

BRAKE CONTROL SYSTEM

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GENERAL INFORMATION

Overview

Description



BC0001001

1 - ABS/ESP Control Module Assembly	2 - Steering Angle Sensor
3 - Rear Right Wheel Speed Sensor	4 - Rear Left Wheel Speed Sensor
5 - Front Left Wheel Speed Sensor	6 - Front Right Wheel Speed Sensor

Brake control system equipped on this model is ABS (Anti-lock Brake System) + EBD (Electronic Brake Force Distribution), ESP (Body Electronic Stability Program). With HDC (Hill Descent Control). It mainly consist of following components:

- ABS/ESP control module assembly (hydraulic control module and electronic control module).
- Wheel speed sensors (each wheel has one sensor).
- Steering angle sensor (ESP).
- Yaw rate sensor (built in ESP control module assembly).
- HBA is English abbreviation of brake assist system, is extended function of ESP system. In emergency situation, drivers always apply brake timely, but not apply maximum brake force generally, thus extending brake distance. When this occurs, brake assist system will operate: when driver depresses brake pedal quickly in emergency with insufficient depressing force, HBA will increase brake pressure to maximum quickly, thus brake distance will be shortened by anti-lock brake system quickly and effectively.

- HHC is English abbreviation of Hill-start Assist Control System. When vehicle is static, HHC will determine if vehicle is on slope via longitudinal acceleration sensor. When vehicle starts to up from resting state (uphill forward or reversing), HHC will enter operating state automatically. When starting off, system will keep previous brake pressure for 1 to 2 seconds after driver releases brake pedal, make sure vehicle is still stopped. Brake pressure will decrease when drive torque increases, thus avoiding an accident caused by vehicle sliding rearward during starting off on a slope.
- TCS is English abbreviation of Traction Control System. Drive wheel may slip when vehicle starts up or accelerates rapidly. Accident may occur due to direction out of control on smooth road surface such as ice and snow etc. TCS detects that drive wheel idling can be avoided when accelerating by applying brake to idling wheel or decreasing engine torque when driven wheel speed is lower than drive wheel (a feature of sliding).

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

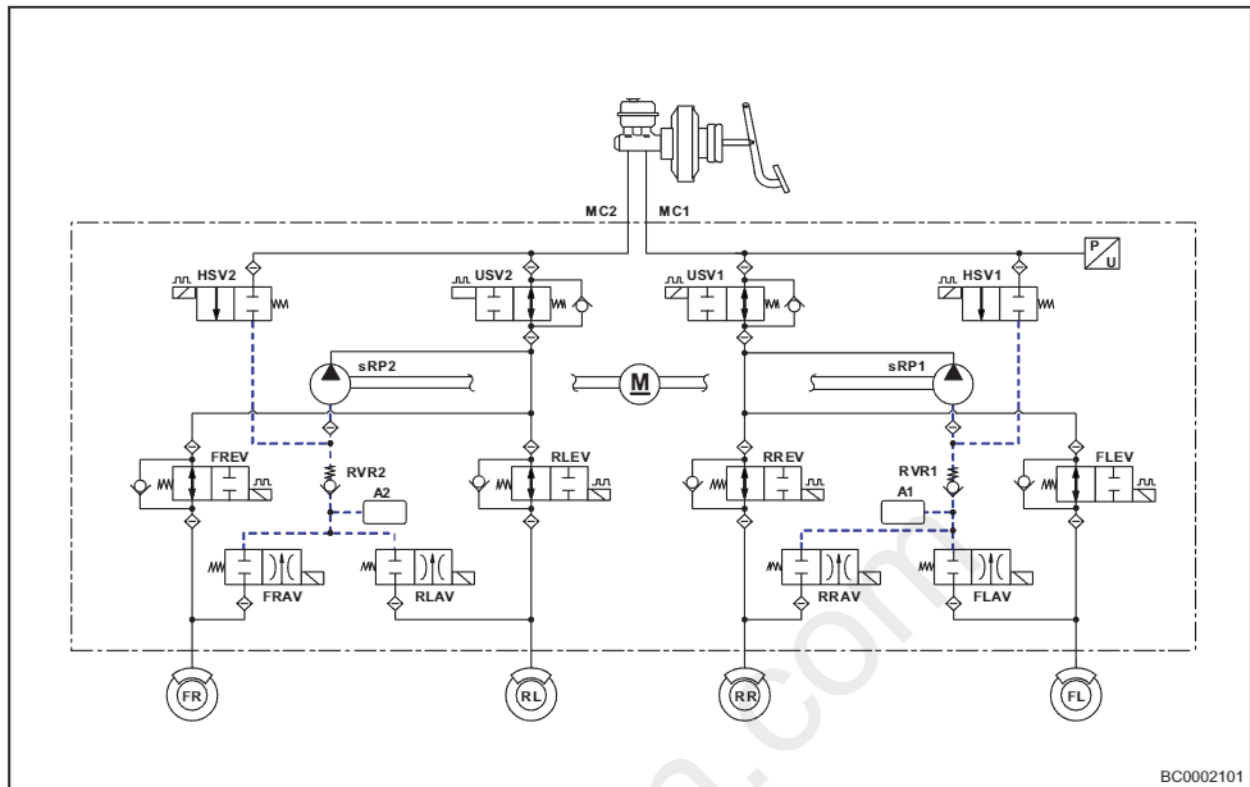
- Improving vehicle driving stability.
- Improving vehicle steering ability.
- Maintaining optimal brake pressure.
- Shortening brake distance efficiently.

ABS/ESP Operation

1. ABS Braking

- (a) If ABS system detects that wheels may be locked when applying brake, brake system will enter ABS braking mode. During braking, ABS/ESP control module outputs signal from each wheel speed sensor to each solenoid valve after analysis in order to adjust fluid pressure in each line, to prevent wheels from being locked.
- (b) There are some operating symptoms of ABS/ESP, but in fact they are normal.
 - If electronic control module is malfunctioning, fail-safe function will be activated, ABS/ESP system will not operate and ABS/ESP warning light will come on.
 - After vehicle is powered on or engine is started, short "buzz" sound can be heard. This is normal sound from ABS/ESP self-check.
 - Motor, solenoid valve, and return pump movement in hydraulic unit will cause noise when ABS/ESP is operating normally, but this is normal.
 - Brake pedal may vibrate slightly and mechanical noise can be heard during ABS/ESP operation, but this is normal.
 - Bumping sound between suspension and vehicle body can be caused by sudden brake.

2. ABS/ESP Control Mode



BC0002101

Description	Definition	Description	Definition
MC1	Brake Master Cylinder Circuit 1	FLEV	Front Left Wheel Inlet Valve
MC2	Brake Master Cylinder Circuit 2	FLAV	Front Left Wheel Outlet Valve
M	Motor	FREV	Front Right Wheel Inlet Valve
RP1	Return Pump 1	FRAV	Front Right Wheel Outlet Valve
RP2	Return Pump 2	FLEV	Rear Left Wheel Inlet Valve
A1	Accumulator 1	RLAV	Rear Left Wheel Outlet Valve
A2	Accumulator 2	RREV	Rear Right Wheel Inlet Valve
FL	Front Left Wheel	RRAV	Rear Right Wheel Outlet Valve
FR	Front Right Wheel	HSV1	High Pressure Switch Valve 1
RL	Rear Left Wheel	HSV2	High Pressure Switch Valve 2
RR	Rear Right Wheel	USV1	Circuit Control Valve 1
UP	Pressure Sensor	USV2	Circuit Control Valve 2

(a) General Brake Operating Condition

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

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	OFF	On
Normal Close Valve	OFF	OFF

(b) ABS/ESP Operating (Relief) Condition

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

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

(c) ABS/ESP Operating (Maintaining) Condition

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

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	OFF	On
Normal Close Valve	OFF	OFF

(d) ABS/ESP Operating (Boost) Condition

When relieving pressure condition, if brake fluid is drained excessively or friction coefficient between wheels and road increases, it needs to increase each wheel pressure. In this case, ABS/ESP control module transmits the command that increases wheel pressure to hydraulic control module. Normal open valve open oil circuit and normal open valve cut off oil circuit. Brake fluid stored in low pressure accumulator is supplied to each wheel cylinder through master cylinder and normal open valve to boost pressure it each wheel cylinder.

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Normal Open Valve	OFF	On
Normal Close Valve	OFF	OFF

ABS system operates circularly under relief, maintaining and boost pressure conditions until vehicle is completely stopped, so vehicle braking and steering performance will be guaranteed. ESP adjustment procedure is similar to ABS adjustment procedure. Brake fluid is supplied to wheel cylinders that need to increase pressure by pump, when stability control are realized and HSV valve opens and USV valve closes.

Hill Descent Control (HDC)

HDC system is a hill descent control system, which can help driver downhill in low speed and without brake intervention by driver actively.

No.	Function	Operation Method	Precautions
1	Function on	Press HDC switch button on auxiliary fascia console manually, functional indicator of meter and operation indicator of button turn on. (Green car icon light on meter turns on, switch indicator turns on).	Speed range of function on is between 0 and 60 km/h; HDC function is invalid when ESP system is malfunctioning.
2	Function off	Manually off: Press HDC switch button on auxiliary fascia console manually again, functional indicator of meter and operation indicator of button turn off. (Green car icon light on meter turns off, switch indicator turns off). Automatically off: When vehicle speed is higher than 60 km/h or system has a malfunction, function turns off automatically.	-
3	Functional roles	After function turns on, automatic gear vehicle can perform vehicle speed control within in 8 to 60 km/h, manual gear vehicle can perform vehicle speed control within in 14 to 60 km/h; If initial speed is lower than minimum or higher than maximum controlling speed, vehicle will perform control with minimum or maximum controlling speed acquiescently; Current controlling speed can be increased or decreased in given speed interval by depressing accelerator pedal or brake pedal.	This function applies brake actively via ESP increases pressure actively, at this time there is hydraulic operating sound, and it is normal.

Indicators and Warning Lights

No.	Function	Operation Method	Precautions
1	Green HDC indicator remains on	Function turns on normally	Function turns on normally
2	Green HDC indicator intermittently on	HDC function works	Function turns on normally
3	Yellow ESP light remains on	ESP is malfunctioning, HDC function can not turn on	It is suggested to check and repair by Chery dealer

Caution:

- When HDC system is operating, ABS will be activated automatically if wheel is locked.
- When HDC system is operating, brake force will be distributed to wheel with higher attachment coefficient if any wheel loses contact with ground.
- When HDC system is operating, for safety, driver must make preparations to control vehicle any time. Because system may be overheating or ESP system malfunction will occur except it is locked by button. At this time system will exit control automatically, driver needs to control speed timely instead of HDC.



Specifications

Torque Specifications

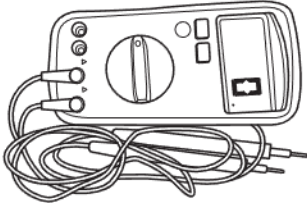
Description	Torque (N·m)
Wheel Mounting Bolt	110 ± 10
Fixing Nut Between ABS/ESP Control Module Assembly and Mounting Bracket	8 ± 2
Fixing Bolt Between ABS/ESP Control Module Assembly Mounting Bracket and Body	23 ± 3.5
Front Wheel Speed Sensor Fixing Bolt	9 ± 1.5
Rear Wheel Speed Sensor Fixing Bolt	9 ± 1.5
Coupling Bolt Between Brake Pipe and ABS/ESP Control Module Assembly	16 ± 2

Tool

Special Tool

Diagnostic Tester	 001
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General Tool

Digital Multimeter	 002
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Technical Parameters Table

Vehicle Model	Chery T18 (EPB) ESP9
Brake Fluid Type	DOT4
Number of Front Shaft Ring Gear Teeth	
Number of Rear Shaft Ring Gear Teeth	
Tire Type	215/60R17, 225/65R17, 235/55R18
Spare Tire Type	T125/80R17

DIAGNOSIS & TESTING

Diagnostic Contents

Problem Symptoms Table

Hint:

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

Symptom	Suspected Area
When turning ENGINE START STOP switch ON, ABS/ESP warning light does not come on	Fuse
	Wire harness or connector
	ABS/ESP control module assembly
	Instrument cluster
ABS/ESP warning light remains on	Fuse
	Wire harness or connector
	ABS/ESP control module assembly
	Instrument cluster
ABS/ESP operation is abnormal	Wheel speed sensor (damaged, improperly installed, foreign matter attached)
	Hub ring gear (damaged, improperly installed, foreign matter attached)
	Hub ring gear (damaged, improperly installed, foreign matter attached)
	Brake line (blocked or leaked)
	Wire harness or connector
	ABS/ESP control module assembly
Communication with ABS/ESP control module assembly cannot be performed	Fuse
	Wire harness or connector
	Diagnostic tester
	ABS/ESP control module assembly



Failure Analysis Table

ESP System Inspection Table

Technicians:

Owner's Name		Vehicle Model	
Contact Number		VIN	
Delivery Time		Driving Distance	

Malfunction Occurrence	Date of Occurrence	
	Frequency of Occurrence	☐ Always ☐ Sometimes
	Condition of Occurrence	
	Current Vehicle Speed	☐ When vehicle is stationary ☐ When vehicle drives to km/h
	Conventional Brake System	☐ Normal ☐ Abnormal (Symptoms:)
	Battery Voltage	
Malfunction Symptom	☐ EBD operates well ☐ Poor operation ☐ Does not operate	
	☐ ABS operates well ☐ ABS operates well ☐ ABS operates well	
	☐ ESP operates well ☐ ESP operates well ☐ ESP operates well (including TCS)	
	☐ EBD warning light	☐ Constants on ☐ Does not come on
	☐ ABS warning light	☐ Constants on ☐ Does not come on
	☐ ESP warning light	☐ Constants on ☐ Does not come on
DTC Check	Warranty status	☐ No DTC ☐ Current DTC (DTC code:) ☐ History DTC (DTC code:)
	After clearing DTCs and performing running test	☐ No DTC ☐ Current DTC (DTC code:) ☐ History DTC (DTC code:)

Diagnosis Procedure

Hint:

Use following procedures to troubleshoot the brake control system.

1 Vehicle brought to workshop

Result

Proceed to
Next

Next

2 Check battery voltage

Check if battery voltage is normal.

OK

Standard voltage: Not less than 12 V

Result

Proceed to
OK
NG

NG

Check and repair battery

OK

3 Customer problem analysis

Result

Proceed to
Next

Next

4 Check and clear DTCs

Result

Proceed to
Next

Next



- 5** Confirm and duplicate malfunction: accelerate vehicle to 40 km/h or above, simulate malfunction conditions and read DTCs again

Result

Proceed to
No DTC
Current DTC
History DTC

History DTC

- 6** Problem Repair (No DTC)

Result

Proceed to
Next

Next

Go to step 8

- 7** Troubleshoot according to Diagnostic Trouble Code (DTC) chart

Result

Proceed to
Next

Next

Go to step 8

- 8** Troubleshoot according to Problem Symptoms Table

Result

Proceed to
Next

Next

- 9** Conduct test and confirm malfunction has been repaired

Result

Proceed to
Next

Next

End

Problem Repair (No DTC)

If there is a problem in brake system, but no DTC is stored in ABS/ESP 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 ABS/ESP braking performance decreasing, drift, long braking distance etc.).

Hint:

- ABS/ESP no power supply or power supply abnormality will cause ABS/ESP 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 following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ENGINE START STOP switch to ON.
- Using diagnostic tester, record and clear DTCs stored in ABS/ESP control module assembly.
- Turn ENGINE START STOP switch to OFF and wait several seconds.
- Start engine, drive vehicle at 40 km/h or more and perform road test with diagnostic tester connected to Data Link Connector (DLC).
- Use diagnostic tester to read DTCs.
- If DTC is detected, malfunction indicated by DTC is current. Go to diagnosis procedure - Step 1.
- If no DTC is detected, malfunction indicated by DTC is intermittent Please refer to Intermittent DTC Troubleshooting.

Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- If possible, try to duplicate conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Check for broken, bent, protruded or corroded terminals.
- Inspect wheel speed sensors and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.



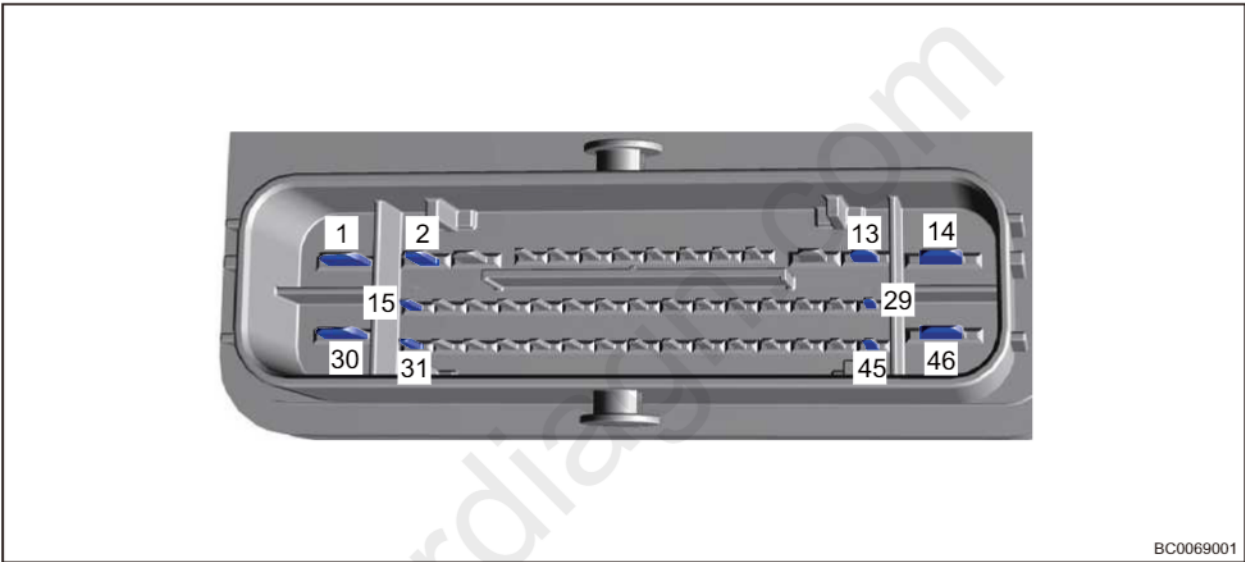
Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points 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. Check the ground points as follows:

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

ABS/ESP Control Module Assembly Terminal List (EPB)

Connector Terminal



BC0069001

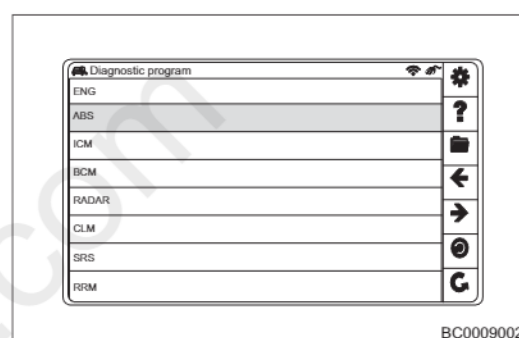
Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
1	Motor Power Supply End (Positive)	24	Wheel Speed Sensor Signal End (Front Left)
2	Right Motor Positive	25	CAN2 Low
3	Right Motor Negative	26	Wheel Speed Sensor Signal End (Front Right)
4	-	27	-
5	CAN1 High	28	-
6	-	29	-
7	Wheel Speed Sensor Signal Terminal (Front Left)	30	Valve Relay Power Supply Terminal
8	AVH Indicator	31	APB Switch (3)
9	Vehicle Speed Output	32	APB Switch (1)
10	HID Indicator	33	-
11	CAN2 High	34	Front Right Wheel Speed Output
12	Left Motor Negative	35	-
13	Left Motor Positive	36	ECU Power Supply Terminal (Ignition Power Supply Wire)
14	Motor Ground Terminal	37	Wheel Speed Sensor Signal Terminal (Rear Right)
15	APB Switch (4)	38	Brake Light Switch

Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
16	APB Switch (2)	39	Wheel Speed Sensor Power Supply Terminal (Rear Left)
17	HID Switch	40	-
18	APB Indicator	41	AVH Switch
19	CAN 1 Low	42	-
20	-	43	ESP OFF
21	Wheel Speed Sensor Power Supply Terminal (Front Right)	44	-
22	Wheel Speed Sensor Power Supply Terminal (Rear Right)	45	-
23	Wheel Speed Sensor Signal Terminal (Rear Left)	46	ECU Ground Terminal

Diagnostic Tester Menu Function and Date Flow

1. Diagnostic menu options

Tiggo 8/T18 → ABS/ESP



2. Reading Version Information function menu

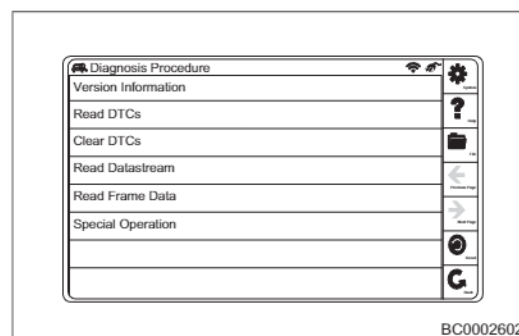
As shown in figure:

3. ABS (Antilock Brake System)/ESP (EPB) (Electronic Stability Program) function menu

As shown in figure:

Read Fault Code: Read the current and history DTCs

Clear Fault Memory: Clear the current and history DTCs

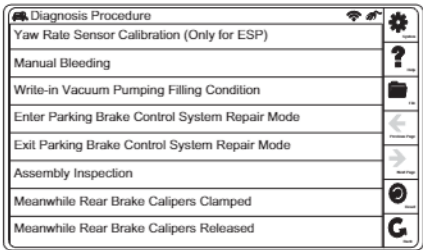


4. Reading data flow function

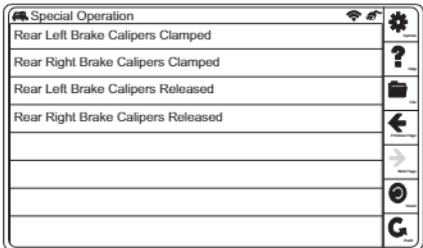
It is used to read the data flow related to controller, data is as follows:

- Hydraulic module filling status: After vacuum pumping/filling brake fluid operation completes, "Filling Is Completed and Succeeded" will be displayed. After vacuum pumping of brake fluid, service technicians should select "Write E&F Process Control Byte" menu and write it into this status.
- Off-line detection status: After vacuum pumping/filling completes, production line facility writes this status "Off-line Inspection finished successfully" into controller automatically.

- (c) Wheel speed: When vehicle is stopped, vehicle speed becomes 0; when vehicle is driven straight, speed of four wheels is basically the same.
Front left wheel speed: km/h;
Front right wheel speed: km/h;
Rear left wheel speed: km/h;
Rear right wheel speed: km/h;
 - (d) Solenoid valve and pump motor:
ESP valve status (only for ESP): Activated/Not activated;
Valve relay status: Activated/Not activated;
Pump motor status: Activated/Not activated;
When valve or motor operates, activated is displayed.
 - (e) Brake pedal switch:
Activated is displayed when brake pedal is depressed; Not activated is displayed when brake pedal is released.
 - (f) Steering angle sensor (only for ESP): Deg
With vehicle driven straight and steering wheel centered, read the angle value is within $\pm 5^\circ$.
 - (g) Acceleration:
Lateral acceleration (only for ESP): m/s^2
Longitudinal acceleration (only for ESP): m/s^2
Yaw rate (only for ESP): rad/s
If vehicle has acceleration, lateral acceleration, longitudinal acceleration and yaw rate will be displayed.
 - (h) Master cylinder pressure (only for ESP): bar
When brake pedal is depressed, pressure value not from brake master cylinder will be displayed.
 - (i) Power supply voltage: V, same as the battery voltage value.
 - (j) Vehicle speed: km/h.
 - (k) Configuration information: Software configuration bar code: 2-digit configuration code.
Software configuration information (only for ESP): Configuration code represents the vehicle configuration, such as engine, transmission and tires, etc.
5. Special Operation menu
There are 12 functions, the menu is as shown in illustration:



BC0002702



BC0002402

(a) Yaw rate sensor calibration (only for ESP)

When removing and installing / replacing ESP assembly or if DTC code for yaw rate sensor occurs, it is necessary to use this menu to perform yaw rate sensor calibration.

Calibration condition: Refer to Yaw Rate Sensor Calibration.

Caution:

- When replacing ESP, integrated sensor calibration must be performed. During calibration, ECU will write the measured new data into EEPROM for use by ESP. Ensure the above calibration conditions are right, because ESP cannot determine whether the above mentioned preconditions are proper or not. If offset is too large, system will reject the calibration. In the case, it is necessary to repair the vehicle.

(b) Manual bleeding

For all failed vacuum pumping/filling processes used in production line, or if service replacement part is dry-type ABS/ESP, manual bleeding must be performed in accordance with this procedure. To reach sufficient pressure in hydraulic regulator, brake pedal needs to be depressed repeatedly during whole draining process.

Operating method: Operates according to prompt on diagnostic tester. Note: Usually, service spare part is dry-type ABS/ESP assembly and this menu needs to be used.

(c) Write vacuum pumping and filling status

Use this menu to write E & F process control byte after bleeding operation is performed by service technicians or manual bleeding for production line is performed.

After service technicians performs bleeding, perform this menu to write "adding is finished successfully".

Description	Refer to
Enter into parking brake control system maintenance mode	Refer to ELECTRONIC PARKING BRAKE SYSTEM
Exit parking brake control system maintenance mode	
Assembly inspection	
Rear brake caliper clamps at the same time	
Rear wheel speed sensor fixing bolt	
Rear brake caliper releases at the same time	
Rear left brake caliper clamps	
Rear right brake caliper clamps	
Rear left brake caliper releases	
Rear right brake caliper releases	

Reading Data Flow Function of Steering Angle Sensor

6. Steering Angle status: Steering angle has calibrated

Datastream			
Datastream Name	Value	Unit	
Steering Angle Condition	Steering Angle Has Calibrated		?

BC0003202



Calibration

1. Calibrating Steering Angle Sensor

Prerequisites for sensor calibration:

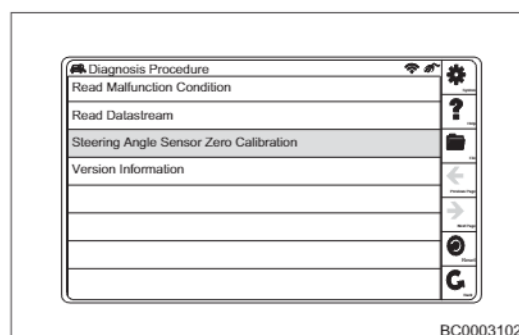
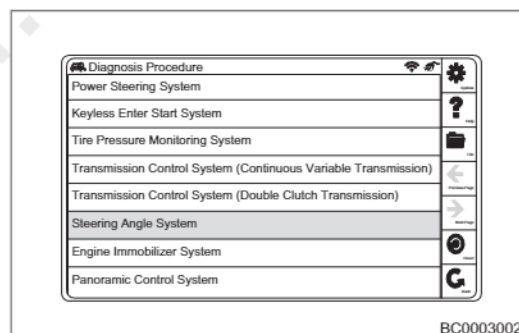
- Perform zero point calibration after steering angle sensor is installed.
- Calibration should be performed at front (four) wheel alignment station (make sure that the four wheel alignment parameters are correct).
- Before calibrating, straighten up the vehicle and wheels must be in straight lines along proceeding direction. Difference between the two angles should meet toe-in of four wheel alignment parameters value. Steering wheel must be adjusted to center.
- Before calibrate a calibrated sensor again, always calibrate it again to make it return uncalibrated state.

Caution:

Steering wheel must be centered in the actual calibration. If not, even correct data can cause wrong calibration when performing four wheel alignment. This problem may not be detected at factory. Long-term cumulative errors may be caused or over range phenomenon may occur when turn steering wheel fully during actual driving. Therefore, when performing four wheel alignment, the steering wheel should be centered.

Operation step:

1. Connect the diagnostic tester.
2. Turn ENGINE START STOP switch to ON.
3. Place the steering wheel to center position (straighten up the vehicle, wheels must be in straight lines along proceeding direction, and center steering wheel).
4. Power should not be cut during calibration.
5. Use diagnostic tester to enter T18 "SAM (Steering Angle Module)", then click "SAS Calibration".



6. Diagnostic tester will detect sensor malfunction and calibration automatically; if sensor has malfunction, it will exit calibration.
7. If sensor is not calibrated, click "OK" to perform calibration.
8. If sensor has been calibrated, "Recalibration" will be prompted. In this case, click "Recalibration" according to prompt on diagnostic tester and then click "Initial Calibration". If there is no response, it will exit calibration.
9. Diagnostic tester will prompt whether calibration is success or not.

Warning:

Never cut off the power during calibration. (Power applied to equipment and steering angle sensor must not be cut off during calibration. Also, diagnostic tester and sensor must be connected properly. Otherwise, calibration cannot be performed properly. If any of them are connected poorly, electrical overload of the products can be caused worst of all.)

Caution:

The steering angle sensor should to be calibrated again after four wheel alignment are performed.

2. Calibrating Yaw Rate Sensor

Prerequisites for sensor calibration:

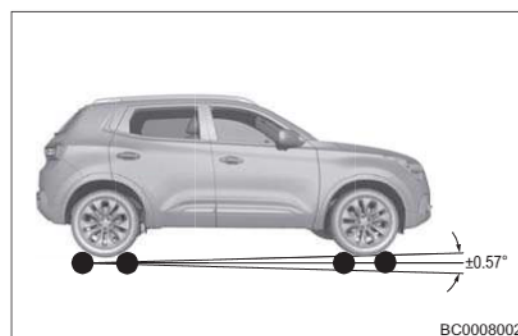
- Calibration can be performed on rotary hub tester or a flat area.
- Maximum tilting angle of tester must be within allowable range, that both are met $\pm 0.57^\circ$ ($\pm 1\%$) in two positive directions.
- The tester must be stationary.
- Turn steering wheel to straight ahead position.
- Tire pressure is proper.
- Vehicle load is normal.
- Less remaining fuel in fuel tank is allowable.
- Vehicle stands on its own wheels.
- Only driver sits in vehicle.
- Additional interference is prohibited, such as vibration due to opening or closing hood etc.

Caution:

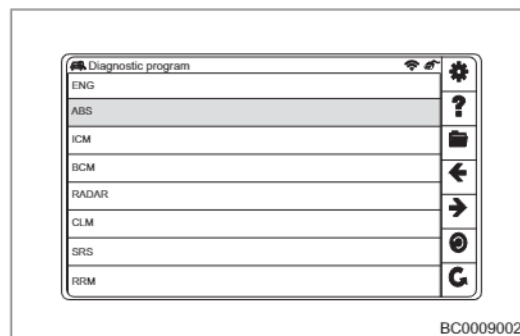
When replacing ABS/ESP module, integrated sensor must be calibrated. During calibration, ECU will write the measured new data into the EEPROM for use by ESP. Ensure the above calibration conditions are right, because ESP cannot determine whether the above mentioned preconditions are proper or not. If offset is too large, system will reject the calibration. In the case, it is necessary to repair the vehicle.

