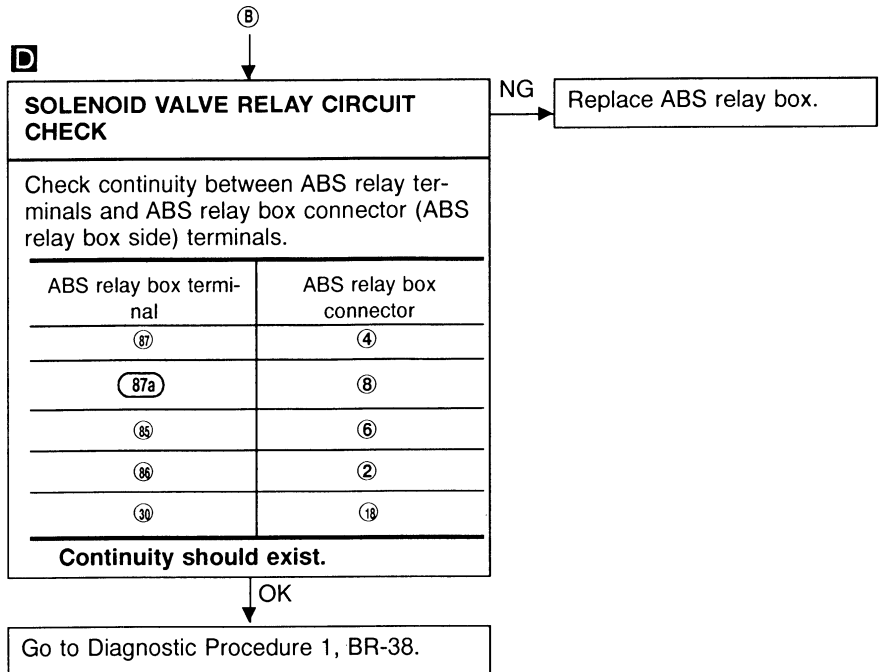
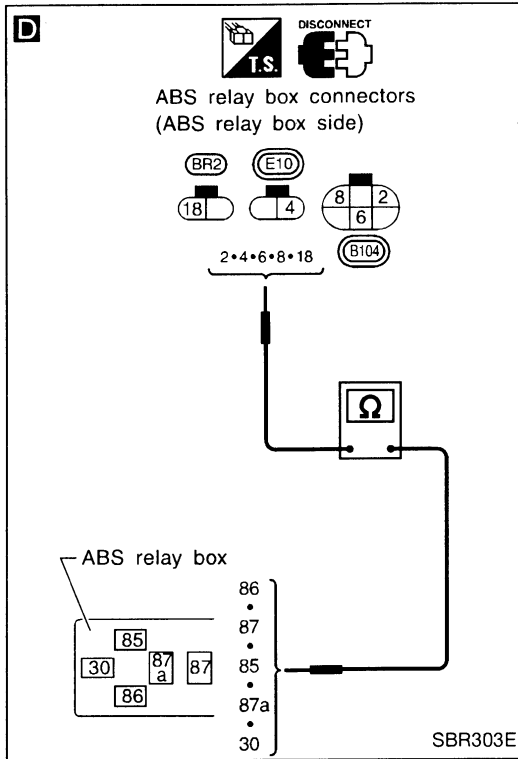
NG → Replace solenoid valve relay.

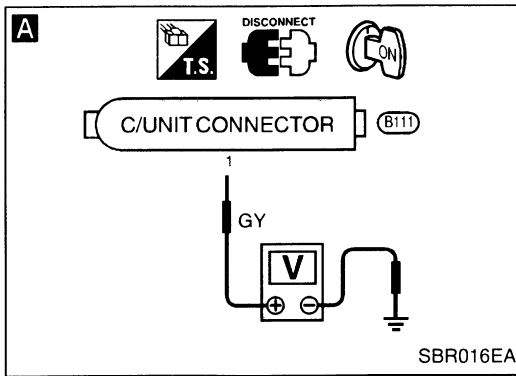
OK

(Go to next page.)

TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEM

Diagnostic Procedure 4 (Solenoid valve relay) (Cont'd)





Diagnostic Procedure 5 (Low voltage)

Malfunction code No. 57

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

No → Inspection end.

Yes

A

CONTROL UNIT POWER SUPPLY CHECK

NG → ① (See below.)

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

OK

CONTROL UNIT GROUND CHECK

NG → Repair harness and connectors.

Refer to "CONTROL UNIT GROUND", Ground Circuit Check, BR-37.

OK

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

①

Check 7.5A fuse [7]. Refer to EL section ("POWER SUPPLY ROUTING").

NG → Replace fuse.

OK

Check continuity between battery and control unit connector terminal ①.

NG → Repair harness and connectors.

OK

Check battery. Refer to EL section ("BATTERY").

Diagnostic Procedure 6 (Control unit)

Malfunction code No. 71

Carry out Self-diagnosis after erasing self-diagnostic results, BR-28.

Does warning lamp indicate code No. 71 again?

Yes → Replace control unit.

No

Inspect the system according to the code No.

