BRAKE CONTROL SYSTEM

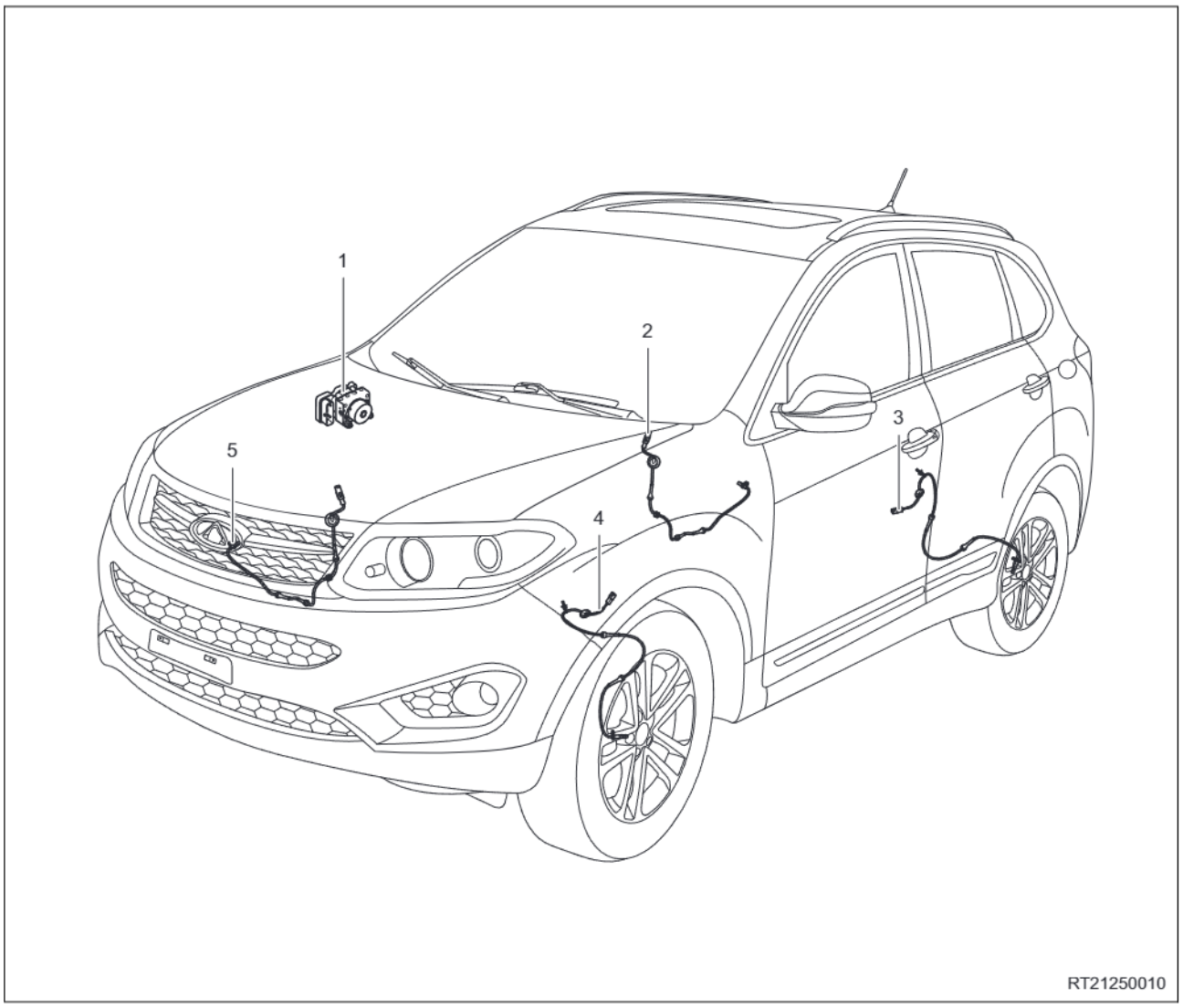
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GENERAL INFORMATION

Description



1 - ABS Control Module Assembly	2 - Rear Right Wheel Speed Sensor
3 - Rear Left Wheel Speed Sensor	4 - Front Left Wheel Speed Sensor
5 - Front Right Wheel Speed Sensor	

The brake control system equipped on this vehicle is ABS (Anti-lock Brake System) + EBD (Electronic Brake Force Distribution). It mainly consists of the following components:

- ABS control module assembly (hydraulic control module and electronic control module)
- Wheel speed sensors (each wheel has one sensor)

The primary purpose of ABS is to prevent wheels from being locked during sudden braking. It has the following effects:

1. Improve vehicle driving stability.
2. Improve vehicle steering ability.
3. Maintain optimal brake pressure.

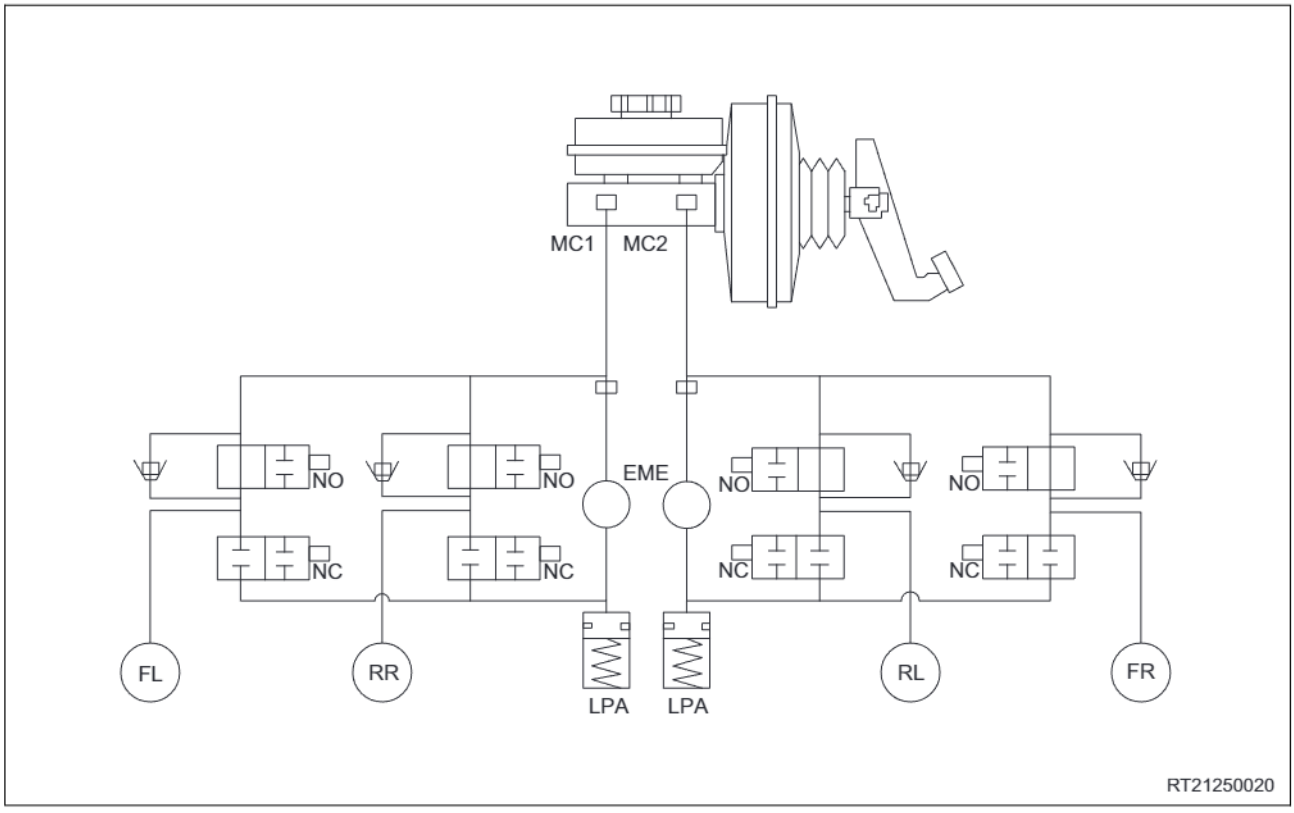
4. Shorten brake distance effectively.

Operation

ABS Braking

1. If ABS system detects that the wheels may be locked when applying brake, the brake system will enter ABS braking mode. During braking, ABS control module outputs signal from each wheel speed sensor to each solenoid valve after analysis in order to adjust the fluid pressure in each line, to prevent the wheels from being locked.
2. There are some operating symptoms of ABS that seem to be abnormal at first, but in fact they are normal. The symptoms are as follows:
   a. If the electronic control module is malfunctioning, fail-safe function will be activated, ABS system will not operate and ABS warning light will come on.
   b. After vehicle is power on or engine is started, short "buzz" sound can be heard, which is the ABS self-check sound, and this is normal.
   c. Noise caused by the corresponding solenoid valve movement when EBD is involved in braking can be heard, but this is normal.
   d. Brake pedal may vibrate slightly and mechanical noise can be heard during ABS operation, but this is normal.
   e. Braking distance may be longer than that of vehicles without ABS when braking on rough, sandy, or snow-covered roads.

ABS Control Mode

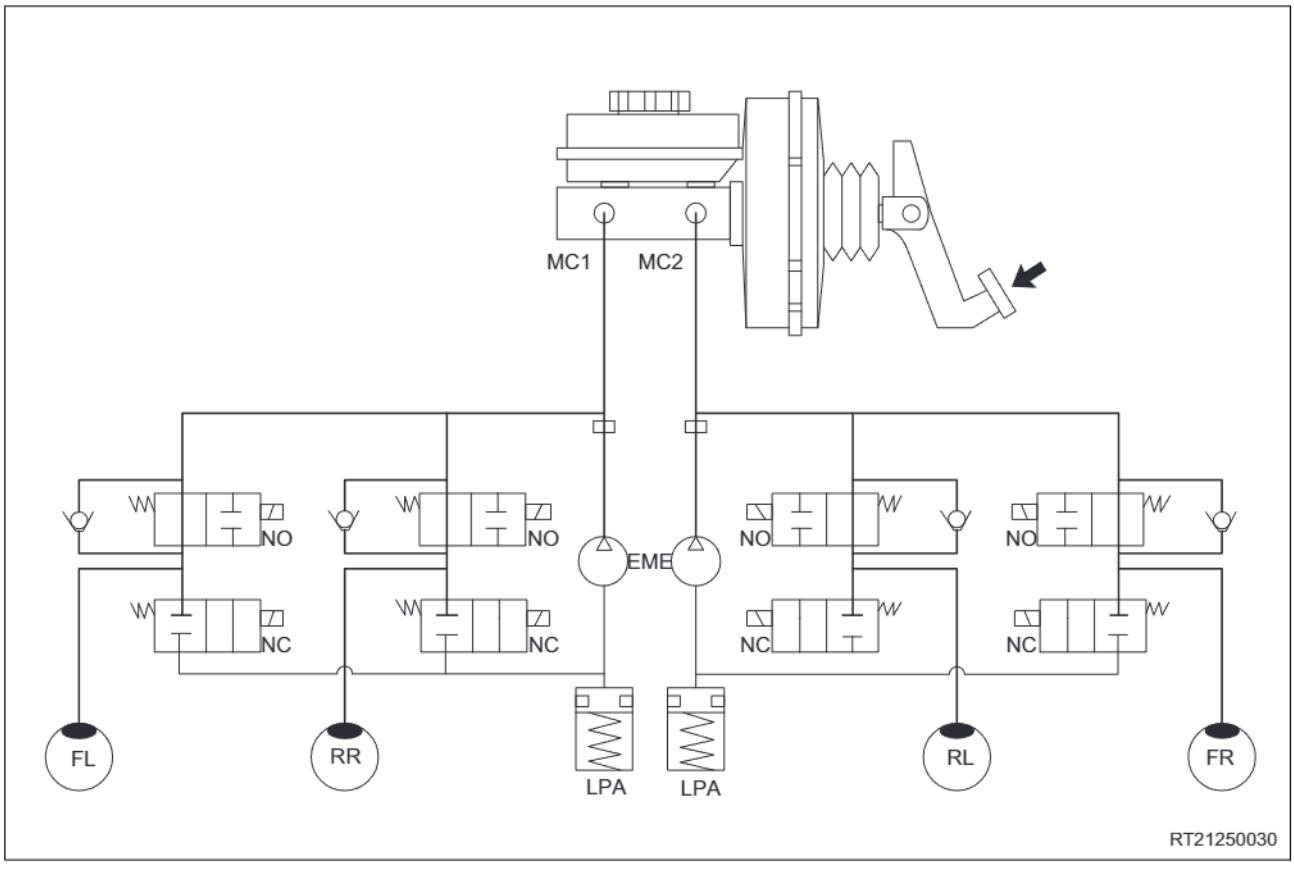


Description	Definition	Description	Definition
MC1	Brake Master Cylinder Circuit 1	LPA	Low Pressure Accumulator
MC2	Brake Master Cylinder Circuit 2	FL	Front Left Wheel
EME	Return Pump	RR	Rear Right Wheel
NO	Normal Open (Solenoid Valve)	RL	Rear Left Wheel
NC	Normal Close (Solenoid Valve)	FR	Front Right Wheel

1. General Brake Operating Condition

   For vehicles equipped with ABS, if brake pressure applied to wheels is not enough to lock the wheels, the oil pressure generated by master cylinder will be transmitted to the wheel cylinder through normal open valve, producing regular braking effect. When it is not necessary to continue braking, and if the driver reduces the pressure to brake pedal, the brake fluid of each wheel returns to master cylinder and the brake pressure decreases.

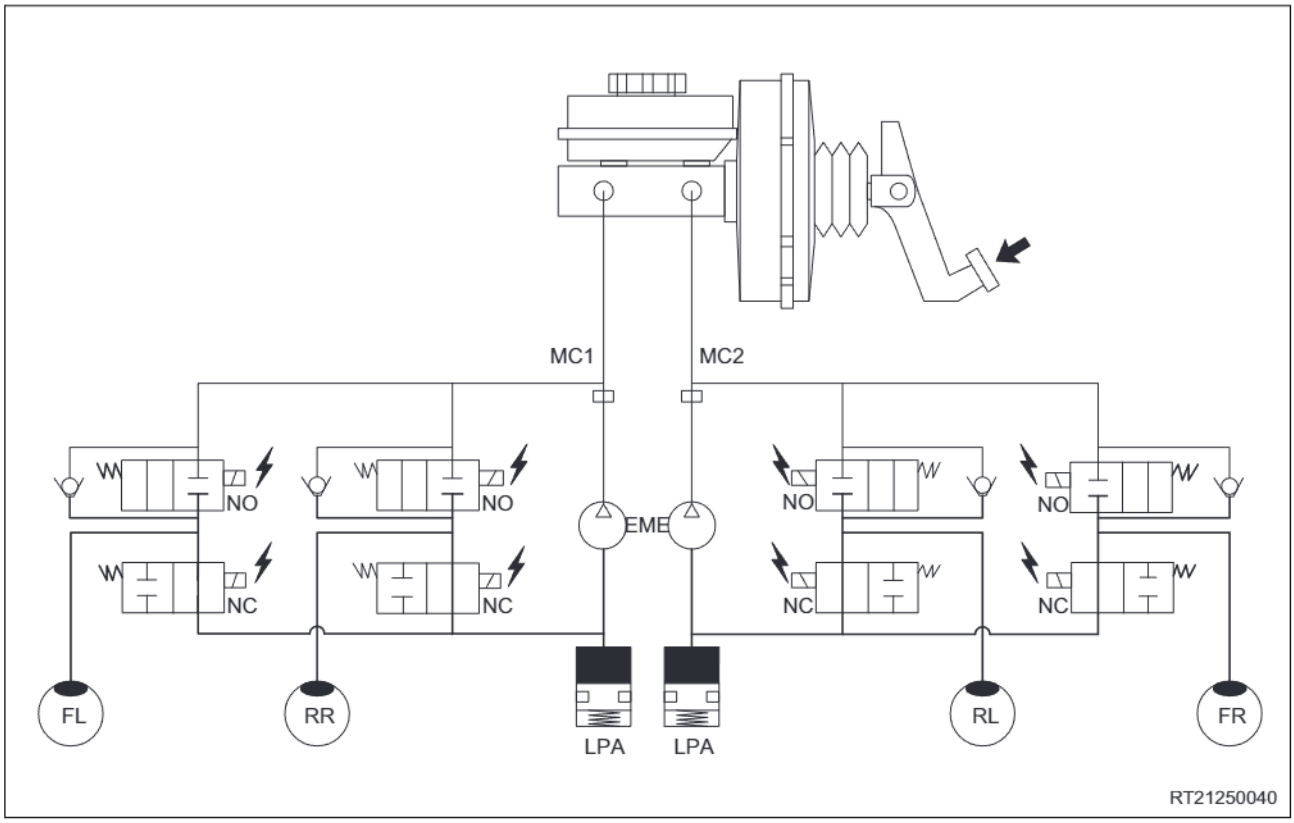
Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	OFF	OPEN
Normal Close Valve	OFF	CLOSE



2. ABS Operating (Relief) Condition

For vehicles equipped with ABS, if brake pressure is applied excessively, the friction coefficient between wheels and road will decrease, and the wheels will be decelerated earlier than vehicle, which could cause the wheels to lock first. In this case, the ABS control module transmits command that reduces the wheel pressure to hydraulic control module. In other words, the normal open valve cuts off oil passage and the oil passage of normal close valve is open, in order to reduce the wheel cylinder pressure. At this time, the brake fluid drained from wheel cylinder is temporarily stored in the low pressure accumulator. Then, the brake fluid stored in low pressure accumulator returns to the master cylinder with the rotation of motor.

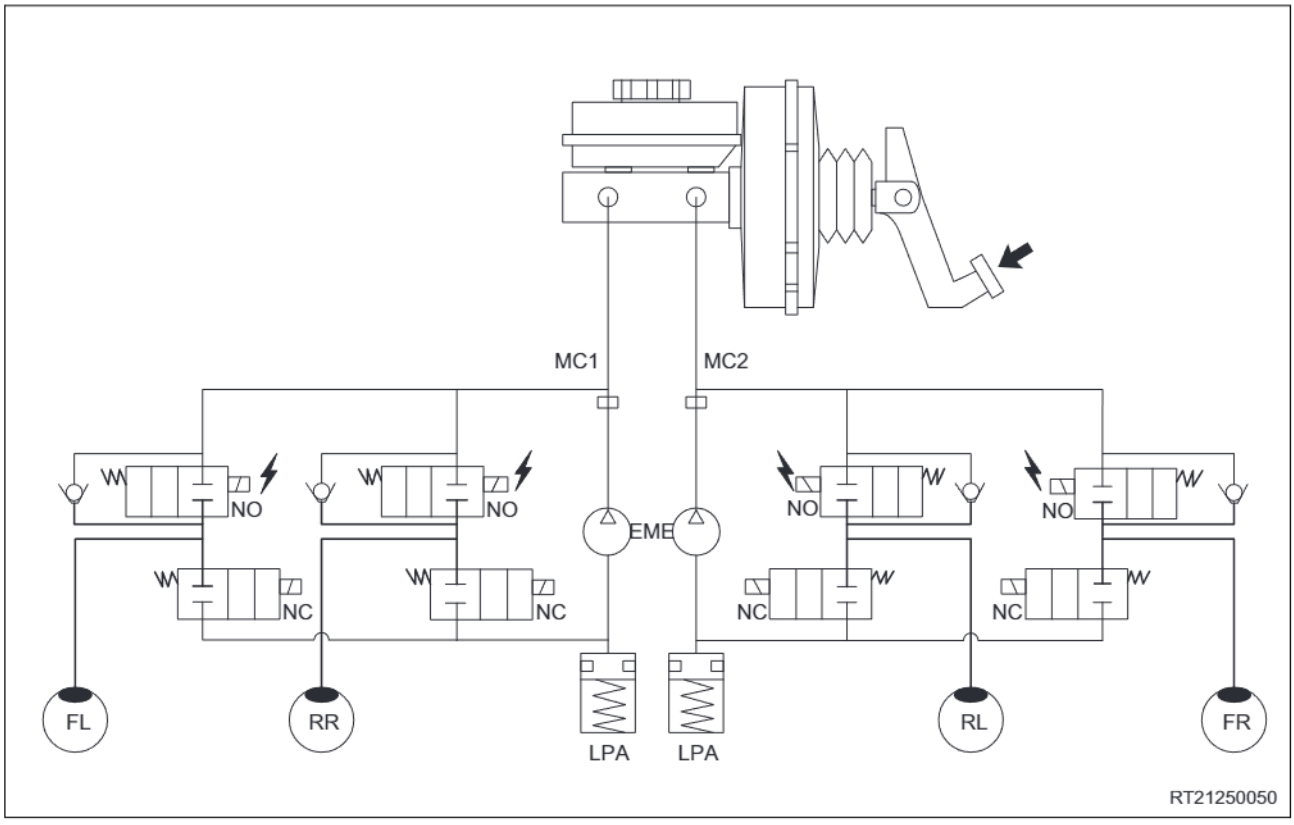
Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	ON	CLOSE
Normal Close Valve	ON	OPEN



3. ABS Operating (Maintaining) Condition

When appropriate pressure is applied to the wheel cylinder, ABS system enters maintaining pressure state. In other words, the normal open valve cuts off oil passage and the normal close valve also cuts off the oil passage, the wheel cylinder pressure is maintained.