Operation step:

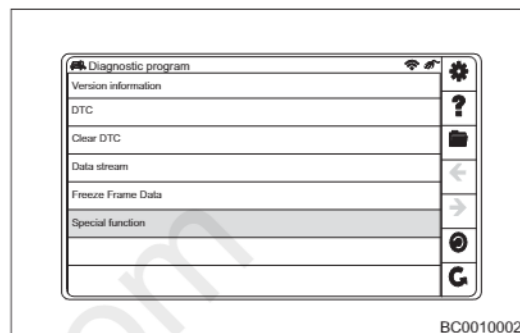
1. Connect the diagnostic tester.
2. Turn ENGINE START STOP switch to ON.
3. Make sure vehicle tilt angle is in range of $\pm 0.57^\circ$ ($\pm 1\%$).



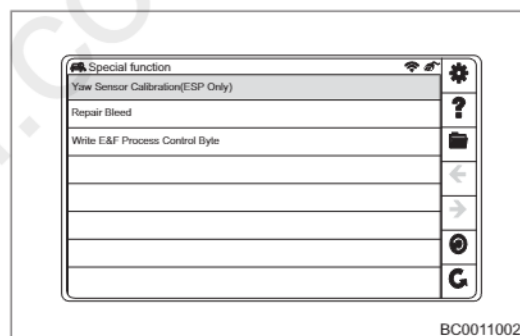
4. Enter menu "ABS".



5. Click "Special function".



6. Click "Yaw Sensor Calibration (ESP only)".



Warning:

Never cut off the power during calibration. (Power applied to equipment and steering angle sensor must not be cut off during calibration. Also, diagnostic tester and sensor must be connected properly. Otherwise, calibration cannot be performed properly. If any of them are connected poorly, electrical overload of the products can be caused worst of all.)

Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
C0001-04	TCS Control Channel Changeover Valve1 (ESP Only)
C0002-04	TCS Control Channel Changeover Valve2 (ESP Only)
C0003-04	TCS Control Channel High Pressure Switch Valve1 (ESP Only)
C0004-04	TCS Control Channel High Pressure Switch Valve2 (ESP Only)
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
C0020-04	ABS Pump Motor Control

DTC	DTC Definition
C0031-00	Left Front Wheel Speed Sensor Failures
C0031-09	Left Front Wheel Speed Sensor Failures
C0031-11	Left Front Wheel Speed Sensor Failures
C0031-12	Left Front Wheel Speed Sensor Failures
C0031-13	Left Front Wheel Speed Sensor Failures
C0031-29	Left Front Wheel Speed Sensor Failures
C0031-37	Left Front Wheel Speed Sensor Failures
C0034-00	Right Front Wheel Speed Sensor Failures
C0034-09	Right Front Wheel Speed Sensor Failures
C0034-11	Right Front Wheel Speed Sensor Failures
C0034-12	Right Front Wheel Speed Sensor Failures
C0034-13	Right Front Wheel Speed Sensor Failures
C0034-29	Right Front Wheel Speed Sensor Failures
C0034-37	Right Front Wheel Speed Sensor Failures
C0037-00	Right Front Wheel Speed Sensor Failures
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
C0037-37	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
C003A-37	Right Rear Wheel Speed Sensor
C0040-64	Brake Pedal Switch (ESP Only)
C0044-01	Brake Pressure Sensor (ESP Only)
C0044-28	Brake Pressure Sensor (ESP Only)
C0051-29	Steering Wheel Position Sensor (ESP Only)
C0051-54	Steering Wheel Position Sensor (ESP Only)
C0051-64	Steering Wheel Position Sensor (ESP Only)
C0061-64	Lateral Acceleration Sensor (ESP Only)
C0062-64	Longitudinal Acceleration Sensor (ESP Only)
C0063-01	Yaw Rate Sensor (ESP Only)
C0063-54	Yaw Rate Sensor (ESP Only)
C0063-64	Yaw Rate Sensor (ESP Only)
C006B-00	Stability System Active Too Long
C0089-04	TCS Disable Switch (ESP Only)
C1000-16	ECU Voltage Supply
C1000-17	ECU Voltage Supply
C1001-04	ECU
C1002-49	CAN Hardware Internal Electronic Failure
C1003-04	Valve Relay
C1004-00	General Valve
C1007-29	Reverse Gear Switch (ESP Only)



25-BRAKE CONTROL SYSTEM

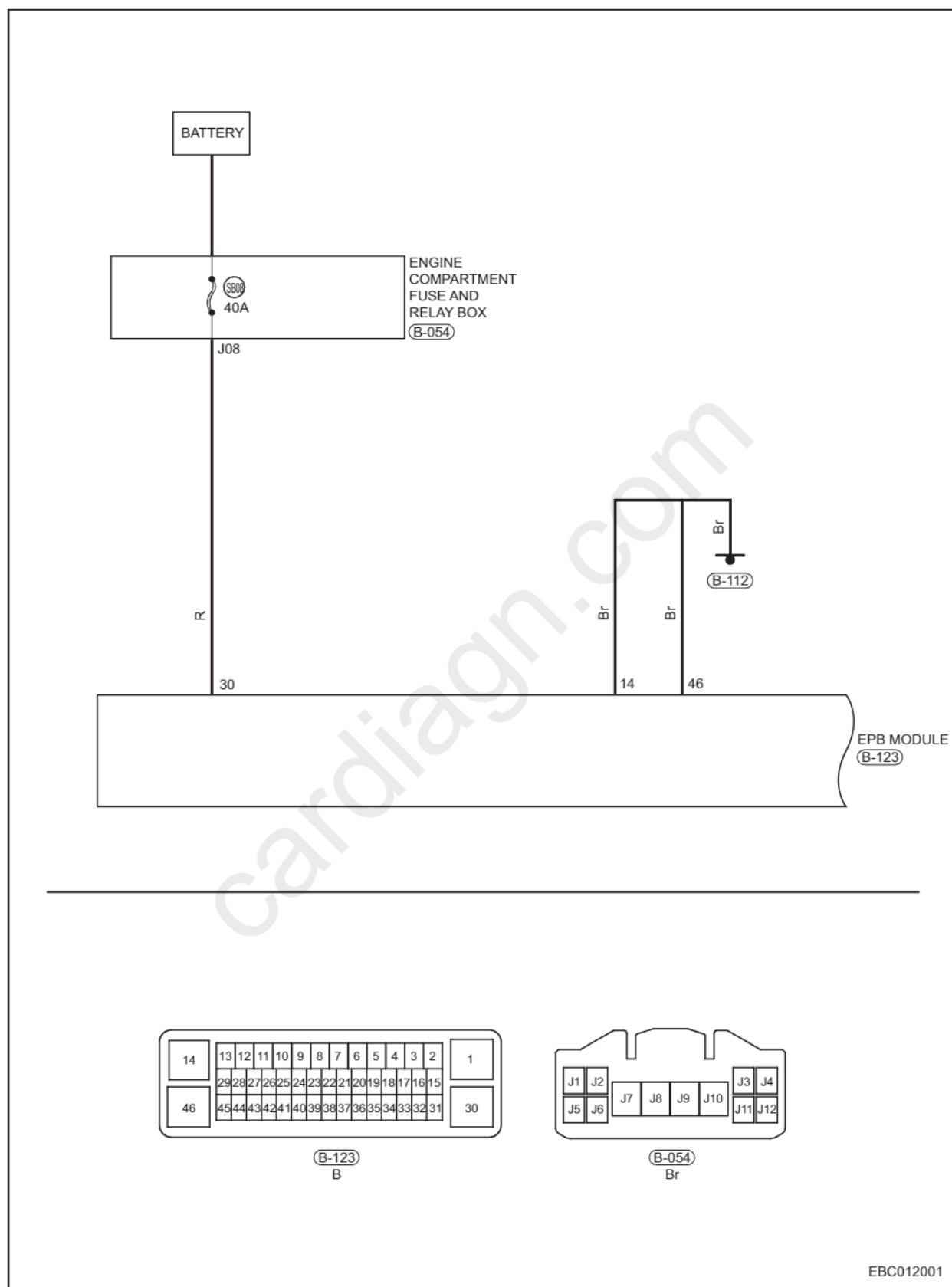
DTC	DTC Definition
C1007-29	Reverse Gear Switch (ESP Only)
C1008-00	General WSS
C1009-00	ECU Hard Ware Related
U0005-00	High Speed CAN Communication Bus (+) High
U0007-00	High Speed CAN Communication Bus (-) Low
U0073-88	Control Module Communication Bus Off
U0100-87	Lost Communication With Engine Control System Module
U0101-87	Lost Communication With Transmission Control Unit
U0126-87	Lost Communication With SAM
U0140-87	Lost Communication With Body Control Module
U0401-81	Invalid Data Received From Engine Control System Module
U0402-81	Invalid Data Received From Transmission Control Unit
U0422-81	Invalid Data Received From Body Control Module
U0428-81	Invalid Data Received From SAM
U1300-55	Software Configuration Error
C1800-93	Left Actuator
C1800-19	Left Actuator
C1800-74	Left Actuator
C1800-73	Left Actuator
C1800-72	Left Actuator
C1800-91	Left Actuator
C1800-92	Left Actuator
C1800-97	Left Actuator
C1801-93	Right Actuator
C1801-19	Right Actuator
C1801-74	Right Actuator
C1801-73	Right Actuator
C1801-72	Right Actuator
C1801-91	Right Actuator
C1801-92	Right Actuator
C1801-97	Right Actuator
C1802-44	PBC EEPROM Fault
C1802-17	Supply Voltage
C1802-16	Supply Voltage
C1803-95	Assembly Test
C1804-53	Maintenance Mode
C1805-94	Hydric Support Failed
C1806-01	Apb Button Line Failure
C1806-04	Apb Button Always Pushed Or Pulled
C1824-01	APBActL_ElectricalFailure
C1825-01	APBActR_ElectricalFailure
C1822-00	APBActL_Failure
C1821-00	APBActR_Failure
C1824-1E	APBActL_ShuntOnLineOrECU
C1825-1E	APBActR_ShuntOnLineOrECU
C1830-00	APBActR_CAT
C1833-00	APBActR_UnintendedRun
C1831-00	APBActR_CAT

DTC	DTC Definition
C186D-44	SupervisionFail
C1832-00	APBActL_UnintendedRun
C1806-16	APB Button Under Voltage
C1823-00	APB Motor Enable Line Violation
C1807-98	Disc Over Heat
C1826-01	APBActDriverGen_ElectricalFailure
C1808-12	APB left motor lines short circuit to Ubatt
C1808-11	APB left Motor lines short circuit to GND
C1808-13	APB Left Motor line interruption
C1815-12	APB right motor lines short circuit to Ubatt
C1815-11	APB right Motor lines short circuit to GND
C1815-13	APB right Motor line interruption
C0032-08	Wrong direction of Left Front Wheel Speed Sensor
C0035-08	Wrong direction of Left Rear Wheel Speed Sensor
C0038-08	Wrong direction of Right Front Wheel Speed Sensor
C003b-08	Wrong direction of Right Rear Wheel Speed Sensor
C1099-08	Wrong direction of Wheel Speed Sensor
C10AD-08	Vacuum Sensor General Fault
C156B-00	EPBASIC_GenericError
C1546-04	EPB_SupplyFault
U0104-04	Lost CommunicationWith ACC (ESP Only)
U0104-08	Invalid Data Received From ACC (ESP Only)
U1602-08	HAS_InvalidValue
U1600-08	APBSystemState_InvalidValue
U1605-0	ABANet_InvalidValue
U1606-08	ABPNet_InvalidValue
U1612-08	ACCNet_InvalidValue
U1607-08	AEBNet_InvalidValue
U1608-08	AWBNet_InvalidValue
U1615-08	AccPedalNet_InvalidValue
U1614-08	BTMNet_InvalidValue
U1610-08	CDDNet_InvalidValue
U1603-08	SCLutch_InvalidValue
U1619-08	EngineNet_InvalidValue
U1620-08	StartStopNet_InvalidValue
U1613-08	TCUNet_InvalidValue
U1609-08	VLCNet_InvalidValue
U1625-08	VacuumNet_InvalidValue



DTC	C0001-04	TCS Control Channel Changeover Valve1 (ESP Only)
DTC	C0002-04	TCS Control Channel Changeover Valve2 (ESP Only)
DTC	C0003-04	TCS Control Channel High Pressure Switch Valve1 (ESP Only)
DTC	C0004-04	TCS Control Channel High Pressure Switch Valve2 (ESP Only)
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

Circuit Diagram



25-BRAKE CONTROL SYSTEM

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0001-04	TCS Control Channel Changeover Valve1 (ESP Only)	This DTC occurs when any of following conditions is met: - Valve power supply malfunction (short to ground in power supply or ground circuit open). - Solenoid valve temperature is too high (overheat protection). - Short circuit in more than 5 solenoid valves (fuses). - Corresponsive solenoid valve activated with no feedback. - Solenoid valve itself malfunction.	- Valve set relay malfunction. - Poor connection of ABS/ESP control module ground circuit - Fuse malfunctions - Solenoid valve short or open circuit itself - Overheat protection triggered - ABS/ESP control module assembly is damaged
C0002-04	TCS Control Channel Changeover Valve2 (ESP Only)		
C0003-04	TCS Control Channel High Pressure Switch Valve1 (ESP Only)		
C0004-04	TCS Control Channel High Pressure Switch Valve2 (ESP Only)		
C0010-04	Left Front Inlet Control		
C0011-04	Left Front Inlet Control		
C0014-04	Right Front Inlet Control		
C0015-04	Right Front Inlet Control		
C0018-04	Left Rear Inlet Control		
C0019-04	Left Rear Inlet Control		
C001C-04	Right Rear Inlet Control		
C001D-04	Right Rear Inlet Control		
C001D-04	Right Rear Outlet Control		

Caution:

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

Procedure

1	Check for DTCs
----------	-----------------------

- Leave vehicle for 5 minutes, clear and read ABS/ESP control module assembly DTC again with diagnostic tester.
- Refer to "DTC confirmation procedure".
- Check if the same DTCs are still output.

Result

Proceed to
OK
NG

NG

Problem indicated by DTC is intermittent (system overheat protection)

OK

25

2	Check fuse
----------	-------------------

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Remove the fuse SB-08 (40 A) from engine compartment fuse and relay box.
- Check if fuse is blown.

Result

Proceed to
OK
NG

NG**Replace fuse SB-08****OK****3****Check wire harness and connector****Use circuit diagram as a guide to perform following procedures:**

- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the negative battery cable.
- (c) Disconnect the ABS/ESP control module connector B-123.
- (d) Check wire harness between terminal J08 of engine compartment fuse and relay box and terminal 30 of ABS/ESP control module assembly.
- (e) Check if wire harnesses are worn, pierced, pinched or partially broken.
- (f) Check for broken, bent, protruded or corroded terminals.
- (g) Check if related connector terminals are in good condition.

Result

Proceed to
OK
NG

NG**Repair or replace body wire harness and connector****OK****4****Check ABS/ESP control module power supply circuit (ABS/ESP control module assembly - power supply)**

- (a) Disconnect the negative battery cable.
- (b) Turn ENGINE START STOP switch to OFF.
- (c) Disconnect the ABS/ESP control module assembly connector B-123.