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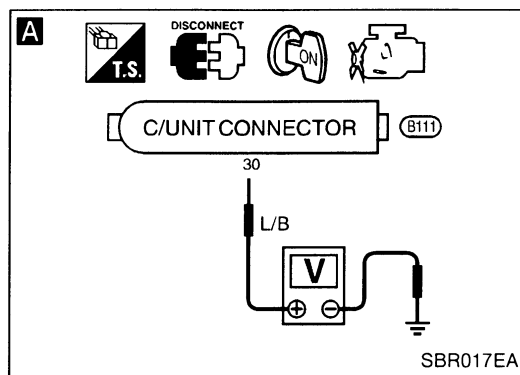
BT

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TROUBLE DIAGNOSES FOR SYMPTOM



Diagnostic Procedure 7 (Warning lamp does not come on.)

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

WARNING LAMP CIRCUIT CHECK

NG

Replace fuse.

Check 10A fuse 18 for warning lamp. For fuse layout, refer to EL section ("POWER SUPPLY ROUTING").

OK

Check warning lamp bulb.

NG

Replace bulb.

OK

A

1. Install 10A fuse and bulb.
2. Disconnect connectors from control unit and ABS relay box.
3. Check voltage between control unit connector terminal 30 and ground after turning ignition switch ON.
Battery voltage should exist after turning ignition switch ON.

NG

Repair harness and connectors.

OK

B

Check continuity between ABS relay box 6-pin connector (body side) and control unit terminal.

NG

Repair harness and connectors.

ABS relay box	Control unit
10	30
8	Ground

Continuity should exist.

OK

C

1. Remove solenoid valve relay.
2. Check continuity between ABS relay box 6-pin connector (ABS relay box side) and ABS relay box terminals.

NG

Replace ABS relay box.

ABS relay box connector	ABS relay box terminals
10 ⊕	30 ⊖
8	87a

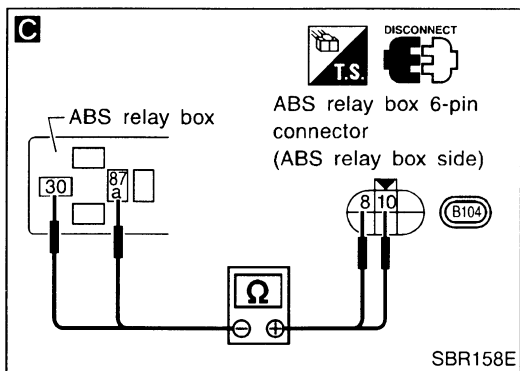
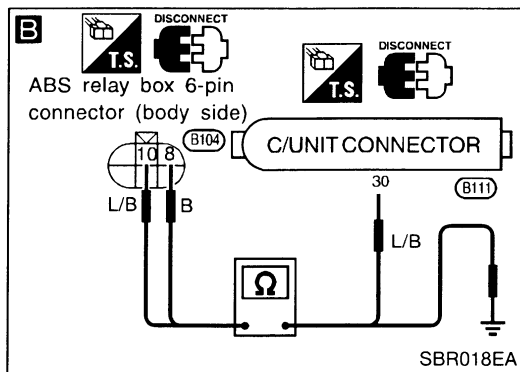
Continuity should exist.

Note: Specifications may vary depending on tester type. Before performing this inspection, be sure to refer to the instruction manual for tester being used.

OK

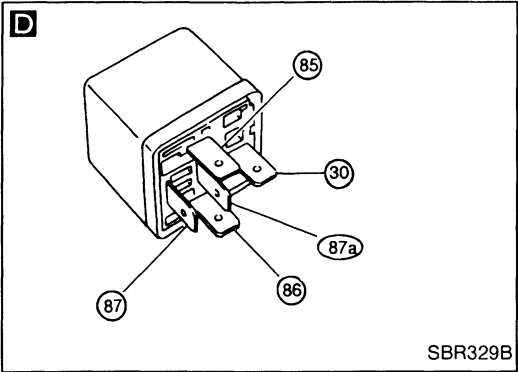
A

(Go to next page.)



TROUBLE
DIAGNOSES
FOR
SYMPTOM

Diagnostic Procedure 7 (Warning lamp does not come on.) (Cont'd)



A

D

SOLENOID VALVE RELAY CHECK

Check solenoid valve relay applying battery voltage.

Condition	Continuity	
	between 30 and 87a	between 30 and 87
Battery voltage not applied between 85 and 86.	Yes	No
Battery voltage applied between 85 and 86.	No	Yes

While applying battery voltage to relay terminals, insert fuse into the circuit.

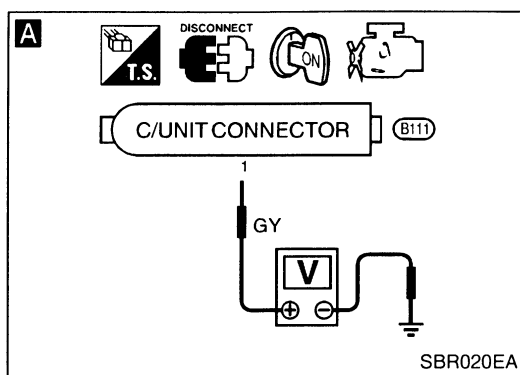
NG

Replace solenoid valve relay.

