SECTION BRC
BRAKE CONTROL SYSTEM

CONTENTS

ABS

PRECAUTIONS

PFP:00001

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

EFS002IR

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

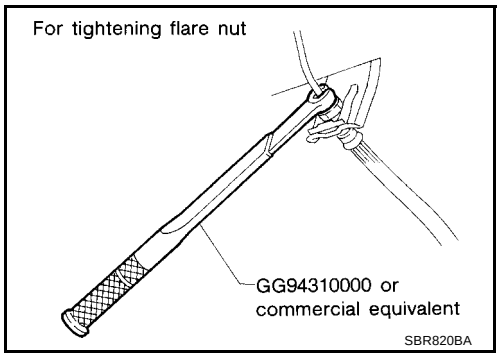
WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI 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 SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harness connectors.**

Precautions for Brake System

EFS002HT

- Recommended fluid is brake fluid “DOT 3” or “DOT 4”.
- Do not reuse the 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.
- Do not 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 malfunctioning parts. If any malfunctioning part is found, replace the part with a new one.
- Before working, turn ignition switch OFF and disconnect connectors for ABS actuator and electric unit or battery terminals.
- When installing brake piping, be sure to check tightening torque.



Precautions for Brake Control

EFS002HU

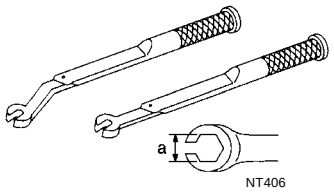
- During ABS operation, brake pedal lightly vibrates and a mechanical noise may be heard. This is normal.
- When starting engine, or just after starting vehicle, brake pedal may vibrate or motor operating noise may be heard from engine compartment. This is a normal status of operation check.
- Stopping 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 the customer (what symptoms are present under what conditions) and check for simple causes before starting diagnostic servicing. Besides the electrical system inspection, check booster operation, brake fluid level, and oil leaks.
- If tyre 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 the control unit, ABS system may malfunction or return an error.
- If aftermarket parts (e.g. car stereo equipment, CD player) have been installed, check electrical harnesses for pinches, open, and improper wiring.

PREPARATION

PFP:00002

Special Service Tools

EFS002IS

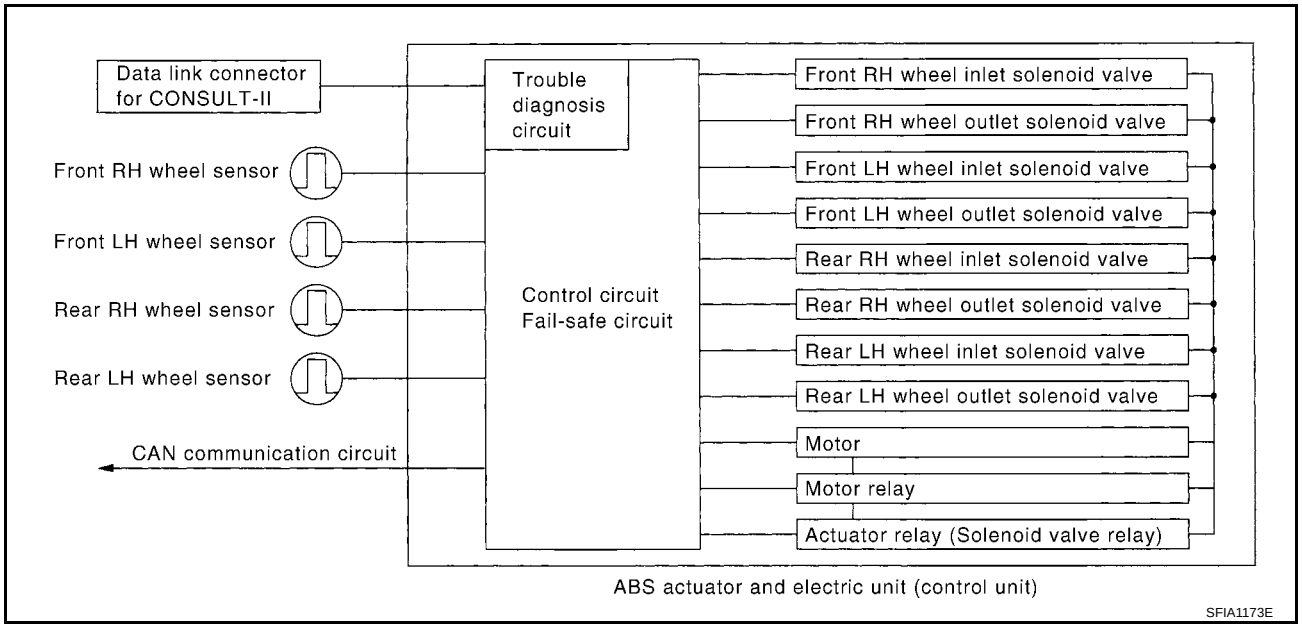
Tool number Tool name		Description
GG94310000 Flare nut torque wrench a: 10 mm (0.39 in)	 NT406	Removing and installing each brake piping

SYSTEM DESCRIPTION

PFP:00000

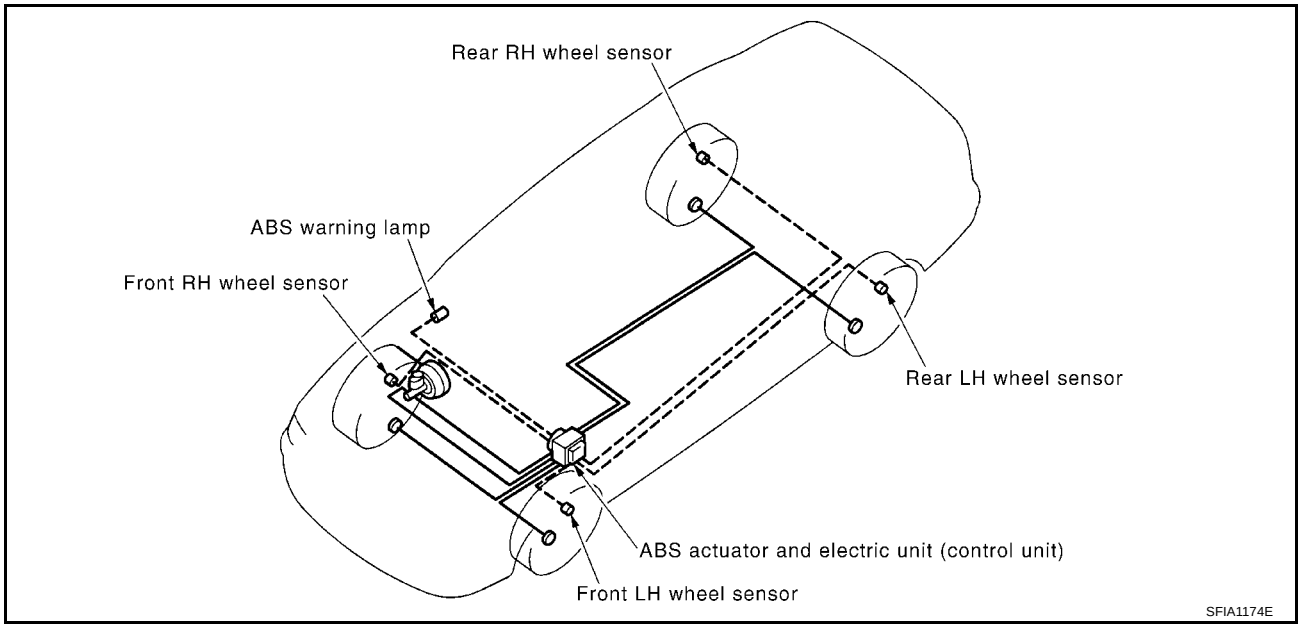
System Diagram

EFS002HX



System Components

EFS002HY



ABS Function

EFS002HZ

- Anti-lock Brake System monitors wheel rotation in braking and electronically controls braking force (brake fluid pressure) to prevent wheel locking. Thus, it improves vehicle stability in abrupt braking and allows driver to clear obstacles more easily.
- In the event of an electric system malfunction, the fail-safe function will operate, the vehicle will enter the ABS non-operation state, and ABS warning lamp will come on.
- CONSULT-II can be used to diagnose the electrical system.

EBD Function

EFS002I0

- The electronically controlled braking force distribution unit detects the minute slips that occur in front and rear wheels during braking and uses electronic control to control rear wheel braking force (brake hydraulic pressure) to suppress rear wheel slipping as much as possible to improve stability during braking.
- In the event an electrical system malfunction occurs, the fail-safe function will operate and EBD and ABS will enter non-operational states, and ABS warning lamp and brake warning lamp will come on.
- CONSULT-II can be used to diagnose the electrical system.

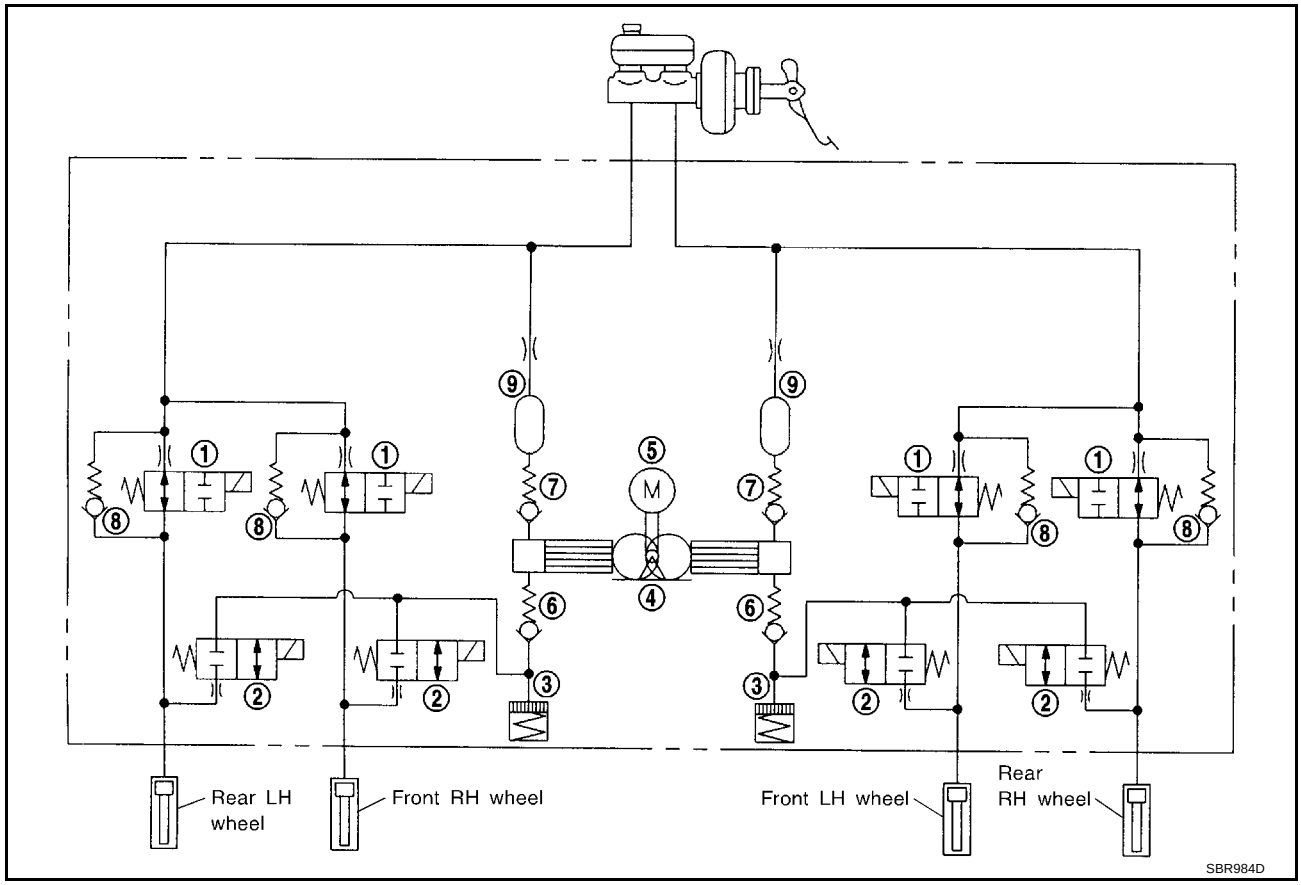
Fail-Safe Function

EFS002I1

- If a malfunction occurs in ABS system, “ABS warning lamp” turns ON.
- If a malfunction occurs in EBD, brake warning lamp and ABS warning lamp turn ON.