25-BRAKE CONTROL SYSTEM

- (d) Using a digital multimeter, measure the voltage between terminal 30 of ABS/ESP control module assembly and body ground to check if power supply circuit is normal according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (30) - Body ground (digital multimeter)	Always	Not less than 12 V
B-123 (30) - Body ground (test lamp 21 W)	Always	On

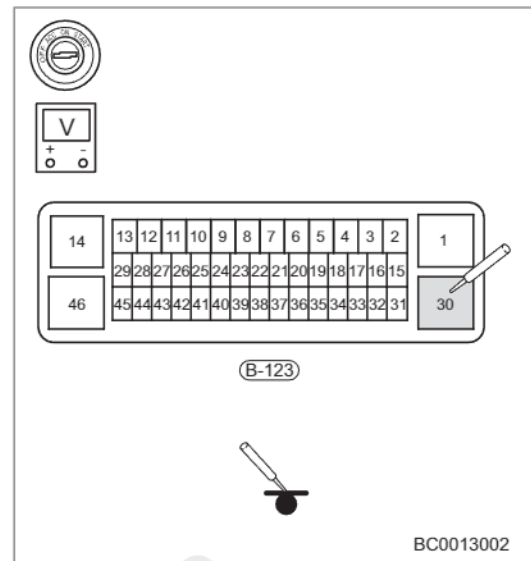
Result

Proceed to
OK
NG

NG

Repair or replace body wire harness and connector

OK



5

Check ABS/ESP control module ground circuit (ABS/ESP control module assembly - Body ground)

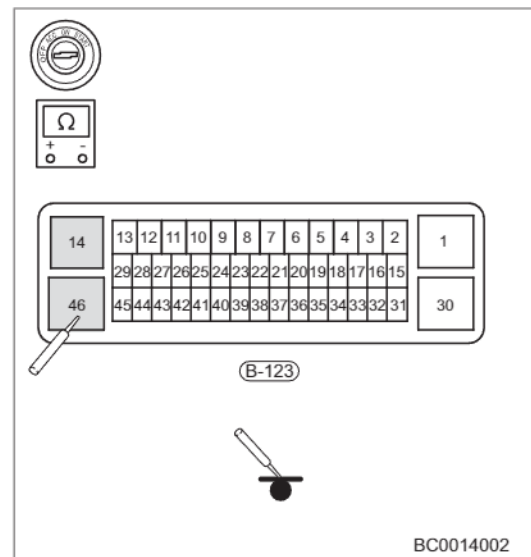
- (a) Turn ENGINE START STOP switch to OFF.
 (b) Disconnect the negative battery cable.
 (c) Disconnect the ABS/ESP control module assembly connector B-123.
 (d) Using a digital multimeter, check for continuity between terminals 14, 46 of ABS/ESP control module assembly and body ground to check if system ground circuit is normal.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (14) - Body ground	Always	$\leq 1 \Omega$
B-123 (46) - Body ground	Always	$\leq 1 \Omega$

Result

Proceed to
OK
NG



25

NG

Repair or replace body wire harness and connector

OK

6 Reconfirm DTCs

- (a) Use diagnostic tester to clear DTCs.
- (b) Start the engine.
- (c) Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- (d) Check if the same DTCs are still output.

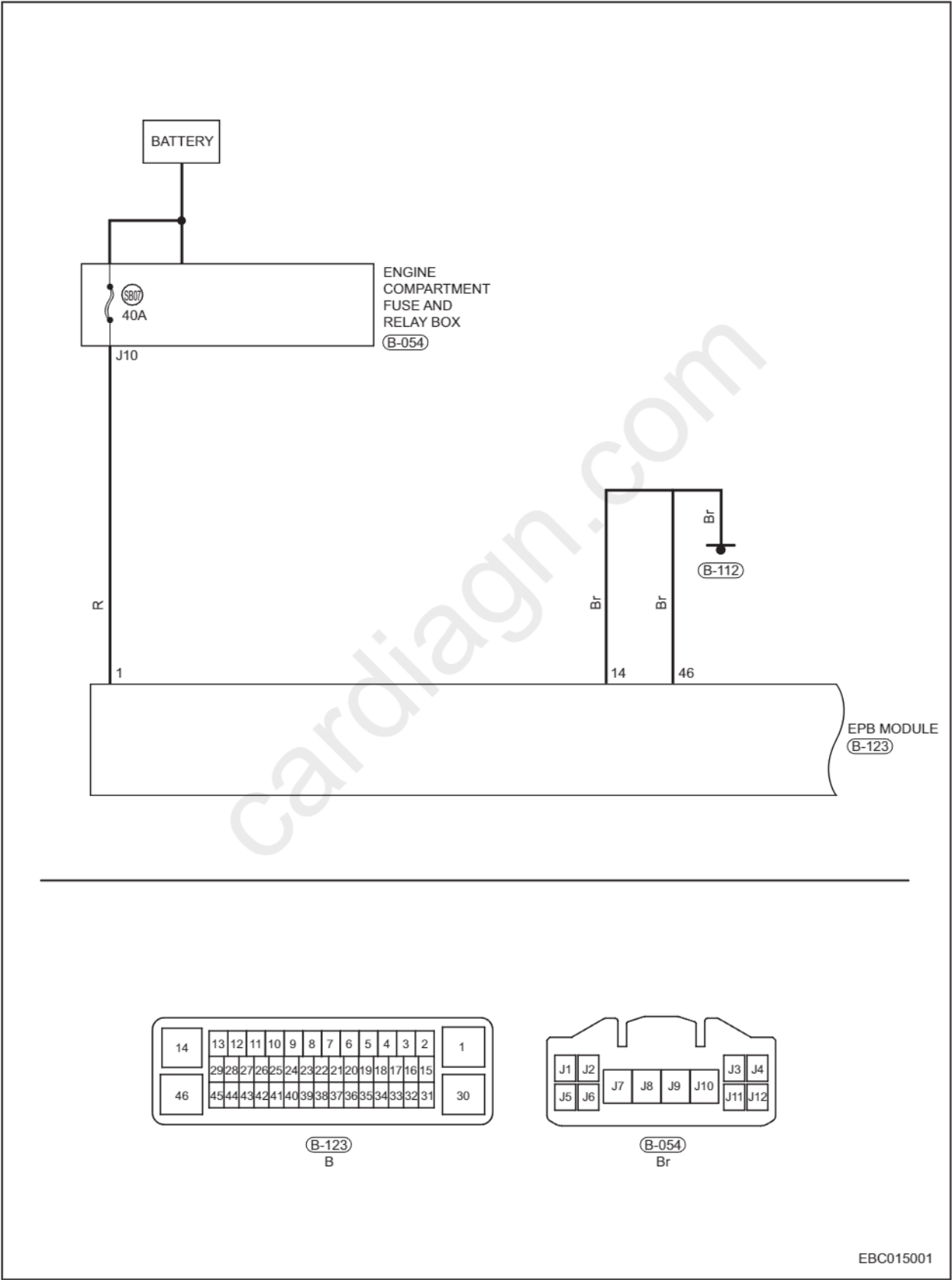
Result

Proceed to
OK
NG

OK**System operates normally****NG****Replace ABS/ESP control module assembly**

DTC	C0020-04	ABS Pump Motor Control
-----	----------	------------------------

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0020-04	ABS Pump Motor Control	This DTC occurs when any of following conditions is met: - Pump motor operates with overload, and temperature is too high (overload protection). - Return pump motor relay missing voltage signal is more than 60 ms - Return pump motor relay missing voltage signal is more than 2.5 s - Return pump motor relay stops operating when return pump voltage does not decrease.	- Fuse malfunctions - Pump motor has poor ground connection - System overheat protection - Abnormal pump motor power supply - Pump motor malfunction

Caution:

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

Procedure**1 Check for DTCs**

- Leave vehicle for 5 minutes, clear and read ABS/ESP control module assembly DTC again with diagnostic tester.
- Refer to "DTC confirmation procedure".
- Check if the same DTCs are still output.

Result

Proceed to
OK
NG

NG

Problem indicated by DTC is intermittent (system overheat protection)

OK**2 Check fuse**

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Remove the fuse SB-07 (40 A) from engine compartment fuse and relay box.
- Check if fuse is blown.

Result

Proceed to
OK
NG

NG

Replace fuse SB-07



OK

3 Check wire harness and connector**Use circuit diagram as a guide to perform following procedures:**

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module connector B-123.
- Check wire harness between terminal J10 of engine compartment fuse and relay box connector and terminal 1 of ABS/ESP control module assembly.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if related connector terminals are in good condition.

Result

Proceed to
OK
NG

NG

Repair or replace body wire harness and connector

OK

4 Check ABS/ESP control module power supply circuit (ABS/ESP control module assembly - power supply)

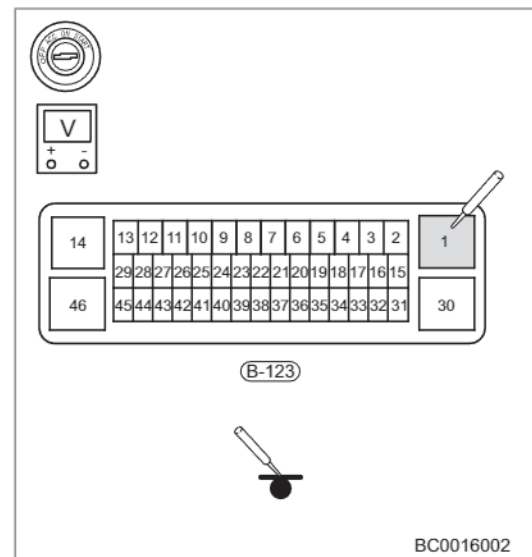
- Disconnect the negative battery cable.
- Turn ENGINE START STOP switch to OFF.
- Disconnect the ABS/ESP control module connector B-123.
- Using a digital multimeter, measure the voltage between terminal 1 of ABS/ESP control module assembly and body ground to check if power supply circuit is normal according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (1) - Body ground (digital multimeter)	Always	Not less than 12 V
B-123 (1) - Body ground (test lamp 21 W)	Always	On

Result

Proceed to
OK
NG



BC0016002

NG

Repair or replace body wire harness and connector

OK

5 Check ABS/ESP control module ground circuit (ABS/ESP control module assembly - Body ground)

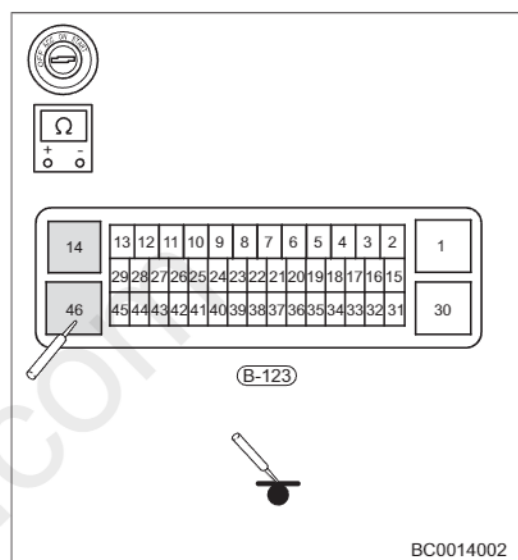
- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module connector B-123.
- Using a digital multimeter, check for continuity between terminals 14, 46 of ABS/ESP control module assembly and body ground to check if system ground circuit is normal.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (14) - Body ground	Always	$\leq 1 \Omega$
B-123 (46) - Body ground	Always	$\leq 1 \Omega$

Result

Proceed to
OK
NG



NG

Repair or replace body wire harness and connector

OK

6 Reconfirm DTCs

- Use diagnostic tester to clear DTCs.
- Start the engine.
- Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- Check if the same DTCs are still output.

Result

Proceed to
OK
NG

OK

System operates normally

NG

Replace ABS/ESP control module assembly

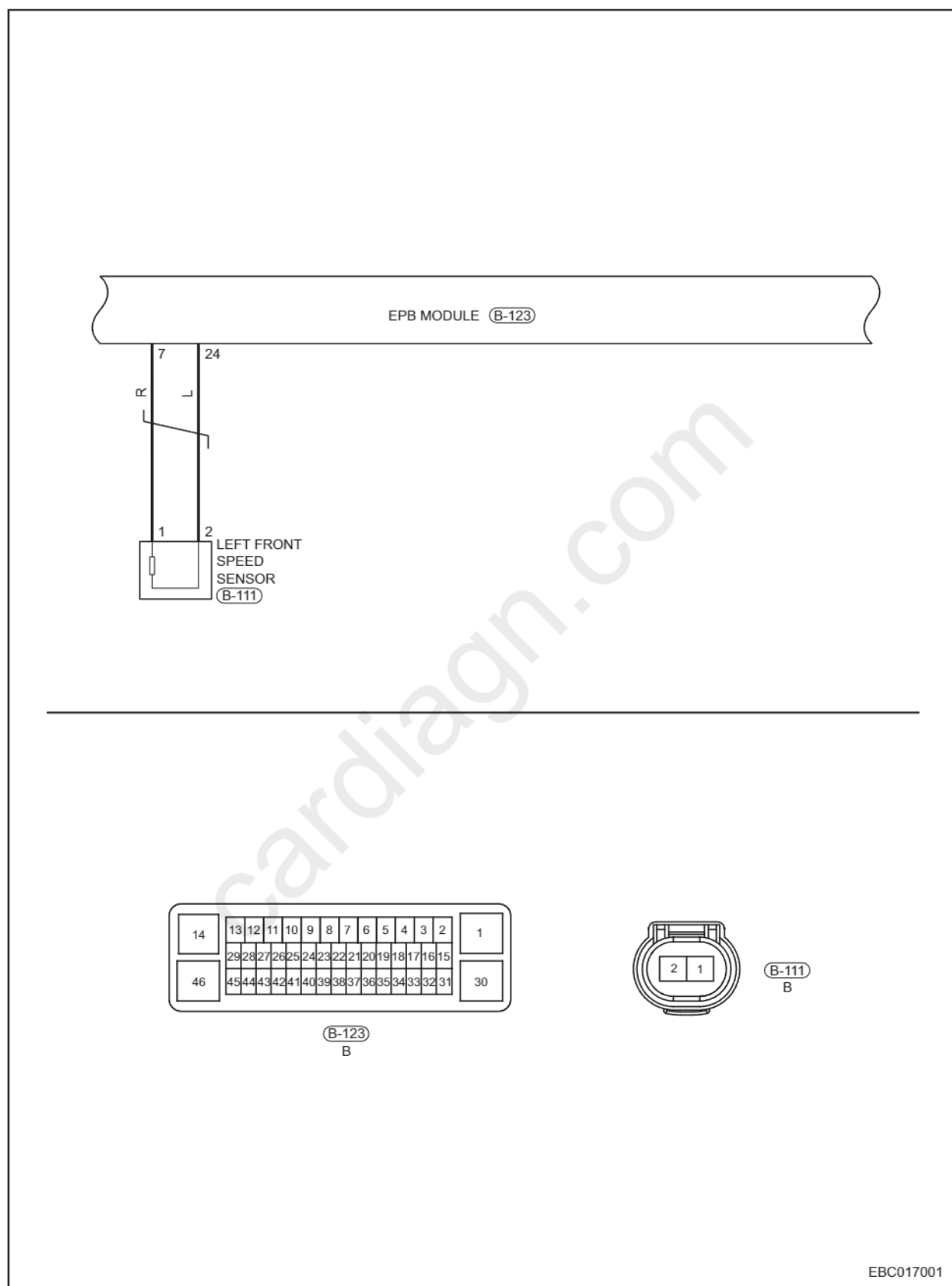
25



DTC	C0031-00	Left Front Wheel Speed Sensor Failures
DTC	C0031-09	Left Front Wheel Speed Sensor Failures
DTC	C0031-11	Left Front Wheel Speed Sensor Failures
DTC	C0031-12	Left Front Wheel Speed Sensor Failures
DTC	C0031-13	Left Front Wheel Speed Sensor Failures
DTC	C0031-29	Left Front Wheel Speed Sensor Failures
DTC	C0031-37	Left Front Wheel Speed Sensor Failures

cardiagn.com

Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0031-00	Left Front Wheel Speed Sensor Failures	This DTC occurs when any of following conditions is met: • ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to ground. • Wheel speed sensor line is open. • ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to power supply. • ABS/ESP control module assembly detects that wheel speed sensor power supply wire is short to ground. • Wheel speed sensor signal is invalid.	• Wheel speed sensor signal wire is connecting with power supply wire in reverse • 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 connector damages • 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, teeth missing, dirty, demagnetized, off center • Clearance between sensor and ring gear is excessive • Number of ring gear teeth is wrong • Tire size is not as specified • ABS/ESP control module assembly is damaged
C0031-09	Left Front Wheel Speed Sensor Failures		
C0031-11	Left Front Wheel Speed Sensor Failures		
C0031-12	Left Front Wheel Speed Sensor Failures		
C0031-13	Left Front Wheel Speed Sensor Failures		
C0031-29	Left Front Wheel Speed Sensor Failures		
C0031-37	Left Front Wheel Speed Sensor Failures		

Caution:

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

Procedure

1	Check front left wheel speed sensor wire harness and connector
----------	---

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the front left wheel speed sensor connector B-111.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.