OK

Go to Diagnostic Procedure 5, BR-47.

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Diagnostic Procedure 8 (Warning lamp stays on.)

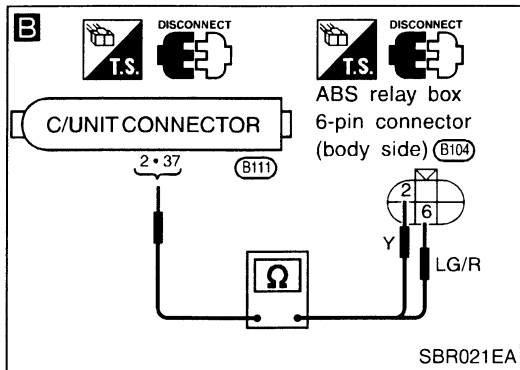
Warning light stays on when ignition switch is turned ON.

CONTROL UNIT POWER SUPPLY CIRCUIT

Check 7.5A fuse 7 for control unit.
For fuse layout, refer to EL section ("POWER SUPPLY ROUTING").

NG (Go to ③ on BR-52.)

OK



- A**
1. Disconnect connector from control unit.
 2. Check voltage between control unit connector terminal ① and ground after turning ignition switch ON.
Battery voltage should exist.

NG Repair harness and connector.

OK

SOLENOID VALVE RELAY COIL POWER SUPPLY CIRCUIT

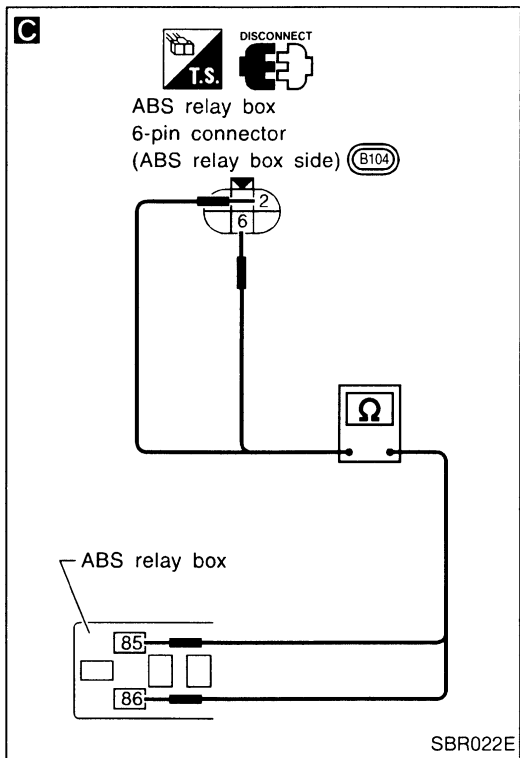
- B**
1. Turn ignition switch OFF. Disconnect ABS relay box 6-pin connector.
 2. Check continuity between control unit connector terminals and ABS relay box 6-pin connector (body side) terminals.

NG Repair harness and connector.

Control unit	ABS relay box
②	②
③⑦	⑥

Continuity should exist.

OK



CIRCUIT CHECK

- C**
1. Disconnect solenoid valve relay.
 2. Check continuity between ABS relay box 6-pin connector (ABS relay box side) terminals and solenoid valve relay box terminals.

NG Replace ABS relay box.