Hydraulic Circuit Diagram

EFS002I2



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

TROUBLE DIAGNOSIS

PFP:00004

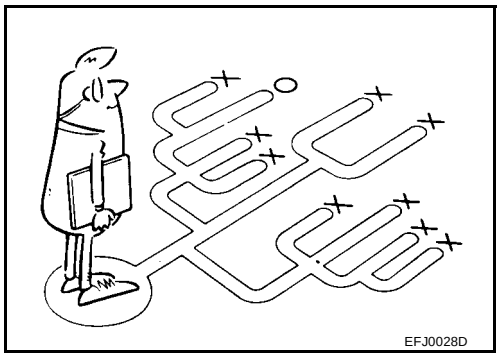
Diagnosis Procedure

EFS002I3

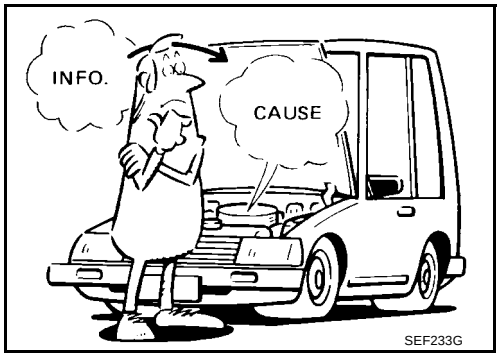
BASIC CONCEPT

- The most important point in performing trouble diagnosis is to thoroughly understand the vehicle systems (both control and mechanical).
- It is also important to clarify customer concerns before starting the inspection.
  First of all, reproduce the symptom, and understand it fully.
  Ask the customer about his/her complaints carefully. In some cases, it will be necessary to check the symptoms by driving the vehicle with the customer.

  CAUTION:
  Customers are not professional. It is dangerous to make an easy guess like “maybe the customer means that...,” or “maybe the customer mentions this symptom”.


EFJ0028D

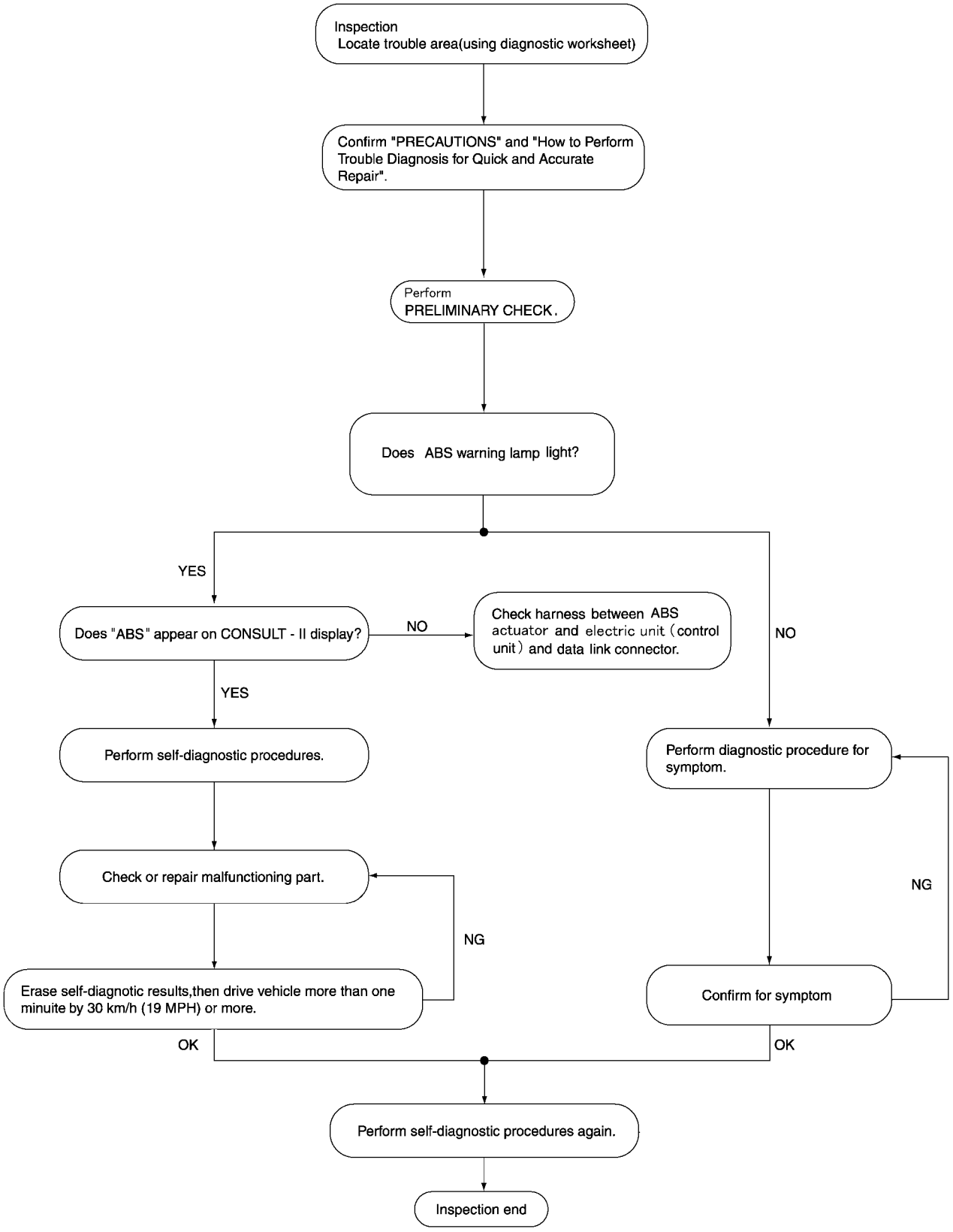
- It is essential to check symptoms right from the beginning in order to repair a error completely.
  For an intermittent error, it is important to reproduce the symptom based on an interview with the customer and past examples. Do not perform an inspection on an ad hoc basis. Most intermittent errors are caused by poor contacts. In this case, it will be effective to shake the suspected harness or connector by hand. When repairs are performed without any symptom diagnosis, no one can judge if the error has actually been eliminated.
- After completing trouble diagnosis, be sure to perform “erase memory”. Refer to BRC-17, "SELF-DIAGNOSIS" .
- For an intermittent error, move the harness or harness connector by hand to check for poor contact or false open circuit.



SEF233G

- Always read the GI section to be aware of the general precautions. Refer to GI-4, "General Precautions" .

DIAGNOSIS FLOW



SFIA0953E

QUESTIONNAIRE

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

KEY POINTS

WHAT ..... Vehicle model
WHEN ..... Date, Frequencies
WHERE ..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

SBR339B

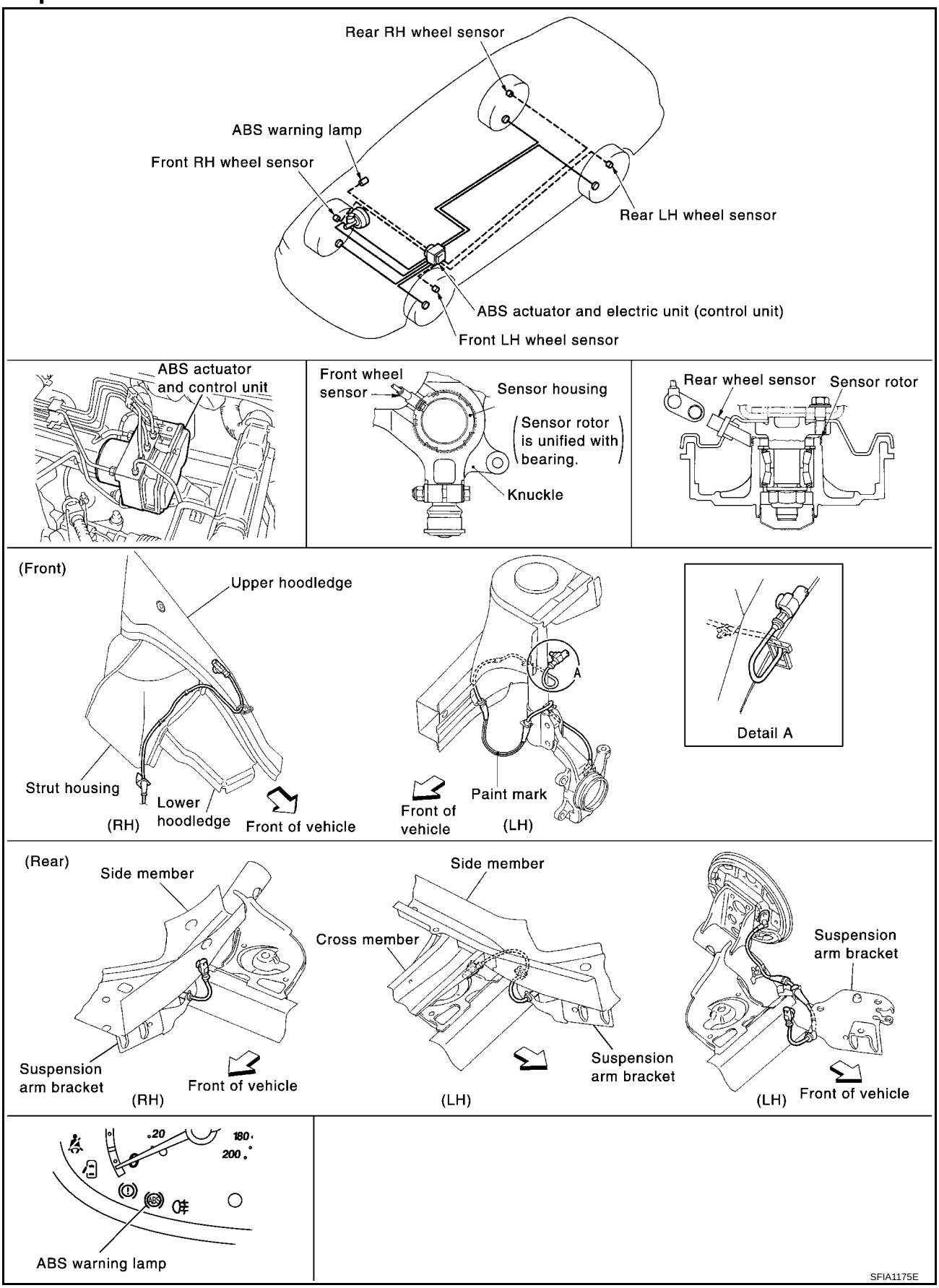
EXAMPLE OF DIAGNOSIS SHEET

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
	☐ TCS does not work (Rear wheels slip when accelerating)	☐ ABS does 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		