Result

Proceed to
OK
NG

NG

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

OK

2	Check installation of front left wheel speed sensor
----------	--

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Check front left wheel speed sensor mounting bolt for looseness.
- Check if excessive clearance exists between installation position of front left wheel speed sensor and front steering knuckle.
- Check installation position of front left wheel speed sensor for dirt.

Result

Proceed to
OK
NG

NG

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

OK**3 Check front left wheel speed sensor**

- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Drive vehicle straight ahead, and read datastream of front left wheel speed sensor with diagnostic tester.
- Check if data change of front left wheel speed sensor matches that of other wheel speed sensors.

Result

Proceed to
OK
NG

NG

Replace left front wheel speed sensor

OK**4 Check front left drive shaft ring gear upper**

- Check front left drive shaft ring gear upper.
- Check front left drive shaft ring gear upper for foreign matter, missing teeth or damage.
- Check front left drive shaft ring gear upper for secure installation.

Result

Proceed to
OK
NG

NG

Replace outer joint assembly

OK**5 Check wire harness and connector (Left front wheel speed sensor - ABS/ESP control module assembly)**

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module assembly connector B-123.
- Disconnect the front left wheel speed sensor connector B-111.

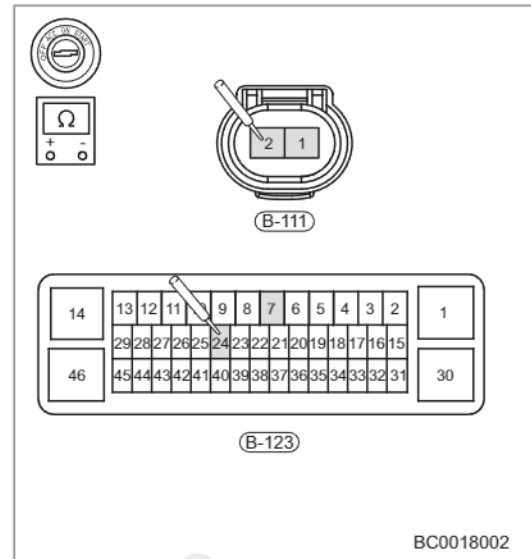


25-BRAKE CONTROL SYSTEM

- (e) Using a digital multimeter, check for continuity between the terminals of connector B-123 and connector B-111 to check if there is an open in the wire harness and connector according to the table below.

OK

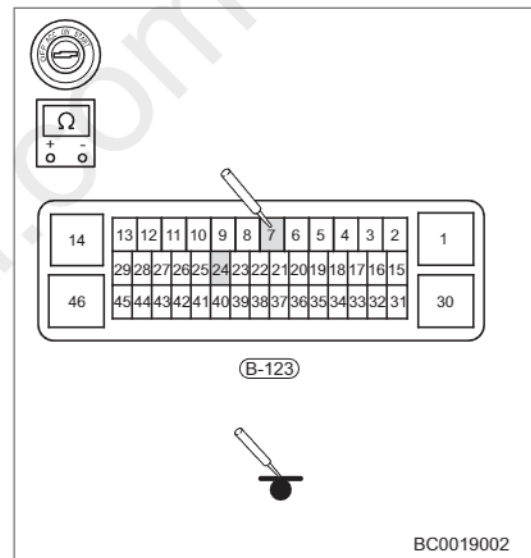
Multimeter Connection	Condition	Specified Condition
B-123 (24) - B-111 (2)	Always	$\leq 1 \Omega$
B-123 (7) - B-111 (1)	Always	$\leq 1 \Omega$
B-123 (24) - B-111 (1)	Always	∞
B-123 (7) - B-111 (2)	Always	∞



- (f) Using a digital multimeter, check for continuity between connector B-123 and body ground to check if front left wheel speed sensor is short to ground.

OK

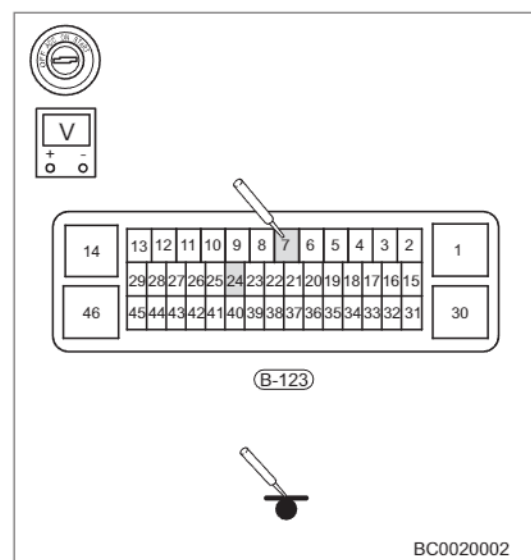
Multimeter Connection	Condition	Specified Condition
B-123 (7) - Body ground	Always	∞
B-123 (24) - Body ground	Always	∞



- (g) Disconnect the negative battery cable.
 (h) Turn ENGINE START STOP switch to ON.
 (i) Using a digital multimeter, measure voltage between connector B-123 and body ground to check if front left wheel speed sensor is short to power supply according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (7) - Body ground	ENGINE START STOP switch ON	Approx. 0 V
B-123 (24) - Body ground	ENGINE START STOP switch ON	Approx. 0 V



25

Result

Proceed to
OK
NG

NG

Repair or replace wire harness and connector between front left wheel speed sensor and ABS/ESP control module assembly

OK

6**Reconfirm DTCs**

- (a) Use diagnostic tester to clear DTCs.
- (b) Start the engine.
- (c) Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- (d) Check if the same DTCs are still output.

Result

Proceed to
OK
NG

OK

System operates normally

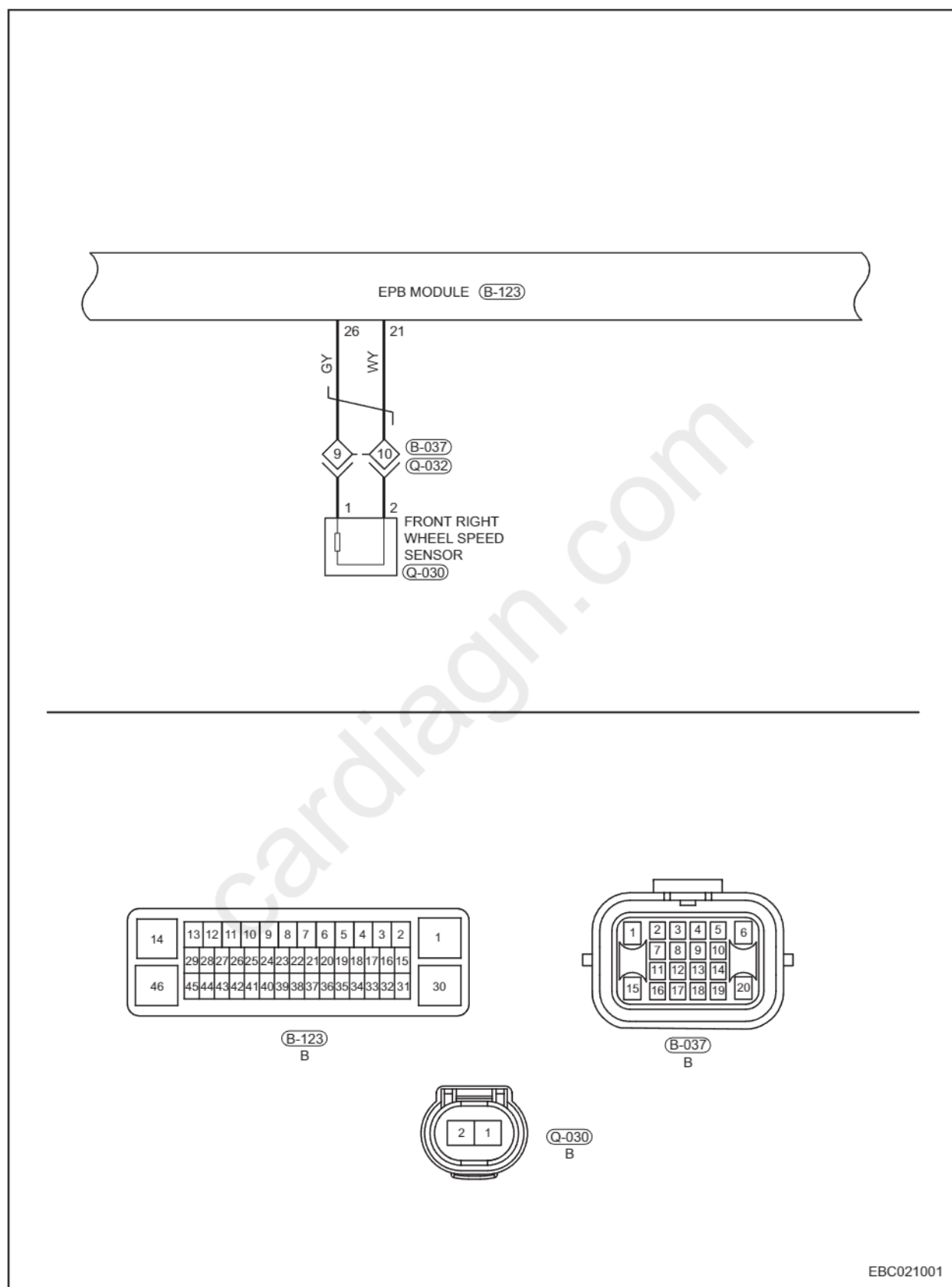
NG

Replace ABS/ESP control module assembly

DTC	C0034-00	Right Front Wheel Speed Sensor Failures
DTC	C0034-09	Right Front Wheel Speed Sensor Failures
DTC	C0034-11	Right Front Wheel Speed Sensor Failures
DTC	C0034-12	Right Front Wheel Speed Sensor Failures
DTC	C0034-13	Right Front Wheel Speed Sensor Failures
DTC	C0034-29	Right Front Wheel Speed Sensor Failures
DTC	C0034-37	Right Front Wheel Speed Sensor Failures

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Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0034-00	Right Front Wheel Speed Sensor Failures	This DTC occurs when any of following conditions is met: • ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to ground. • Wheel speed sensor line is open. • ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to power supply. • ABS/ESP control module assembly detects that wheel speed sensor power supply wire is short to ground. • Wheel speed sensor signal is invalid.	• Wheel speed sensor signal wire is connecting with power supply wire in reverse • 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 connector damages • 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, teeth missing, dirty, demagnetized, off center • Clearance between sensor and ring gear is excessive • Number of ring gear teeth is wrong. • Tire size is not as specified • ABS/ESP control module assembly is damaged
C0034-09	Right Front Wheel Speed Sensor Failures		
C0034-11	Right Front Wheel Speed Sensor Failures		
C0034-12	Right Front Wheel Speed Sensor Failures		
C0034-13	Right Front Wheel Speed Sensor Failures		
C0034-29	Right Front Wheel Speed Sensor Failures		
C0034-37	Right Front Wheel Speed Sensor Failures		

Caution:

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

Procedure

1 Check front right wheel speed sensor wire harness and connector

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the front right wheel speed sensor connector Q-030.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.

Result

Proceed to
OK
NG

NG

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

OK

2 Check installation of front right wheel speed sensor

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Check front right wheel speed sensor mounting bolt for looseness.
- Check if excessive clearance exists between installation position of front right wheel speed sensor and front steering knuckle.
- Check installation position of right wheel speed sensor for dirt.

Result

Proceed to
OK
NG

NG

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

OK**3 Check front right wheel speed sensor**

- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Drive vehicle straight ahead, and read datastream of front right wheel speed sensor with diagnostic tester.
- Check if data change of front right wheel speed sensor matches that of other wheel speed sensors.

Result

Proceed to
OK
NG

NG

Replace right front wheel speed sensor

OK**4 Check front right drive shaft ring gear upper**

- Check front right drive shaft ring gear upper.
- Check front right drive shaft ring gear upper for foreign matter, missing teeth or damage.
- Check front right drive shaft upper ring gear for secure installation.

Result

Proceed to
OK
NG

NG

Replace outer joint assembly

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

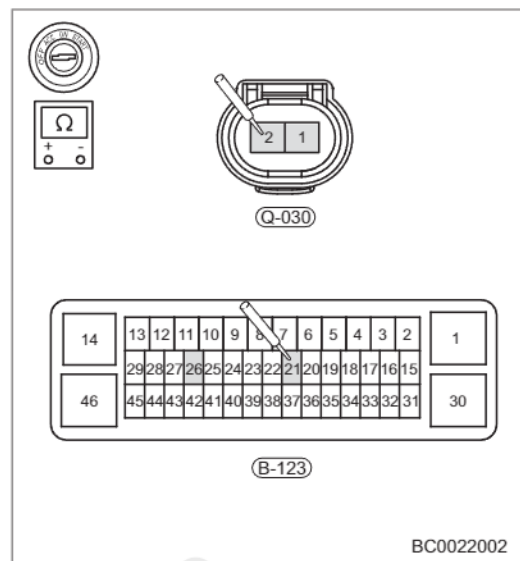
- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module assembly connector B-123.
- Disconnect the front right wheel speed sensor connector Q-030.



- (e) Using a digital multimeter, check for continuity between terminals of connector B-123 and connector Q-030 to check if there is an open in the wire harness and connector according to the table below.

OK

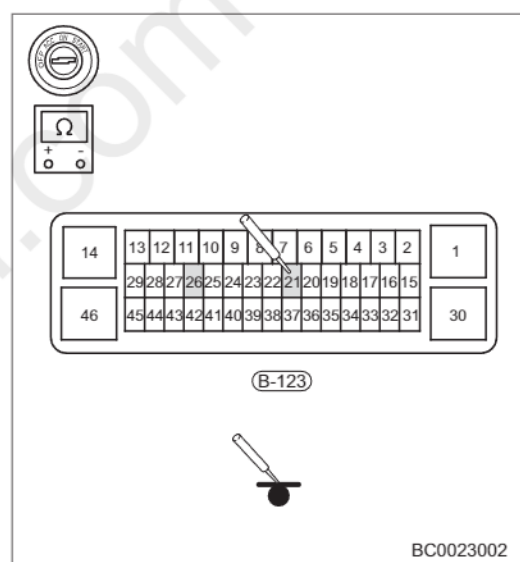
Multimeter Connection	Condition	Specified Condition
B-123 (21) - Q-030 (2)	Always	$\leq 1 \Omega$
B-123 (26) - Q-030 (1)	Always	$\leq 1 \Omega$
B-123 (21) - Q-030 (1)	Always	∞
B-123 (26) - Q-030 (2)	Always	∞



- (f) Using a digital multimeter, check for continuity between connector B-123 and body ground to check if front right wheel speed sensor is short to ground according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (21) - Body ground	Always	∞
B-123 (26) - Body ground	Always	∞



- (g) Disconnect the negative battery cable.
(h) Turn ENGINE START STOP switch to ON.
(i) Using a digital multimeter, measure voltage between connector B-123 and body ground to check if front right wheel speed sensor is short to power supply according to the table below.