ABS relay box connector	ABS relay box terminals
②	⑧⑨
⑥	⑧⑤

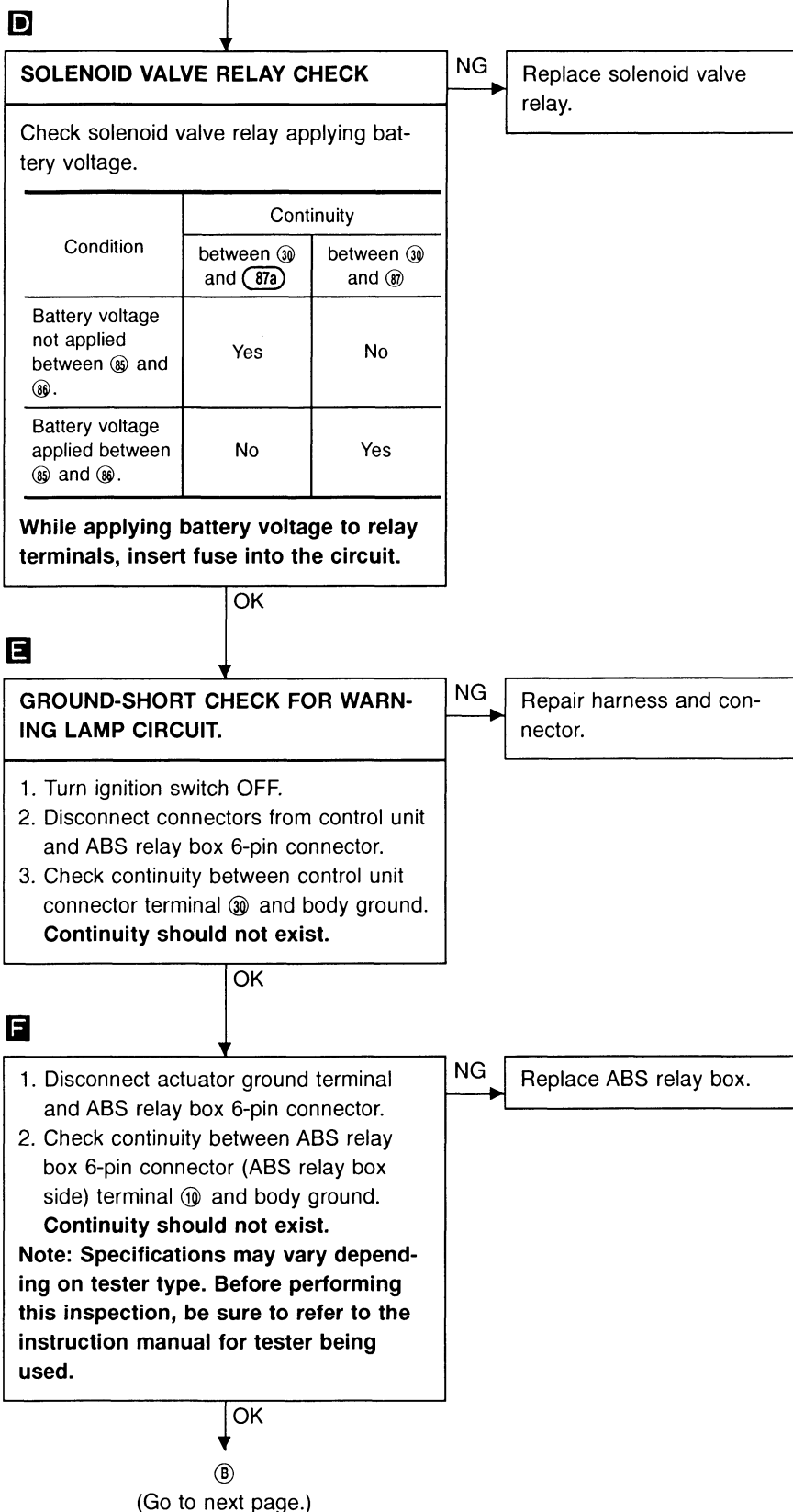
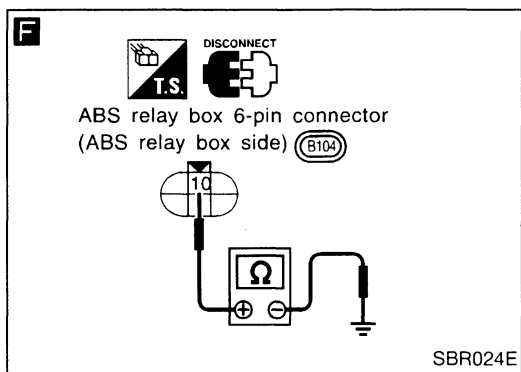
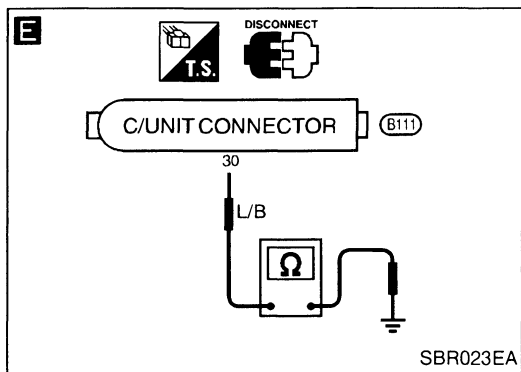
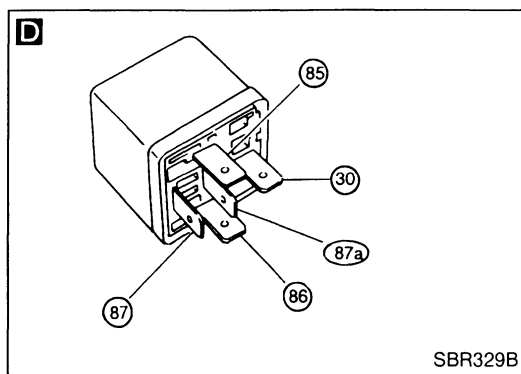
Continuity should exist.

OK

①
(Go to next page.)

TROUBLE DIAGNOSES FOR SYMPTOM

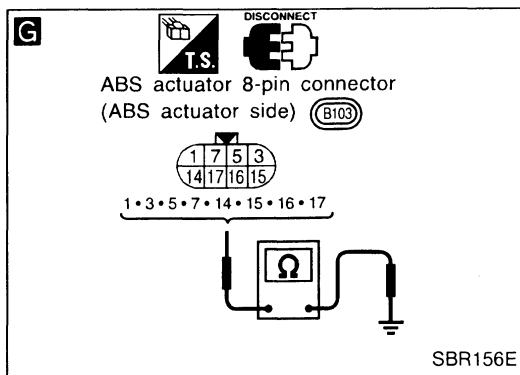
Diagnostic Procedure 8 (Warning lamp stays on.) (Cont'd)



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TROUBLE DIAGNOSES FOR SYMPTOM

Diagnostic Procedure 8 (Warning lamp stays on.) (Cont'd)