SFIA0791E

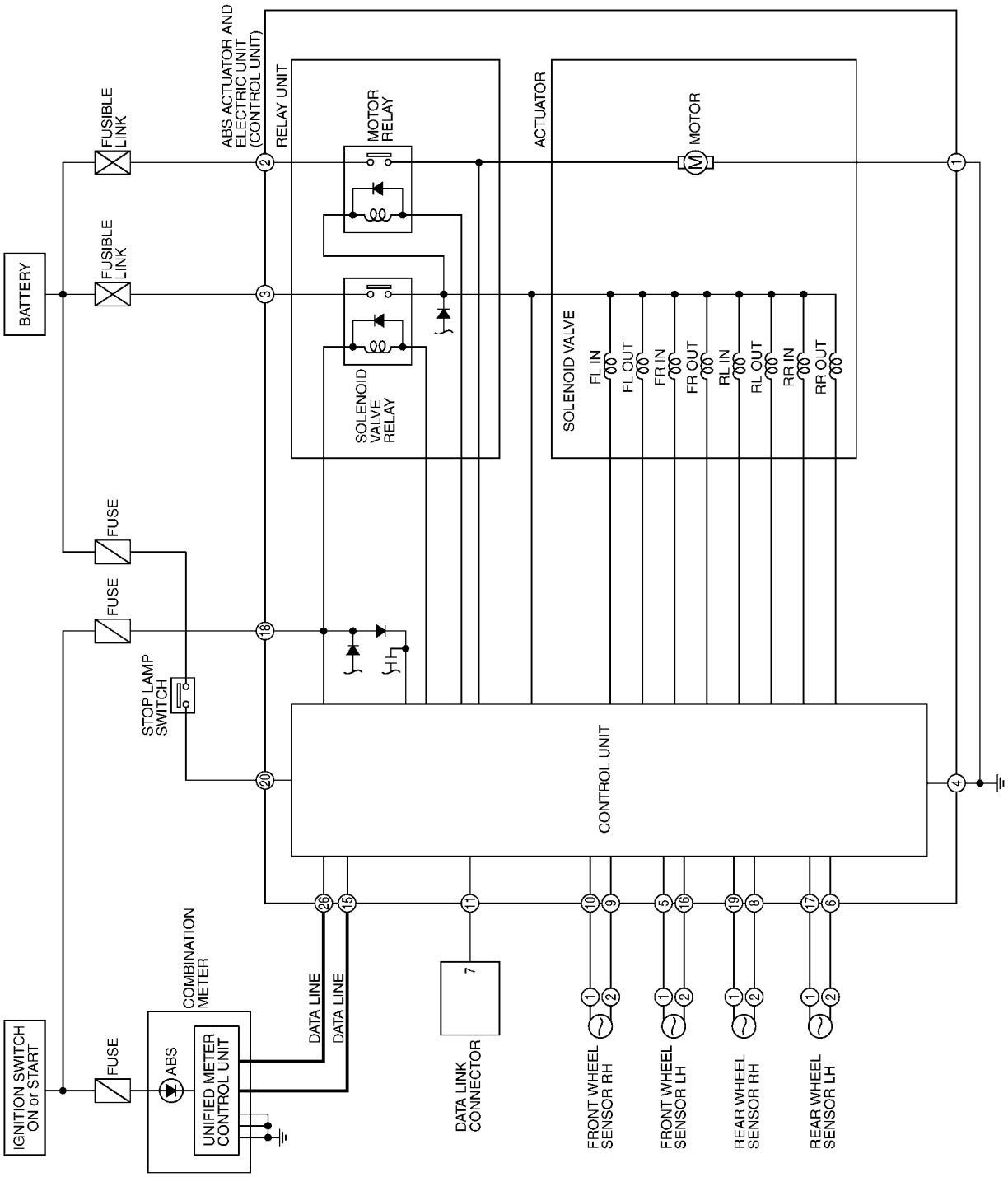
Component Parts Location

EFS002I4



Schematic

EFS002I5



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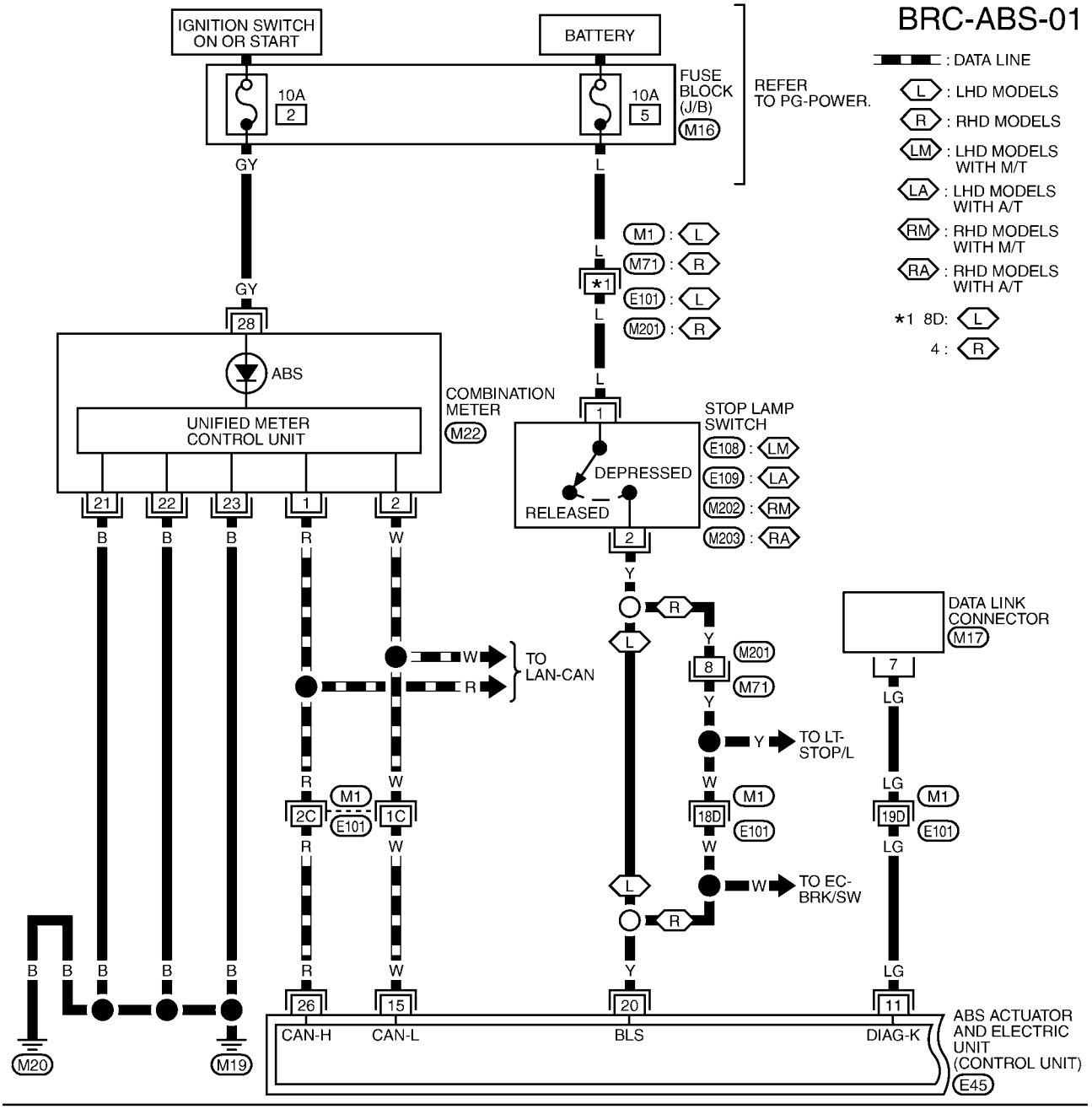
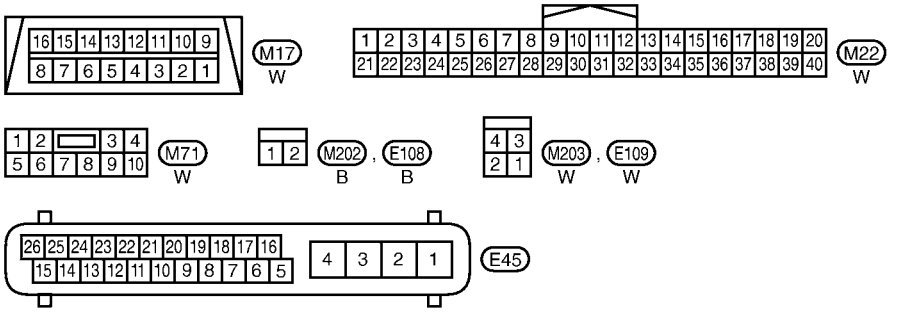
Wiring Diagram — ABS —

EFS002IP

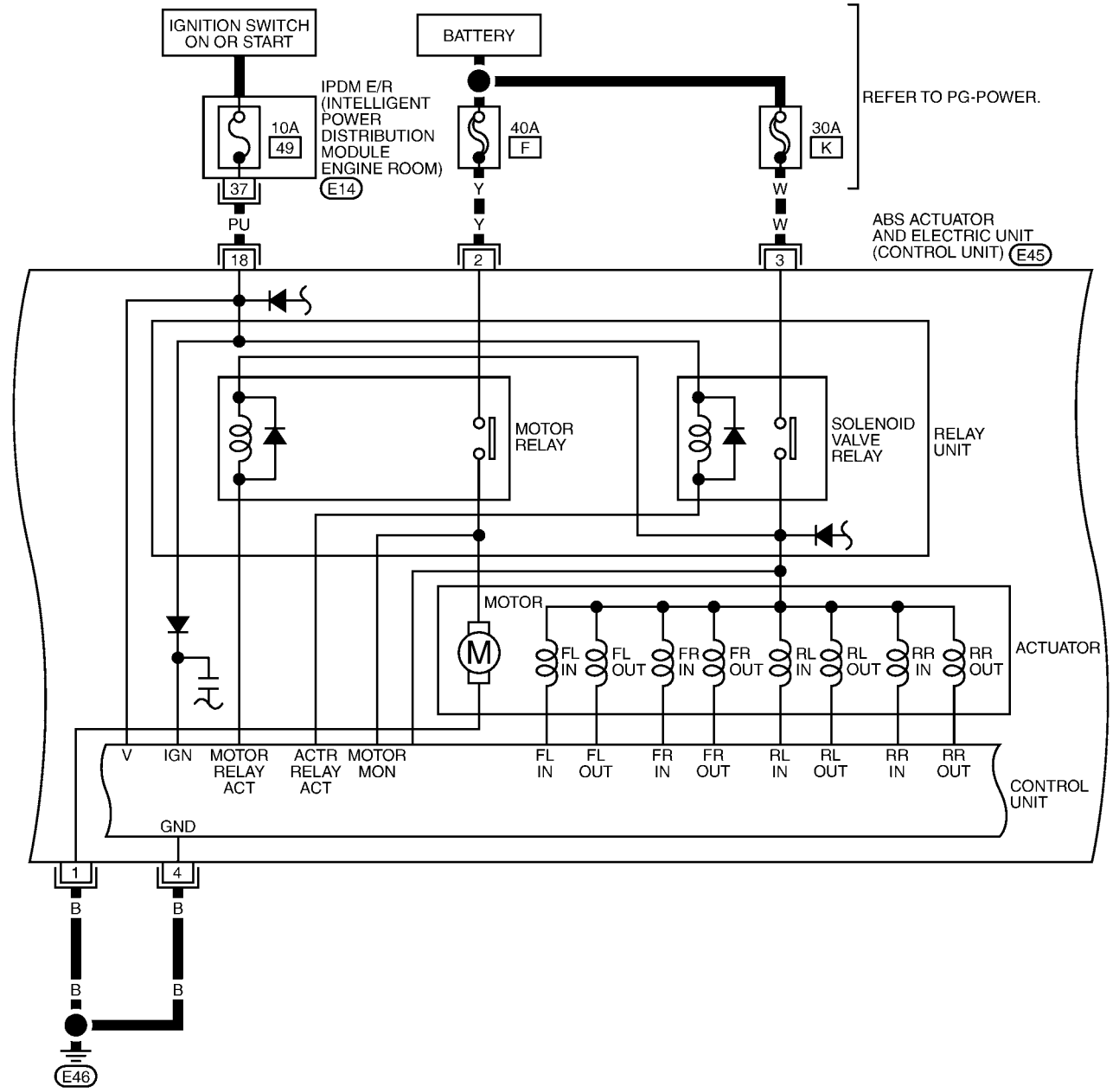


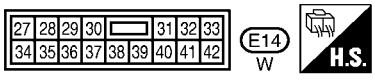


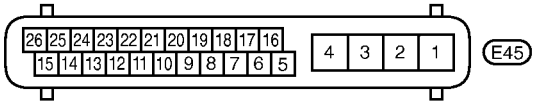
REFER TO THE FOLLOWING.
M1 -SUPER MULTIPLE JUNCTION (SMJ)
M16 -FUSE BLOCK-JUNCTION BOX (J/B)

MFWA0017E

BRC-ABS-02







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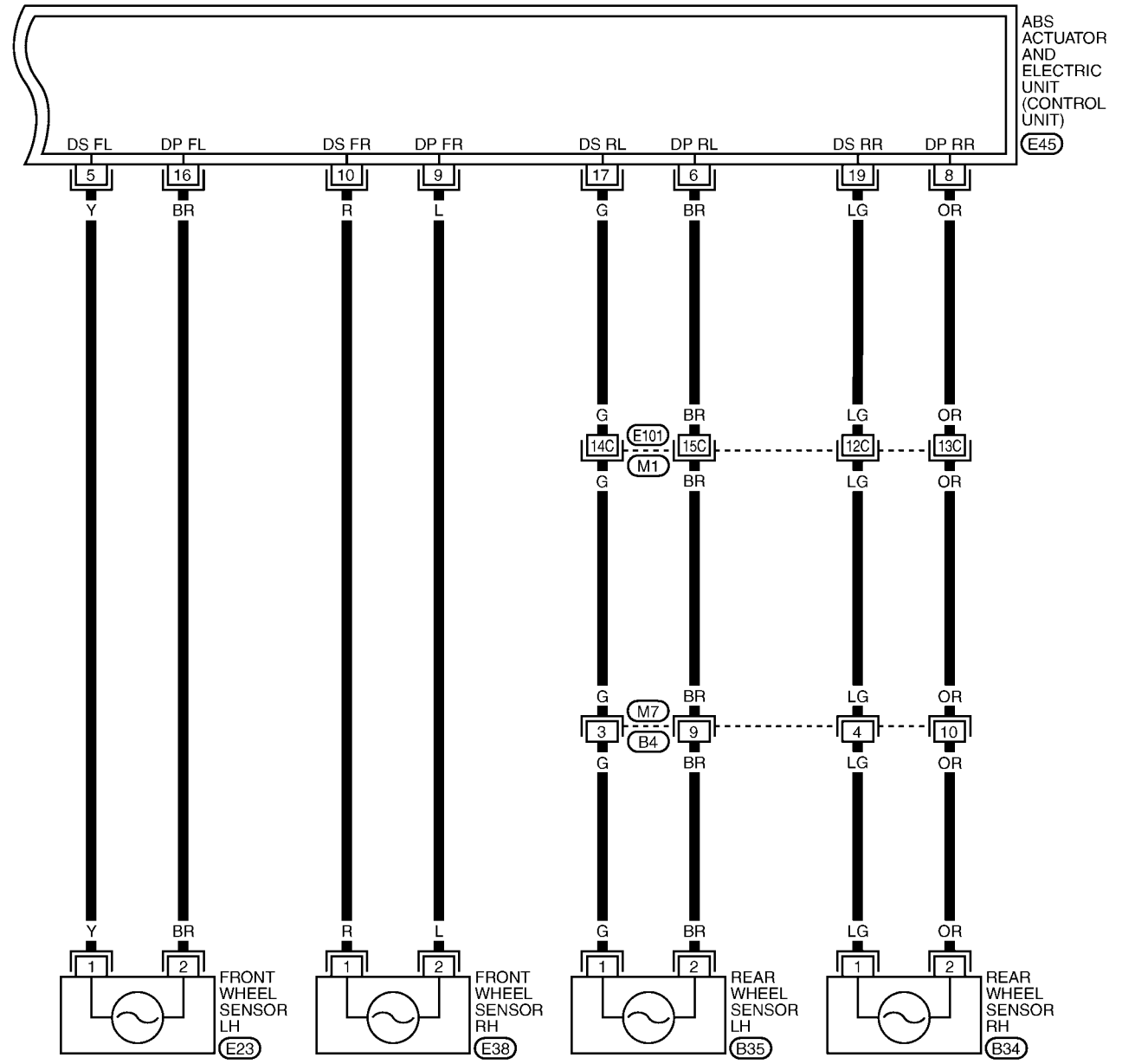
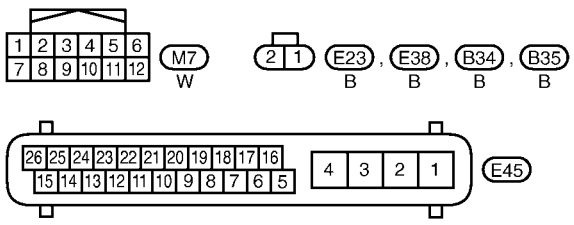
BRC-ABS-03