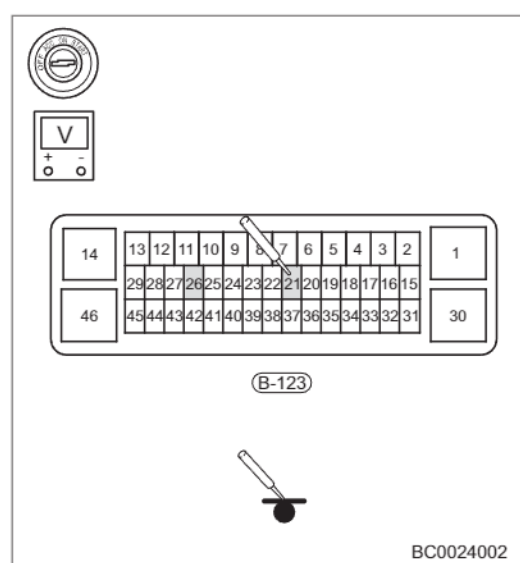
OK

Multimeter Connection	Condition	Specified Condition
B-123 (21) - Body ground	ENGINE START STOP switch ON	Approx. 0 V
B-123 (26) - Body ground	ENGINE START STOP switch ON	Approx. 0 V

25

Result

Proceed to
OK
NG



NG

Repair or replace wire harness and connector between front right wheel speed sensor and ABS/ESP control module assembly

OK

6**Reconfirm DTCs**

- (a) Use diagnostic tester to clear DTCs.
- (b) Start the engine.
- (c) Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- (d) Check if the same DTCs are still output.

Result

Proceed to
OK
NG

OK

System operates normally

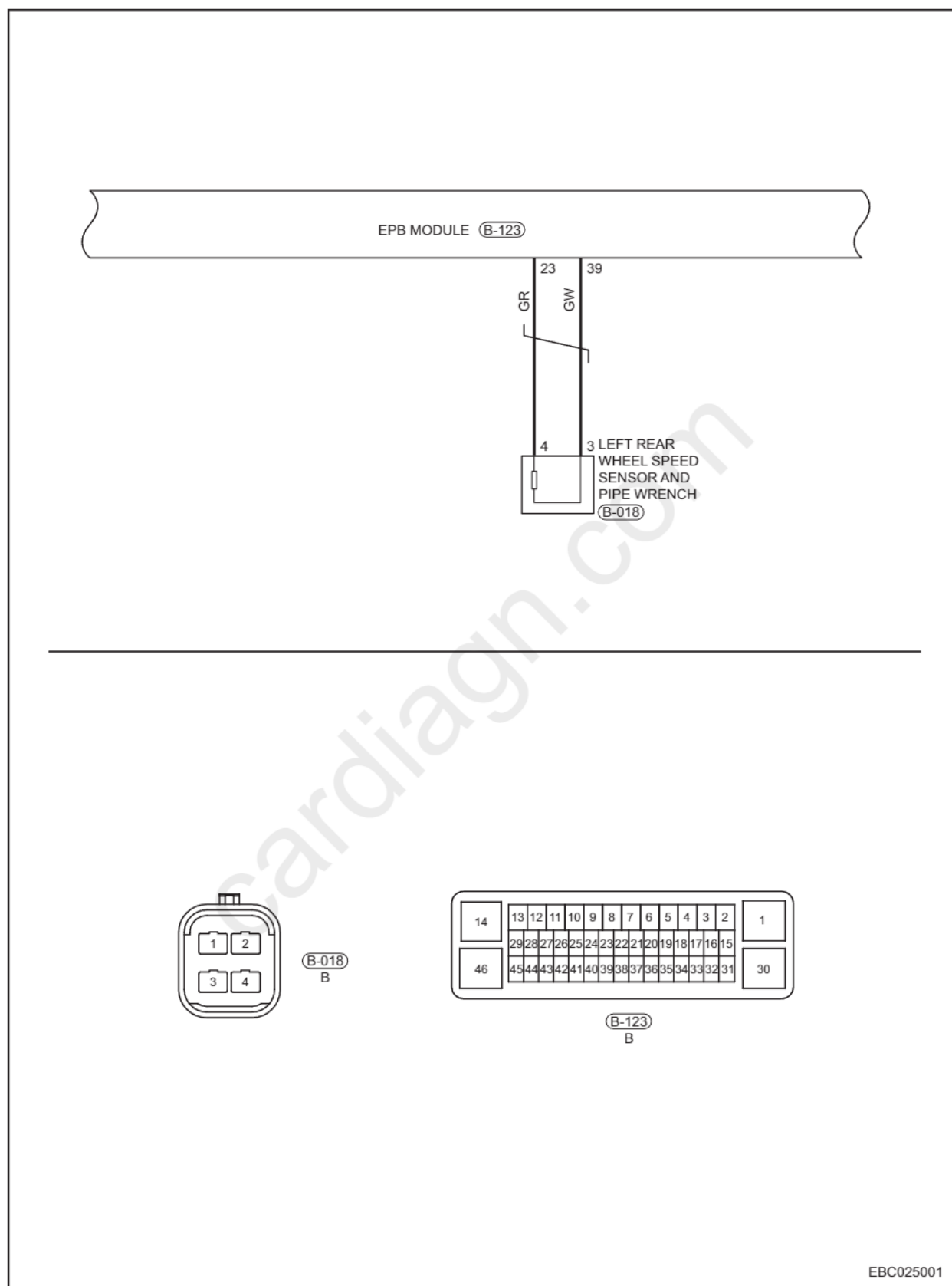
NG

Replace ABS/ESP control module assembly

DTC	C0037-00	Right Front Wheel Speed Sensor Failures
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
DTC	C0037-37	Left Rear Wheel Speed Sensor

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Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0034-00	Right Front Wheel Speed Sensor Failures	This DTC occurs when any of following conditions is met: • ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to ground. • Wheel speed sensor line is open. • ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to power supply. • ABS/ESP control module assembly detects that wheel speed sensor power supply wire is short to ground. • Wheel speed sensor signal is invalid.	• Wheel speed sensor signal wire is connecting with power supply wire in reverse • 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 connector damages • 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, teeth missing, dirty, demagnetized, off center • Clearance between sensor and ring gear is excessive • Number of ring gear teeth is wrong • Tire size is not as specified • ABS/ESP control module assembly is damaged
C0034-09	Left Rear Wheel Speed Sensor		
C0034-11	Left Rear Wheel Speed Sensor		
C0034-12	Left Rear Wheel Speed Sensor		
C0034-13	Left Rear Wheel Speed Sensor		
C0034-29	Left Rear Wheel Speed Sensor		
C0034-37	Left Rear Wheel Speed Sensor		

Caution:

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

Procedure

1	Check rear left wheel speed sensor wire harness and connector
----------	--

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the rear left wheel speed sensor connector B-018.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.

Result

Proceed to
OK
NG

NG

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

OK

2	Check installation of rear left wheel speed sensor
----------	---

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Check rear left wheel speed sensor mounting bolt for looseness.
- Check if excessive clearance exists between installation position of rear left wheel speed sensor and front steering knuckle.
- Check installation position of rear left wheel speed sensor for dirt.

Result

Proceed to
OK
NG

NG

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

OK**3 Check rear left wheel speed sensor**

- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Drive vehicle straight ahead, and read datastream of rear left wheel speed sensor with diagnostic tester.
- Check if data change of rear left wheel speed sensor matches that of other wheel speed sensors.

Result

Proceed to
OK
NG

NG

Replace left rear wheel speed sensor

OK**4 Check rear left hub ring gear**

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

Result

Proceed to
OK
NG

NG

Replace rear left hub bearing assembly

OK**5 Check wire harness and connector (Left rear wheel speed sensor - ABS/ESP control module assembly)**

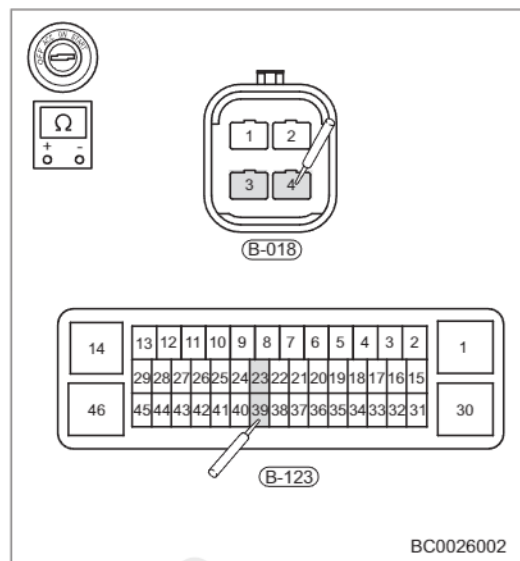
- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module assembly connector B-123.
- Disconnect the rear left wheel speed sensor connector B-018.



- (e) Using a digital multimeter, check for continuity between the terminals of connector B-123 and connector B-018 to check if there is an open in the wire harness and connector according to the table below.

OK

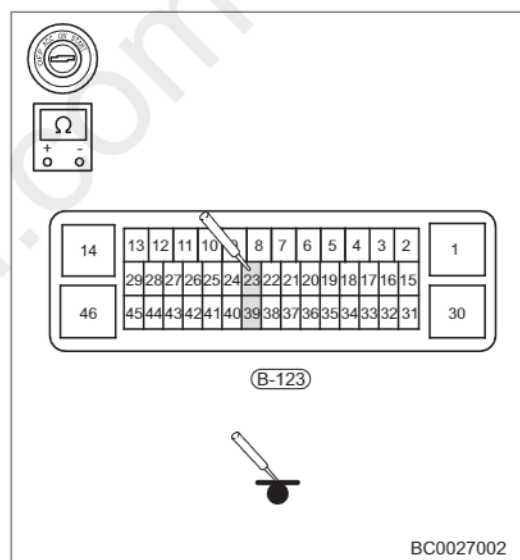
Multimeter Connection	Condition	Specified Condition
B-123 (39) - B-018 (3)	Always	$\leq 1 \Omega$
B-123 (23) - B-018 (4)	Always	$\leq 1 \Omega$
B-123 (39) - B-018 (4)	Always	∞
B-123 (23) - B-018 (3)	Always	∞



- (f) Using a digital multimeter, check for continuity between connector B-123 and body ground to check if rear left wheel speed sensor is short to ground according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (23) - Body ground	Always	∞
B-123 (39) - Body ground	Always	∞



- (g) Disconnect the negative battery cable.
(h) Turn ENGINE START STOP switch to ON.
(i) Using a digital multimeter, measure voltage between connector B-123 and body ground to check if rear left wheel speed sensor is short to power supply according to the table below.

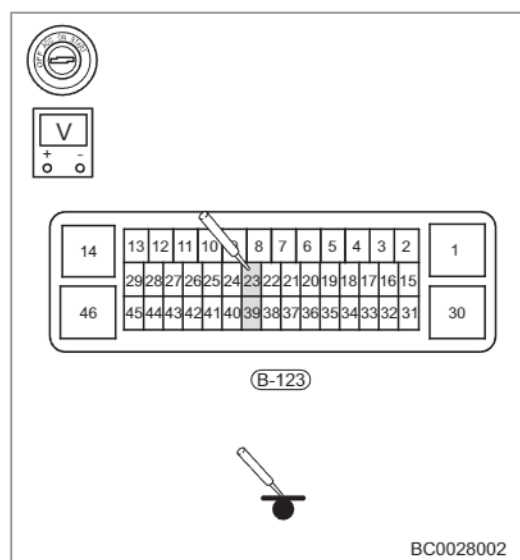
OK

Multimeter Connection	Condition	Specified Condition
B-123 (23) - Body ground	ENGINE START STOP switch ON	Approx. 0 V
B-123 (39) - Body ground	ENGINE START STOP switch ON	Approx. 0 V

25

Result

Proceed to
OK
NG



NG

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

OK

6**Reconfirm DTCs**

- (a) Use diagnostic tester to clear DTCs.
- (b) Start the engine.
- (c) Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- (d) Check if the same DTCs are still output.

Result

Proceed to
OK
NG

OK

System operates normally

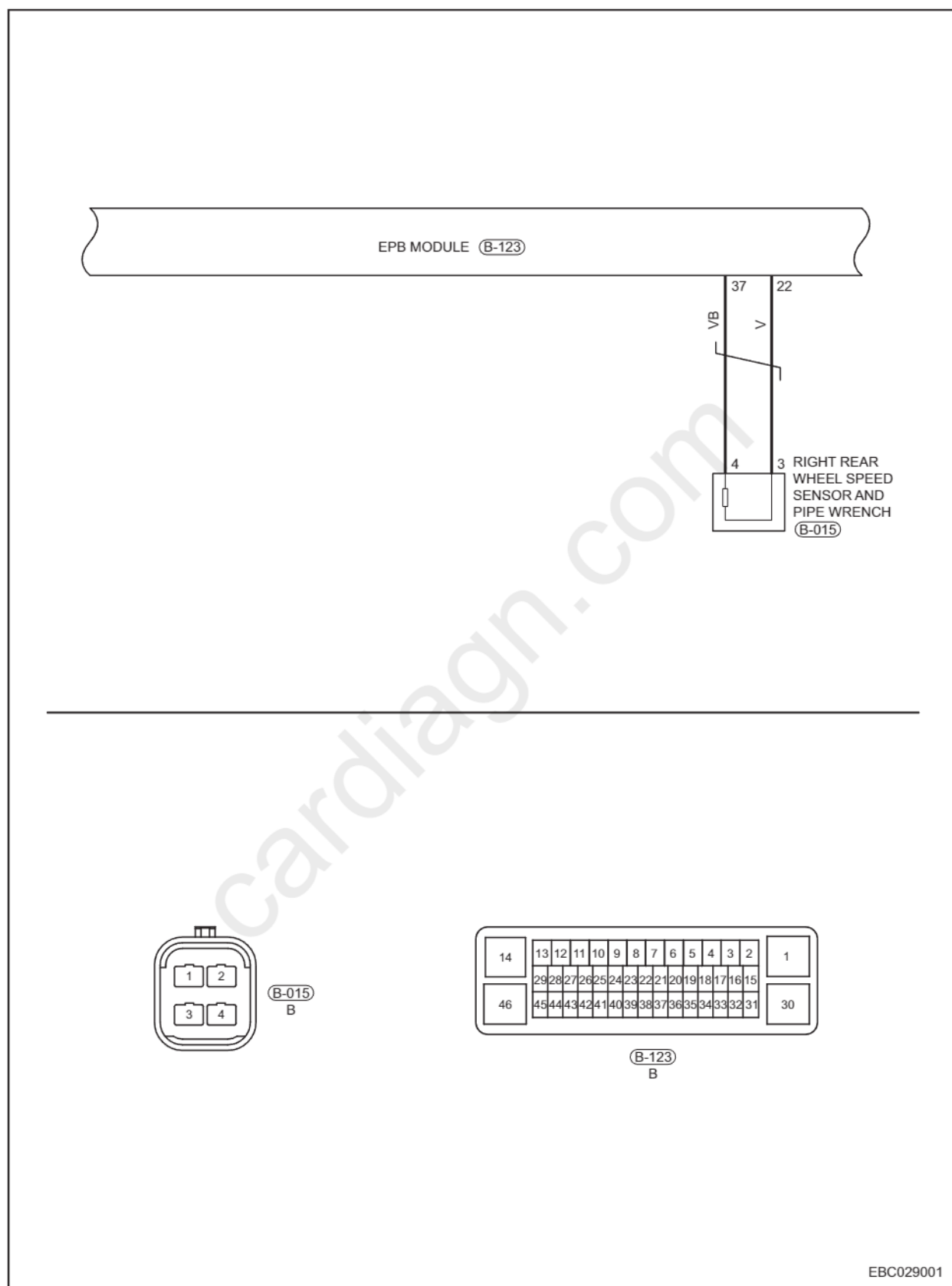
NG

Replace ABS/ESP 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
DTC	C003A-37	Right Rear Wheel Speed Sensor

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Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0034-00	Right Rear Wheel Speed Sensor	This DTC occurs when any of following conditions is met: • ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to ground. • Wheel speed sensor line is open. • ABS/ESP control module assembly detects that wheel speed sensor signal wire is short to power supply. • ABS/ESP control module assembly detects that wheel speed sensor power supply wire is short to ground. • Wheel speed sensor signal is invalid.	• Wheel speed sensor signal wire is connecting with power supply wire in reverse • 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 connector damages • 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, teeth missing, dirty, demagnetized, off center • Clearance between sensor and ring gear is excessive • Number of ring gear teeth is wrong • Tire size is not as specified • ABS/ESP control module assembly is damaged
C0034-09	Right Rear Wheel Speed Sensor		
C0034-11	Right Rear Wheel Speed Sensor		
C0034-12	Right Rear Wheel Speed Sensor		
C0034-13	Right Rear Wheel Speed Sensor		
C0034-29	Right Rear Wheel Speed Sensor		
C0034-37	Right Rear Wheel Speed Sensor		

Caution:

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

Procedure

1	Check rear right wheel speed sensor wire harness and connector
----------	---

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the rear right wheel speed sensor connector B-015.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.