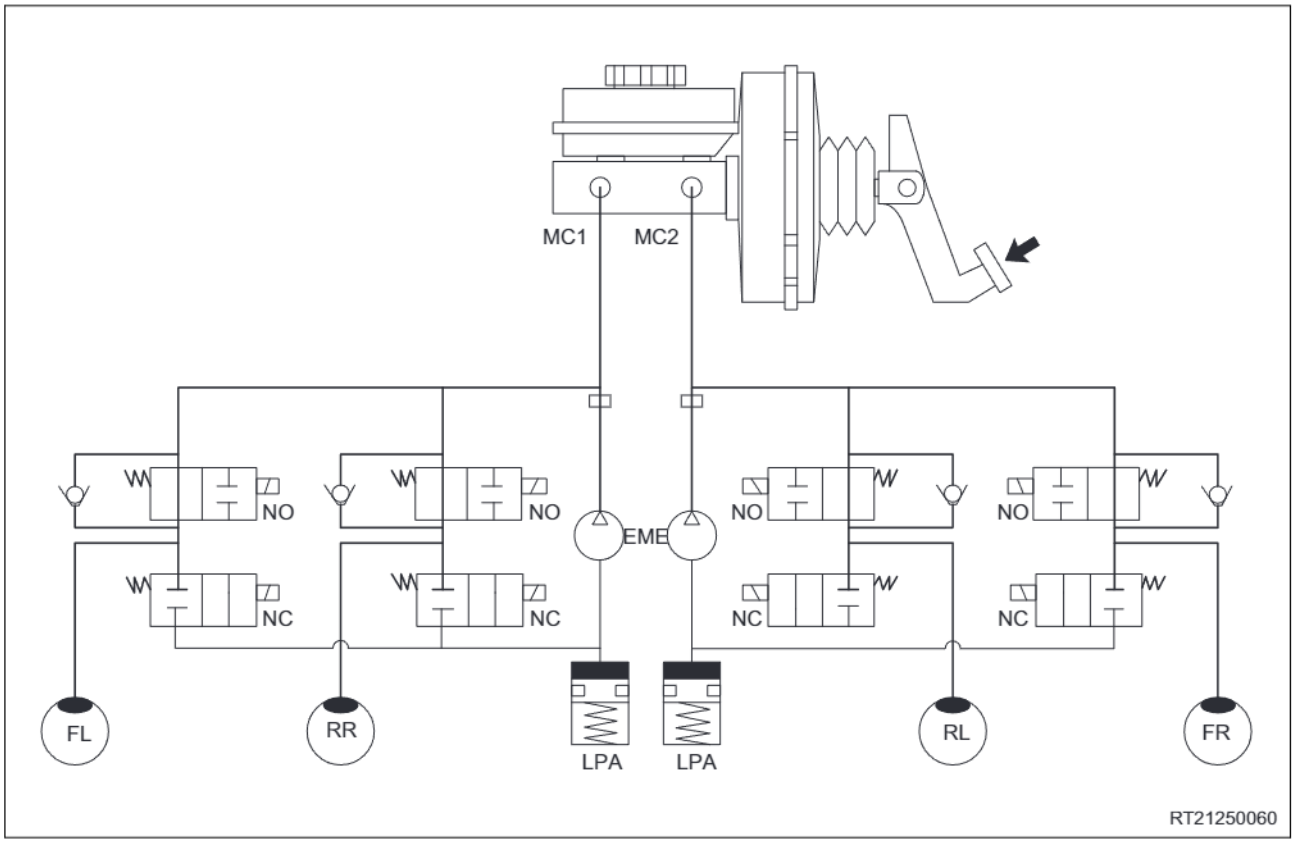
Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	ON	CLOSE
Normal Close Valve	OFF	CLOSE



4. ABS Operating (Boost) Condition

When ABS operates under relief pressure condition, if brake fluid is drained excessively or friction coefficient between wheel and road surface increases, it needs to increase each wheel pressure. In this case, the ABS control module transmits command that increases wheel pressure to the hydraulic control module. In other words, the normal open valve opens oil passage and the normal close valve cuts off oil passage, in order to increase the wheel cylinder pressure. Brake fluid stored in the low pressure accumulator is supplied to each wheel cylinder through the master cylinder and normal open valve.

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	OFF	OPEN
Normal Close Valve	OFF	CLOSE



ABS system operates circularly under relief, maintaining and boost pressure conditions until vehicle is completely stopped, so the vehicle braking and steering performance will be guaranteed.

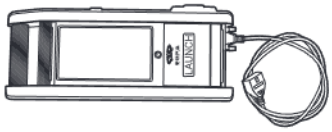
Specifications

Torque Specifications

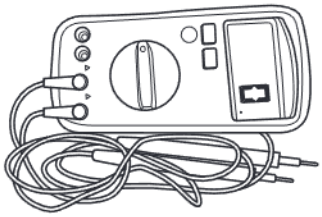
Description	Torque (N·m)
Wheel Mounting Bolt	110 ± 10
Brake Pipe Coupling Plug	16 ± 2
ABS Control Module Assembly Mounting Bracket Fixing Bolt	23 ± 2
ABS Control Module Assembly Mounting Bracket Fixing Nut	23 ± 2
ABS Control Module Assembly Bottom Mounting Nut	8 ± 2
Front Wheel Speed Sensor Fixing Bolt	10 ± 1
Rear Wheel Speed Sensor Fixing Bolt	10 ± 1

Tools

Special Tool

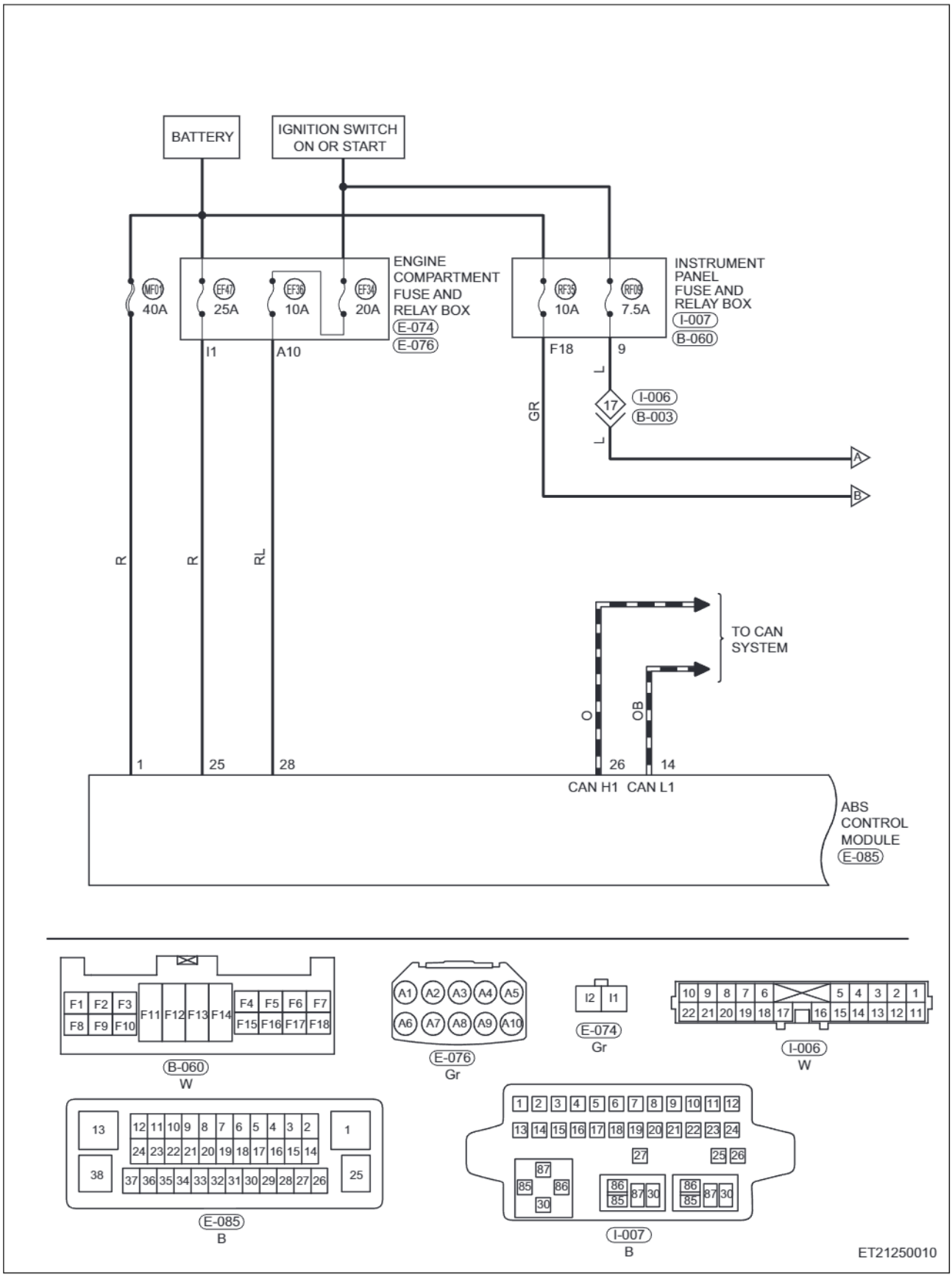
X-431 3G Diagnostic Tester	 RCH0000001

General Tool

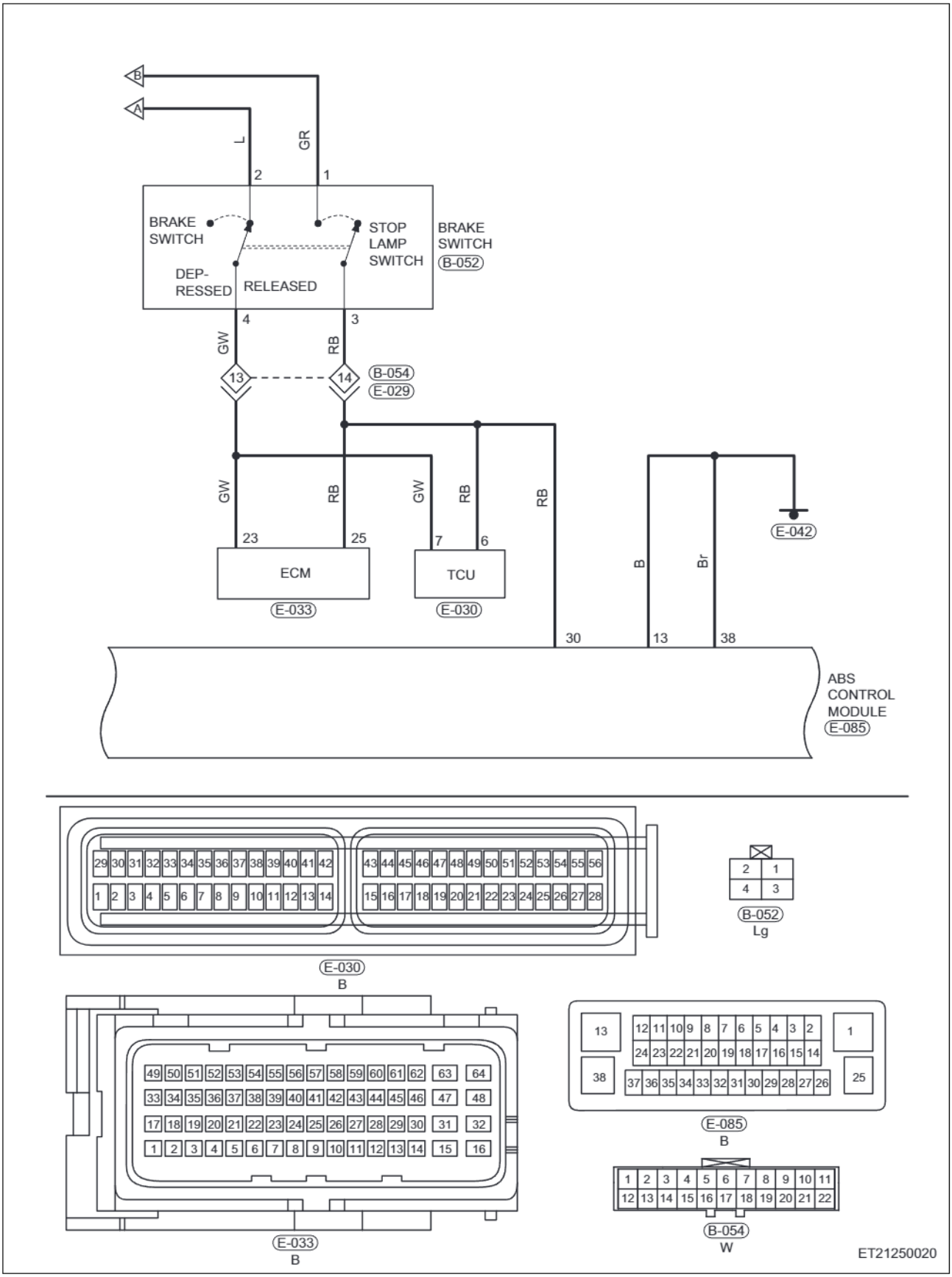
Digital Multimeter	 RCH0000002

Circuit Diagram

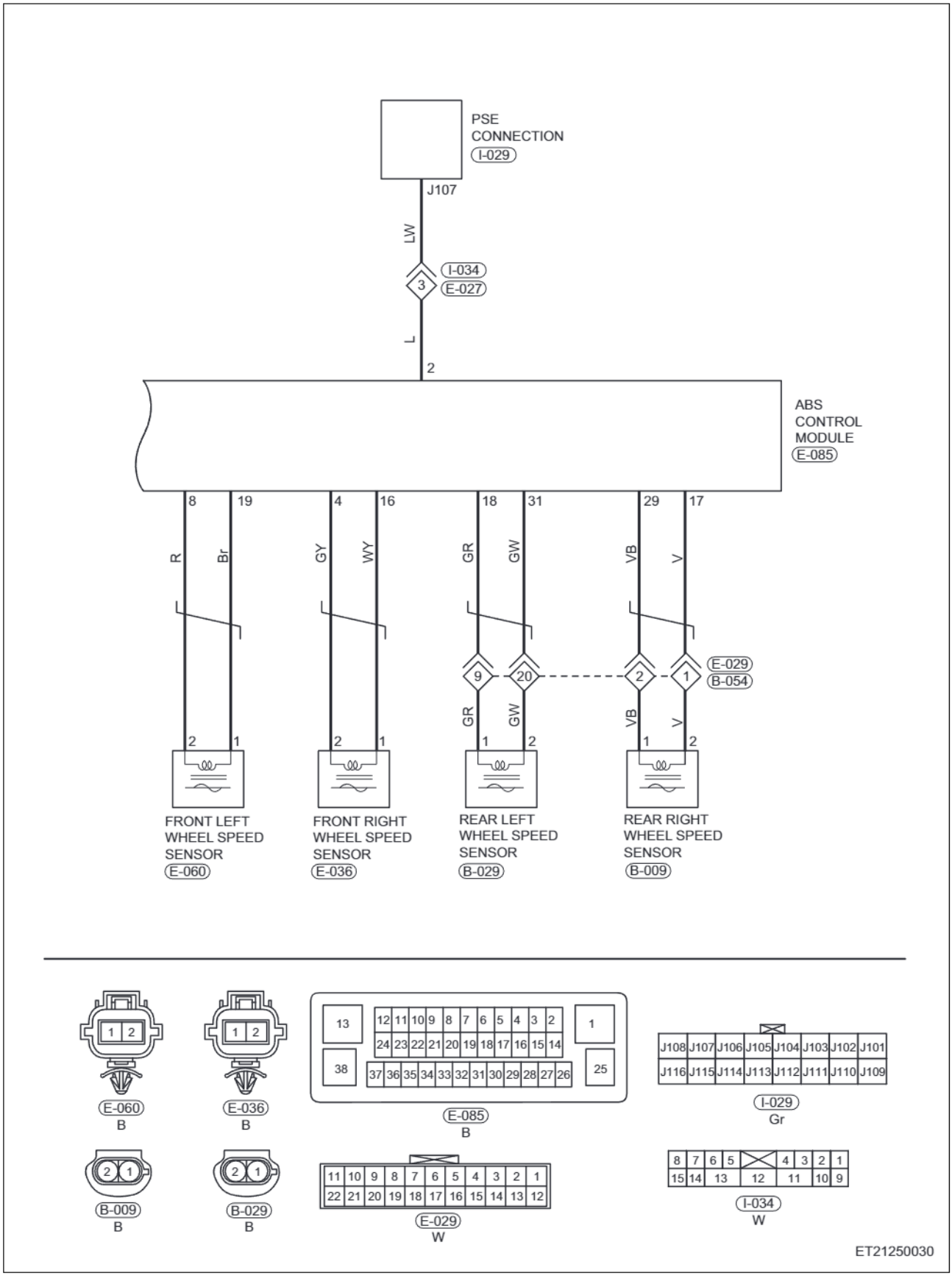
Brake Control System (Page 1 of 3)



Brake Control System (Page 2 of 3)



Brake Control System (Page 3 of 3)



DIAGNOSIS & TESTING

Problem Symptoms Table

HINT:
Use the table below to help determine the cause of problem symptoms. Check each suspected area in sequence. Repair or replace the faulty components, or adjust as necessary.

Symptom	Suspected Area	See page
When turning ignition switch ON, ABS warning light does not come on	ABS fuse	51-34
	Wire harness or connector	-
	ABS control module assembly	25-71
	Instrument cluster	38-42
ABS warning light remains on	ABS fuse	51-34
	Wire harness or connector	-
	ABS control module assembly	25-71
	Instrument cluster	38-42
ABS operation is abnormal	Wheel speed sensor (damaged, improper installed, foreign matter attached)	25-74, 25-76
	Hub ring gear (damaged, improper installed, foreign matter attached)	-
	Brake line (blocked or leaked)	-
	Wire harness or connector	-
	ABS control module assembly	25-71
Communication with diagnostic tester cannot be performed	ABS fuse	51-34
	Wire harness or connector	-
	X-431 3G diagnostic tester	-
	ABS control module assembly	25-71

Diagnosis Procedure

HINT:
Use the following procedures to troubleshoot the Anti-lock Brake System (ABS).

1	**Vehicle brought to workshop**

NEXT

2	**Check battery voltage**

Standard voltage: 11 to 14 V

If voltage is below 11 V, recharge or replace the battery before proceeding to next step.

NEXT

3	Customer problem analysis

NEXT

4	Check and clear DTCs

NEXT

5	Confirm and duplicate malfunction: accelerate vehicle to 15 km/h or more, simulate malfunction conditions and read DTCs again

DTC occurs → For current DTC, go to step 7

No DTC → For history DTC, go to step 8

6	Problem repair (no DTC), then go to step 9

NEXT

7	Troubleshoot according to Diagnostic Trouble Code (DTC) chart, then go to step 9

NEXT

8	Troubleshoot according to Problem Symptoms Table, then go to step 9

NEXT

9	Conduct test and confirm malfunction has repaired

NEXT

10	End

Problem Repair (No DTC)

If there is a problem in brake system, but no DTC is stored in ABS control module assembly, this problem is called a problem without DTC. A problem without DTC is caused by basic brake system malfunction. For example:

1. Brake fluid leakage (it may result in weak braking, brake pedal overtravel, or even ineffective braking).
2. Using inferior brake fluid (it can result in corrosion of brake line and ABS hydraulic regulating module internal elements, or even ineffective braking).
3. Air in brake line (it may result in weak braking, or even ineffective braking).
4. Brake line blockage (it may result in hard braking, or even ineffective braking).
5. Excessive wear of brake disc (it may result in weak braking, brake pedal overtravel).
6. Brake booster malfunction (it may result in weak or hard braking, brake pedal overtravel, or even ineffective braking).
7. Wrong brake line connection (it may result in braking performance decreasing, drift, long braking distance etc.).

HINT:

- ABS interrupted due to no power supply or power supply abnormality will cause the ABS warning light remains on without storing DTC.
- Troubleshooting method: check corresponding component according to the malfunction, repair or replace as necessary.

DTC Confirmation Procedure

Confirm that battery voltage is normal before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch ON.
- Using X-431 3G diagnostic tester to record and clear the DTCs stored in the ABS control module assembly.
- Turn ignition switch to LOCK and wait for a few seconds.
- Start engine, drive the vehicle at 20 km/h or more and perform road test with X-431 3G diagnostic tester connected to Data Link Connector (DLC).
- Using X-431 3G diagnostic tester to select "Read Code".
- If DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent. Please refer to Intermittent DTC Troubleshooting.

Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connectors are loose.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Wiggle related wire harnesses and connectors and observe if signal is interrupted in related circuit.
- If possible, try to duplicate the conditions under which the DTC was set.
- Look for the data that has changed or the DTC to be reset during the wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect the mounting areas of wheel speed sensor for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and grounding parts related to the current DTC.
- Remove the ABS control module assembly from the malfunctioning vehicle and install it to a new vehicle and perform a test. If DTC cannot be cleared, the ABS control module is malfunctioning. If DTC can be cleared, reinstall the ABS control module assembly to original vehicle.
- If multiple trouble codes were set, refer to the circuit diagrams to look for any common ground circuit or power supply circuit applied to the DTC.
- Refer to Technical Bulletin that is applied to the malfunction.

Ground Inspection

Groundings are very important to the proper operation of circuits. Groundings are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit works.

Circuits are very sensitive to proper grounding. A loose or corroded ground can affect the control circuit.

The operations to check the ground points are as follows:

1. Remove the ground bolt or nut.
2. Check all contact surfaces for tarnish, dirt, rust, etc.
3. Clean as necessary to ensure that contacting is in a good condition.
4. Reinstall the ground bolt or nut securely.
5. Check if add-on accessories interfere with the ground circuit.
6. If several wire harnesses are crimped into one ground terminal, check if they are installed correctly. Make sure all wire harnesses are clean, securely fastened and providing a good ground path.

ABS Control Module Assembly Terminal List

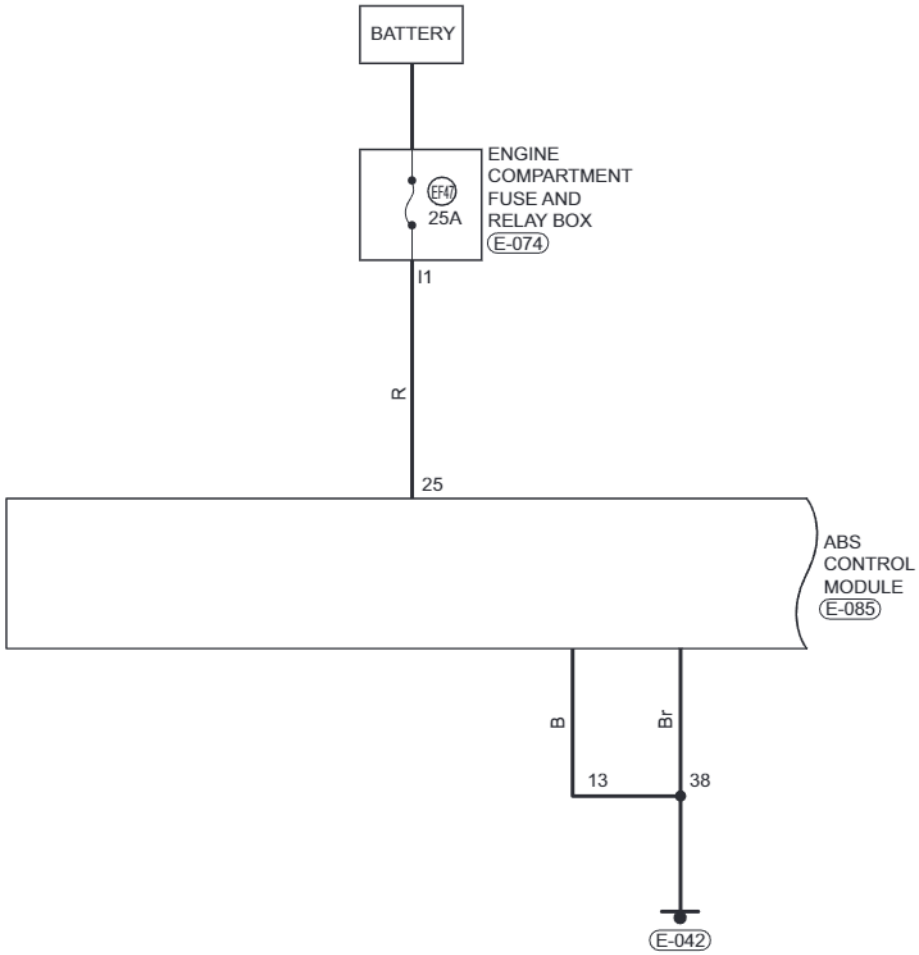
Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
1	Battery Power Supply (Pump Motor)	20	-
2	Wheel Speed Sensor Signal Output	21	-
3	-	22	-
4	Front Right Wheel Speed Sensor Signal	23	-
5	-	24	-
6	-	25	Battery Power Supply (Valve Relay)
7	-	26	CAN H
8	Front Left Wheel Speed Sensor Signal	27	-
9	-	28	Power Supply (Ignition Switch)
10	-	29	Rear Right Wheel Speed Sensor Signal
11	-	30	Brake Light Switch Signal
12	-	31	Rear Left Wheel Speed Sensor Power Supply
13	Ground	32	-
14	CAN L	33	-
15	-	34	-
16	Front Right Wheel Speed Sensor Power Supply	35	-
17	Rear Right Wheel Speed Sensor Power Supply	36	-
18	Rear Left Wheel Speed Sensor Signal	37	-
19	Front Left Wheel Speed Sensor Power Supply	38	Ground

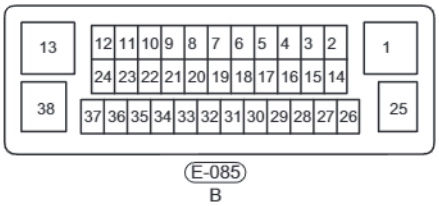
Diagnostic Trouble Code (DTC) Chart

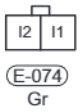
DTC Code	DTC Definition
C0010-04	Left Front Inlet Control
C0011-04	Left Front Outlet Control
C0014-04	Right Front Inlet Control
C0015-04	Right Front Outlet Control
C0018-04	Left Rear Inlet Control
C0019-04	Left Rear Outlet Control
C001C-04	Right Rear Inlet Control
C001D-04	Right Rear Outlet Control
C1003-04	Valve Relay
C1004-00	General Valve
C0020-04	ABS Pump Motor Control
C0031-00	Left Front Wheel Speed Sensor
C0031-09	Left Front Wheel Speed Sensor
C0031-11	Left Front Wheel Speed Sensor
C0031-12	Left Front Wheel Speed Sensor
C0031-13	Left Front Wheel Speed Sensor
C0031-29	Left Front Wheel Speed Sensor
C0034-00	Right Front Wheel Speed Sensor
C0034-09	Right Front Wheel Speed Sensor
C0034-11	Right Front Wheel Speed Sensor
C0034-12	Right Front Wheel Speed Sensor
C0034-13	Right Front Wheel Speed Sensor
C0034-29	Right Front Wheel Speed Sensor
C0037-00	Left Rear Wheel Speed Sensor
C0037-09	Left Rear Wheel Speed Sensor
C0037-11	Left Rear Wheel Speed Sensor
C0037-12	Left Rear Wheel Speed Sensor
C0037-13	Left Rear Wheel Speed Sensor
C0037-29	Left Rear Wheel Speed Sensor
C003A-00	Right Rear Wheel Speed Sensor
C003A-09	Right Rear Wheel Speed Sensor
C003A-11	Right Rear Wheel Speed Sensor
C003A-12	Right Rear Wheel Speed Sensor
C003A-13	Right Rear Wheel Speed Sensor
C003A-29	Right Rear Wheel Speed Sensor
C006B-00	Stability System Active Too Long

DTC Code	DTC Definition
C1000-16	ECU Voltage Supply
C1000-17	ECU Voltage Supply
C1001-04	ECU
C1009-00	ECU Hardware Related

DTC	C0010-04	Left Front Inlet Control
DTC	C0011-04	Left Front Outlet Control
DTC	C0014-04	Right Front Inlet Control
DTC	C0015-04	Right Front Outlet Control
DTC	C0018-04	Left Rear Inlet Control
DTC	C0019-04	Left Rear Outlet Control
DTC	C001C-04	Right Rear Inlet Control
DTC	C001D-04	Right Rear Outlet Control
DTC	C1003-04	Valve Relay
DTC	C1004-00	General Valve


BATTERY
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-074
EF47
25A
I1
R
25
ABS CONTROL MODULE
E-085
B
Br
13
38
E-042


13
12 11 10 9 8 7 6 5 4 3 2
1
24 23 22 21 20 19 18 17 16 15 14
38
37 36 35 34 33 32 31 30 29 28 27 26
25
E-085
B


I2 I1
E-074
Gr

ET21250040

Self-diagnosis Detection Logic

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
C0010-04	Left Front Inlet Control	These DTCs occur when any of the following conditions is met: 1. Valve power supply malfunction (power supply is short to ground or ground is open). 2. Solenoid valve temperature is too high (overheat protection). 3. Short in solenoid valves more than 5 (fuse). 4. Activate the corresponsive solenoid valve, but no feedback. 5. Solenoid valve itself is malfunctioning. 6. Valve set relay is malfunctioning.	• Valve relay power supply is abnormal. • ABS control module assembly has poor ground connection. • Fuse is malfunctioning. • Solenoid valve is short to power supply and ground, or ground is open. • System overheat protection. • ABS control module assembly is damaged.
C0011-04	Left Front Outlet Control		
C0014-04	Right Front Inlet Control		
C0015-04	Right Front Outlet Control		
C0018-04	Left Rear Inlet Control		
C0019-04	Left Rear Outlet Control		
C001C-04	Right Rear Inlet Control		
C001D-04	Right Rear Outlet Control		
C1003-04	Valve Relay		
C1004-00	General Valve		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to the circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check for DTCs

a. Leave the vehicle for 5 minutes, clear and read the ABS control module assembly DTC again with X-431 3G diagnostic tester.

b. Refer to DTC Confirmation Procedure.

c. Check if the same DTC is output.

NO → **Problem indicated by DTC is intermittent (system overheat protection)**

YES

2	Check ABS fuse

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Remove the ABS fuse EF-47 (25 A) from the engine compartment fuse and relay box.
d. Check if the fuse is blown.

NG → **Replace ABS fuse**

OK →

3	Check wire harness and connector

Use the circuit diagram as a guide to perform the following procedures:

- Turn ignition switch to LOCK.
- Disconnect the negative battery cable.
- Disconnect the ABS control module assembly connector E-085 and engine compartment fuse and relay box connector E-074.
- Check if the wire harnesses are worn, pierced, pinched or partially broken.
- Look for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.

NG → **Repair or replace body wire harness and connector**

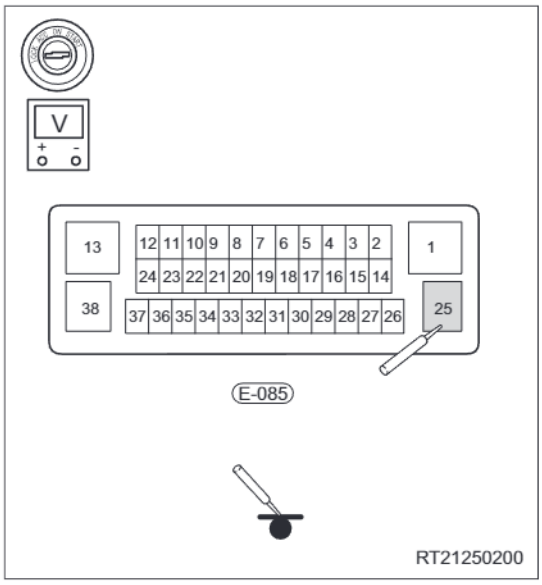
OK →

4	Check wire harness and connector (ABS control module assembly - battery)

a. Connect the negative battery cable.
b. Turn ignition switch to LOCK.
c. Disconnect the ABS control module assembly connector E-085.
d. Using a digital multimeter, measure the voltage between ABS control module assembly terminal 25 and body ground to check if the power supply circuit is normal according to the table below.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
E-085 (25) - Body ground	Always	9 to 16 V



NG → **Repair or replace engine compartment wire harness and connector**

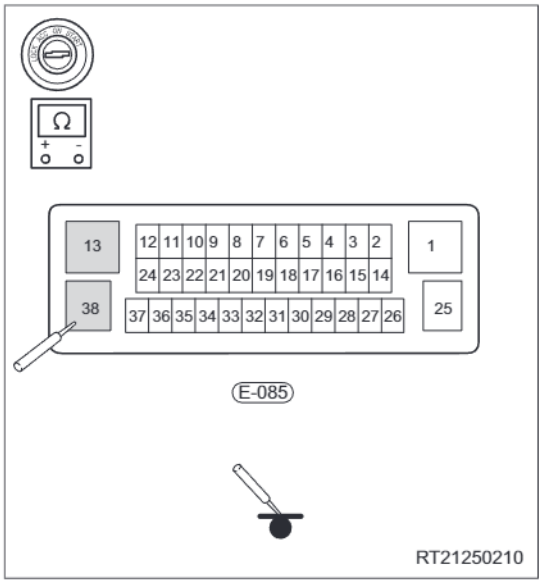
OK

5	Check wire harness and connector (ABS control module assembly - body ground)

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS control module assembly connector E-085.
d. Using a digital multimeter, check for continuity between ABS control module assembly terminal 13, 38 and body ground to check if the system ground circuit is normal according to the table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-085 (13) - Body ground	Always	Continuity
E-085 (38) - Body ground	Always	Continuity



NG → **Repair or replace engine compartment wire harness and connector**

OK

6	Reconfirm DTCs

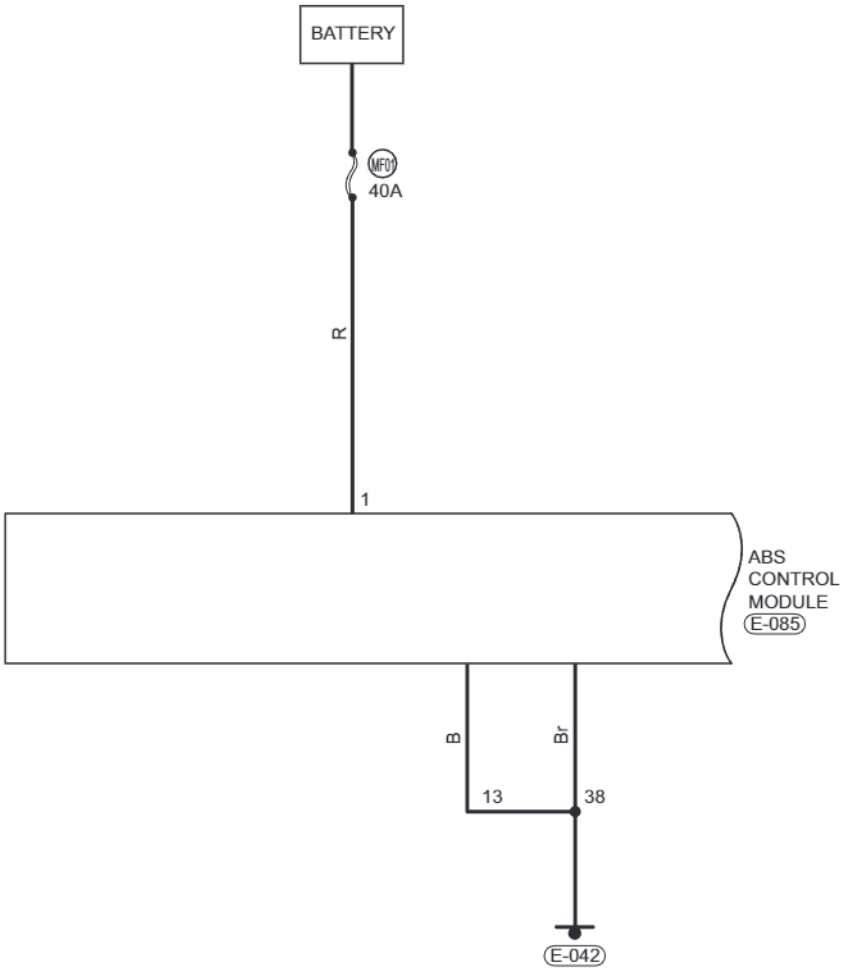
a. Use X-431 3G diagnostic tester to clear the DTC.
b. Start the engine.
c. Drive the vehicle at 15 km/h or more, read the ABS control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if the same DTC is output.

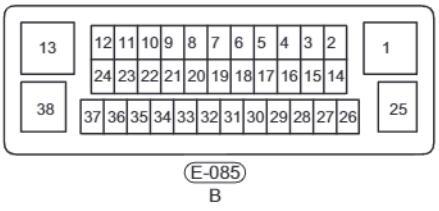
NO → **System operates normally**

YES

Replace ABS control module assembly

DTC	C0020-04	ABS Pump Motor Control





ET21250050

Self-diagnosis Detection Logic

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
C0020-04	ABS Pump Motor Control	These DTCs occur when any of the following conditions is met: 1. Pump motor operates with overload, and temperature is too high (over protection). 2. Return pump monitor still cannot detect the voltage signal after return pump motor relay operates for 60 ms. 3. Return pump monitor detects the voltage for more than 2.5 s when return pump motor relay does not operate. 4. Return pump monitor detects that the voltage does not drop when return pump motor relay stop operating.	• Fuse malfunction • Pump motor has poor ground connection • System overheat protection • Pump motor power supply is abnormal • Pump motor relay malfunction. • Pump motor malfunction

CAUTION

- When performing electrical equipment diagnosis and test, always refer to the circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check for DTCs

a. Leave the vehicle for 5 minutes, clear and read the ABS control module assembly DTC again with X-431 3G diagnostic tester.

b. Refer to DTC Confirmation Procedure.

c. Check if the same DTC is output.

NO → **Problem indicated by DTC is intermittent (system overheat protection)**

YES

2	Check ABS fuse

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Remove the ABS fuse MF-01 (40 A) from the engine compartment fuse and relay box.
d. Check if the fuse is blown.

NG → **Replace ABS fuse**

OK

3	Check wire harness and connector

Use the circuit diagram as a guide to perform the following procedures:

- Turn ignition switch to LOCK.
- Disconnect the negative battery cable.
- Disconnect the ABS control module assembly connector E-085.
- Check if the wire harnesses are worn, pierced, pinched or partially broken.
- Look for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.