REFER TO THE FOLLOWING.
M1 -SUPER MULTIPLE JUNCTION (SMJ)

MFWA0019E

Control Unit Input/Output Signal Standard

EFS002I6

STANDARDS BY CONSULT-II

CAUTION:

The displayed item is the calculated data by the control unit, so it may indicate a normal value even if an output circuit (harness) is open or shorted.

Monitor item	Display content	Data monitor		Note: Error inspection checklist
		Condition	Reference values for normal operation	
FR LH SENSOR FR RH SENSOR RR LH SENSOR RR RH SENSOR	Vehicle wheel speed	Vehicle stopped	0 (km/h)	BRC-29, "Inspection 1 Wheel Sensor System"
		While driving (Note 1)	Almost in accordance with the speedometer display (within ±10 %)	
STOP LAMP SWITCH	Brake pedal operation	Brake pedal depressed	ON	BRC-33, "Inspection 6 Stop Lamp Switch System"
		Brake pedal not depressed	OFF	
IN SOL	Solenoid valve operation	ABS solenoid activated or fail-safe activated (Note 2)	ON	BRC-31, "Inspection 4 ABS Actuator Relay or ABS Motor Relay Power System"
OUT SOL		Actuator relay is activated and ABS solenoid is not activated	OFF	
ACTUATOR RLY	Actuator relay activated	Vehicle stop (Ignition switch ON)	ON	
		Vehicle stopped (engine running)	ON	
MOTOR RELAY	Motor relay and motor activated	Motor relay and motor activated	ON	
		Motor relay and motor not activated	OFF	
WARN LAMP	ABS warning lamp ON (Note 3)	ABS warning lamp ON	ON	BRC-28, "BASIC INSPECTION 3: ABS WARNING LAMP AND BRAKE WARNING LAMP INSPECTION"
		ABS warning lamp OFF	OFF	
BATTERY VOLT	Battery voltage supplied to control unit	Ignition switch ON	Approximately 10 - 16 V	BRC-30, "Inspection 2 ABS Actuator and Electric Unit Power and Ground System"
CAN COMM	CAN communication condition	CAN communication is normal	OK	BRC-32, "Inspection 5 CAN Communication System"
		CAN communication error	NG	
CAN CIRC 1	CAN communication condition	CAN communication is normal	OK	
		CAN communication error	UNKWN	
CAN CIRC 2	CAN communication condition	CAN communication is normal	OK	
		CAN communication error	UNKWN	
EBD SIGNAL	EBD operation signal	EBD is operating	ON	—
		EBD is not operating	OFF	
ABS SIGNAL	ABS operation signal	ABS activated	ON	—
		ABS not activated	OFF	
ABS FAIL SIG	ABS fail signal status	During ABS fail-safe During EBD fail-safe	OFF	ABS system EBD system

NOTE:

1. Confirm tyre pressure is normal.
2. The solenoid turns off when the actuator relay is not operating.
3. ON/OFF timing of ABS warning lamp
   ON: When the switch is turned to ON for approximately 1 or when a malfunction is detected.
   OFF: Approximately 1 second after ignition switch is turned ON (when the system is in normal operation).

CONSULT-II Functions

EFS002I7

CONSULT-II FUNCTION APPLICATION TABLE

- "FUNCTION TEST" shall not be used for diagnosis. For details, refer to separately supplied "CONSULT-II Instruction Manual (FUNCTION TEST)".

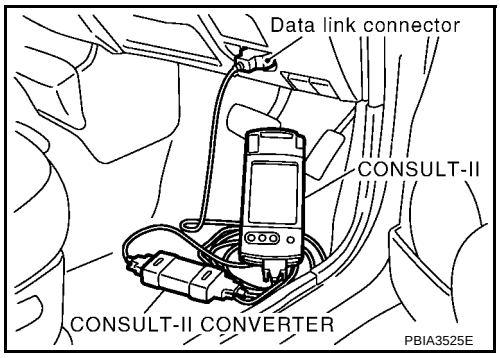
Items	Self-diagnosis	Data monitor	Active test
FR RH SENSOR	×	×	–
FR LH SENSOR	×	×	–
RR RH SENSOR	×	×	–
RR LH SENSOR	×	×	–
Stop lamp switch	×	×	–
FR RH IN ABS SOL	×	×	×
FR RH OUT ABS SOL	×	×	×
FR LH IN ABS SOL	×	×	×
FR LH OUT ABS SOL	×	×	×
RR RH IN ABS SOL	×	×	×
RR RH OUT ABS SOL	×	×	×
RR LH IN ABS SOL	×	×	×
RR LH OUT ABS SOL	×	×	×
ABS ACTUATOR RELAY	×	×	×
ABS MOTOR RELAY	×	×	×
ABS WARNING LAMP	–	×	–
BATTERY VOLTAGE	×	×	–
ABS CONTROL UNIT	×	–	–
CAN COMMUNICATION	×	×	–

×: Applicable
–: Not applicable

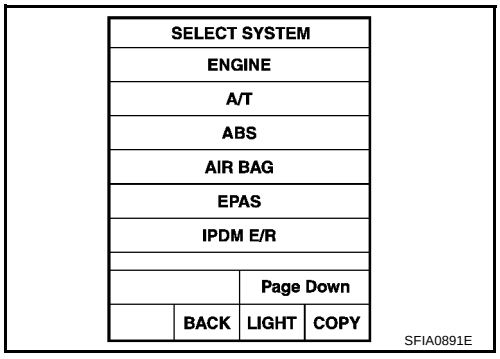
CONSULT-II BASIC OPERATION PROCEDURE

1. Turn ignition switch OFF.
2. Connect CONSULT-II and CONSULT-II CONVERTER data link connector and turn ignition switch ON or start engine.

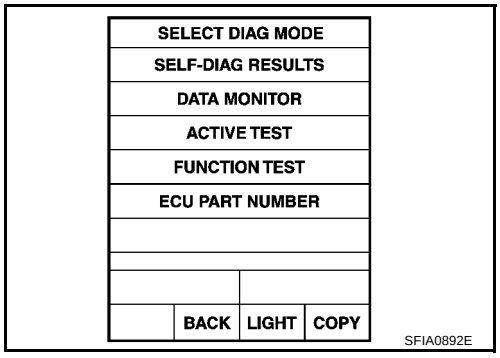
   CAUTION:
   If CONSULT-II is connected without the CONSULT-II CONVERTER, malfunction may be detected by self-diagnosis in Control units that use CAN communication.



3. Touch “START (NISSAN BASED VHCL)”.
4. Touch “ABS” on the “SELECT SYSTEM” screen.



5. Select desired part to be diagnosed on “SELECT DIAG MODE” screen.



SELF-DIAGNOSIS

Description

If a failure occurs in the ABS system, the “ABS warning lamp” turns ON.

Operation Procedure

1. Turn ignition switch OFF.
2. Connect CONSULT-II and CONSULT-II CONVERTER to data link connector.
3. Start engine and drive at approximately 30 km/h (19 MPH) for approximately 1 minute.
4. After stopping the vehicle, with engine running, touch “START (NISSAN BASED VHCL)”, “ABS”, and “SELF-DIAGNOSIS” on CONSULT-II screen in this order.

   CAUTION:
   Just after starting the engine, or turning ignition switch ON, “ABS” may not be displayed on the system selection screen even if “START (NISSAN BASED VHCL)” is touched. In this case, start over from step 1
5. Self-diagnostic results is displayed. (If necessary, touch “PRINT” to print out self-diagnostic results.)
   - When “NO DTC IS DETECTED” is displayed, check ABS warning lamp. Refer to BRC-28, "Basic Inspection" .
6. Go to appropriate “Inspection” chart according to “Indication 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:
   If wheel sensor [SHORT] is detected, the ABS warning lamp does not turn off until the vehicle is driven at 30km/h (19 MPH) for approximately 1 minute, even in normal conditions.
8. Turn ignition switch OFF to prepare for erasing the memory.
9. Start engine, and touch “START (NISSAN BASED VHCL)”, “ABS”, “SELF-DIAGNOSIS”, and “ERASE MEMORY” on CONSULT-II screen in this order to erase the diagnostic memory.

   CAUTION:
   If memory cannot be erased, start over from step 5.
10. As the final inspection, drive at approximately 30 km/h (19 MPH) for approximately 1 minute, and confirm that the ABS warning lamp is OFF.

Display Item List

Suspect systems	Malfunction detecting condition	Inspection system
FR RH SENSOR 1 (Note 1)	Circuit of FR RH wheel sensor is open or shorted.	Wheel sensor circuit [Inspection 1] (Note 2) BRC-29
FR LH SENSOR 1 (Note 1)	Circuit of FR LH wheel sensor is open or shorted.	
RR RH SENSOR 1 (Note 1)	Circuit of RR RH wheel sensor is open or shorted.	
RR LH SENSOR 1 (Note 1)	Circuit of RR LH wheel sensor is open or shorted.	
FR RH SENSOR 2	When there is a sensor power voltage error in the FR RH wheel sensor, and when the control unit cannot recognize sensor pulse because gap between wheel sensor and sensor rotor is large.	
FR LH SENSOR 2	When there is a sensor power voltage error in the FR LH wheel sensor, and when the control unit cannot recognize sensor pulse because gap between wheel sensor and sensor rotor is large.	
RR RH SENSOR 2	When there is a sensor power voltage error in the RR RH wheel sensor, and when the control unit cannot recognize sensor pulse because gap between wheel sensor and sensor rotor is large.	
RR LH SENSOR 2	When there is a sensor power voltage error in the RR LH wheel sensor, and when the control unit cannot recognize sensor pulse because gap between wheel sensor and sensor rotor is large.	
WHEEL SENSOR	When a rotation sensor signal error is detected in one or more of the four wheels, and when operation of one or more of the wheels continues beyond the specified time.	

Suspect systems	Malfunction detecting condition	Inspection system
FR RH IN ABS SOL	Displays when control unit detects error in FR RH IN SOL system.	ABS actuator relay or ABS motor relay power system (Note 3) [Inspection 3] BRC-31
FR LH IN ABS SOL	Displays when control unit detects error in FR LH IN SOL system.	
RR RH IN ABS SOL	Displays when control unit detects error in RR RH IN SOL system.	
RR LH IN ABS SOL	Displays when control unit detects error in RR LH IN SOL system.	
FR RH OUT ABS SOL	Displays when control unit detects error in FR RH OUT SOL system.	
FR LH OUT ABS SOL	Displays when control unit detects error in FR LH OUT SOL system.	
RR RH OUT ABS SOL	Displays when control unit detects error in RR RH OUT SOL system.	
RR LH OUT ABS SOL	Displays when control unit detects error in RR LH OUT SOL system.	
MAIN RELAY	Displayed when control unit detects malfunction in actuator relay system.	
PUMP MOTOR	Displays when control unit detects errors in motor or motor relay system.	
BATTERY VOLTAGE	Battery voltage of control unit is too high.	ABS control unit power and ground systems [Inspection 2] BRC-30
	Battery voltage of control unit is too low.	
STOP LAMP SWITCH	Stop lamp switch circuit is open.	Stop lamp switch system [Inspection 6] BRC-33
CONTROL UNIT	Processing function of control unit is malfunctioning.	ABS control unit system [Inspection 3] BRC-31
CAN COMM	CAN communication error.	CAN communication system [Inspection 5] BRC-32

NOTE:

1. Note 1: After completing repairs of the shorted sensor circuit, when ignition switch is turned ON, the ABS warning lamp turns on. Make sure the ABS warning lamp turns off while driving the vehicle at approx. 30 km/h for approx. 1 minute according to self-diagnosis procedure.
2. Note 2: Also, when each wheel sensor displays 2, check wheel sensor path and control unit power battery voltage.
3. Note 3: If there are no errors in 1 to 3 below, replace the actuator unit.