G

SOLENOID VALVE CIRCUIT

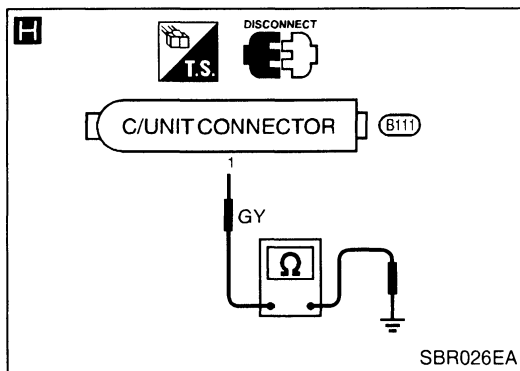
1. Disconnect ABS actuator 8-pin connector.
2. Check continuity between each ABS actuator 8-pin connector (ABS actuator side) terminals and body ground.
Continuity should not exist.

NG

Replace ABS actuator.

OK

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



C

Replace 7.5A fuse **7**.
Does the fuse blow out when ignition switch is turned ON?

No

Inspection end.

Yes

H

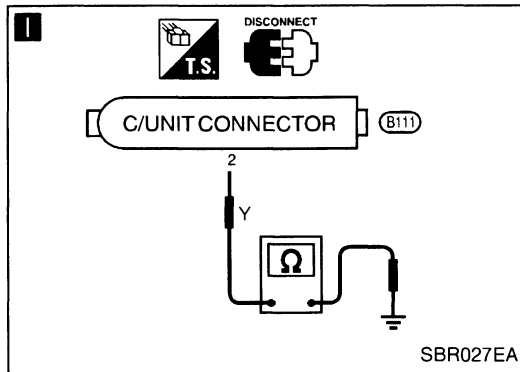
CONTROL UNIT POWER SUPPLY CIRCUIT

1. Disconnect control unit connector.
2. Check continuity between control unit connector terminal ① and body ground.
Continuity should not exist.

NG

Repair harness and connector.

OK



I

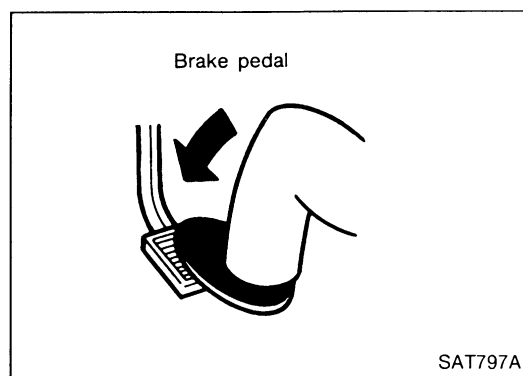
Check continuity between control unit connector terminal ② and body ground.
Continuity should not exist.

NG

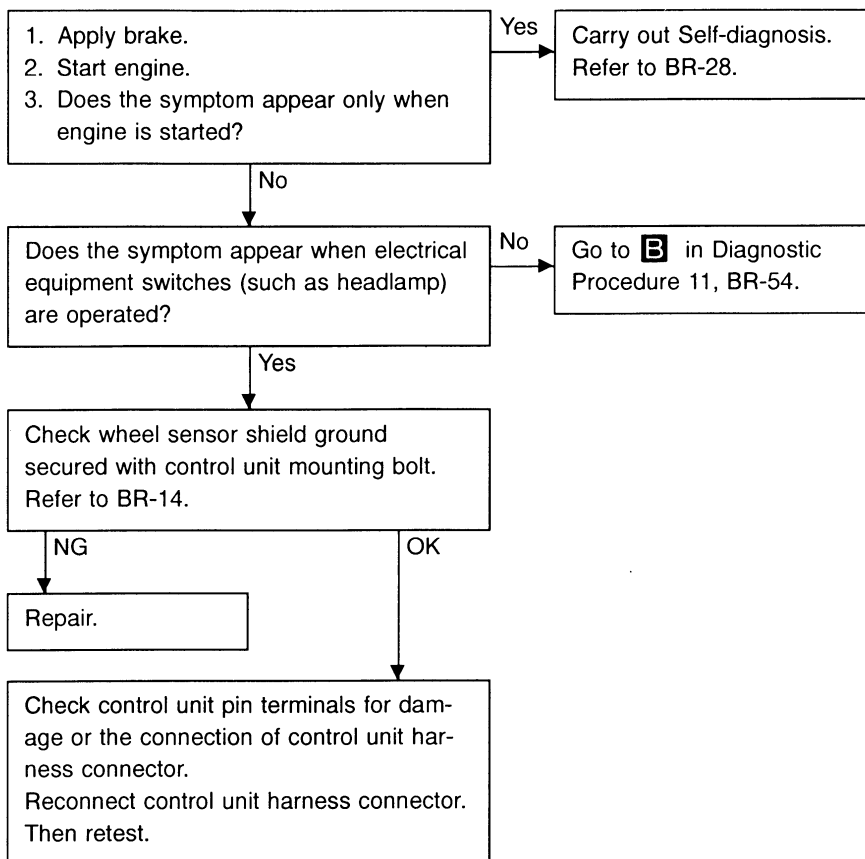
Repair harness and connector.