NG → **Repair or replace engine compartment wire harness and connector**

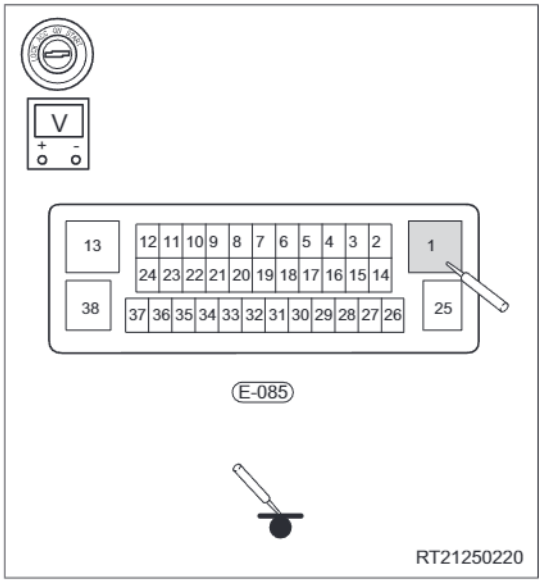
OK

4	Check wire harness and connector (ABS control module assembly - battery)

a. Connect the negative battery cable.
b. Turn ignition switch to LOCK.
c. Disconnect the ABS control module assembly connector E-085.
d. Using a digital multimeter, measure the voltage between ABS control module assembly terminal 1 and body ground to check if the power supply circuit is normal according to the table below.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
E-085 (1) - Body ground	Always	9 to 16 V



NG → **Repair or replace engine compartment wire harness and connector**

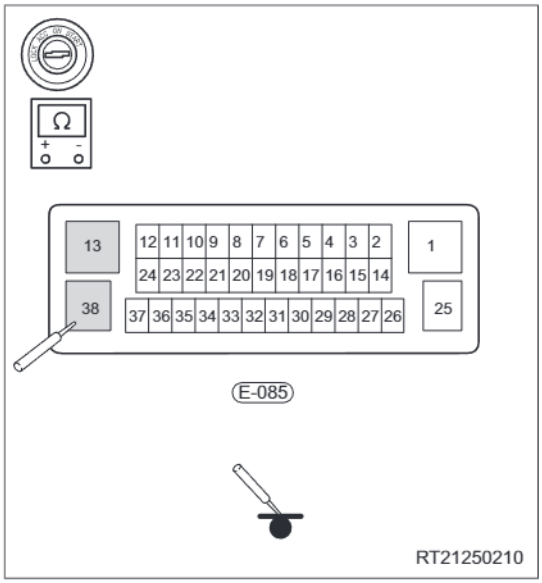
OK

5	Check wire harness and connector (ABS control module assembly - body ground)

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS control module assembly connector E-085.
d. Using a digital multimeter, check for continuity between ABS control module assembly terminal 13, 38 and body ground to check if the system ground circuit is normal according to the table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-085 (13) - Body ground	Always	Continuity
E-085 (38) - Body ground	Always	Continuity



NG → **Repair or replace engine compartment wire harness and connector**

OK

6	Reconfirm DTCs

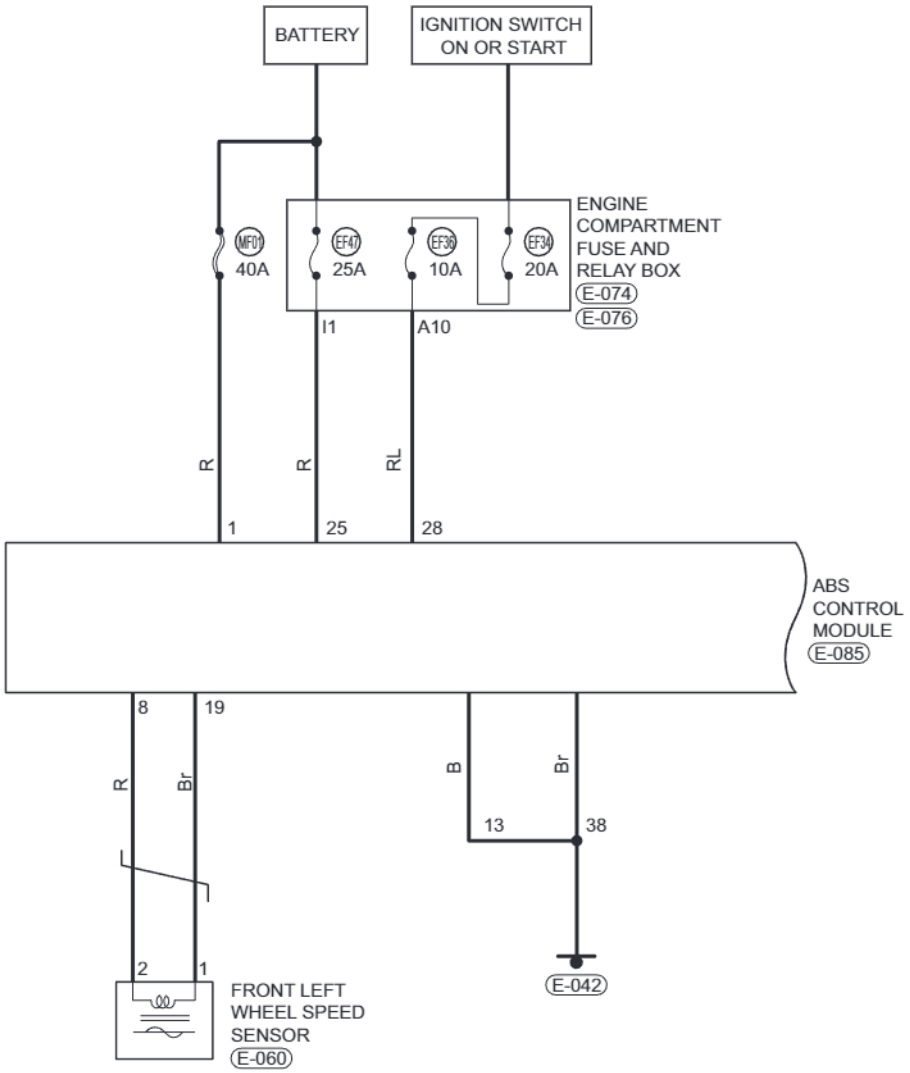
a. Use X-431 3G diagnostic tester to clear the DTC.
b. Start the engine.
c. Drive the vehicle at 15 km/h or more, read the ABS control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if the same DTC is output.

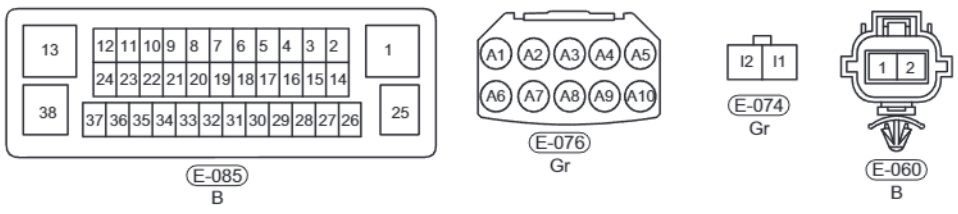
NO → **System operates normally**

YES

Replace ABS control module assembly

Code	C0031-00	Left Front Wheel Speed Sensor
Code	C0031-09	Left Front Wheel Speed Sensor
Code	C0031-11	Left Front Wheel Speed Sensor
Code	C0031-12	Left Front Wheel Speed Sensor
Code	C0031-13	Left Front Wheel Speed Sensor
Code	C0031-29	Left Front Wheel Speed Sensor


BATTERY
IGNITION SWITCH ON OR START
MF01 40A
EF47 25A
EF36 10A
EF34 20A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-074
E-076
I1
A10
R
R
RL
1
25
28
ABS CONTROL MODULE
E-085
8
19
R
Br
B
Br
13
38
2
1
FRONT LEFT WHEEL SPEED SENSOR
E-060
E-042


13
12 11 10 9 8 7 6 5 4 3 2
1
24 23 22 21 20 19 18 17 16 15 14
38
37 36 35 34 33 32 31 30 29 28 27 26
25
E-085
B
A1 A2 A3 A4 A5
A6 A7 A8 A9 A10
E-076
Gr
I2 I1
E-074
Gr
1 2
E-060
B

ET21250060

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
C0031-00	Left Front Wheel Speed Sensor	These DTCs occur when any of the following conditions is met: 1. ABS control module assembly detects that the wheel speed sensor signal wire is short to ground. 2. Wheel speed sensor line is open. 3. ABS control module assembly detects that the wheel speed sensor signal wire is short to power supply. 4. ABS control module assembly detects that the wheel speed sensor power supply wire is short to ground. 5. Wheel speed sensor signal is invalid.	• Wheel speed sensor signal wire is connecting with the power supply wire in reverse. • Wheel speed sensor signal wire is short to ground. • Wheel speed sensor line is open, connector is loose or broken. • Wheel speed sensor signal wire is short to power supply. • Wheel speed sensor power supply wire is short to ground. • Sensor head or plug pin is damaged. • Wheel speed sensor is interfered by magnetic field outside (wheel or axle is not demagnetized). • Wheel speed sensor body is malfunctioning. • Ring gear is not installed, has teeth missing, dirty, demagnetized or off center. • Clearance between sensor and ring gear is excessive. • Number of ring gear teeth is wrong. • Tire size is not as specified. • ABS control module assembly is damaged.
C0031-09	Left Front Wheel Speed Sensor		
C0031-11	Left Front Wheel Speed Sensor		
C0031-12	Left Front Wheel Speed Sensor		
C0031-13	Left Front Wheel Speed Sensor		
C0031-29	Left Front Wheel Speed Sensor		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to the circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check front left wheel speed sensor wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the front left wheel speed sensor connector E-060.
d. Check if the wire harnesses are worn, pierced, pinched or partially broken.
e. Look for broken, bent, protruded or corroded terminals.
f. Check if related connector pins are in good condition.

NG → **Repair or replace front left wheel speed sensor wire harness and connector**

OK

2	Check installation of front left wheel speed sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check front left wheel speed sensor mounting bolt for looseness.
d. Check if excessive clearance exists between the installation position of front left wheel speed sensor and front steering knuckle.
e. Check the installation position of front left wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace front left wheel speed sensor**

OK

3	Check front left wheel speed sensor

a. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
b. Drive the vehicle straight ahead, and read the data stream of front left wheel speed sensor with X-431 3G diagnostic tester.
c. Check if the data change of front left wheel speed sensor matches the change of other wheel speed sensors.

NG → **Replace front left wheel speed sensor**

OK

4	Check front left hub ring gear

a. Remove the front left hub assembly.
b. Check for foreign matter, missing teeth or damage on the front left hub ring gear.
c. Check if the front left hub assembly is securely installed.

NG → **Replace front left hub ring gear**

OK

5	Check wire harness and connector (front left wheel speed sensor - ABS control module assembly)

a. Turn ignition switch to LOCK.

b. Disconnect the negative battery cable.

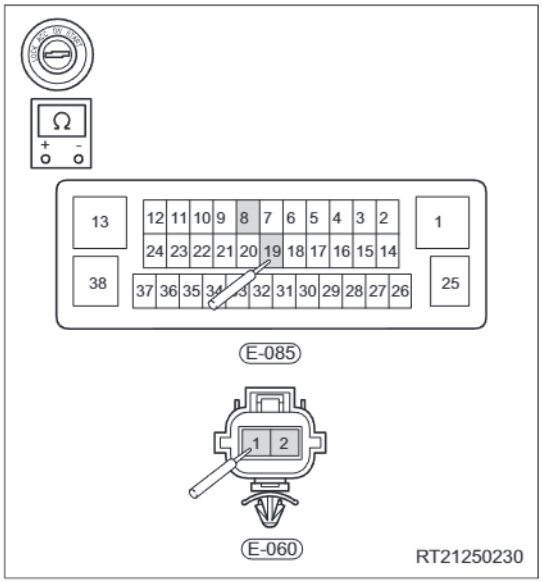
c. Disconnect the ABS control module assembly connector E-085.

d. Disconnect the front left wheel speed sensor connector E-060.

e. Using a digital multimeter, check for continuity between the terminals of connector E-085 and connector E-060 to check if there is an open in the wire harness and connector according to the table below..

Standard Condition

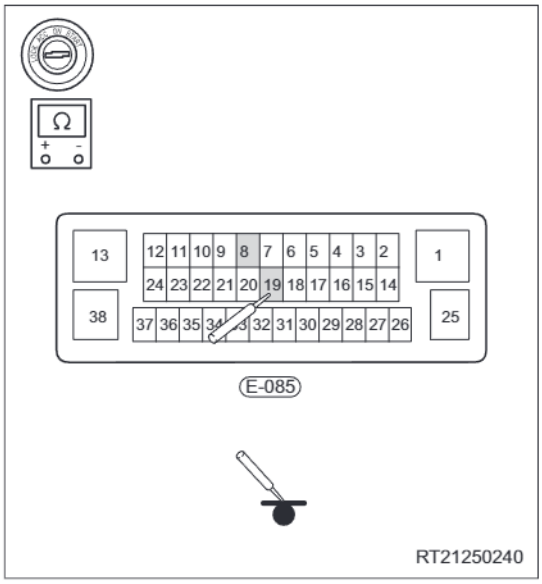
Multimeter Connection	Condition	Specified Condition
E-085 (8) - E-060 (2)	Always	Continuity
E-085 (19) - E-060 (1)	Always	Continuity
E-085 (8) - E-060 (1)	Always	No continuity
E-085 (19) - E-060 (2)	Always	No continuity
E-060 (1) - E-060 (2)	Always	No continuity
E-085 (8) - E-085 (19)	Always	No continuity



f. Using a digital multimeter, check for continuity between connector E-085 and body ground to check if the front left wheel speed sensor is short to ground according to the table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-085 (8) - Body ground	Always	No continuity
E-085 (19) - Body ground	Always	No continuity



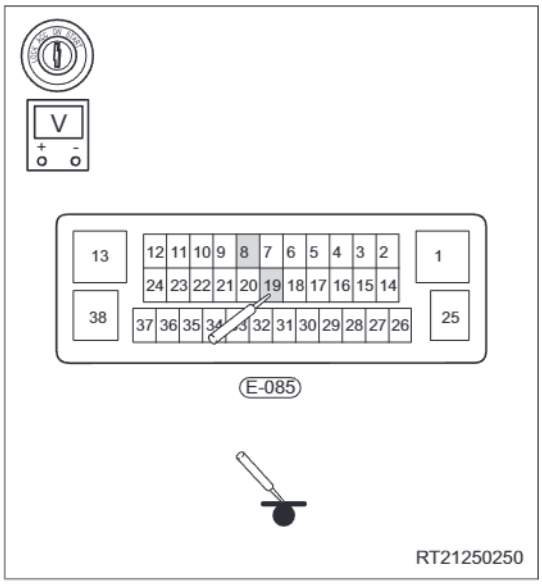
g. Connect the negative battery cable.

h. Turn ignition switch ON.

i. Using a digital multimeter, measure the voltage between connector E-085 and body ground to check if the front left wheel speed sensor is short to power supply according to the table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-085 (8) - Body ground	Ignition switch ON	Approximately 0 V
E-085 (19) - Body ground	Ignition switch ON	Approximately 0 V



NG → **Repair or replace wire harness and connector between front left wheel speed sensor and ABS control module assembly**

OK

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear the DTC.

b. Start the engine.

c. Drive the vehicle at 15 km/h or more, read the ABS control module assembly DTC again with X-431 3G diagnostic tester.

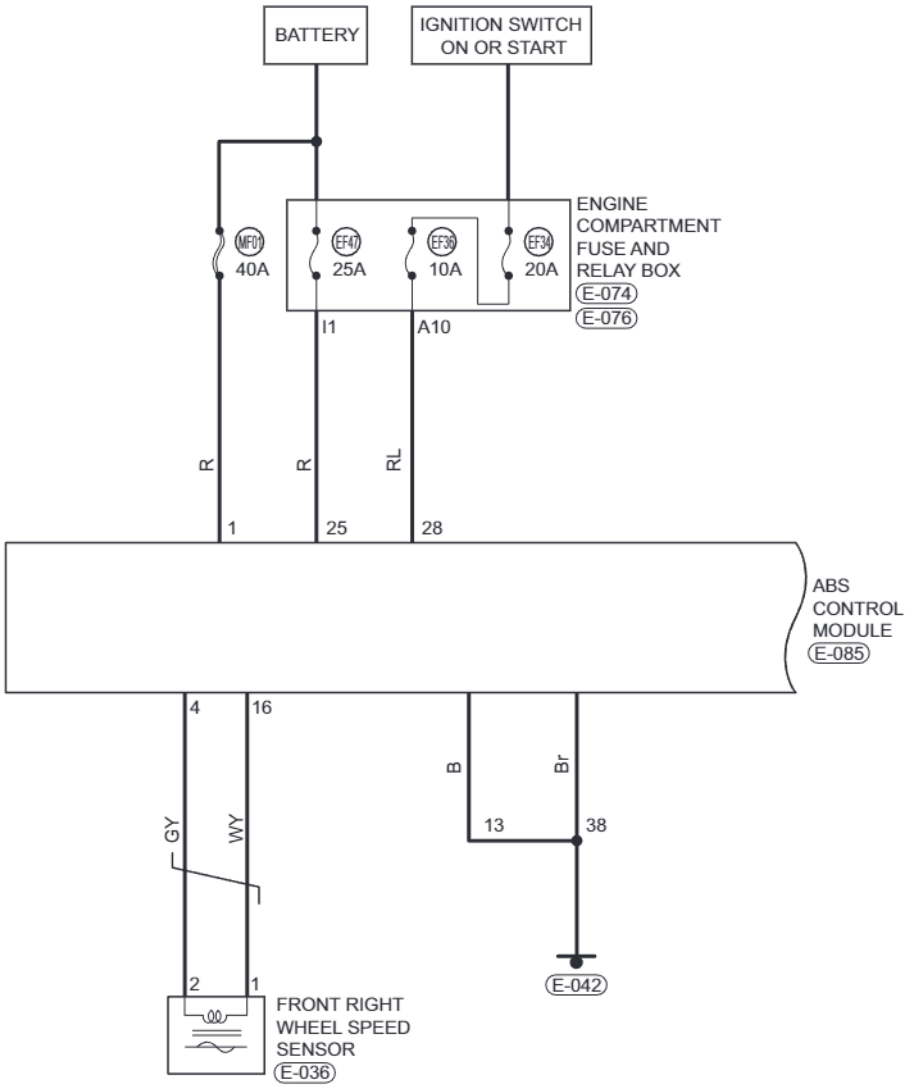
d. Check if the same DTC is output.

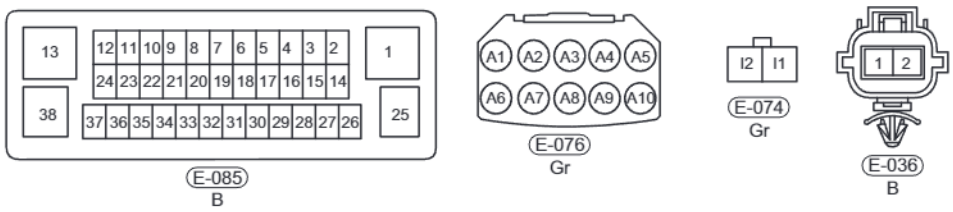
NO → **System operates normally**

YES

Replace ABS control module assembly

Code	C0034-00	Right Front Wheel Speed Sensor
Code	C0034-09	Right Front Wheel Speed Sensor
Code	C0034-11	Right Front Wheel Speed Sensor
Code	C0034-12	Right Front Wheel Speed Sensor
Code	C0034-13	Right Front Wheel Speed Sensor
Code	C0034-29	Right Front Wheel Speed Sensor





ET21250070

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DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
C0034-00	Right Front Wheel Speed Sensor	These DTCs occur when any of the following conditions is met: 1. ABS control module assembly detects that the wheel speed sensor signal wire is short to ground. 2. Wheel speed sensor line is open. 3. ABS control module assembly detects that the wheel speed sensor signal wire is short to power supply. 4. ABS control module assembly detects that the wheel speed sensor power supply wire is short to ground. 5. Wheel speed sensor signal is invalid.	• Wheel speed sensor signal wire is connecting with the power supply wire in reverse. • Wheel speed sensor signal wire is short to ground. • Wheel speed sensor line is open, connector is loose or broken. • Wheel speed sensor signal wire is short to power supply. • Wheel speed sensor power supply wire is short to ground. • Sensor head or plug pin is damaged. • Wheel speed sensor is interfered by magnetic field outside (wheel or axle is not demagnetized). • Wheel speed sensor body is malfunctioning. • Ring gear is not installed, has teeth missing, dirty, demagnetized or off center. • Clearance between sensor and ring gear is excessive. • Number of ring gear teeth is wrong. • Tire size is not as specified. • ABS control module assembly is damaged.
C0034-09	Right Front Wheel Speed Sensor		
C0034-11	Right Front Wheel Speed Sensor		
C0034-12	Right Front Wheel Speed Sensor		
C0034-13	Right Front Wheel Speed Sensor		
C0034-29	Right Front Wheel Speed Sensor		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to the circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check front right wheel speed sensor wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the front right wheel speed sensor connector E-036.
d. Check if the wire harnesses are worn, pierced, pinched or partially broken.
e. Look for broken, bent, protruded or corroded terminals.
f. Check if related connector pins are in good condition.

NG → **Repair or replace front right wheel speed sensor wire harness and connector**

OK

2	Check installation of front right wheel speed sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check front right wheel speed sensor mounting bolt for looseness.
d. Check if excessive clearance exists between the installation position of front right wheel speed sensor and front steering knuckle.
e. Check the installation position of front right wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace front right wheel speed sensor**

OK

3	Check front right wheel speed sensor

a. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
b. Drive the vehicle straight ahead, and read the data stream of front right wheel speed sensor with X-431 3G diagnostic tester.
c. Check if the data change of front right wheel speed sensor matches the change of other wheel speed sensors.

NG → **Replace front right wheel speed sensor**

OK

4	Check front right hub ring gear

a. Remove the front right hub assembly.
b. Check for foreign matter, missing teeth or damage on the front right hub ring gear.
c. Check if the front right hub assembly is securely installed.

NG → **Replace front right hub ring gear**

OK

5	Check wire harness and connector (front right wheel speed sensor - ABS control module assembly)

a. Turn ignition switch to LOCK.

b. Disconnect the negative battery cable.

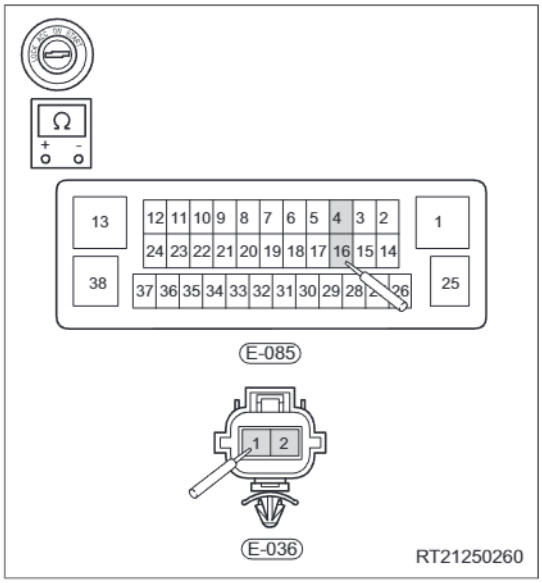
c. Disconnect the ABS control module assembly connector E-085.

d. Disconnect the front right wheel speed sensor connector E-036.

e. Using a digital multimeter, check for continuity between the terminals of connector E-085 and connector E-036 to check if there is an open in the wire harness and connector according to the table below.