– Open or short-circuit in the solenoid power supply, motor power supply, or ground harness.
– Unit side connector pin terminal
– Fusible link

DATA MONITOR

Operation Procedure

1. Touch “DATA MONITOR”.
2. Return to monitor item selection screen, and touch any of “control unit INPUT ITEM”, “MAIN ITEM”, “SELECT ITEM MENU” or “CAN DIAGNOSIS SUPPORT MONITOR”. Refer to BRC-19, "Data Monitor Item Chart" .
3. Touch “START”.
4. Screen of data monitor is displayed.

Data Monitor Item Chart

Item (Unit)	Monitor item selection				Remarks
	ECM INPUT SIGNALS	MAIN SIGNALS	SELECTION FROM MENU	CAN DIAG SUPPORT MNTR	
FR RH SENSOR (km/h)	×	×	×	–	Wheel speed calculated by front RH wheel sensor signal is displayed.
FR LH SENSOR (km/h)	×	×	×	–	Wheel speed calculated by front LH wheel sensor signal is displayed.
RR RH SENSOR (km/h)	×	×	×	–	Wheel speed calculated by RH rear wheel sensor signal is displayed.
RR LH SENSOR (km/h)	×	×	×	–	Wheel speed calculated by LH rear wheel sensor signal is displayed.
FR RH IN SOL (ON/OFF)	–	×	×	–	Condition (ON/OFF) of front RH inlet ABS solenoid valve is displayed.
FR RH OUT SOL (ON/OFF)	–	×	×	–	Condition (ON/OFF) of front RH outlet ABS solenoid valve is displayed.
FR LH IN SOL (ON/OFF)	–	×	×	–	Condition (ON/OFF) of front LH inlet ABS solenoid valve is displayed.
FR LH OUT SOL (ON/OFF)	–	×	×	–	Condition (ON/OFF) of front LH outlet ABS solenoid valve is displayed.
RR RH IN SOL (ON/OFF)	–	×	×	–	Condition (ON/OFF) of rear RH inlet ABS solenoid valve is displayed.
RR RH OUT SOL (ON/OFF)	–	×	×	–	Condition (ON/OFF) of rear RH outlet ABS solenoid valve is displayed.
RR LH IN SOL (ON/OFF)	–	×	×	–	Condition (ON/OFF) of rear LH inlet ABS solenoid valve is displayed.
RR LH OUT SOL (ON/OFF)	–	×	×	–	Condition (ON/OFF) of rear LH outlet ABS solenoid valve is displayed.
STOP LAMP SW (ON/OFF)	×	×	×	–	Condition of stop lamp switch (ON/OFF) is displayed.
ACTUATOR RELAY (ON/OFF)	–	×	×	–	ABS actuator relay (ON/OFF) condition is displayed.
MOTOR RELAY (ON/OFF)	–	×	×	–	ABS motor relay (ON/OFF) condition is displayed.

Item (Unit)	Monitor item selection				Remarks
	ECM INPUT SIGNALS	MAIN SIGNALS	SELECTION FROM MENU	CAN DIAG SUPPORT MNTR	
ABS WARN LAMP (ON/OFF)	–	×	×	–	ABS warning lamp (ON/OFF) status is displayed.
BATTERY VOLT (V)	×	×	×	–	Voltage supplied to ABS control unit is displayed.
EBD SIGNAL (ON/OFF)	–	–	×	–	EBD operation (ON/OFF) status is displayed.
ABS SIGNAL (ON/OFF)	–	–	×	–	ABS operation (ON/OFF) status is displayed.
CAN COMM (OK/NG)	–	–	–	×	CAN communication (OK/NG) status is displayed.
CAN CIRC 1 (OK/UNKWN)	–	–	–	×	CAN communication signal (OK/UNKWN) status is displayed.
CAN CIRC 2 (OK/UNKWN)	–	–	–	×	

×: Applicable
–: Not applicable

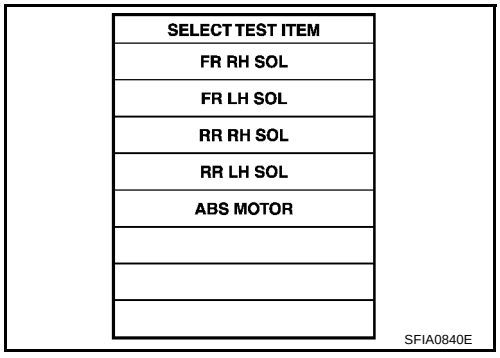
ACTIVE TEST

CAUTION:

- **Do not perform active test while driving.**
- **Make sure to completely bleed air from the brake system.**
- **During active test, ABS and brake warning lamps are on.**

Operation Procedure

1. Touch “ACTIVE TEST”.
2. The “SELECT TEST ITEM” screen is displayed.
3. Touch “TEST ITEM”.
4. Touch “START” with “MAIN SIGNALS” line inverted.
5. The “ACTIVE TEST” screen is displayed, and the following test can be performed.

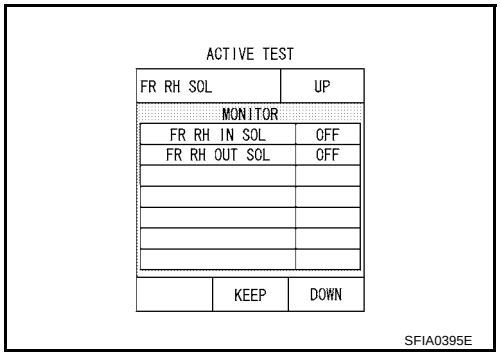


Test Item – ABS Solenoid Valve –

- Touch “UP”, “KEEP” and “DOWN” on the screen to confirm ABS solenoid valves (inlet/outlet) operate as in the following chart.

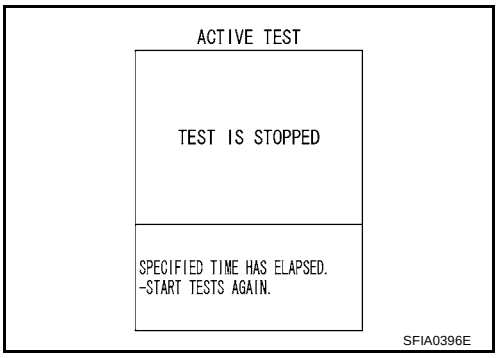
Operation	UP	KEEP	DOWN
ABS inlet S/V	OFF	ON	ON
ABS outlet S/V	OFF	OFF	ON*

*: ON for 1 to 2 seconds after 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 10 seconds after operation start.
- After "TEST STOP" is displayed, to perform test again, touch "BACK" and repeat step 6.



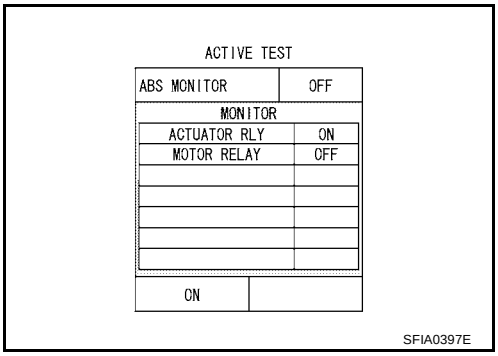
Test Item – ABS Motor –

- Touch "ON" and "OFF" on the screen to confirm the ABS motor relay operates as shown in the following chart.

Operation	ON	OFF
ABS actuator relay	ON	ON
ABS 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 10 seconds after operation start.



CAN Communication

EFS002I8

SYSTEM DESCRIPTION

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

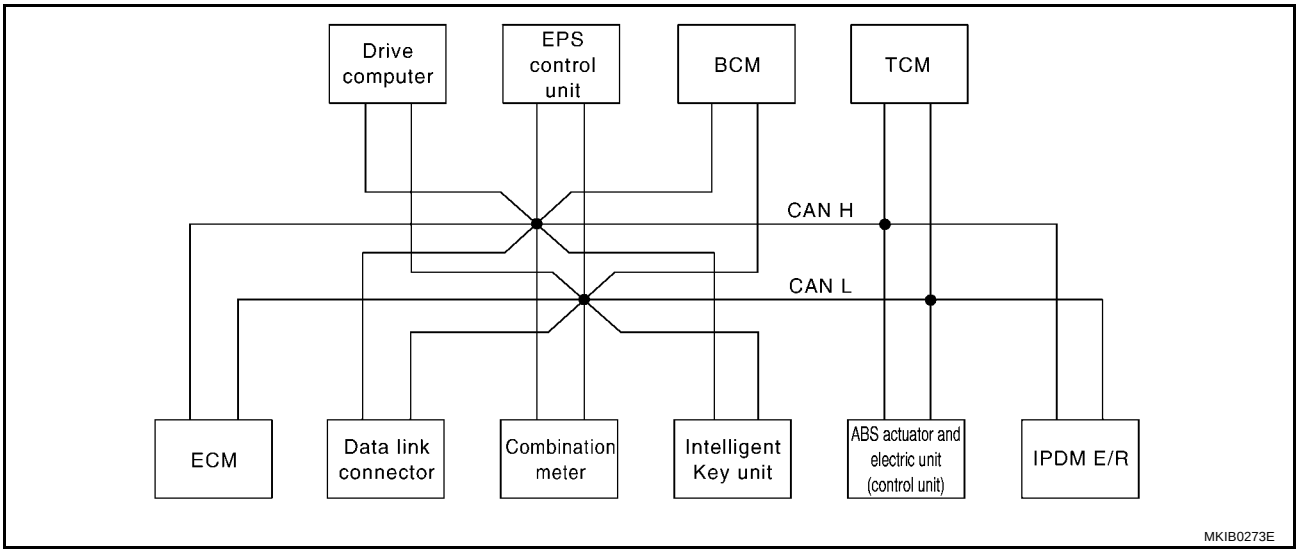
Body type	3door/5door							
Axle	2WD							
Engine	CR10DE/CR12DE/CR14DE							
Handle	LHD/RHD							
Brake control	ABS							
Transmission	A/T				M/T			
Intelligent Key system	Applicable		Not applicable		Applicable		Not applicable	
CAN communication unit								
ECM	×	×	×	×	×	×	×	×
Data link connector	×	×	×	×	×	×	×	×
Combination meter	×	×	×	×	×	×	×	×
Intelligent Key unit	×	×			×	×		
Drive computer	×		×		×		×	
EPS control unit	×	×	×	×	×	×	×	×
BCM	×	×	×	×	×	×	×	×
ABS actuator and electric unit (control unit)	×	×	×	×	×	×	×	×
TCM	×	×	×	×				
IPDM E/R	×	×	×	×	×	×	×	×
CAN communication type	BRC-23, "TYPE 1/TYPE2"				BRC-26, "TYPE 3/TYPE4"			

×: Applicable

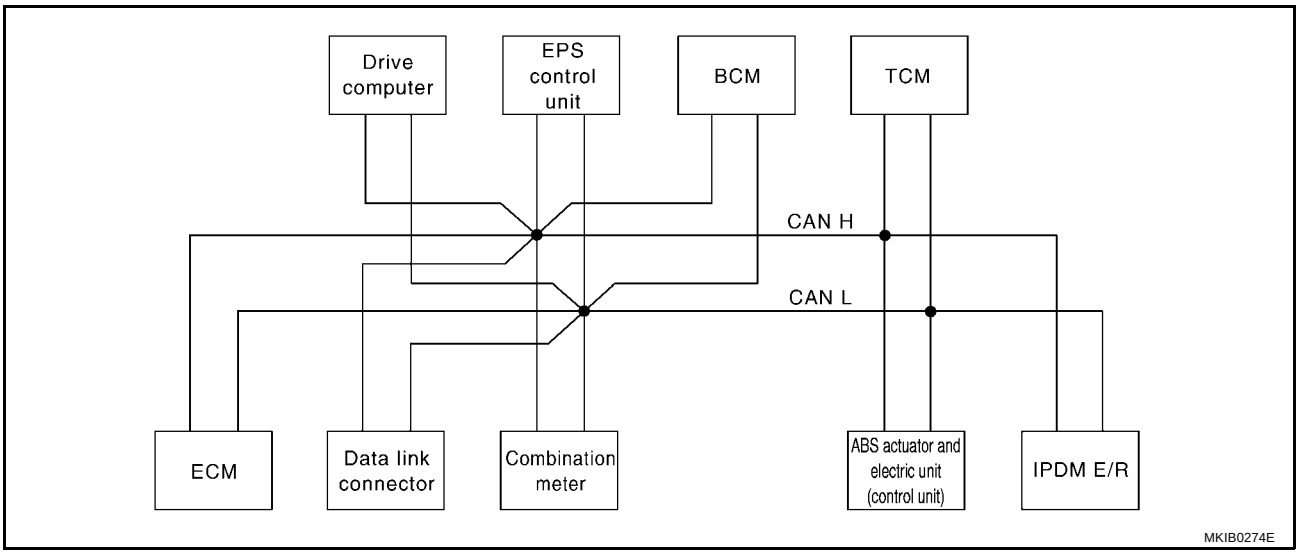
TYPE 1/TYPE2

System diagram

- Type1



- Type2



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	Combi-nation meter.	Intelli-gent Key unit	Drive com-puter	EPS control unit	BCM	ABS actuator and electric unit (control unit)	TCM	IPDM E/R
Engine speed signal	T	R		R	R				
Engine coolant temperature sig-nal	T	R							
A/T self-diagnosis signal	R							T	
Output shaft revolution signal	R							T	
Accelerator pedal position signal	T							R	
Closed throttle position signal	T							R	
Wide open throttle position sig-nal	T							R	