OK

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



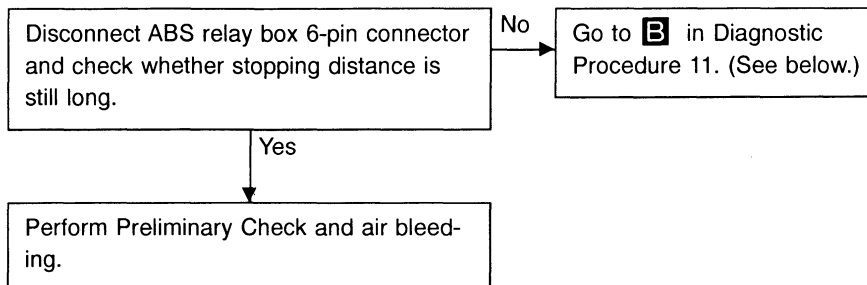
Diagnostic Procedure 9 (Pedal vibration and noise)



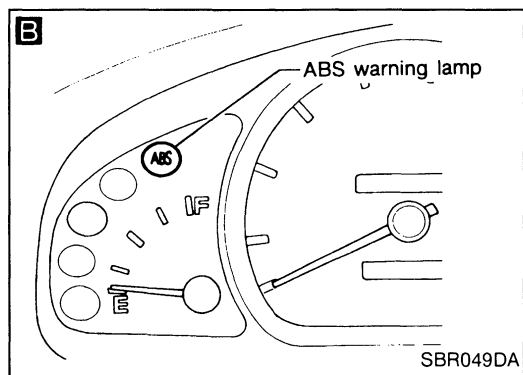
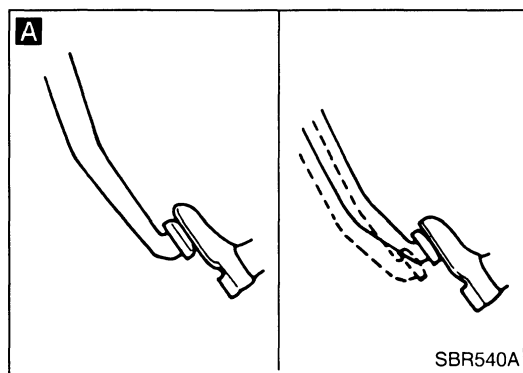
Note: ABS may operate and cause vibration under any of the following conditions.

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

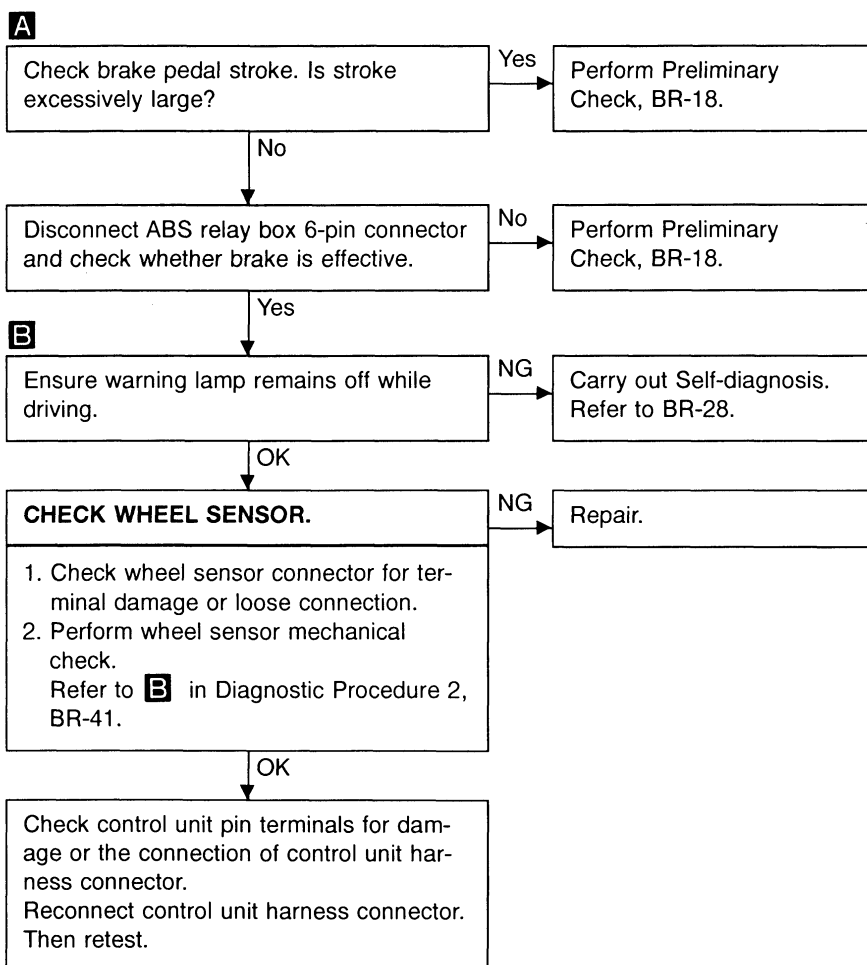
Diagnostic Procedure 10 (Long stopping distance)

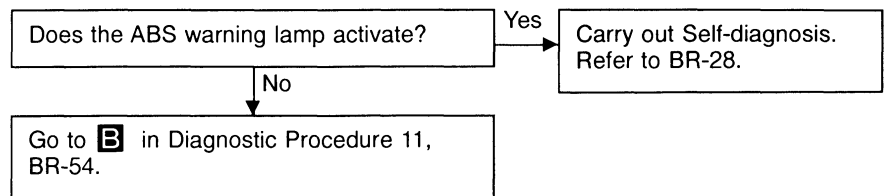


Note: Stopping distance may be larger than vehicles without ABS when road condition is slippery.