Standard Condition

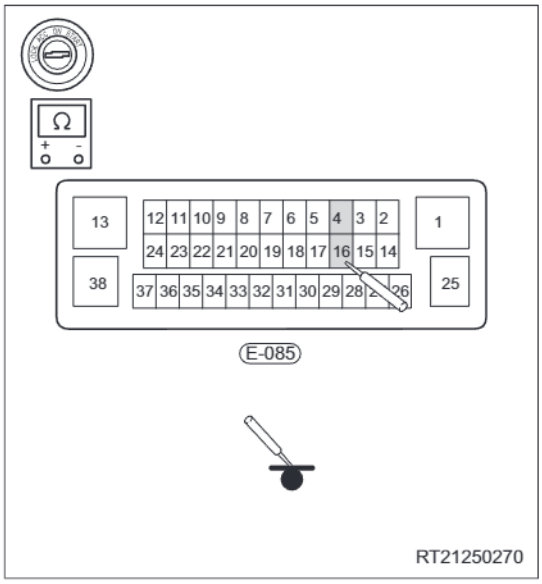
Multimeter Connection	Condition	Specified Condition
E-085 (16) - E-036 (1)	Always	Continuity
E-085 (4) - E-036 (2)	Always	Continuity
E-085 (16) - E-036 (2)	Always	No continuity
E-085 (4) - E-036 (1)	Always	No continuity
E-036 (1) - E-036 (2)	Always	No continuity
E-085 (4) - E-085 (16)	Always	No continuity



f. Using a digital multimeter, check for continuity between connector E-085 and body ground to check if the front right wheel speed sensor is short to ground according to the table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-085 (4) - Body ground	Always	No continuity
E-085 (16) - Body ground	Always	No continuity



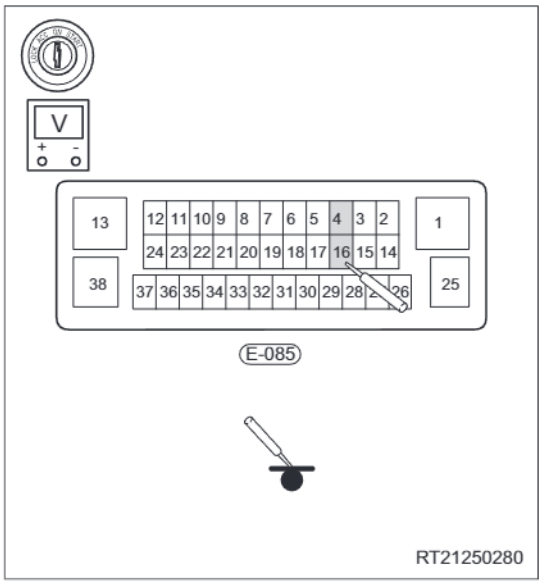
g. Connect the negative battery cable.

h. Turn ignition switch ON.

i. Using a digital multimeter, measure the voltage between connector E-085 and body ground to check if the front right wheel speed sensor is short to power supply according to the table below.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
E-085 (4) - Body ground	Ignition switch ON	Approximately 0 V
E-085 (16) - Body ground	Ignition switch ON	Approximately 0 V



NG → **Repair or replace wire harness and connector between front right wheel speed sensor and ABS control module assembly**

OK

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear the DTC.

b. Start the engine.

c. Drive the vehicle at 15 km/h or more, read the ABS control module assembly DTC again with X-431 3G diagnostic tester.

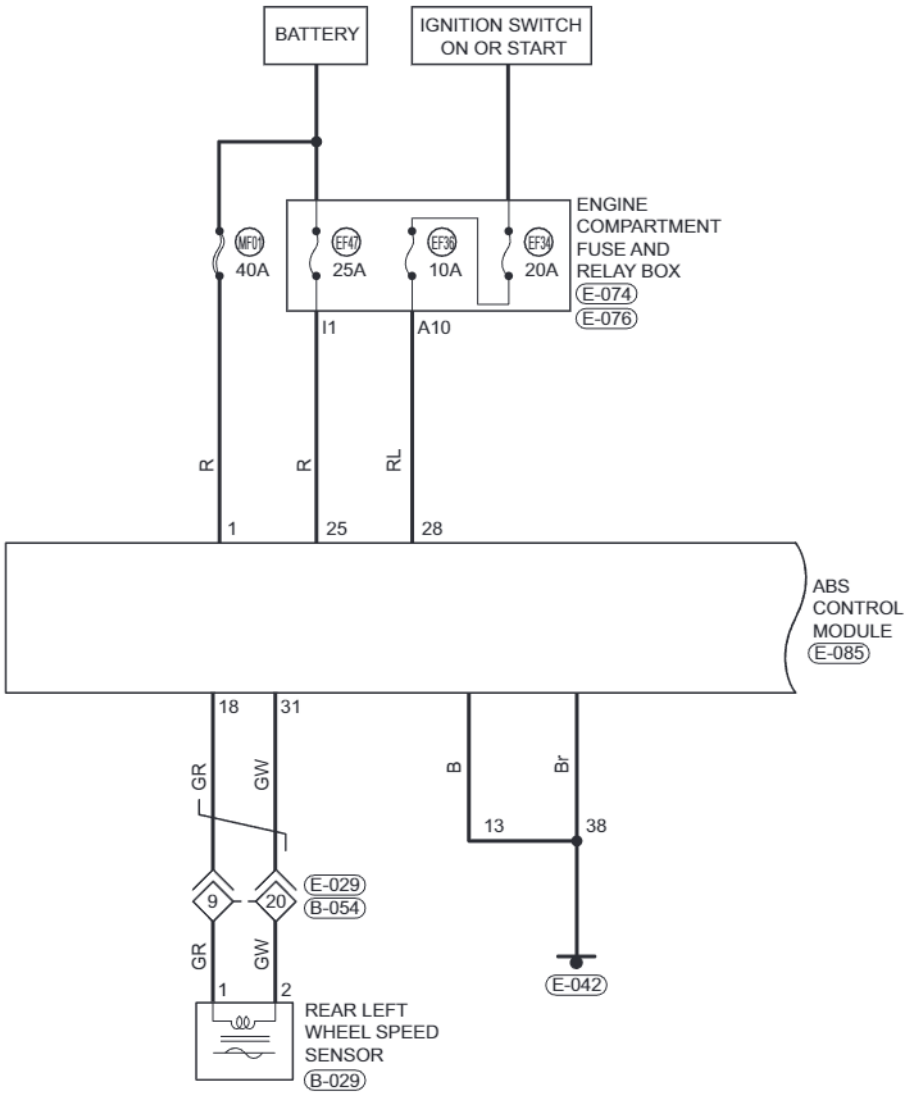
d. Check if the same DTC is output.

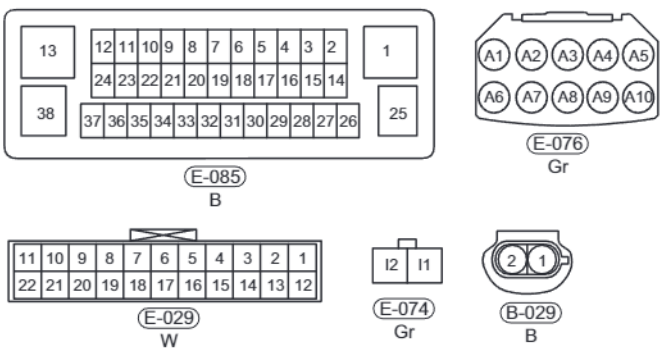
NO → **System operates normally**

YES

Replace ABS control module assembly

DTC	C0037-00	Left Rear Wheel Speed Sensor
DTC	C0037-09	Left Rear Wheel Speed Sensor
DTC	C0037-11	Left Rear Wheel Speed Sensor
DTC	C0037-12	Left Rear Wheel Speed Sensor
DTC	C0037-13	Left Rear Wheel Speed Sensor
DTC	C0037-29	Left Rear Wheel Speed Sensor





ET21250080

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DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
C0037-00	Left Rear Wheel Speed Sensor	These DTCs occur when any of the following conditions is met: 1. ABS control module assembly detects that the wheel speed sensor signal wire is short to ground. 2. Wheel speed sensor line is open. 3. ABS control module assembly detects that the wheel speed sensor signal wire is short to power supply. 4. ABS control module assembly detects that the wheel speed sensor power supply wire is short to ground. 5. Wheel speed sensor signal is invalid.	• Wheel speed sensor signal wire is connecting with the power supply wire in reverse. • Wheel speed sensor signal wire is short to ground. • Wheel speed sensor line is open, connector is loose or broken. • Wheel speed sensor signal wire is short to power supply. • Wheel speed sensor power supply wire is short to ground. • Sensor head or plug pin is damaged. • Wheel speed sensor is interfered by magnetic field outside (wheel or axle is not demagnetized). • Wheel speed sensor body is malfunctioning. • Ring gear is not installed, has teeth missing, dirty, demagnetized or off center. • Clearance between sensor and ring gear is excessive. • Number of ring gear teeth is wrong. • Tire size is not as specified. • ABS control module assembly is damaged.
C0037-09	Left Rear Wheel Speed Sensor		
C0037-11	Left Rear Wheel Speed Sensor		
C0037-12	Left Rear Wheel Speed Sensor		
C0037-13	Left Rear Wheel Speed Sensor		
C0037-29	Left Rear Wheel Speed Sensor		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to the circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check rear left wheel speed sensor wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the rear left wheel speed sensor connector B-029.
d. Check if the wire harnesses are worn, pierced, pinched or partially broken.
e. Look for broken, bent, protruded or corroded terminals.
f. Check if related connector pins are in good condition.

NG → **Repair or replace rear left wheel speed sensor wire harness and connector**

OK

2	Check installation of rear left wheel speed sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check rear left wheel speed sensor mounting bolt for looseness.
d. Check if excessive clearance exists between the installation position of rear left wheel speed sensor and rear hub ring gear.
e. Check the installation position of rear left wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace rear left wheel speed sensor**

OK

3	Check rear left wheel speed sensor

a. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
b. Drive the vehicle straight ahead, and read the data stream of rear left wheel speed sensor with X-431 3G diagnostic tester.
c. Check if the data change of rear left wheel speed sensor matches the change of other wheel speed sensors.

NG → **Replace rear left wheel speed sensor**

OK

4	Check rear left hub ring gear

a. Remove the rear left hub assembly.
b. Check for foreign matter, missing teeth or damage on the rear left hub ring gear.
c. Check if the rear left hub assembly is securely installed.

NG → **Replace rear left hub ring gear**

OK

5	Check wire harness and connector (rear left wheel speed sensor - ABS control module assembly)

a. Turn ignition switch to LOCK.

b. Disconnect the negative battery cable.

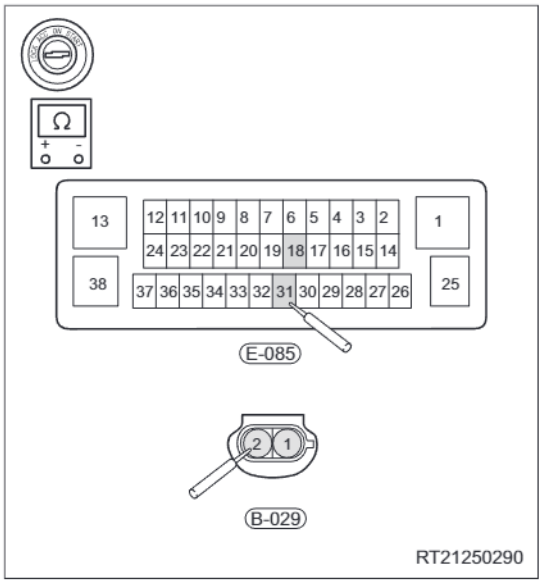
c. Disconnect the ABS control module assembly connector E-085.

d. Disconnect the rear left wheel speed sensor connector B-029.

e. Using a digital multimeter, check for continuity between the terminals of connector E-085 and connector B-029 to check if there is an open in the wire harness and connector according to the table below.

Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (18) - B-029 (1)	Always	Continuity
E-085 (31) - B-029 (2)	Always	Continuity
E-085 (31) - B-029 (1)	Always	No continuity
E-085 (18) - B-029 (2)	Always	No continuity
B-029 (1) - B-029 (2)	Always	No continuity
E-085 (18) - E-085 (31)	Always	No continuity

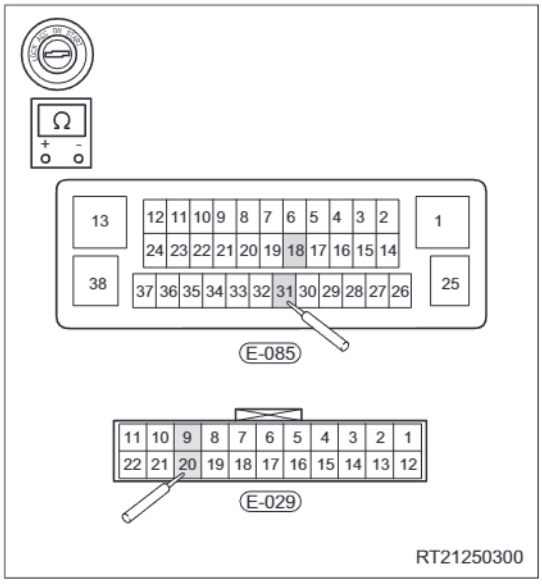


f. Disconnect the engine compartment wire harness connector E-029 and body wire harness connector B-054.

g. Using a digital multimeter, check for continuity between the terminals of connector E-085 and connector E-029 to check if there is an open in the wire harness and connector according to the table below.

Standard Condition

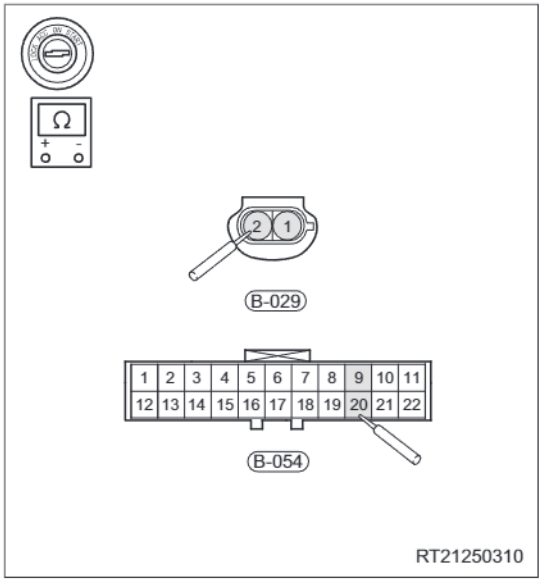
Multimeter Connection Terminal	Condition	Specified Condition
E-085 (18) - E-029 (9)	Always	Continuity
E-085 (31) - E-029 (20)	Always	Continuity



h. Using a digital multimeter, check for continuity between the terminals of connector B-054 and connector B-029 to check if there is an open in the wire harness and connector according to the table below.

Standard Condition

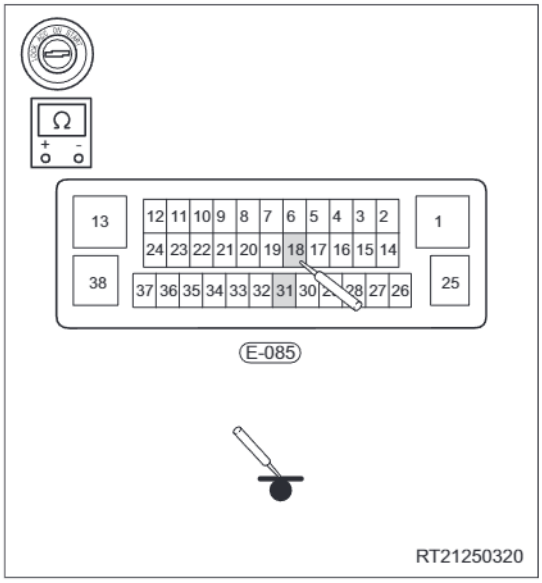
Multimeter Connection Terminal	Condition	Specified Condition
B-029 (1) - B-054 (9)	Always	Continuity
B-029 (2) - B-054 (20)	Always	Continuity



i. Using a digital multimeter, check for continuity between connector E-085 and body ground to check if the rear left wheel speed sensor is short to ground according to the table below.

Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (18) - Body ground	Always	No continuity
E-085 (31) - Body ground	Always	No continuity



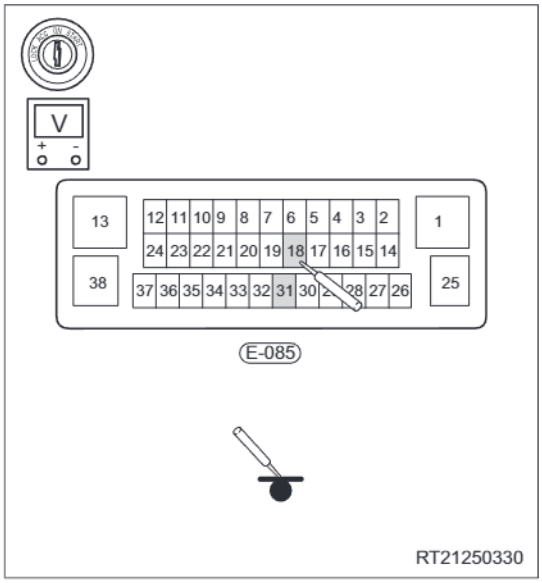
j. Connect the negative battery cable.

k. Turn ignition switch ON.

l. Using a digital multimeter, measure the voltage between connector E-085 and body ground to check if the rear left wheel speed sensor is short to power supply according to the table below.

Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (18) - Body ground	Ignition switch ON	Approximately 0 V
E-085 (31) - Body ground	Ignition switch ON	Approximately 0 V



NG → Repair or replace wire harness and connector between rear left wheel speed sensor and ABS control module assembly

OK

6	Reconfirm DTCs

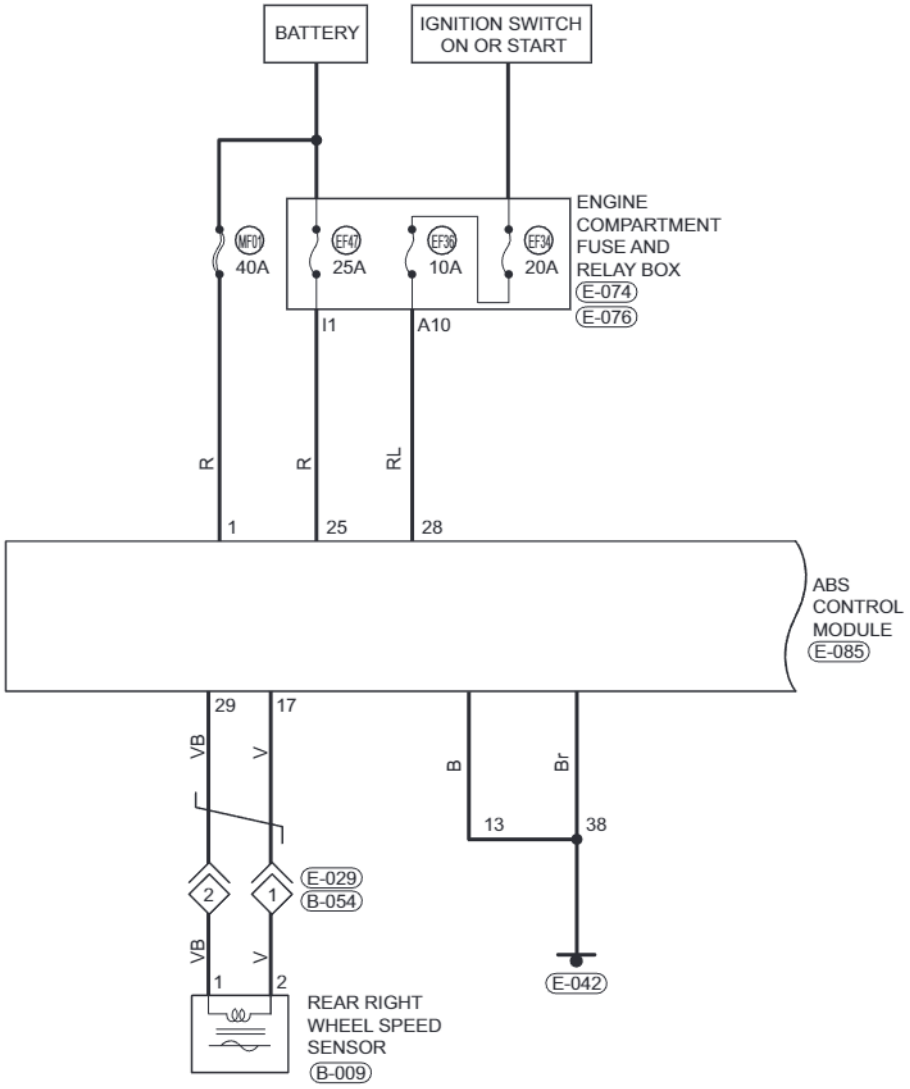
a. Use X-431 3G diagnostic tester to clear the DTC.
b. Start the engine.
c. Drive the vehicle at 15 km/h or more, read the ABS control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if the same DTC is output.