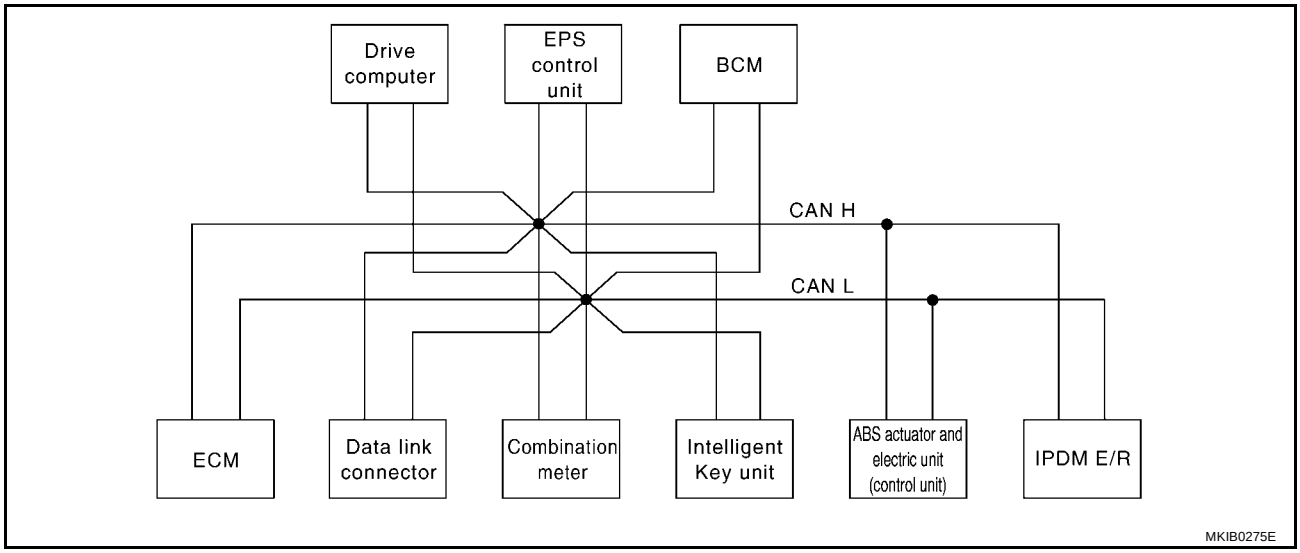
Signals	ECM	Combi-nation meter.	Intelli-gent Key unit	Drive com-puter	EPS control unit	BCM	ABS actuator and electric unit (control unit)	TCM	IPDM E/R
A/T shift position signal		R						T	
Stop lamp switch signal		T						R	
O/D OFF indicator lamp signal		R						T	
Engine and A/T integrated control signal	T							R	
	R							T	
Fuel consumption monitor signal	T	R							
Oil pressure switch signal		R		R					T
A/C compressor request signal	T								R
Heater fan switch signal	R					T			
Cooling fan speed request signal	T								R
Cooling fan speed status signal	R								T
Position lights request signal		R		R		T			R
Position light status signal	R								T
Low beam request signal						T			R
Low beam status signal	R								T
High beam request signal		R				T			R
High beam status signal	R								T
Day time light request signal						T			R
Vehicle speed signal	R	R			R		T		
	R	T	R	R	R	R			
Sleep/wake up signal		R	R			T			R
Door switch signal		R	R	R		T			R
Turn indicator signal		R				T			
Buzzer output signal		R				T			
		R	T						
MI signal	T	R		R					
Front wiper request signal						T			R
Front wiper stop position signal						R			T
Rear window defogger switch signal						T			R
Rear window defogger control signal	R								T
Drive computer signal		T		R					
EPS warning lamp signal		R		R	T				
ABS warning lamp signal		R		R			T		
ABS operation signal	R						T		
Brake warning lamp signal		R		R			T		
Buck-up lamp signal					R	T			
Fuel low warning signal		T		R					
Battery charge malfunction signal		T		R					

Signals	ECM	Combi-nation meter.	Intelli-gent Key unit	Drive com-puter	EPS control unit	BCM	ABS actuator and electric unit (control unit)	TCM	IPDM E/R
Air bag system warning signal		T		R					
Brake fluid level warning signal		T		R					
Engine coolant temperature warning signal		T		R					
Front fog lamp request signal		R				T			R
Rear fog lamp status signal		R				T			
Headlamp washer request signal						T			R
Door lock/unlock request signal			R			T			
Door lock/unlock status signal			R			T			
KEY indicator signal		R	T						
LOCK indicator signal		R	T						

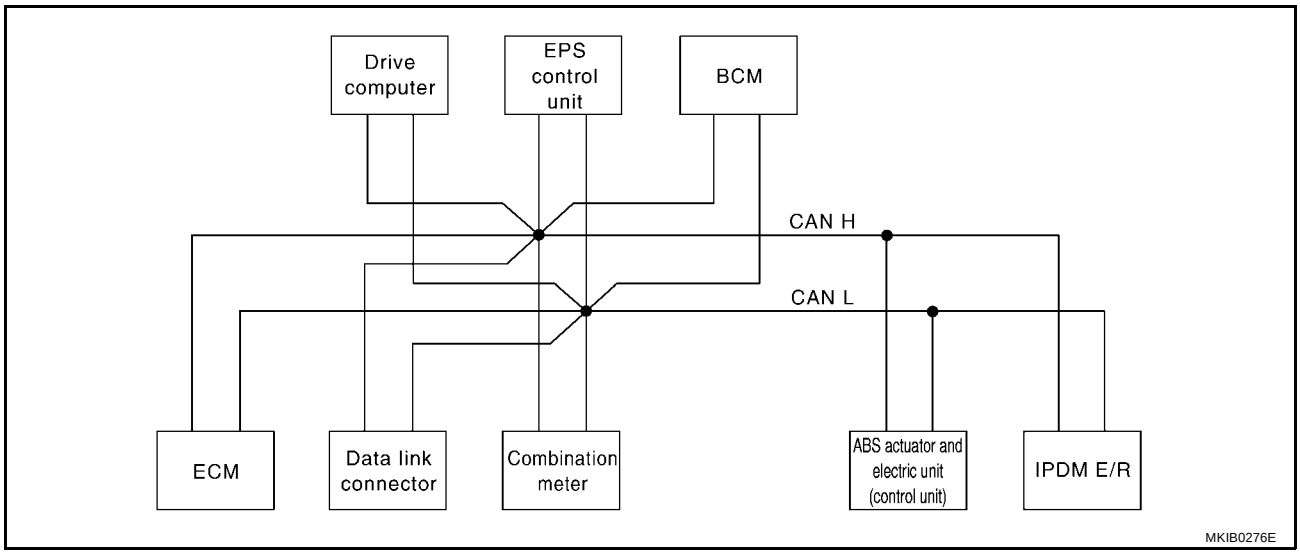
TYPE 3/TYPE4

System diagram

- Type3



- Type4



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	Combination meter.	Intelligent Key unit	Drive computer	EPS control unit	BCM	ABS actuator and electric unit (control unit)	IPDM E/R
Engine speed signal	T	R		R	R			
Engine coolant temperature signal	T	R						
Fuel consumption monitor signal	T	R						
Oil pressure switch signal		R		R				T
A/C compressor request signal	T							R
Heater fan switch signal	R					T		
Cooling fan speed request signal	T							R
Cooling fan speed status signal	R							T
Position lights request signal		R		R		T		R

Signals	ECM	Combination meter.	Intelligent Key unit	Drive computer	EPS control unit	BCM	ABS actuator and electric unit (control unit)	IPDM E/R
Position light status signal	R							T
Low beam request signal						T		R
Low beam status signal	R							T
High beam request signal		R				T		R
High beam status signal	R							T
Day time light request signal						T		R
Vehicle speed signal	R	R			R		T	
	R	T	R	R	R	R		
Sleep/wake up signal		R	R			T		R
Door switch signal		R	R	R		T		R
Turn indicator signal		R				T		
Buzzer output signal		R				T		
		R	T					
MI signal	T	R		R				
Front wiper request signal						T		R
Front wiper stop position signal						R		T
Rear window defogger switch signal						T		R
Rear window defogger control signal	R							T
Drive computer signal		T		R				
EPS warning indicator signal		R		R	T			
ABS warning lamp signal		R		R			T	
ABS operation signal	R			R			T	
Brake warning lamp signal		R					T	
Buck-up lamp signal					R	T		
Fuel low warning signal		T		R				
Battery charge malfunction signal		T		R				
Air bag system warning signal		T		R				
Brake fluid level warning signal		T		R				
Engine coolant temperature warning signal		T		R				
Front fog lamp request signal		R				T		R
Rear fog lamp status signal		R				T		
Headlamp washer request signal						T		R
Door lock/unlock request signal			R			T		
Door lock/unlock status signal			R			T		
KEY indicator signal		R	T					
LOCK indicator signal		R	T					

For Fast and Accurate Diagnosis

EFS002I9

PRECAUTIONS FOR TROUBLE DIAGNOSIS

- Always read the “GI General Information” to confirm the general precautions. Refer to GI-4, "General Precautions" .

- After completing the trouble diagnosis, always erase the fault memory. Refer to BRC-17, "SELF-DIAGNOSIS" .
- When inspection of the continuity or voltage between control units is performed, check connector terminals for disconnection, looseness, bend, or collapse. If any non-standard condition is detected, repair or replace applicable part.
- Intermittent errors may be caused by a poor connection in the harness, connector, or terminal.
- If a circuit tester is used for the check, be careful not to forcibly extend any connector terminal.

Basic Inspection

EFS002IA

BASIC INSPECTION 1: BRAKE FLUID LEVEL, LEAK AND BRAKE PAD INSPECTION

1. Check fluid level in brake reservoir tank. If fluid level is low, refill the brake fluid.
2. Check area around the brake piping and ABS actuator for leaks. If a leak or oozing is detected, check as follows:
   - If ABS actuator connections are loose, tighten piping to the specified torque. Check again for leaks, and make sure there is no fluid leakage.
   - If flare nuts at the connections and the threads of ABS actuator are damaged, replace damaged parts. Then check again for leaks, and make sure that there is no fluid leak.
   - If a leak or oozing is detected on other parts than ABS actuator connections, wipe the applicable part with a clean cloth. Then check again for leaks, and if there is still a leak or oozing, replace damaged part.
   - If leaks or oozing are detected on ABS actuator body, wipe with a clean cloth and check again. If there is still a leak or oozing, replace ABS actuator.

     CAUTION:
     ABS actuator body cannot be disassembled.
3. Check for brake pad wear. Refer to BR-20, "PAD WEAR INSPECTION" .

BASIC INSPECTION 2: INSPECTION OF POWER SUPPLY SYSTEM TERMINAL LOOSENESS AND BATTERY

Check battery for looseness on battery positive/negative cables and ground connection. Also Make sure battery voltage dose not drop.

BASIC INSPECTION 3: ABS WARNING LAMP AND BRAKE WARNING LAMP INSPECTION

1. Make sure ABS warning lamp and brake warning lamp turn on for approximately 1 sec. When ignition switch is turned ON. If they do not turn on, perform CAN communication system diagnosis. Refer to BRC-32, "Inspection 5 CAN Communication System" .
   If CAN communication system is normal, replace combination meter. Refer to DI-27, "Removal and Installation for Combination Meter" .
2. Make sure ABS warning lamp and brake warning lamp turn off after approximately 1 sec. When ignition switch is turned ON. If they do not turn OFF, perform self-diagnosis.
3. Make sure that ABS warning lamp remains off after the vehicle has been driven at approx. 30 km/h (19 MPH) for approx. 1 minute. If it turns on, perform self-diagnosis.
4. After completing self-diagnosis, always erase self-diagnostic results memory. Refer to BRC-17, "SELF-DIAGNOSIS" .