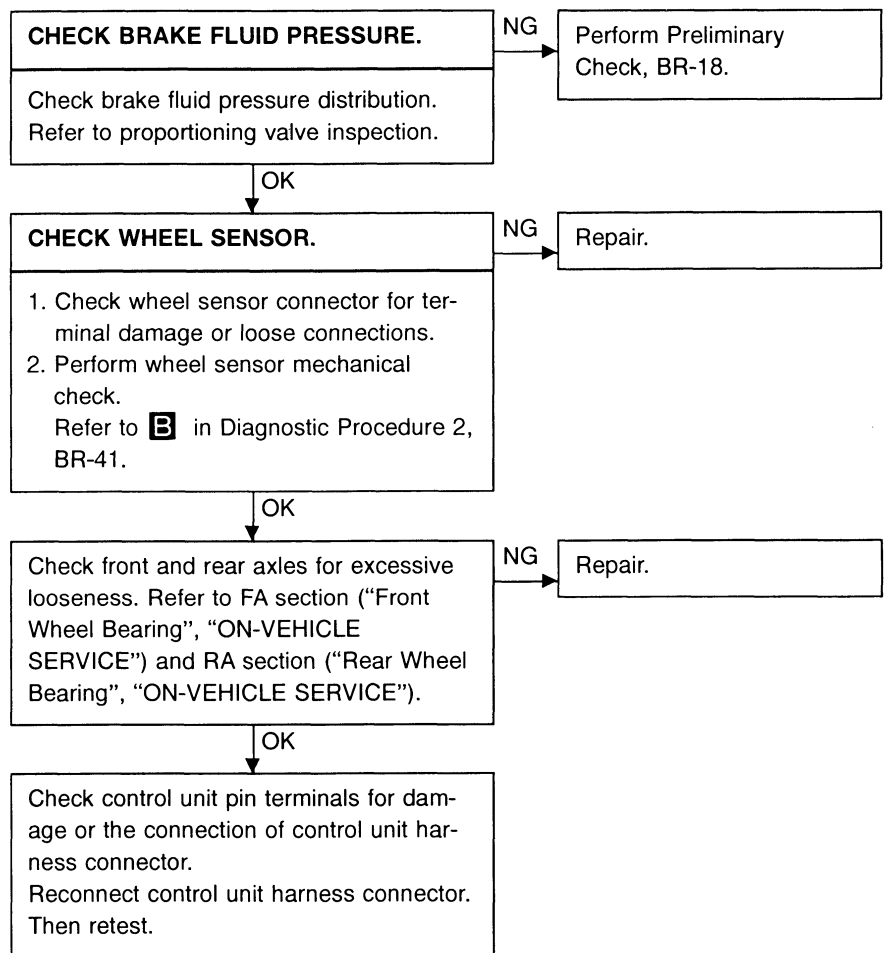


Diagnostic Procedure 11 (Unexpected pedal action)



Diagnostic Procedure 12 (ABS does not work.)

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

Diagnostic Procedure 13 (ABS works frequently.)

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications

BRAKE UNIT (Europe)

Applied model	Without ABS				With ABS	
	GA16DE	GA14DE	CD20E		GA14DE, GA16DE, CD20E	SR20DE
			RHD	LHD		
	Standard				Option	Standard
Front brake						
Brake model	CL22VB	CL22VE			CL22VB	AD22VF
Cylinder bore diameter mm (in)	54.0 (2.126)					
Pad mm (in) length x width x thickness	112.8 x 44.8 x 10.0 (4.44 x 1.764 x 0.394)	106 x 39.5 x 11.0 (4.17 x 1.555 x 0.433)			112.8 x 44.8 x 10.0 (4.44 x 1.764 x 0.394)	106.8 x 43.8 x 10.0 (4.20 x 1.724 x 0.394)
Rotor outer diameter x thick- ness mm (in)	252 x 20 (9.92 x 0.79)	247 x 18 (9.72 x 0.71)			252 x 20 (9.92 x 0.79)	257 x 26 (10.12 x 1.02)
Rear brake						
Brake model	LT18C				CL9HC	
Cylinder bore diameter mm (in)	15.87 (5/8)				33.96 (1-3/8)	
Lining or pad mm (in) length x width x thickness	172.8 x 30 x 4 (6.80 x 1.18 x 0.16)				89.1 x 39.5 x 10.0 (3.508 x 1.555 x 0.394)	
Drum inner diameter or rotor outer diameter x thickness mm (in)	180 (7.09)				258 x 9.0 (10.16 x 0.354)	
Master cylinder						
Cylinder bore diameter mm (in)	22.2 (7/8)				23.8 (15/16)	
Control valve						
Valve model	Dual proportioning valve built into master cylinder			Dual proportioning valve separated from master cylinder		
Split point [kPa (bar, kg/cm², psi)] x reducing ratio	3,923 (39.2, 40, 569) x 0.4					1,961 (19.6, 20, 284) x 0.2
Brake booster						
Booster model	M195T					
Diaphragm diameter mm (in)	Primary: 205 (8.07) Secondary: 180 (7.09)					
Recommended brake fluid	DOT 3 or DOT 4 Never mix different type fluids (DOT3 and DOT4).					