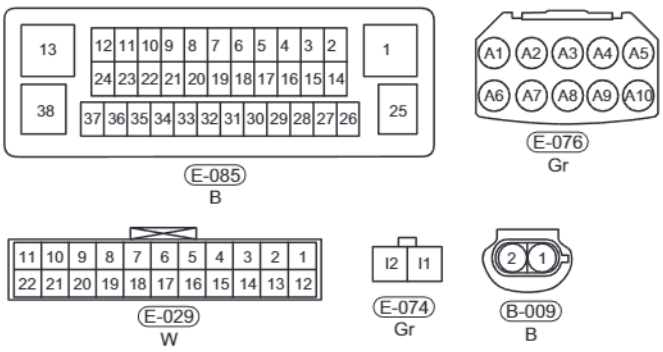
NO → System operates normally

YES

Replace ABS control module assembly

DTC	C003A-00	Right Rear Wheel Speed Sensor
DTC	C003A-09	Right Rear Wheel Speed Sensor
DTC	C003A-11	Right Rear Wheel Speed Sensor
DTC	C003A-12	Right Rear Wheel Speed Sensor
DTC	C003A-13	Right Rear Wheel Speed Sensor
DTC	C003A-29	Right Rear Wheel Speed Sensor


BATTERY
IGNITION SWITCH ON OR START
MF01
40A
EF47
25A
EF36
10A
EF34
20A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-074
E-076
I1
A10
R
R
RL
1
25
28
ABS CONTROL MODULE
E-085
29
17
VB
V
B
Br
13
38
2
1
E-029
B-054
VB
V
1
2
REAR RIGHT WHEEL SPEED SENSOR
B-009
E-042


13
12 11 10 9 8 7 6 5 4 3 2
1
24 23 22 21 20 19 18 17 16 15 14
38
37 36 35 34 33 32 31 30 29 28 27 26
25
E-085
B
A1 A2 A3 A4 A5
A6 A7 A8 A9 A10
E-076
Gr
11 10 9 8 7 6 5 4 3 2 1
22 21 20 19 18 17 16 15 14 13 12
E-029
W
I2 I1
E-074
Gr
2 1
B-009
B

ET21250090

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
C003A-00	Right Rear Wheel Speed Sensor	These DTCs occur when any of the following conditions is met: 1. ABS control module assembly detects that the wheel speed sensor signal wire is short to ground. 2. Wheel speed sensor line is open. 3. ABS control module assembly detects that the wheel speed sensor signal wire is short to power supply. 4. ABS control module assembly detects that the wheel speed sensor power supply wire is short to ground. 5. Wheel speed sensor signal is invalid.	• Wheel speed sensor signal wire is connecting with the power supply wire in reverse. • Wheel speed sensor signal wire is short to ground. • Wheel speed sensor line is open, connector is loose or broken. • Wheel speed sensor signal wire is short to power supply. • Wheel speed sensor power supply wire is short to ground. • Sensor head or plug pin is damaged. • Wheel speed sensor is interfered by magnetic field outside (wheel or axle is not demagnetized). • Wheel speed sensor body is malfunctioning. • Ring gear is not installed, has teeth missing, dirty, demagnetized or off center. • Clearance between sensor and ring gear is excessive. • Number of ring gear teeth is wrong. • Tire size is not as specified. • ABS control module assembly is damaged.
C003A-09	Right Rear Wheel Speed Sensor		
C003A-11	Right Rear Wheel Speed Sensor		
C003A-12	Right Rear Wheel Speed Sensor		
C003A-13	Right Rear Wheel Speed Sensor		
C003A-29	Right Rear Wheel Speed Sensor		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to the circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check rear right wheel speed sensor wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the rear right wheel speed sensor connector B-009.
d. Check if the wire harnesses are worn, pierced, pinched or partially broken.
e. Look for broken, bent, protruded or corroded terminals.
f. Check if related connector pins are in good condition.

NG → **Repair or replace rear right wheel speed sensor wire harness and connector**

OK

2	Check installation of rear right wheel speed sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check rear right wheel speed sensor mounting bolt for looseness.
d. Check if excessive clearance exists between the installation position of rear right wheel speed sensor and rear hub ring gear.
e. Check the installation position of rear right wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace rear right wheel speed sensor**

OK

3	Check rear right wheel speed sensor

a. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
b. Drive the vehicle straight ahead, and read the data stream of rear right wheel speed sensor with X-431 3G diagnostic tester.
c. Check if the data change of rear right wheel speed sensor matches the change of other wheel speed sensors.

NG → **Replace rear right wheel speed sensor**

OK

4	Check rear right hub ring gear

a. Remove the rear right hub assembly.
b. Check for foreign matter, missing teeth or damage on the rear right hub ring gear.
c. Check if the rear right hub assembly is securely installed.

NG → **Replace rear right hub ring gear**

OK

5	Check wire harness and connector (rear right wheel speed sensor - ABS control module assembly)

a. Turn ignition switch to LOCK.

b. Disconnect the negative battery cable.

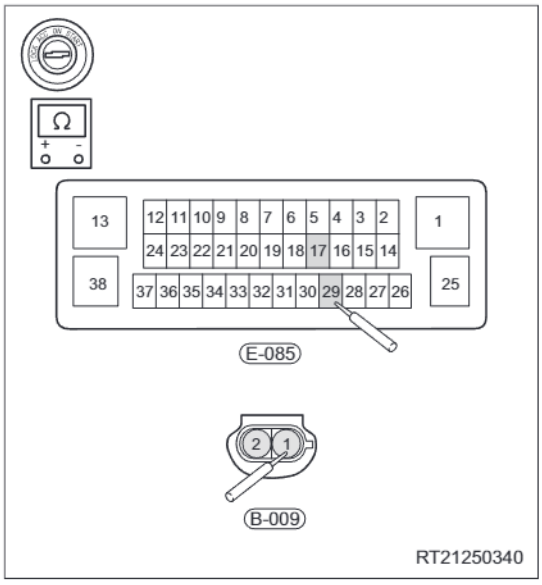
c. Disconnect the ABS control module assembly connector E-085.

d. Disconnect the rear right wheel speed sensor connector B-009.

e. Using a digital multimeter, check for continuity between the terminals of connector E-085 and connector B-009 to check if there is an open in the wire harness and connector according to the table below.

Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (29) - B-009 (1)	Always	Continuity
E-085 (17) - B-009 (2)	Always	Continuity
E-085 (17) - B-009 (1)	Always	No continuity
E-085 (29) - B-009 (2)	Always	No continuity
B-009 (1) - B-009 (2)	Always	No continuity
E-085 (17) - E-085 (29)	Always	No continuity

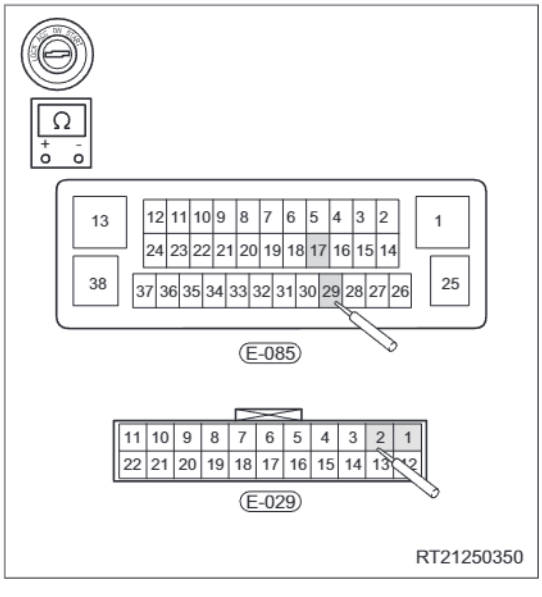


f. Disconnect the engine compartment wire harness connector E-029 and body wire harness connector B-054.

g. Using a digital multimeter, check for continuity between the terminals of connector E-085 and connector E-029 to check if there is an open in the wire harness and connector according to the table below.

Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (17) - E-029 (1)	Always	Continuity
E-085 (29) - E-029 (2)	Always	Continuity

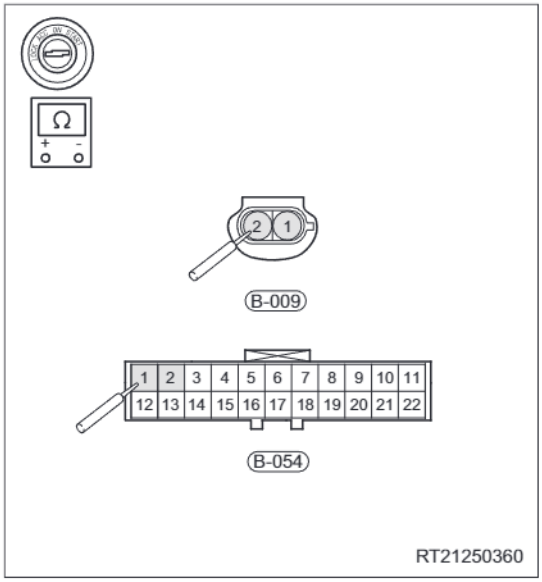


25

h. Using a digital multimeter, check for continuity between the terminals of connector B-054 and connector B-009 to check if there is an open in the wire harness and connector according to the table below.

Standard Condition

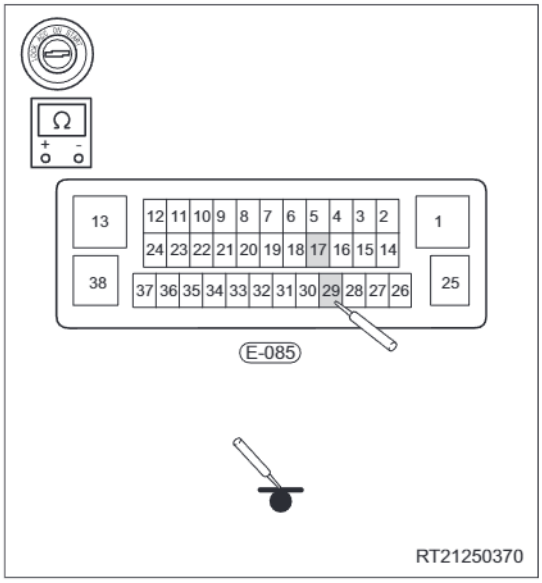
Multimeter Connection Terminal	Condition	Specified Condition
B-009 (1) - B-054 (2)	Always	Continuity
B-009 (2) - B-054 (1)	Always	Continuity



i. Using a digital multimeter, check for continuity between connector E-085 and body ground to check if the rear right wheel speed sensor is short to ground according to the table below.

Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (17) - Body ground	Always	No continuity
E-085 (29) - Body ground	Always	No continuity



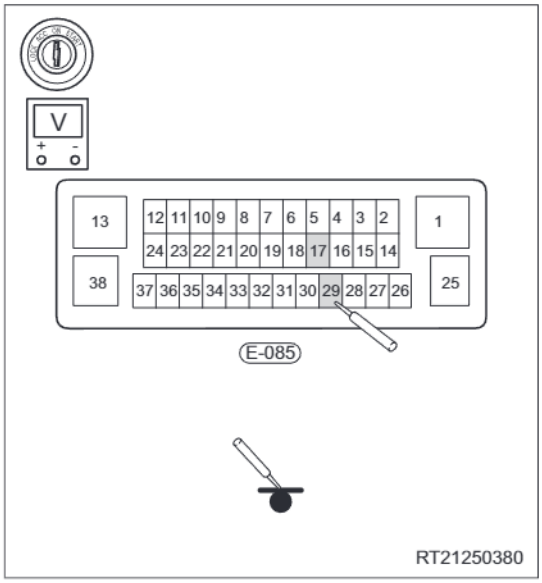
j. Connect the negative battery cable.

k. Turn ignition switch ON.

l. Using a digital multimeter, measure the voltage between connector E-085 and body ground to check if the rear right wheel speed sensor is short to power supply according to the table below.

Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (17) - Body ground	Ignition switch ON	Approximately 0 V
E-085 (29) - Body ground	Ignition switch ON	Approximately 0 V



NG → Repair or replace wire harness and connector between rear right wheel speed sensor and ABS control module assembly

OK ↓

6	Reconfirm DTCs

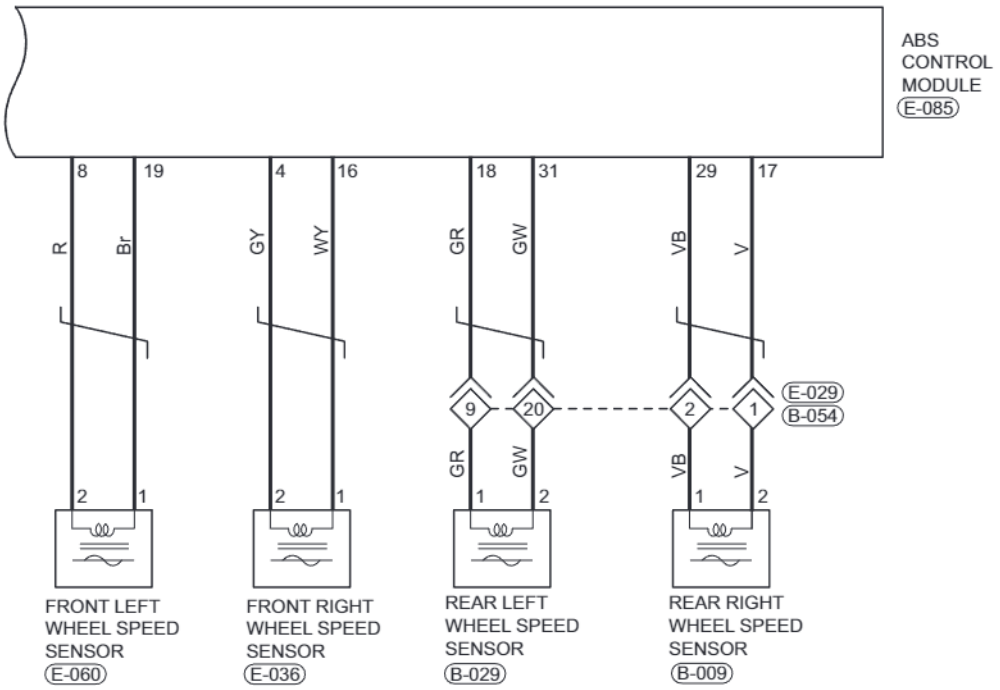
a. Use X-431 3G diagnostic tester to clear the DTC.
b. Start the engine.
c. Drive the vehicle at 15 km/h or more, read the ABS control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if the same DTC is output.

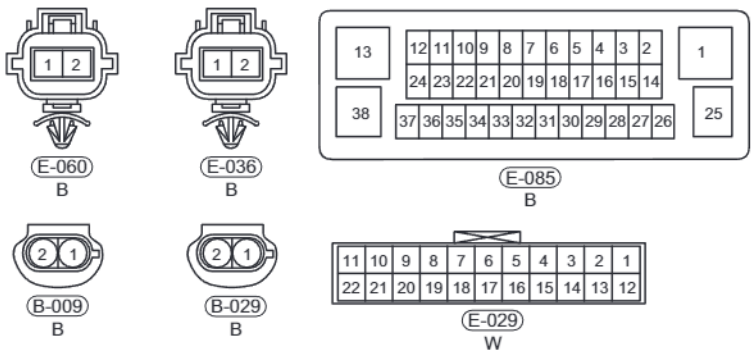
NO → System operates normally

YES ↓

Replace ABS control module assembly

DTC	C006B-00	Stability System Active Too Long





ET21250100

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
C006B-00	Stability System Active Too Long	The DTC occurs when the following condition is met: 1. ABS receives command to continue operating (more than 1 minute).	• Wheel speed difference is excessive. • Wheel speed sensor signal is incorrect. • ABS control module assembly is damaged.

CAUTION

- When performing electrical equipment diagnosis and test, always refer to the circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check wheel speed sensor wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect all wheel speed sensor connectors.
d. Check if the wire harnesses are worn, pierced, pinched or partially broken.
e. Look for broken, bent, protruded or corroded terminals.
f. Check if related connector pins are in good condition.

NG → **Repair or replace corresponding wheel speed sensor wire harness and connector**

OK

2	Check installation of wheel speed sensor

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Check the wheel speed sensor mounting bolt for looseness.
d. Check if excessive clearance exists between the installation position of wheel speed sensor and hub ring gear.
e. Check the installation position of wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace wheel speed sensor**

OK

3	Check wheel speed sensor

a. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
b. Drive the vehicle straight ahead, and read the data stream of each wheel speed sensor with X-431 3G diagnostic tester.
c. Check if the data change of each wheel speed sensor matches the change of other wheel speed sensors.

NG → **Replace corresponding wheel speed sensor**

OK

4	Check hub ring gear

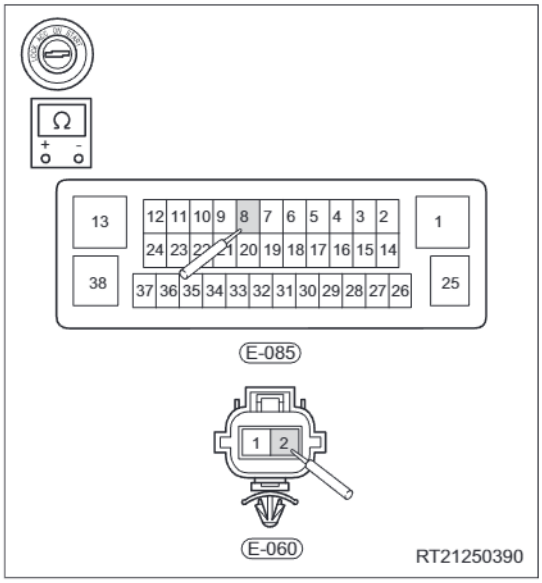
a. Remove the hub assembly.
b. Check for foreign matter, missing teeth or damage on the hub ring gear.
c. Check if the hub assembly is securely installed.

NG → **Replace corresponding hub ring gear**

OK

5	Check wire harness and connector (wheel speed sensor - ABS control module assembly)

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS control module assembly connector E-085.
d. Disconnect the front left wheel speed sensor connector E-060 and front right wheel speed sensor connector E-036.
e. Disconnect the rear left wheel speed sensor connector B-029 and rear right wheel speed sensor connector B-009.
f. Using a digital multimeter, check for continuity between the terminal 8 of connector E-085 and the terminal 2 of connector E-060 to check if there is an open in the front left wheel speed sensor signal wire according to the table below.



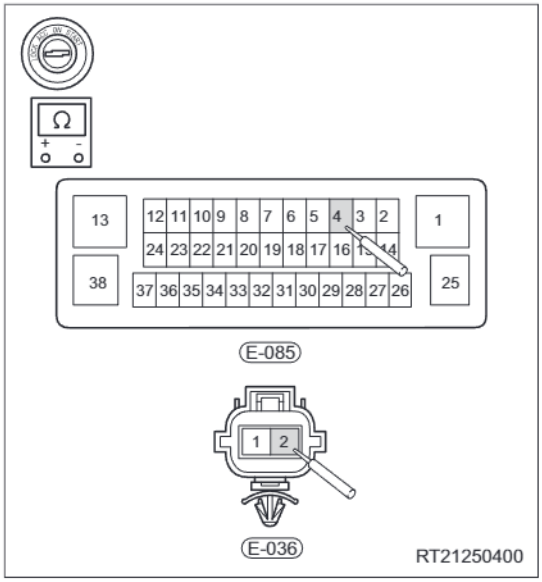
Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (8) - E-060 (2)	Always	Continuity

g. Using a digital multimeter, check for continuity between the terminal 4 of connector E-085 and the terminal 2 of connector E-036 to check if there is an open in the front right wheel speed sensor signal wire according to the table below.