Result

Proceed to
OK
NG

NG

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

OK

2	Check installation of rear right wheel speed sensor
----------	--

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Check rear right wheel speed sensor mounting bolt for looseness.
- Check if excessive clearance exists between installation position of rear right wheel speed sensor and front steering knuckle.
- Check installation position of rear right wheel speed sensor for dirt.

Result

Proceed to
OK
NG

NG

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

OK**3 Check rear right wheel speed sensor**

- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Drive vehicle straight ahead, and read datastream of rear right wheel speed sensor with diagnostic tester.
- Check if data change of rear right wheel speed sensor matches that of other wheel speed sensors.

Result

Proceed to
OK
NG

NG

Replace right rear wheel speed sensor

OK**4 Check right rear hub ring gear**

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

Result

Proceed to
OK
NG

NG

Replace rear right hub bearing assembly

OK**5 Check wire harness and connector (Right rear wheel speed sensor - ABS/ESP control module assembly)**

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module assembly connector B-123.
- Disconnect the rear right wheel speed sensor connector B-015.

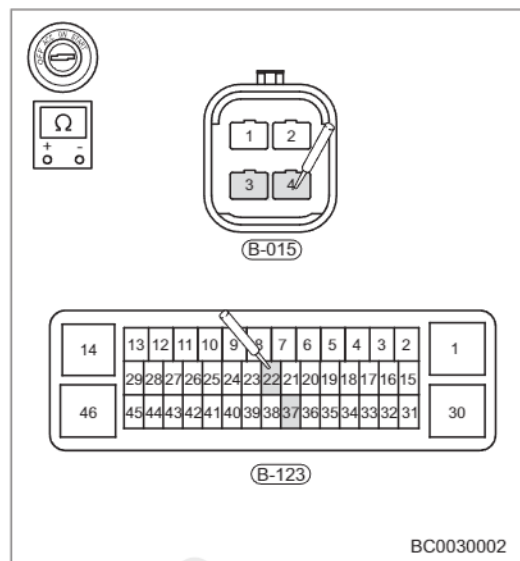


25-BRAKE CONTROL SYSTEM

- (e) Using a digital multimeter, check for continuity between terminals of connector B-123 and connector B-015 to check if there is an open in the wire harness and connector according to the table below.

OK

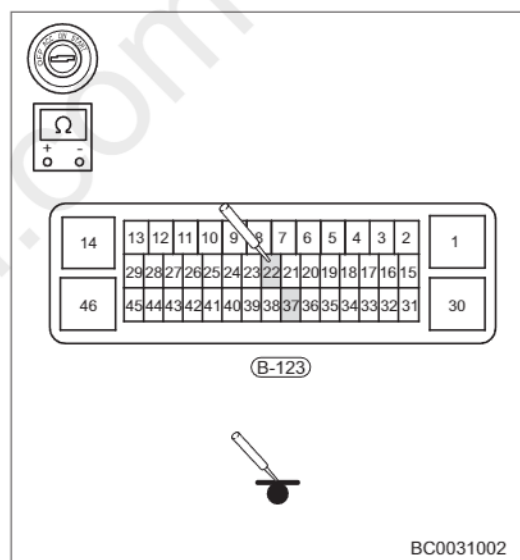
Multimeter Connection	Condition	Specified Condition
B-123 (22) - B-015 (3)	Always	$\leq 1 \Omega$
B-123 (37) - B-015 (4)	Always	$\leq 1 \Omega$
B-123 (22) - B-015 (4)	Always	∞
B-123 (37) - B-015 (3)	Always	∞



- (f) Using a digital multimeter, check for continuity between connector B-123 and body ground to check if rear right wheel speed sensor is short to ground according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (22) - Body ground	Always	∞
B-123 (37) - Body ground	Always	∞



- (g) Disconnect the negative battery cable.
 (h) Turn ENGINE START STOP switch to ON.
 (i) Using a digital multimeter, measure voltage between connector B-123 and body ground to check if rear right wheel speed sensor is short to power supply according to the table below.

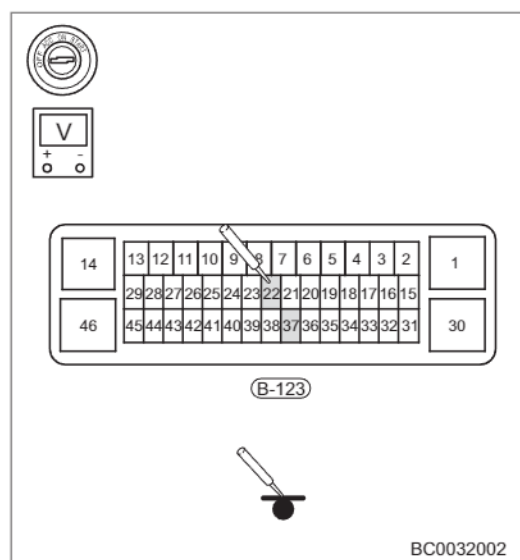
OK

Multimeter Connection	Condition	Specified Condition
B-123 (22) - Body ground	ENGINE START STOP switch ON	Approx. 0 V
B-123 (37) - Body ground	ENGINE START STOP switch ON	Approx. 0 V

25

Result

Proceed to
OK
NG



NG

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

OK

6**Reconfirm DTCs**

- (a) Use diagnostic tester to clear DTCs.
- (b) Start the engine.
- (c) Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- (d) Check if the same DTCs are still output.

Result

Proceed to
OK
NG

OK

System operates normally

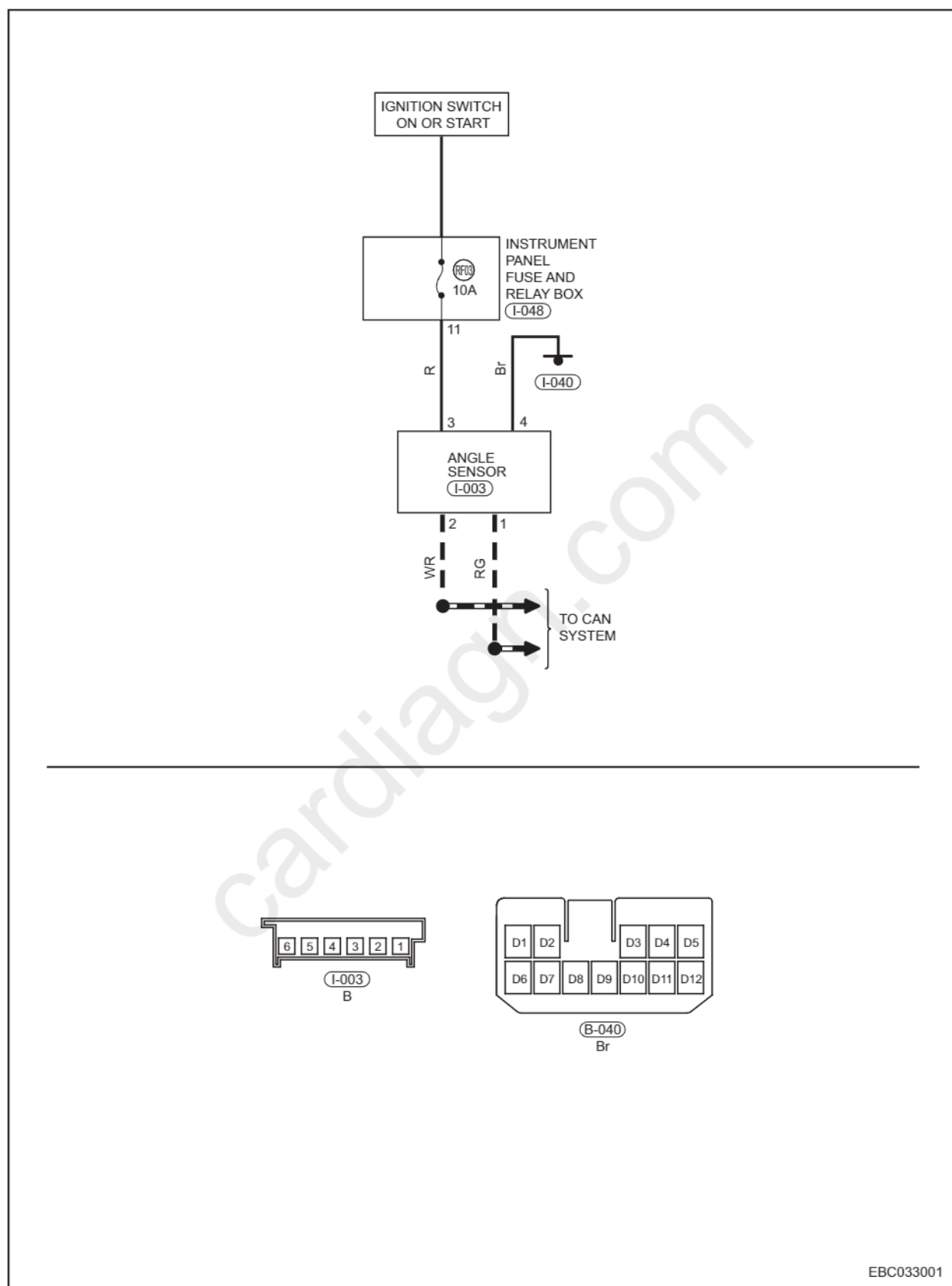
NG

Replace ABS/ESP control module assembly

DTC	C0051-29	Steering Wheel Position Sensor (ESP Only)
DTC	C0051-54	Steering Wheel Position Sensor (ESP Only)
DTC	C0051-64	Steering Wheel Position Sensor (ESP Only)
DTC	U0126-87	Lost Communication With SAM
DTC	U0428-81	Invalid Data Received From SAM

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Circuit Diagram



EBC033001

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0051-29	Steering Wheel Position Sensor (ESP Only)	This DTC occurs when any of following conditions is met: - Steering wheel angle sensor is unmatched (central point is not found). - Steering wheel angle sensor signal is abnormal. - Steering wheel angle sensor signal is interrupted.	- Steering angle sensor is unmatched - Steering angle sensor line is short or open. - Steering angle sensor is damaged
C0051-54	Steering Wheel Position Sensor (ESP Only)		
C0051-64	Steering Wheel Position Sensor (ESP Only)		
U0126-87	Lost Communication With SAM		
U0428-81	Invalid Data Received From SAM		

Caution:

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

Procedure

1 Check steering angle sensor calibration

- Turn ENGINE START STOP switch to ON.
- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Calibrate the steering angle sensor according to instruction of diagnostic tester.
- Use diagnostic tester to clear DTCs.
- Start the engine.
- Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- Check if the same DTCs are still output.

Result

Proceed to
OK
NG

NG

Steering angle sensor is not calibrated

OK

2 Check fuse

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Remove fuse RF03 (10 A) from instrument panel fuse and relay box.
- Check if fuse is blown.

Result

Proceed to
OK
NG

NG

Replace fuse RF03

OK

3 Check wire harness and connector

- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the negative battery cable.
- (c) Disconnect the steering angle sensor connector I-003.
- (d) Check if wire harnesses are worn, pierced, pinched or partially broken.
- (e) Check for broken, bent, protruded or corroded terminals.
- (f) Check if related connector pins are in good condition.

Result

Proceed to
OK
NG

NG

Repair or replace body/instrument panel wire harness and connector

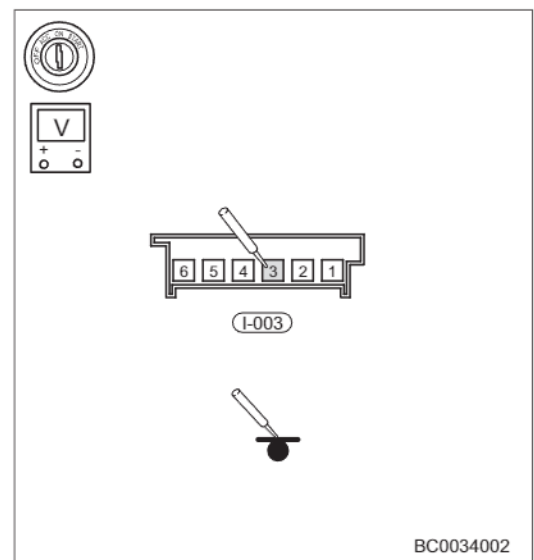
OK

4 Check steering angle sensor power supply and ground

- (a) Disconnect the negative battery cable.
- (b) Turn ENGINE START STOP switch to ON.
- (c) Using a digital multimeter, measure the voltage between steering angle sensor connector terminal I-003 and body ground to check if system power supply circuit is normal according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
I-003 (3) - Body ground (digital multimeter)	ENGINE START STOP switch ON	Not less than 12 V
I-003 (3) - Body ground (test lamp 21 W)	ENGINE START STOP switch ON	On



- (d) Turn ENGINE START STOP switch to OFF.
- (e) Disconnect the negative battery cable.

- (f) Using a digital multimeter, check for continuity between steering angle sensor connector terminal I-003 and body ground to check if system ground circuit is normal according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
I-003 (4) - Body ground	Turn ENGINE START STOP switch to OFF	∞

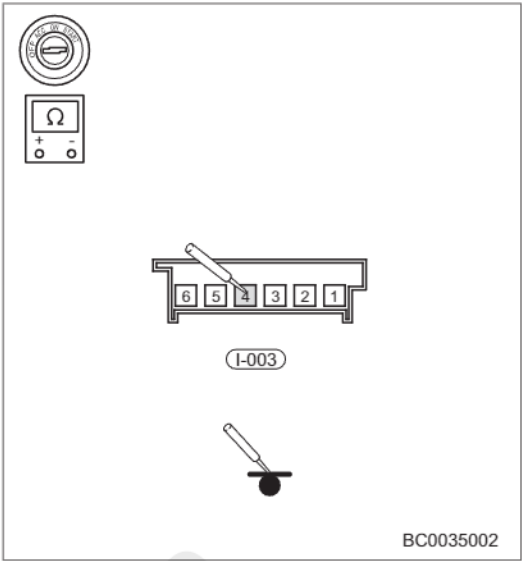
Result

Proceed to
OK
NG

NG

Repair or replace body/instrument panel wire harness and connector

OK

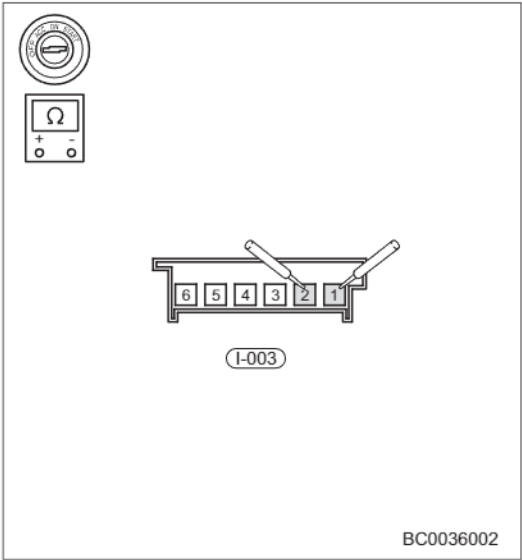


5 Check CAN communication control circuit (steering angle sensor)

- (a) Turn ENGINE START STOP switch to OFF, disconnect the negative battery cable.
(b) Disconnect the steering angle sensor connector I-003.
(c) Use a digital multimeter to check if connection between steering angle sensor connector and CAN communication line is normal according to the table below.