CAUTION:
The brake warning lamp comes on when the parking brake lever is pulled (when switch is on) and when the brake fluid level sensor operates (insufficient brake fluid).

Inspection 1 Wheel Sensor System

EFS002IB

INSPECTION PROCEDURE

After identifying malfunctioning wheel sensor position according to CONSULT-II self-diagnostic results, check the each part and identify the parts to be replaced.

1. CHECK TYRE

Check air pressure, wear and size.

Are air pressure, wear, and size within specifications?

YES >> GO TO 2.
NO >> Adjust air pressure, or replace tyre.

2. CHECK SENSOR AND SENSOR ROTOR

- Inspect the appearance of the sensor and sensor rotor.
- Check sensor rotor rubber bar for damage.
- Check sensor for disconnection or loose.

OK or NG

OK >> GO TO 3.
NG >> Replace sensor rotor.

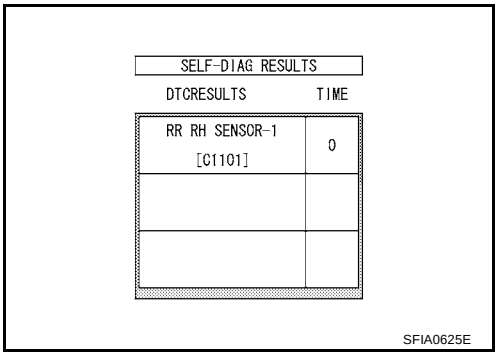
3. SELF-DIAGNOSTIC RESULTS

Check the self-diagnostic results.

Self-diagnostic results
FR RH SENSOR 1, 2
FR LH SENSOR 1, 2
RR RH SENSOR 1, 2
RR LH SENSOR 1, 2

Is any of above displayed on self-diagnosis display?

YES >> GO TO 4.
NO >> INSPECTION END



4. CHECK CONNECTOR

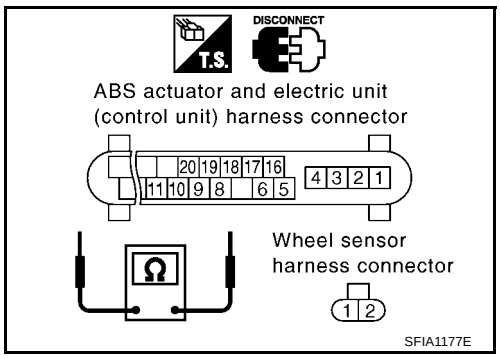
1. Disconnect control unit connector E45 and malfunctioning wheel sensor connector E23 (FL), E38 (FR), B35 (RL) or B34 (RR) and check for deformation, disconnected and loose. If there is any non-standard condition, repair the connector.
2. Reconnect connectors, drive the vehicle at 30km/h (19 MPH) for approximately 1 minute, and then perform self-diagnosis.

OK or NG

OK >> The connector terminal contact is loose, damage, open or shorted.
NG >> GO TO 5.

5. CHECK WHEEL SENSOR HARNESS

1. Disconnect control unit connector E45 and wheel sensor connector E23 (FL), E38 (FR), B35 (RL) and B34 (RR).
2. Check continuity between terminals. (Check resistance as well when turning the steering wheel to the right and left, or moving sensor harness in the wheel well.)



	Power supply system		Signal system		Ground system	
Wheel	Control unit	Wheel sensor	Control unit	Wheel sensor	Control unit (signal)	Control unit (Ground)
Front RH	10 (R)	1 (R)	9 (L)	2 (L)	9 (L), 10 (R)	4 (B)
Front LH	5 (Y)	1 (Y)	16 (BR)	2 (BR)	5 (Y), 16 (BR)	4 (B)
Rear RH	19 (LG)	1 (LG)	8 (OR)	2 (OR)	8 (OR), 19 (LG)	4 (B)
Rear LH	17 (G)	1 (G)	6 (BR)	2 (BR)	6 (BR), 17 (G)	4 (G)

Power supply system : Continuity should exist.
Signal System : Continuity should exist.
Ground system : Continuity should not exist.

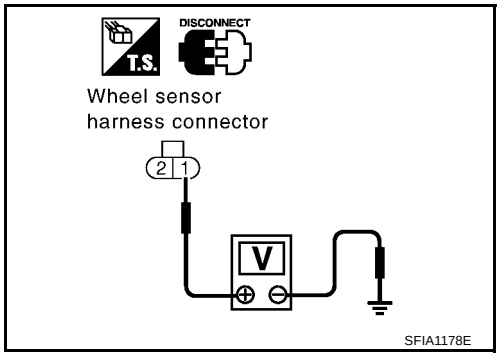
OK or NG

OK >> GO TO 6.
NG >> Repair or replace harness connector between ABS actuator and electric unit (control unit) and wheel sensor.

6. CHECK WHEEL SENSOR POWER SUPPLY CIRCUIT

1. Connect control unit connector.
2. Turn ignition switch ON.
3. Check voltage between wheel sensor power supply terminal and ground.

Voltage : Approx. 12 V



OK or NG

OK >> Replace wheel sensor.
NG >> Replace ABS actuator and electric unit (control unit).

Inspection 2 ABS Actuator and Electric Unit Power and Ground System

EFS002IC

INSPECTION PROCEDURE

1. CHECK SELF-DIAGNOSTIC RESULTS

Check the self-diagnostic results.

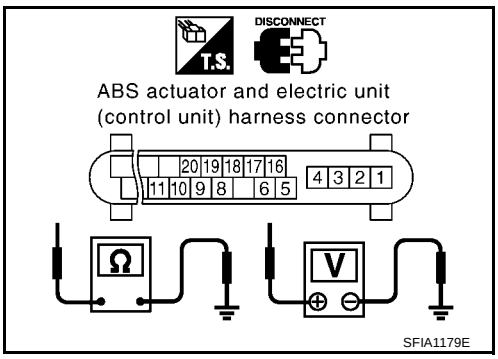
Self-diagnostic results
BATTERY VOLTAGE

Is any of above displayed on self-diagnosis display?

YES >> GO TO 2.
NO >> INSPECTION END

2. CHECK POWER SUPPLY AND GROUND CIRCUIT

1. Disconnect control unit connector E45.
2. Check continuity and voltage between control unit connector terminals and ground.



Terminal	Signal	Ignition switch	Measured value
18 (PU)	Power supply	ON	Battery voltage (approx. 12 V)
		OFF	Approx. 0 V
4 (B)	Ground	OFF	Continuity should exist.

OK or NG

OK >> Check battery for loose terminal and low voltage for malfunction. If it returns an error, repair it.
NG >> Repair or replace harness connector between ABS actuator and electric unit (control unit) and fusible link.

Inspection 3 ABS Control Unit System

EFS002ID

Inspection Procedure

1. CHECK SELF-DIAGNOSTIC RESULTS

Check the self-diagnostic results.

Self-diagnostic results
CONTROL UNIT

Is any of above displayed on self-diagnosis display?

YES >> Replace ABS actuator and electric unit (control unit).
NO >> INSPECTION END

Inspection 4 ABS Actuator Relay or ABS Motor Relay Power System

EFS002IE

Inspection Procedure

1. CHECK SELF-DIAGNOSTIC RESULTS

Check the self-diagnostic results.

Self-diagnostic results
IN ABS SOL
OUT ABS SOL
MAIN RELAY
PUMP MOTOR

Is above displayed on self-diagnosis display?

YES >> GO TO 2.
NO >> INSPECTION END

2. CHECK CONNECTOR

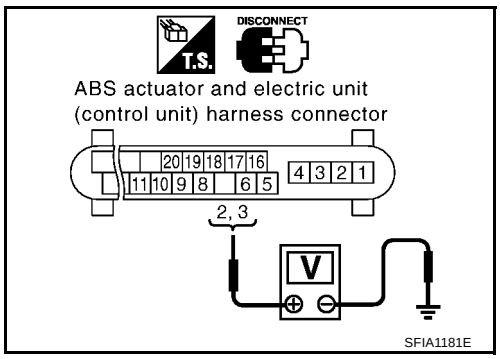
1. Disconnect control unit connector E45. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
2. Reconnect connector securely, and perform self-diagnosis.

OK or NG

OK >> The connector terminal contact is loose, damaged, open or shorted.
NG >> GO TO 3.

3. ABS ACTUATOR RELAY (SOLENOID VALVE RELAY) OR ABS MOTOR RELAY POWER SYSTEM

1. Disconnect control unit connector E45.
2. For ABS actuator relay (solenoid valve relay), check voltage between control unit connector E45 terminal 3 (W) and ground. For the ABS motor relay, check voltage between control unit connector E45 terminal 2 (Y) and ground.



ABS actuator relay (solenoid valve relay)

3 (W) – Ground : Battery voltage (approx. 12 V)

ABS motor relay

2 (Y) – Ground : Battery voltage (approx. 12 V)

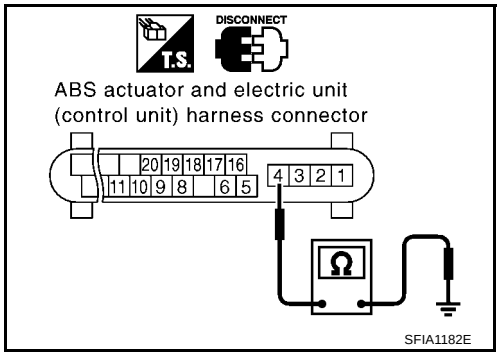
OK or NG

OK >> GO TO 4.

NG >> Repair or replace harness connector between ABS actuator and electric unit (control unit) and fusible link.

4. CHECK GROUND CIRCUIT

Check continuity between control unit connector E45 terminal 4 (B) and ground.



4 (B) – Ground : Continuity should exist.

OK or NG

OK >> Replace ABS actuator and electric unit (control unit).

NG >> Repair or replace ABS actuator and electric unit ground harness.

Inspection 5 CAN Communication System

EFS002IF

INSPECTION PROCEDURE

1. START INSPECTION

1. Using CONSULT-II, perform self-diagnosis.
2. Print the result of the self-diagnosis.
3. Check “CAN communication support monitor” in data monitor.

CAN Diagnosis Support Monitor

Normal	When failure occurs
CAN COMM: OK	CAN COMM: NG
CAN CIRC 1: OK	CAN CIRC 1: UNKWN
CAN CIRC 2: OK	CAN CIRC 2: UNKWN

>> After printing the monitor items, GO TO “CAN System”. Refer to LAN-3, "Precautions When Using CONSULT-II" .

Inspection 6 Stop Lamp Switch System

EFS002IG

INSPECTION PROCEDURE

1. CHECK SELF-DIAGNOSTIC RESULTS

Check the self-diagnostic results.

Self-diagnostic results
STOP LAMP SW

Is above displayed on self-diagnosis display?

YES >> GO TO 2.
NO >> INSPECTION END

2. CHECK CONNECTOR

1. Disconnect control unit connector E45 and stop lamp switch connector E108, E109, M202 or M203.
2. Check terminals for deformation, disconnection, and looseness. If there is any non-standard condition, repair or replace it.
3. Reconnect connector securely, and perform self-diagnosis.

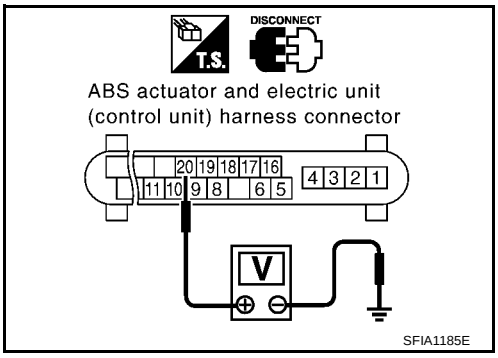
OK or NG

OK >> The connector terminal contact is loose, damaged, open or shorted.
NG >> GO TO 3.

3. CHECK STOP LAMP SWITCH CIRCUIT

1. Disconnect control unit connector E45.
2. Check voltage between control unit connector E45 terminal 20 (Y) and ground.

ABS actuator and electric unit (control unit)	Ground	Measuring condition	Voltage
20	—	Brake pedal depressed	Battery voltage (approx. 12 V)
		Brake pedal not depressed	0 V



OK or NG

OK >> INSPECTION END
NG >> Repair or replace harness connector between ABS actuator and electric unit (control unit) and stop lamp switch.

Symptom 1 ABS Works Frequently.

EFS002IH

1. START INSPECTION

Check brake force distribution.

OK or NG

OK >> GO TO 2.
NG >> Check brake system.

2. CHECK FRONT AND REAR AXLE

Check front and real axle for significant “looseness”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK WHEEL SENSOR

Wheel Sensor Inspection

- Sensor installation and damage inspection
- Sensor rotor installation and damage inspection
- Sensor connector engagement inspection
- Sensor harness inspection

OK or NG

OK >> GO TO 4.
NG >>
- Replace wheel sensor or sensor rotor.
- Repair harness.