Standard Condition

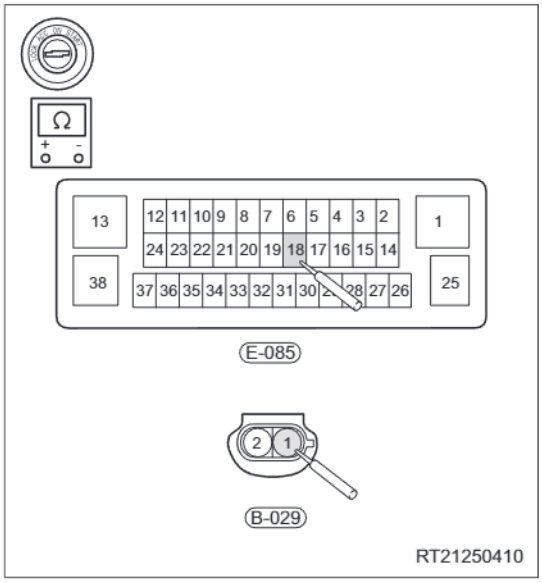
Multimeter Connection Terminal	Condition	Specified Condition
E-085 (4) - E-036 (2)	Always	Continuity



h. Using a digital multimeter, check for continuity between the terminal 18 of connector E-085 and the terminal 1 of connector B-029 to check if there is an open in the rear left wheel speed sensor signal wire according to the table below.

Standard Condition

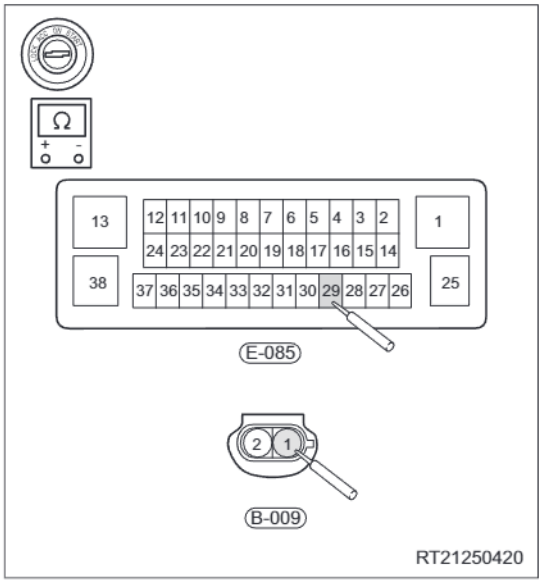
Multimeter Connection Terminal	Condition	Specified Condition
E-085 (18) - B-029 (1)	Always	Continuity



i. Using a digital multimeter, check for continuity between the terminal 29 of connector E-085 and the terminal 1 of connector B-009 to check if there is an open in the rear right wheel speed sensor signal wire according to the table below.

Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (29) - B-009 (1)	Always	Continuity

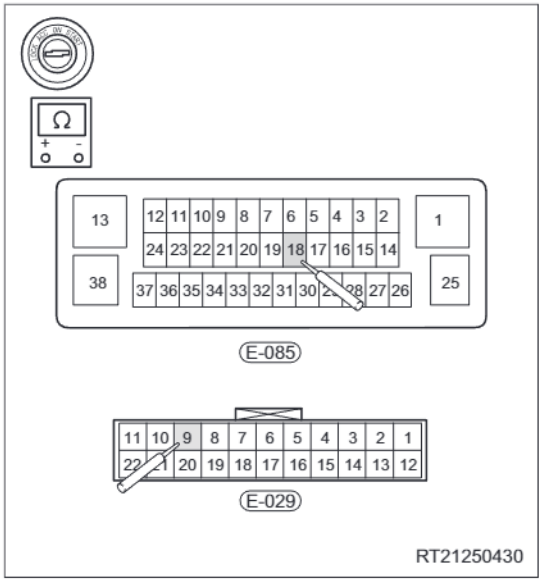


j. Disconnect the engine compartment wire harness connector E-029 and body wire harness connector B-054.

k. Using a digital multimeter, check for continuity between the terminal 18 of connector E-085 and the terminal 9 of connector E-029 to check if there is an open in the rear left wheel speed sensor signal wire according to the table below.

Standard Condition

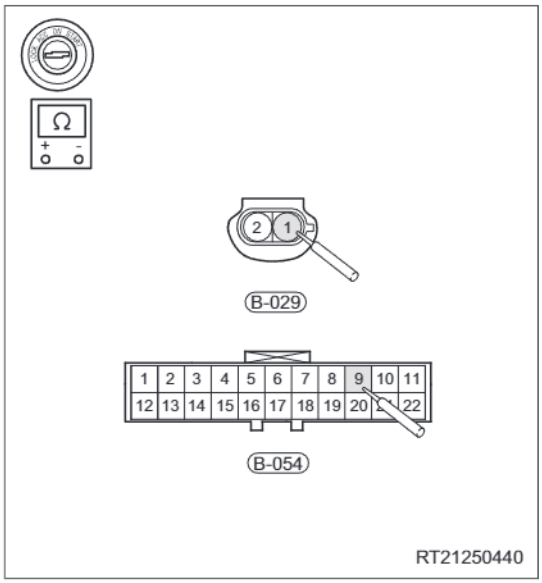
Multimeter Connection Terminal	Condition	Specified Condition
E-085 (18) - E-029 (9)	Always	Continuity



l. Using a digital multimeter, check for continuity between the terminal 1 of connector B-029 and the terminal 9 of connector B-054 to check if there is an open in the rear left wheel speed sensor signal wire according to the table below.

Standard Condition

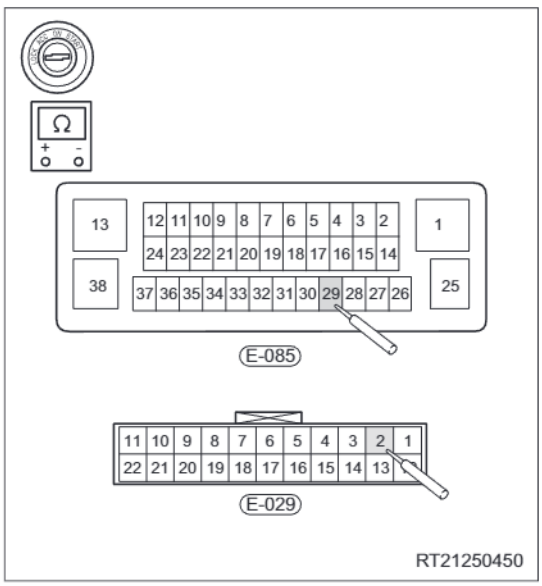
Multimeter Connection Terminal	Condition	Specified Condition
B-029 (1) - B-054 (9)	Always	Continuity



m. Using a digital multimeter, check for continuity between the terminal 29 of connector E-085 and the terminal 2 of connector E-029 to check if there is an open in the rear right wheel speed sensor signal wire according to the table below.

Standard Condition

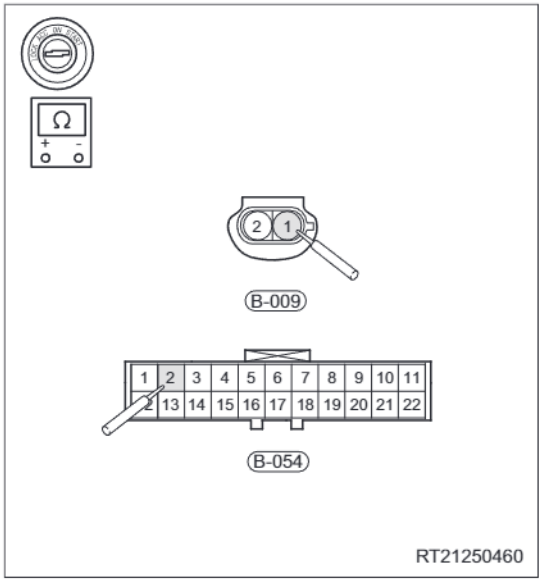
Multimeter Connection Terminal	Condition	Specified Condition
E-085 (29) - E-029 (2)	Always	Continuity



n. Using a digital multimeter, check for continuity between the terminal 1 of connector B-009 and the terminal 2 of connector B-054 to check if there is an open in the rear right wheel speed sensor signal wire according to the table below.

Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
B-009 (1) - B-054 (2)	Always	Continuity



NG → **Repair or replace wire harness and connector between wheel speed sensor and ABS control module assembly**

OK

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear the DTC.

b. Start the engine.

c. Drive the vehicle at 15 km/h or more, read the ABS control module assembly DTC again with X-431 3G diagnostic tester.

d. Check if the same DTC is output.

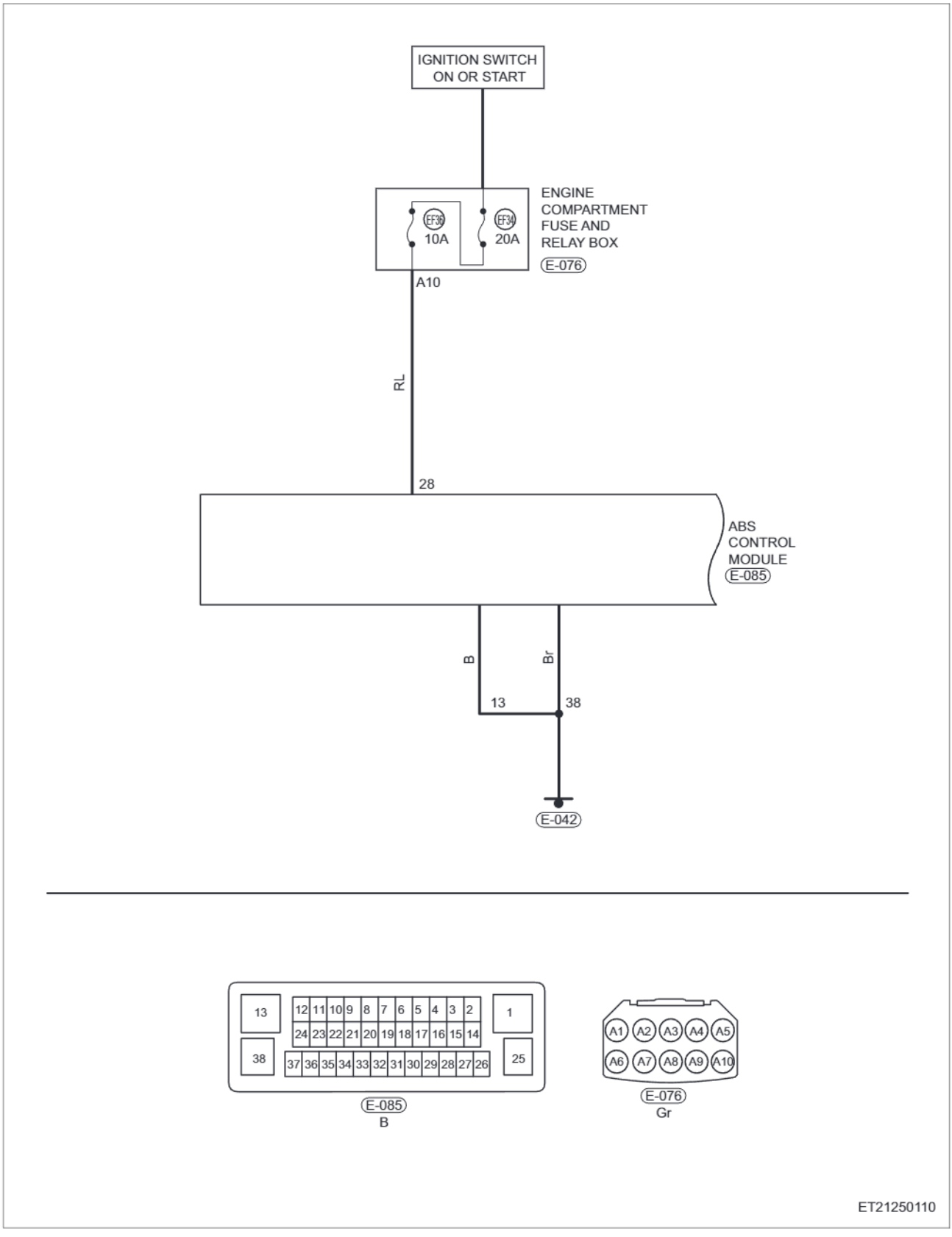
NO → **System operates normally**

YES

Replace ABS control module assembly

DTC	C1000-16	ECU Voltage Supply

DTC	C1000-17	ECU Voltage Supply



DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
C1000-16	ECU Voltage Supply	These DTCs occur when any of the following conditions is met: 1. Battery voltage is too high. 2. Battery voltage is too low. 3. Body ground is poor.	• Fuse malfunction • High or low battery voltage • Charging system malfunction • Wire harness or connector damaged • ABS control module assembly malfunction
C1000-17	ECU Voltage Supply		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to the circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check ABS fuse

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Remove the ABS fuse EF-36 (10 A) from the engine compartment fuse and relay box.
d. Check if the fuse is blown.

NG → Replace ABS fuse

OK

2	Check battery

a. Using a digital multimeter, measure the voltage between positive battery terminal and negative battery terminal.
b. The battery voltage should be between 9 V and 16 V.

NG → Check charging system (See page 16-6)

OK

3	Check ABS control module assembly wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS control module assembly connector E-085.
d. Check if the wire harnesses are worn, pierced, pinched or partially broken.

e. Look for broken, bent, protruded or corroded terminals.

f. Check if related connector pins are in good condition.

NG → **Repair or replace ABS control module assembly wire harness and connector**

OK

4	Check wire harness and connector (ABS control module assembly - battery)

a. Turn ignition switch to LOCK.

b. Disconnect the negative battery cable.

c. Disconnect the ABS control module assembly connector E-085.

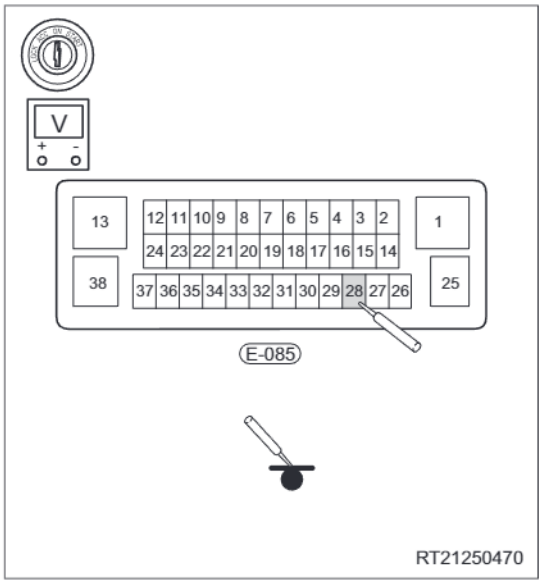
d. Connect the negative battery cable.

e. Turn ignition switch ON.

f. Using a digital multimeter, measure the supply voltage between ABS control module assembly connector E-085 and body ground to check if the power supply circuit is normal according to the table below.

Standard Voltage

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (28) - Body ground	Ignition switch ON	9 to 16 V



NG → **Repair or replace engine compartment wire harness and connector**

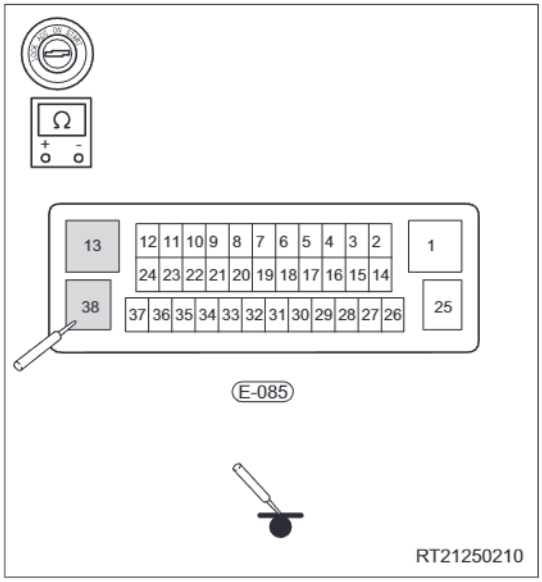
OK

5	Check wire harness and connector (ABS control module assembly - body ground)

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS control module assembly connector E-085.
d. Using a digital multimeter, check for continuity between ABS control module assembly connector E-085 and body ground to check if the system ground circuit is normal according to the table below.

Standard Condition

Multimeter Connection Terminal	Condition	Specified Condition
E-085 (13) - Body ground	Always	Continuity
E-085 (38) - Body ground	Always	Continuity



NG → **Repair or replace ABS control module assembly wire harness and connector**

OK

6	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear the DTC.
b. Start the engine.
c. Drive the vehicle at 15 km/h or more, read the ABS control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if the same DTC is output.

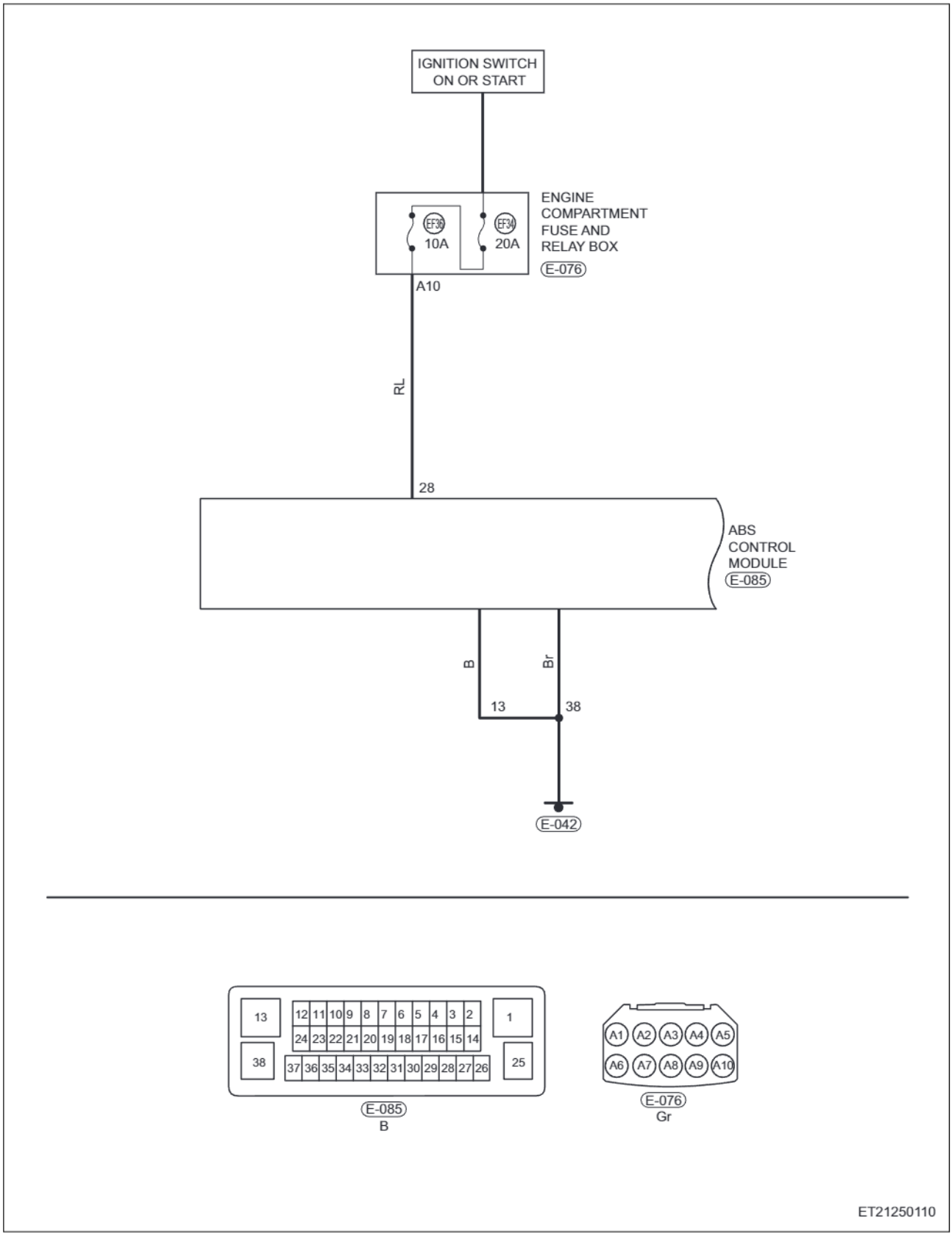
NO → **System operates normally**

YES

Replace ABS control module assembly

DTC	C1001-04	ECU

DTC	C1009-00	ECU Hardware Related



ET21250110

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
C1001-04	ECU	These DTCs occur when any of the following conditions is met: 1. ABS control module assembly power supply is malfunctioning. 2. ABS control module assembly is damaged.	• Fuse malfunction • Wire harness or connector damaged • ABS control module assembly malfunction
C1009-00	ECU Hardware Related		

CAUTION

- When performing electrical equipment diagnosis and test, always refer to the circuit diagram for related circuit and component information.

Diagnosis Procedure

1	Check ABS fuse

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Remove the ABS fuse EF-36 (10 A) from the engine compartment fuse and relay box.
d. Check if the fuse is blown.

NG → **Replace ABS fuse**

OK ↓

2	Check ABS control module assembly wire harness and connector

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS control module assembly connector E-085.
d. Check if the wire harnesses are worn, pierced, pinched or partially broken.
e. Look for broken, bent, protruded or corroded terminals.
f. Check if related connector pins are in good condition.