SERVICE DATA AND SPECIFICATIONS (SDS)

General Specifications (Cont'd)

BRAKE UNIT (Except for Europe)

Applied model	Except for Australia	Australia	Except for Australia	Australia	
	Without ABS		With ABS		
	GA15DE, GA16DE	GA16DE	GA15DE, GA16DE	GA16DE	SR20DE
	Standard	Standard	Option	Option	Standard
Front brake					
Brake model	CL22VD	CL22VE	CL22VD	CL22VE	AD22VF
Cylinder bore diameter mm (in)	54.0 (2.126)				
Pad length x width x thickness mm (in)	106 x 39.5 x 11.0 (4.17 x 1.555 x 0.433)		106 x 39.5 x 11.0 (4.17 x 1.555 x 0.433)		106.8 x 43.8 x 10.0 (4.20 x 1.724 x 0.394)
Rotor outer diameter x thickness mm (in)	232 x 18 (9.13 x 0.71)	247 x 18 (9.72 x 0.71)	232 x 18 (9.13 x 0.71)	247 x 18 (9.72 x 0.71)	257 x 26 (10.12 x 1.02)
Rear brake					
Brake model	LT18C		LT20B	CL7HB	CL9HC
Cylinder bore diameter mm (in)	15.87 (5/8)		15.87 (5/8)	30.23 (1-1/4)	33.96 (1-3/8)
Lining or pad length x width x thickness mm (in)	172.8 x 30 x 4 (6.80 x 1.18 x 0.16)		195 x 35 x 4.5 (7.68 x 1.38 x 0.177)	94 x 29 x 10 (3.70 x 1.14 x 0.39)	89.1 x 39.5 x 10.0 (3.508 x 1.555 x 0.394)
Drum inner diameter or rotor outer diameter x thickness mm (in)	180 (7.09)		203 (7.99)	234 x 7 (9.21 x 0.28)	258 x 9.0 (10.16 x 0.354)
Master cylinder					
Cylinder bore diameter mm (in)	20.6 (13/16)	22.2 (7/8)	22.2 (7/8)	22.2 (7/8)	23.8 (15/16)
Control valve					
Valve model	Dual proportioning valve built into master cylinder		Dual proportioning valve separated from master cylinder		
Split point [kPa (bar, kg/cm ² , psi)] x reducing ratio	3,923 (39.2, 40, 569) x 0.4	3,923 (39.2, 40, 569) x 0.4	3,923 (39.2, 40, 569) x 0.4	3,923 (39.2, 40, 569) x 0.4	1,961 (19.6, 20, 284) x 0.2
Brake booster					
Booster model	S205 or C205	M195T			
Diaphragm diameter mm (in)	205 (8.07)	Primary: 205 (8.07) Secondary: 180 (7.09)			
Recommended brake fluid	DOT 3				

SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment

DISC BRAKE

Unit: mm (in)					
Brake model	Front			Rear	
	CL22VB	CL22VD, CL22VE	AD22VF	CL7HB	CL9HC
Pad wear limit					
Minimum thickness	2.0 (0.079)			1.5 (0.059)	
Rotor repair limit					
Minimum thickness	18.0 (0.709)	16.0 (0.630)	24.0 (0.945)	6.0 (0.236)	8.0 (0.315)
Maximum runout	0.07 (0.0028)				
Maximum thickness variation	0.02 (0.0008)				

DRUM BRAKE

Unit: mm (in)		
Brake model	Rear	
	LT18C	LT20B
Lining wear limit		
Minimum thickness	1.5 (0.059)	
Drum repair limit		
Maximum inner diameter	181 (7.13)	204.5 (8.05)
Out-of-round	0.03 (0.0012) or less	

BRAKE PEDAL

Unit: mm (in)		
Applied model	RHD	LHD
Free height		
M/T	155.0 - 165.0 (6.10 - 6.50)	148.0 - 158.0 (5.83 - 6.22)
A/T	164.0 - 174.0 (6.46 - 6.85)	157.0 - 167.0 (6.18 - 6.57)
Depressed height		
[under force of 490 N (50 kg, 110 lb) with engine running]	M/T: 75 (2.95) or more A/T: 85 (3.35) or more	
Clearance between switches and pedal stopper bracket	0.3 - 1.0 (0.012 - 0.039)	

PARKING BRAKE CONTROL

Brake type	Drum	Disc
Control type	Center lever	
Number of notches		
[under force of 196 N (20 kg, 44 lb)]	7 - 8	8 - 9
Number of notches when warning switch comes on	1 or less	