4. CHECK INDICATOR DISPLAY OF WARNING LAMP

Make sure warning lamp is off approximately 1 second after ignition switch is turned ON or during driving.

OK or NG

OK >> Normal
NG >> Perform self-diagnosis. Refer to BRC-17, "SELF-DIAGNOSIS" .

Symptom 2 Unexpected Pedal Reaction

EFS002II

1. CHECK BRAKE PEDAL STROKE

Check brake pedal stroke.

Is brake pedal stroke not excessive?

YES >>
- Bleed air from brake piping.
- Check for looseness of brake pedal, master back, and master cylinder. Also check brake system for oil leak. Repair as necessary.

NO >> GO TO 2.

2. PERFORMANCE CHECK

Disconnect control unit connector E45 to deactivate ABS. In this condition, make sure braking force is normal after inspection, reconnect connector.

OK or NG

OK >> GO TO 3. Wheel Sensor Inspection in BRC-33, "Symptom 1 ABS Works Frequently." .
NG >> Check brake system.

Symptom 3 Longer Stopping Distance

EFS002IJ

CAUTION:
On slippery road, stopping distance could be longer when ABS is activated than when it is not.

1. CHECK FUNCTION

Disconnect control unit connector E45 to deactivate ABS. In this condition, check braking distance After inspection, reconnect connector.

OK or NG

OK >> ● Bleed air from brake piping.
● Check brake system.

NG >> GO TO 3. Wheel Sensor Inspection in BRC-33, "Symptom 1 ABS Works Frequently." .

Symptom 4 ABS Does Not Work

EFS002IK

CAUTION:
ABS does not operate when vehicle speed is 10 km/h (6 MPH) or lower.

1. CHECK INDICATOR DISPLAY OF WARNING LAMP

Make sure warning lamp is off approximately 1 second after ignition switch is turned ON or during driving.

OK or NG

OK >> GO TO 3. Wheel Sensor Inspection in BRC-33, "Symptom 1 ABS Works Frequently." .
NG >> Perform a self-diagnosis. Refer to BRC-17, "SELF-DIAGNOSIS" .

Symptom 5 Pedal Vibration and ABS Operation Noise

EFS002IL

CAUTION:
Under the following conditions, when brake pedal is lightly depressed (just place a foot on it), ABS is activated and vibration is felt. However, this is normal.

- **When shifting gears and operating clutch**
- **When driving on slippery road**
- **During cornering at high speed**
- **When passing over bumps or grooves [50 mm (1.97 in) or more]**
- **When pulling away just after starting engine [at approximately 10 km/h (6 MPH) or higher]**

1. SYMPTOM CHECK 1

Check brake system for pedal vibration or noise at engine start.

OK or NG

OK >> GO TO 2.
NG >> Perform self-diagnosis. Refer to BRC-17, "SELF-DIAGNOSIS" .

2. SYMPTOM CHECK 2

Operate electrical equipment (head lamp or equivalents), and confirm symptoms.

Does symptom occur when electrical switches (head lamp, etc.) are operated?

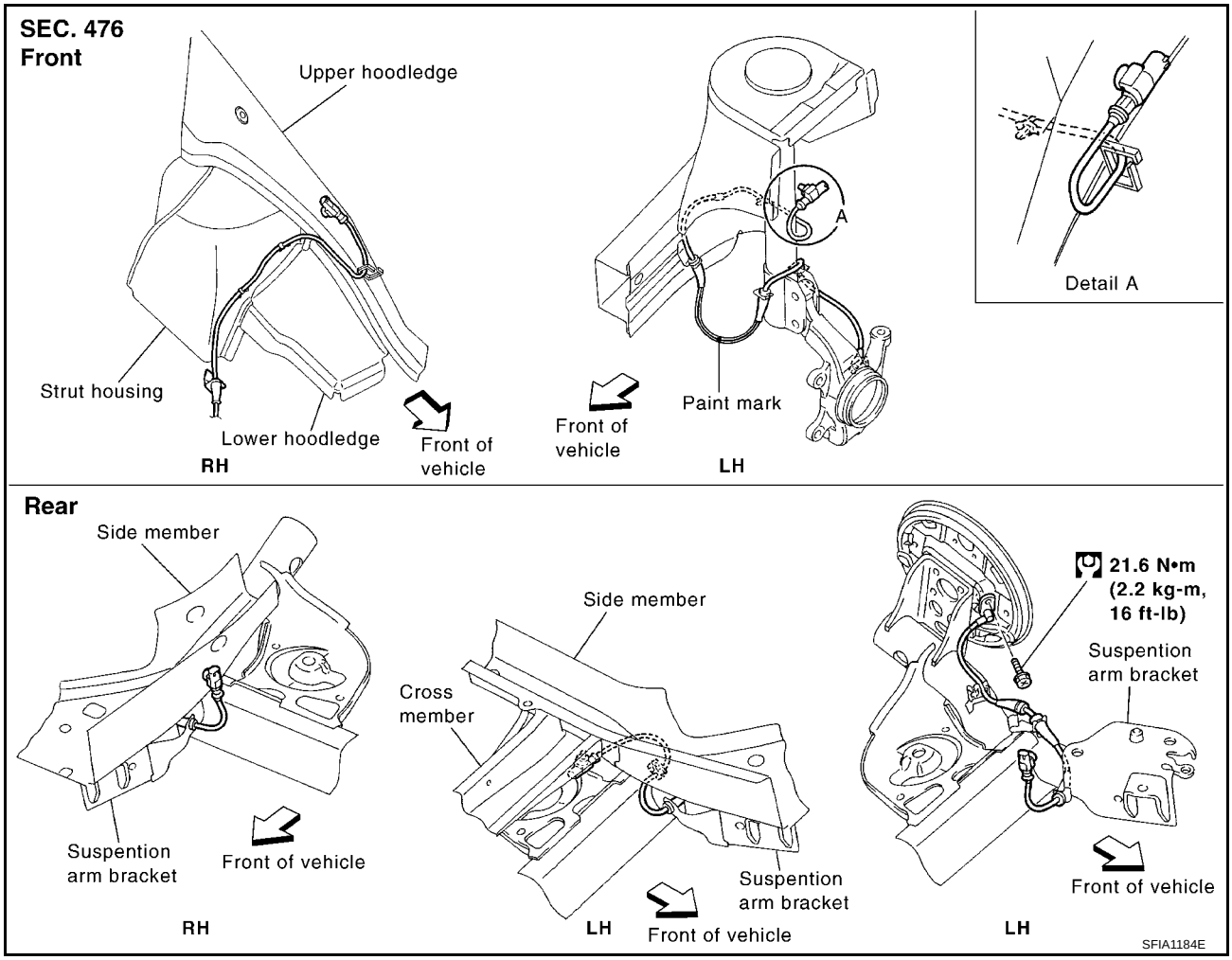
YES >> Check for radio, antenna, and antenna lead-in wires (including wiring) near the control unit. If they are near ABS actuator and electric unit (control unit), move them.
NO >> GO TO 3. Wheel Sensor Inspection in BRC-33, "Symptom 1 ABS Works Frequently." .

WHEEL SENSORS

PFP:47910

Removal and Installation

EFS002IM



REMOVAL

Be careful of the following.

CAUTION:

- **When removing the sensor, do not rotate it if possible, and not forcibly pull the sensor harness.**
- **Before removing front or rear wheel hub, remove wheel sensor to avoid sensor wiring damage.**

INSTALLATION

Be certain to tighten bolts to the specified torque. Be careful of the following:

- Check the inside of the sensor mounting hole for foreign material, the rotor surface for iron chips and other foreign material, and if anything is non-standard, clean it before installation, or replace it.
- When installing the front sensor, completely push in the strut bracket and body bracket rubber grommets until they lock so that the sensor harness does not become twisted. In addition, there should be no twists in the harness when installed. Install the harness so that the painted part faces the outside of the vehicle.
- When installing the rear sensor, completely push in the rubber bracket of the suspension arm bracket and lock the marking area of the side member harness mount so that the sensor harness will not be twisted. In addition, there should be no twists in the harness when installed.

SENSOR ROTOR

PFP:47970

Removal and Installation

EFS002IN

FRONT

- Because the sensor rotor is integrated with the wheel bearing, replace it together with the wheel bearing assembly. Refer to FAX-6, "FRONT WHEEL HUB AND KNUCKLE" .

REAR

- During removal and installation, remove the wheel hub (brake drum). Refer to RAX-5, "WHEEL HUB" .

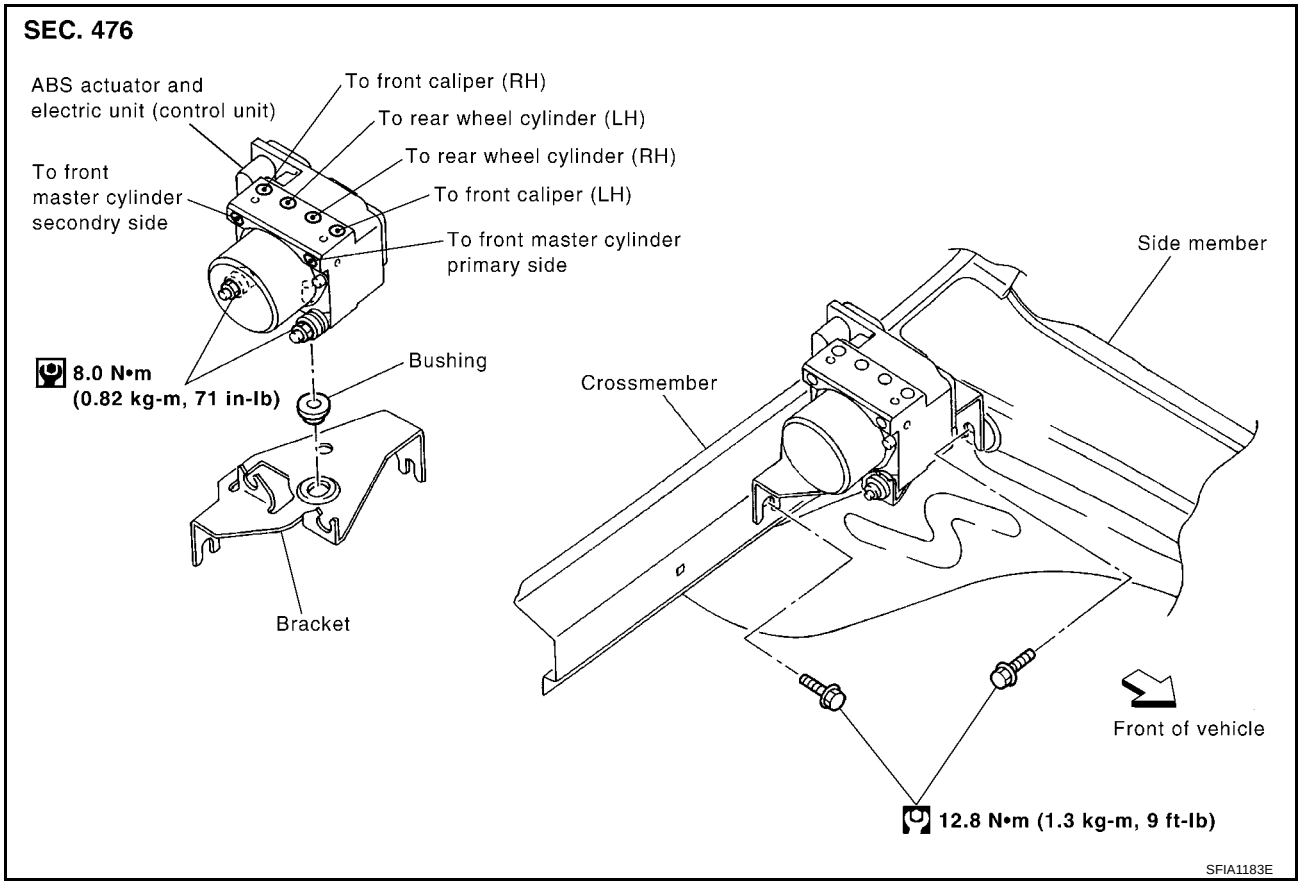
CAUTION:
The sensor rotor is a non-reusable part, it must be replaced by an new part when removing it.

ACTUATOR AND ELECTRIC UNIT (ASSEMBLY)

PFP:47660

Removal and Installation

EFS002IO



REMOVAL

Be careful of the following.

CAUTION:

- **Before servicing, disconnect the 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 flare nut torque wrench and tighten to the specified torque.**
- **Do not apply excessive impact to the actuator, such as dropping it.**

INSTALLATION

Be careful of the following.

- When setting the actuator in the bracket, push it in until it locks.
- Tighten the mounting bolts and nuts to the specified torque.
- After the work, breed the air from the brake piping. Refer to BR-10, "Bleeding Brake System" .
- After installing the vehicle harness connector in the actuator, make sure the connector is securely locked.