NG → **Repair or replace ABS control module assembly wire harness and connector**

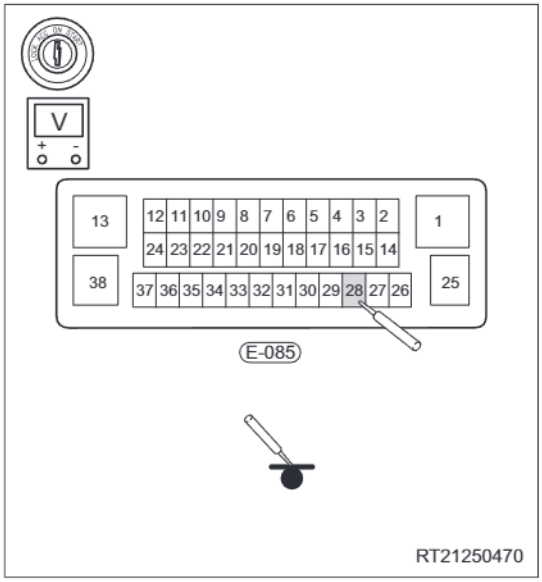
OK ↓

3	Check wire harness and connector (ABS control module assembly - battery)

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS control module assembly connector E-085.
d. Connect the negative battery cable.
e. Turn ignition switch ON.
f. Using a digital multimeter, measure the supply voltage between ABS control module assembly connector E-085 and body ground to check if the power supply circuit is normal according to the table below.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
E-085 (28) - Body ground	Ignition switch ON	9 to 16 V



NG → **Repair or replace engine compartment wire harness and connector**

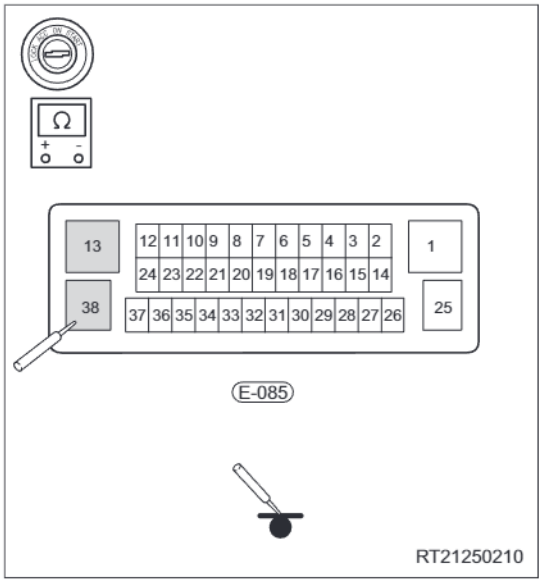
OK

4	Check wire harness and connector (ABS control module assembly - body ground)

a. Turn ignition switch to LOCK.
b. Disconnect the negative battery cable.
c. Disconnect the ABS control module assembly connector E-085.
d. Using a digital multimeter, check for continuity between ABS control module assembly connector E-085 and body ground to check if the system ground circuit is normal according to the table below.

Standard Condition

Multimeter Connection	Condition	Specified Condition
E-085 (13) - Body ground	Always	Continuity
E-085 (38) - Body ground	Always	Continuity



NG → **Repair or replace ABS control module assembly wire harness and connector**

OK

5	Reconfirm DTCs

a. Use X-431 3G diagnostic tester to clear the DTC.
b. Start the engine.
c. Drive the vehicle at 15 km/h or more, read the ABS control module assembly DTC again with X-431 3G diagnostic tester.
d. Check if the same DTC is output.

NO → System operates normally

YES ↓

Replace ABS control module assembly

ON-VEHICLE SERVICE

ABS Bleeding

⚠ WARNING

- When bleeding the brake system, wear safety glasses. If brake fluid gets on your eyes or skin, wash off with water completely.
- DO NOT drop brake fluid onto the body paint, as brake fluid can corrode the body paint.

CAUTION

- Brake fluid should meet the Chery specified type (DOT 4). DO NOT mix the brake fluid with other types of brake fluid.
- Brake fluid has strong water absorbability, be sure to place it in the original sealed container.
- To prevent dust and other foreign matter from entering the reservoir, wipe it off before removing the reservoir cap.

The bleeding procedures for brake system with X-431 3G diagnostic tester are as follows:

1. Make sure all brake lines are installed and tightened properly.
2. Check that battery voltage is normal.
3. Turn ignition switch to LOCK.
4. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
5. Turn ignition switch ON.
6. Using X-431 diagnostic tester, record and clear the DTCs stored in ABS control module assembly.
7. Using X-431 3G diagnostic tester, enter Brake Control System, select Repair Bleed Function, and then perform operation according to the information and procedures displayed on the diagnostic tester.

   HINT:
   - If the bleeder plug is open, never depress the brake pedal repeatedly. Doing so will increase the amount of air in the system.
   - Do not drain brake fluid from the brake fluid reservoir while bleeding the system. Otherwise, low fluid level in the brake reservoir will cause additional air to enter the brake system.
   - Always check the brake fluid level at all times to ensure that brake fluid level in the brake reservoir is always close to the "MAX" level.
8. For X type brake circuit, the bleeding order is: rear left wheel, front left wheel, front right wheel, rear right wheel.
9. After bleeding is completed, fill the brake reservoir with brake fluid to the "MAX" level .
10. Drive the vehicle to perform a road test, and confirm that the ABS system operates normally and brake pedal feel is good.

ABS Control Module Assembly

Removal

⚠ WARNING

- When repairing ABS system, first release the pressure of high pressure brake fluid in the accumulator, to prevent the high pressure brake fluid from spraying out and causing injury.
- Operation procedures: turn ignition switch off first, and then depress and release brake pedal repeatedly until brake pedal becomes hard.
- In addition, never turn the ignition switch on before the ABS system is installed completely to prevent the hydraulic pump from energizing and running.

1. Turn off all the electrical equipment and ignition switch.
2. Disconnect the negative battery cable.
3. Drain the brake fluid (See page 26-13).

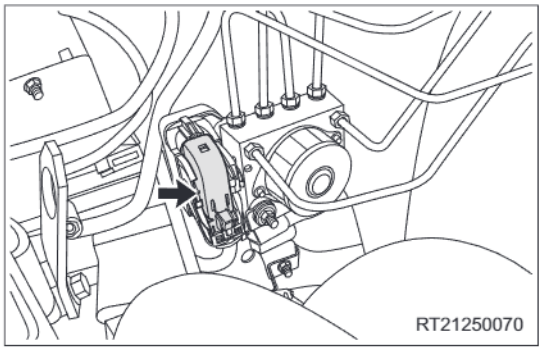
CAUTION

- Wash off brake fluid immediately if it comes in contact with any paint surface.

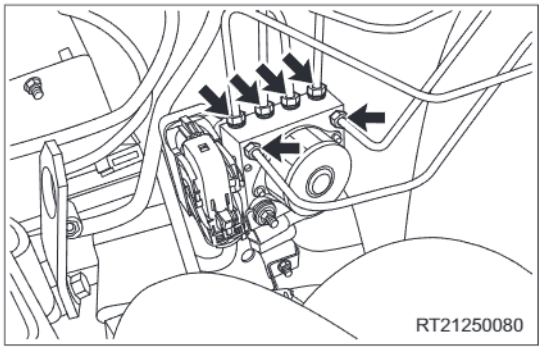
ENVIRONMENTAL PROTECTION

- Drained brake fluid should be well kept in a container. Never discard it at will.

4. Remove the engine trim cover assembly.
5. Remove the ABS control module assembly.
   a. Press the lock area of ABS control module assembly connector, move the connector lock bracket upward and disconnect the ABS control module assembly connector (arrow).



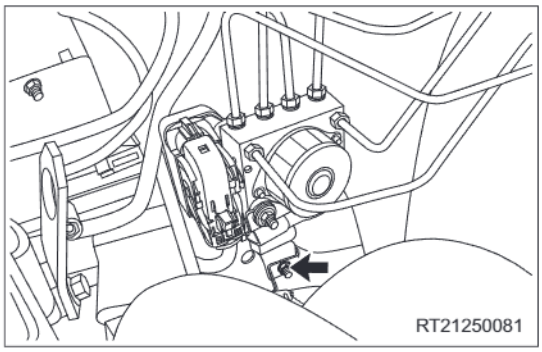
   b. Using a fixing wrench, carefully disconnect 6 brake pipe coupling plugs (arrow).
   (Tightening torque: 16 ± 2 N·m)



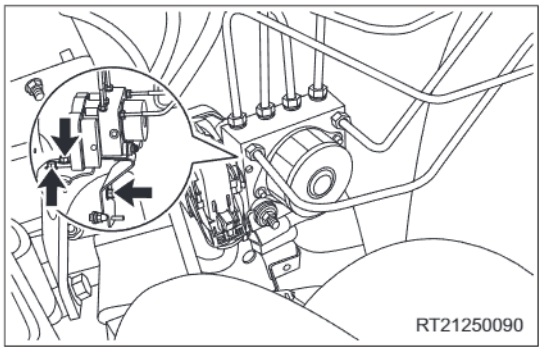
CAUTION

- When removing brake line, prevent foreign matter form entering the ABS control module assembly thread holes.
- After disconnecting brake line, sealing measure should be taken to prevent foreign matter form entering.

c. Remove the coupling nut (arrow) between ABS control module assembly mounting bracket and body. (Tightening torque: 23 ± 2 N·m)



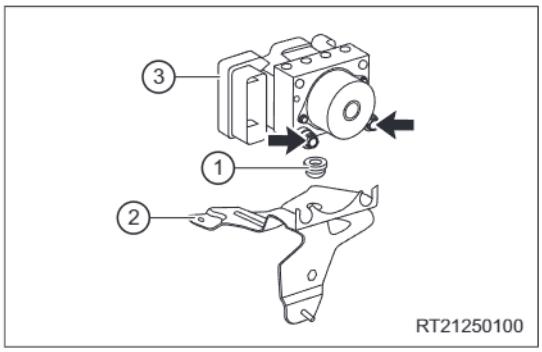
d. Remove 3 coupling bolts (arrow) between ABS control module assembly mounting bracket and body. (Tightening torque: 23 ± 2 N·m)



e. Remove the ABS control module with mounting bracket assembly.

Disassembly

1. Remove the ABS control module assembly.
   a. Remove the coupling nuts (arrow) between the lower part of ABS control module assembly and mounting bracket. (Tightening torque: 8 ± 2 N·m)
   b. Detach the rubber shock pad (1) from the bottom of ABS control module assembly.
   c. Detach the ABS control module assembly (3) from the mounting bracket (2).



Assembly

Assembly is in the reverse order of disassembly.

CAUTION

- Check if shock pad is deteriorated or damaged. Replace if necessary.

Installation

Installation is in the reverse order of removal.

CAUTION

- ABS control module assembly consists of hydraulic control module and electronic control module. As a unit, they cannot be repaired or replaced individually.
- When installing fixing bolts and screws, be sure to tighten them to specified torque.
- Perform ABS bleeding procedures for brake system after completing installation (See page 25-70).
- Using X-431 3G diagnostic tester, enter brake control system, record and clear the trouble code, then drive vehicle to perform a road test, confirming that the ABS system operates normally and brake pedal feel is good.

Front Wheel Speed Sensor

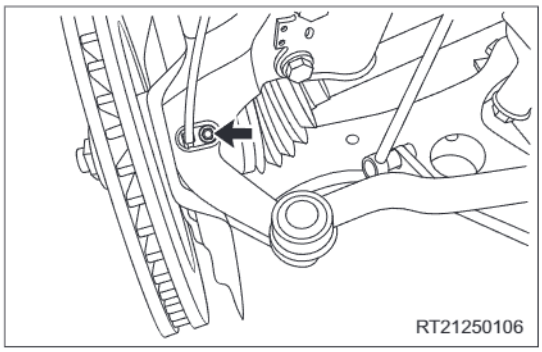
Removal

CAUTION

- Keep the wheel speed sensor away from oil or other dirt. Otherwise, the speed signal generated by wheel speed sensor may be inaccurate, and the system may fail to operate normally.

HINT:
- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

1. Turn off all the electrical equipment and ignition switch.
2. Disconnect the negative battery cable.
3. Remove the front left wheel (See page 24-9).
4. Remove the front left wheel speed sensor.
   a. Remove the coupling bolt (arrow) between front left wheel speed sensor and front left steering knuckle assembly, and disengage the front left wheel speed sensor carefully.
   (Tightening torque: 10 ± 1 N·m)

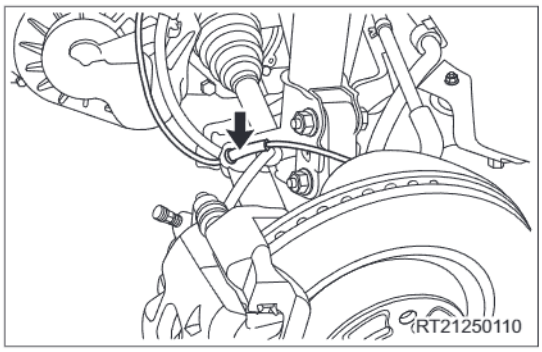


CAUTION

- Keep the head and installation hole of sensor free of foreign matter.

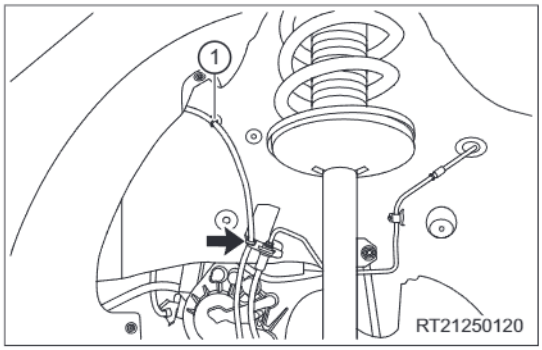
   b. Detach the attachment part (arrow) of front left wheel speed sensor wire harness from the front left shock absorber assembly.

   HINT:
   Observe the winding direction of sensor wire harness to prevent incorrect installation.

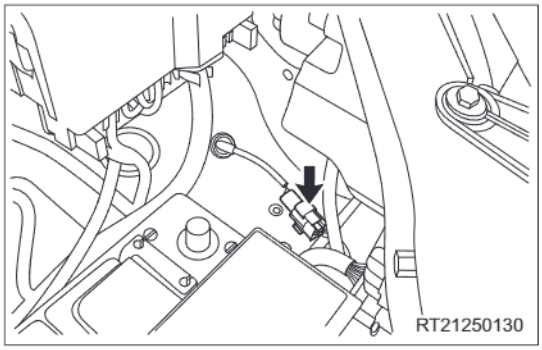


c. Detach the attachment part (arrow) and fixing clamp (1) of front left wheel speed sensor wire harness from the fixing bracket and body.

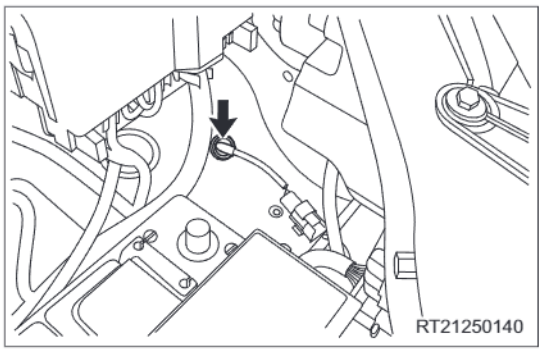
HINT:
Observe the winding direction of sensor wire harness to prevent incorrect installation.



d. Disconnect the front left wheel speed sensor wire harness connector (arrow).



e. Detach the front left wheel speed sensor wire harness cover (arrow) from body.



f. Remove the front left wheel speed sensor.

Inspection

1. Check the front wheel speed sensor.
   a. Check front wheel speed sensor surface for breakage, dents or notch.
   b. Check front wheel speed sensor connector or wire harness for scratches, breakage or damage.
   c. If any of the above conditions occurs, replace the front wheel speed sensor with a new one.

Installation

Installation is in the reverse order of removal.

CAUTION

- When installing coupling bolts, be sure to tighten them to specified torque.

Rear Wheel Speed Sensor

Removal

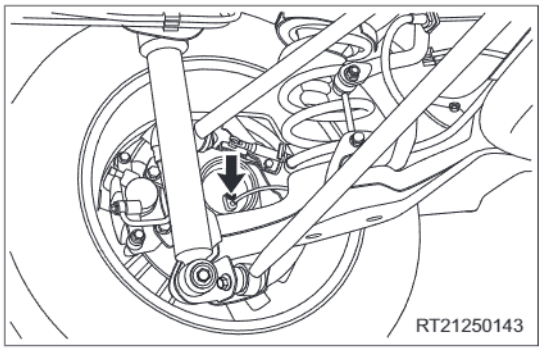
CAUTION

- Keep the wheel speed sensor away from oil or other dirt. Otherwise, the speed signal generated by wheel speed sensor may be inaccurate, and the system may fail to operate normally.

HINT:

- Use the same procedures for the right side and left side.
- Procedures listed below are for the left side.

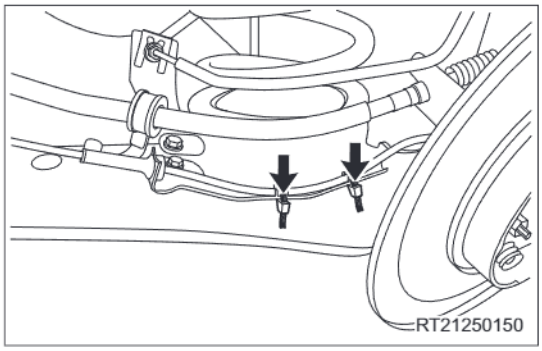
1. Turn off all the electrical equipment and ignition switch.
2. Disconnect the negative battery cable.
3. Remove the rear left wheel (See page 24-9).
4. Remove the left C-pillar lower protector assembly (See page 49-23).
5. Remove the rear left wheel speed sensor.
   a. Remove the coupling bolt (arrow) between rear left wheel speed sensor and rear left hub bearing unit, and disengage the rear left wheel speed sensor. (Tightening torque: 10 ± 1 N·m)



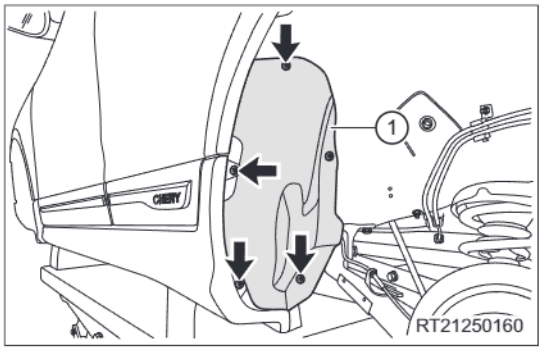
CAUTION

- Keep the head and installation hole of sensor free of foreign matter.

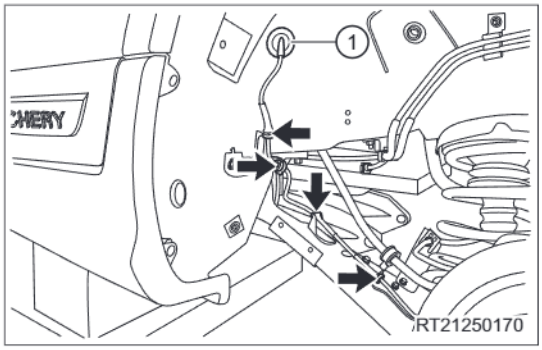
   b. Loosen the fixing bands (arrow) from the rear left wheel speed sensor wire harness.



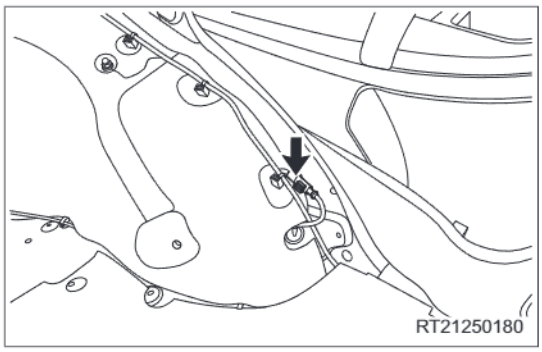
c. Remove 4 fixing screws (arrow) and the front wheel house protector assembly (1) of rear left wheel.



d. Detach the attachment parts (arrow) between rear left wheel speed sensor wire harness and fixing bracket, and detach the wire harness cover (1).



e. Disconnect the rear left wheel speed sensor wire harness connector (arrow).



f. Remove the rear left wheel speed sensor.

Inspection

1. Check the rear wheel speed sensor.
   a. Check rear wheel speed sensor surface for breakage, dents or notch.
   b. Check rear wheel speed sensor connector or wire harness for scratches, breakage or damage.
   c. If any of the above conditions occurs, replace the rear wheel speed sensor with a new one.

Installation

Installation is in the reverse order of removal.

CAUTION

- When installing coupling bolts, be sure to tighten them to specified torque.