OK

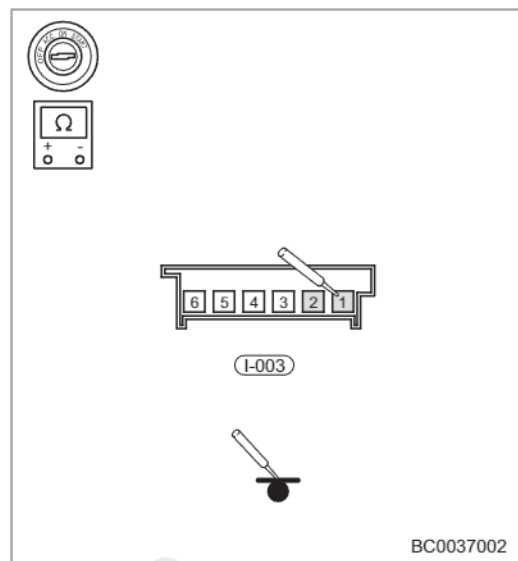
Multimeter Connection	Condition	Specified Condition (Ω)
I-003 (1) - I-003 (2)	Always	≈ 60



- (d) Use a digital multimeter to check if line between steering angle sensor and CAN communication line is short to ground according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
I-003 (1) - Body ground	Always	More than 1 MΩ
I-003 (2) - Body ground	Always	More than 1 MΩ



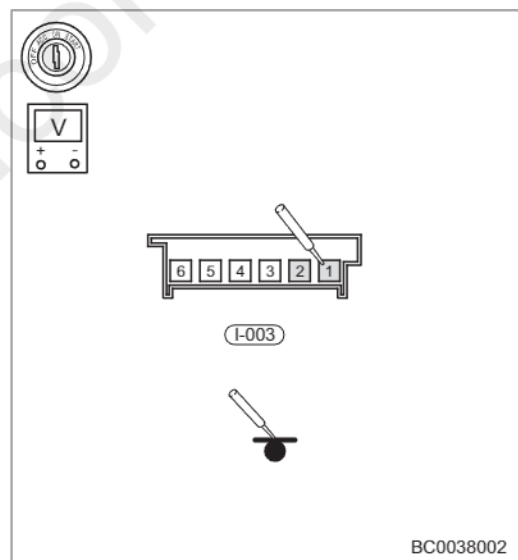
- (e) Disconnect the negative battery cable.
 (f) Turn ENGINE START STOP switch to ON.
 (g) Use a digital multimeter to check if line between steering angle sensor and CAN communication line is short to power supply according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
I-003 (1) - Body ground	Always	1.5 - 2.5 V
I-003 (2) - Body ground	Always	2.5 - 3.5 V

Result

Proceed to
OK
NG



NG

Refer to check and repair CAN communication

OK

6 Reconfirm DTCs

- (a) Use diagnostic tester to clear DTCs.
 (b) Start the engine.
 (c) Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
 (d) Check if the same DTCs are still output.



OK

Proceed to
OK
NG

OK	System operates normally
NG	Replace ABS/ESP control module assembly

DTC	C0061-64	Lateral Acceleration Sensor (ESP Only)
DTC	C0062-64	Longitudinal Acceleration Sensor (ESP Only)
DTC	C0063-64	Yaw Rate Sensor (ESP Only)
DTC	C0063-01	Yaw Rate Sensor (ESP Only)
DTC	C0063-54	Yaw Rate Sensor (ESP Only)

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0061-64	Lateral Acceleration Sensor (ESP Only)	This DTC occurs when any of following conditions is met: • Y&G sensor is not calibrated. • Y&G sensors signal is abnormal. • Y&G sensors signal is interrupted.	• Y&G sensor is not calibrated • Y&G sensor is short or open • Y&G sensor is damaged
C0062-64	Longitudinal Acceleration Sensor (ESP Only)		
C0063-64	Yaw Rate Sensor (ESP Only)		
C0063-01	Yaw Rate Sensor (ESP Only)		
C0063-54	Yaw Rate Sensor (ESP Only)		

Caution:

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

Procedure

1	Check sensor calibration
----------	---------------------------------

- Turn ENGINE START STOP switch to ON.
- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Calibrate the Y&G sensor according to instruction of diagnostic tester.
- Use diagnostic tester to clear DTCs.
- Start the engine.
- Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- Check if the same DTCs are still output.

End

Proceed to
OK
NG

NG	Y&G sensor is not calibrated
-----------	---

OK

25

2	Check installation of ABS/ESP control module
----------	---

Caution:

Y&G sensor is integrated and installed inside of ABS/ESP control module.



25-BRAKE CONTROL SYSTEM

- (a) Check ABS/ESP control module fixing bolt for looseness.
- (b) Check ABS/ESP control module fixing bracket for looseness.

Result

Proceed to
OK
NG

NG

Retighten ABS/ESP control module fixing bolt and bracket

OK

3

Reconfirm DTCs

- (a) Use diagnostic tester to clear DTCs.
- (b) Start the engine.
- (c) Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- (d) Check if the same DTCs are still output.

Result

Proceed to
OK
NG

OK

System operates normally

NG

Replace ABS/ESP control module

DTC	C006B-00	Stability System Active Too Long
------------	-----------------	---

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C006B-00	Stability System Active Too Long	This DTC occurs when any of following conditions is met: • ABS receive command to continue operation (more than 1 second). • ESP receive command to continue operation (more than 10 second).	• Wheel speed differs • Sensor signal is incorrect • ABS/ESP control module assembly is damaged

Caution:

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

Procedure

1	Check wire harness and connector
----------	---

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect all wheel speed sensor and steering angle sensor connectors.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if terminal contact pins of related connectors are in good condition.

Result

Proceed to
OK
NG

NG

Repair or replace related wire harness and connector

OK

2	Check installation of wheel speed sensor
----------	---

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Check wheel speed sensor sensor mounting bolt for looseness.
- Check wheel speed sensor mounting position and hub ring gear for any gaps.
- Check installation position of wheel speed sensor for dust.

Result

Proceed to
OK
NG

NG

Tighten mounting bolts correctly, clean or replace wheel speed sensor



OK

3 Check wheel speed sensor

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

Result

Proceed to
OK
NG

NG

Replace corresponding wheel speed sensor

OK

4 Check hub gear ring and drive shaft ring gear upper

- (a) Remove the hub assembly.
- (b) Check hub gear ring and drive shaft ring gear upper for foreign matter, missing teeth or damage.
- (c) Check hub assembly and drive shaft ring gear upper for secure installation.

Result

Proceed to
OK
NG

NG

Replace corresponding signal ring gear

OK

5 Check installation of steering angle sensor

- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the negative battery cable.
- (c) Check if steering angle sensor connector is connected securely.
- (d) Check if steering angle sensor is installed in place.
- (e) Check installation position of steering angle sensor for dust.

Result

Proceed to
OK
NG

25

NG

Clean and replace steering angle sensor

OK

6 Reconfirm DTCs

- (a) Use diagnostic tester to clear DTCs.
- (b) Start the engine.
- (c) Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- (d) Check if the same DTCs are still output.

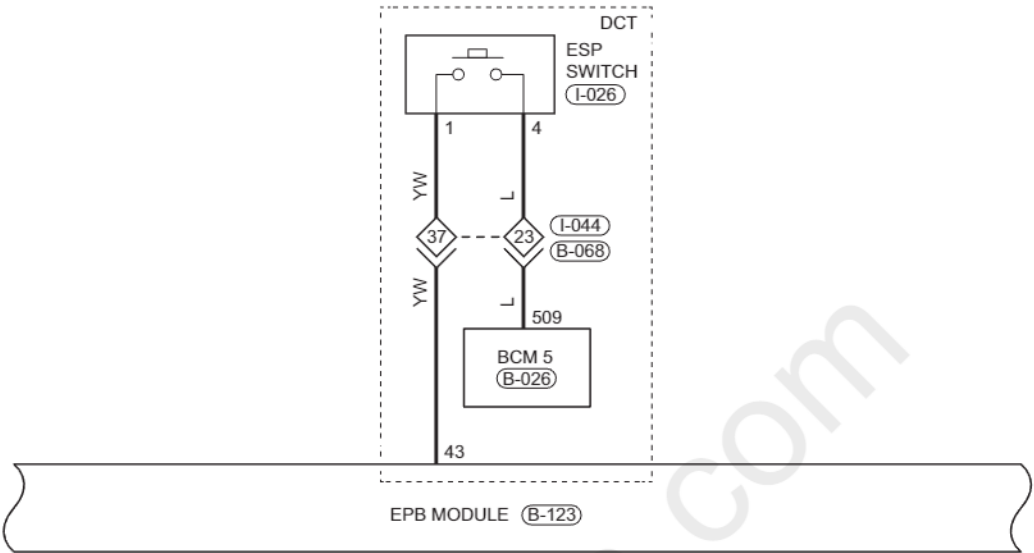
Result

Proceed to
OK
NG

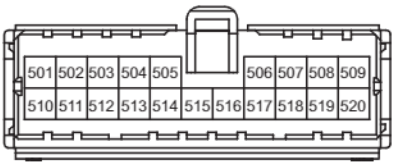
OK**System operates normally****NG****Replace ABS/ESP control module assembly**

DTC	C0089-04	TCS Disable Switch (ESP Only)
-----	----------	-------------------------------

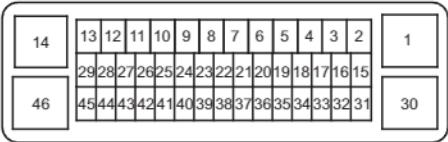
Circuit Diagram



I-044
W



B-026
W



B-123
B

EBC039001

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C0089-04	TCS Disable Switch (ESP Only)	This DTC occurs when any of following conditions is met: - Press and hold ESP switch more than 10 seconds. - During igniting, ESP OFF switch activity signal is detected more than 2 seconds.	- ESP switch if off - ESP switch if damaged

Caution:

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

Procedure**1 Check ESP switch**

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Check if ESP switch is stuck or pushed in by other objects.

Result

Proceed to
OK
NG

NG**Replace ESP switch****OK****2 Check wire harness and connector**

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.

Result

Proceed to
OK
NG

NG**Repair or replace body instrument panel wire harness and connector****OK****25**

3	Reconfirm DTCs
----------	-----------------------

- (a) Use diagnostic tester to clear DTCs.
- (b) Start the engine.
- (c) Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- (d) Check if the same DTCs are still output.

Result

Proceed to
OK
NG

OK

System operates normally

NG

Replace adjustment switch assembly

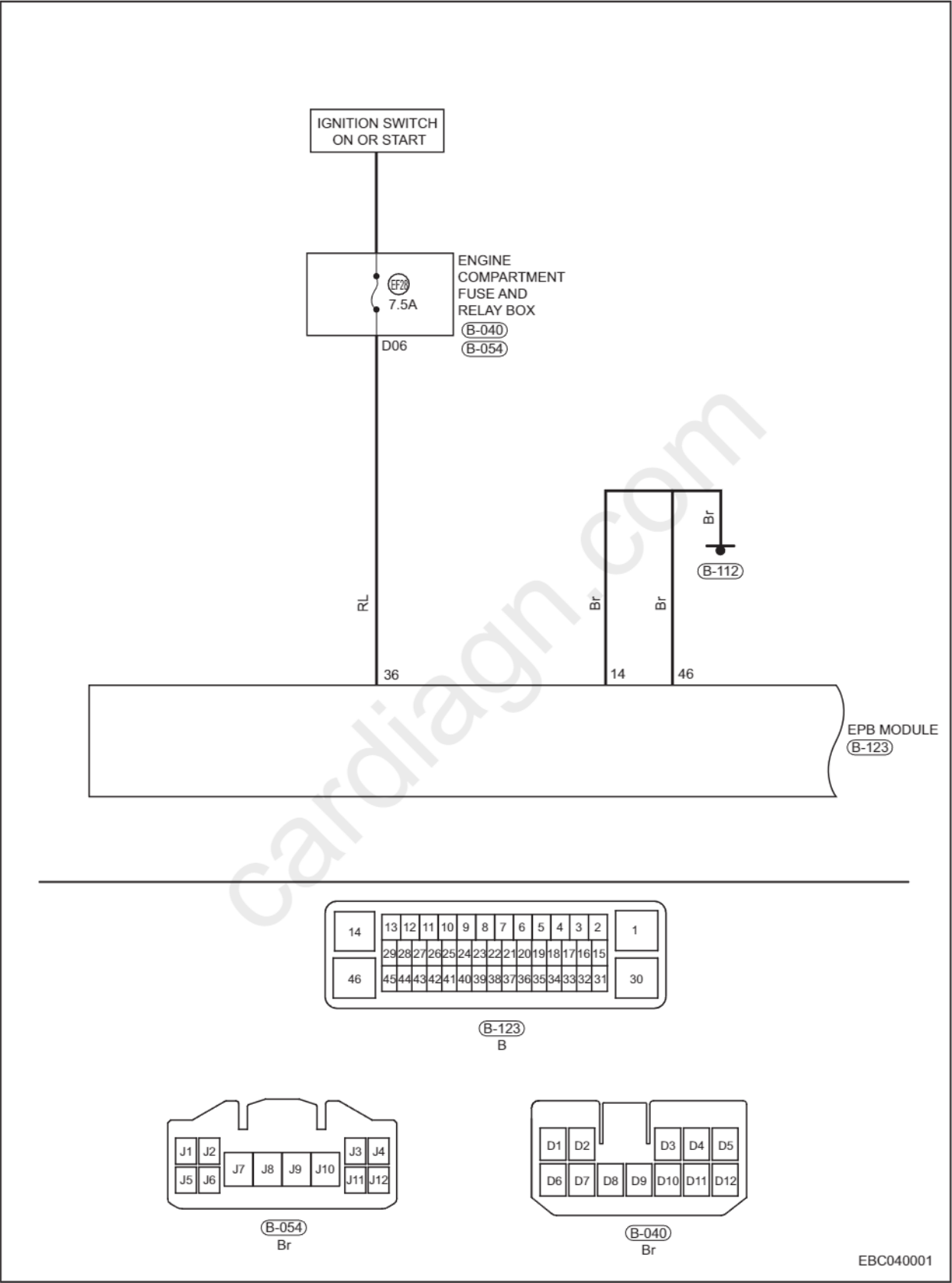
cardiagn.com

DTC	C1000-16	ECU Voltage Supply
DTC	C1000-17	ECU Voltage Supply
DTC	C1001-04	ECU
DTC	C1009-00	ECU Hard Ware Related

cardiagn.com



Circuit Diagram



Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C1000-16	ECU Voltage Supply	This DTC occurs when any of following conditions is met: - Battery voltage is too high. - Battery voltage is too low. - Module itself.	- Fuse malfunctions - High or low battery voltage - Charging system malfunctions. - Wire harness or connector damaged - ABS/ESP control module assembly malfunctions
C1000-17	ECU Voltage Supply		
C1001-04	ECU		
C1009-00	ECU Hard Ware Related		

Caution:

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

Procedure**1 Check fuse**

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Remove ABS fuse EF28 (7.5A) from engine compartment fuse and relay box.
- Check if fuse is blown.

Result

Proceed to
OK
NG

NG

Replace ABS fuse

OK

2 Check battery

- Using a digital multimeter, measure voltage between positive battery terminal and negative battery terminal.
- Battery voltage should be higher than 12 V.

Result

Proceed to
OK
NG

NG

Check charging system

OK

3 Check ABS/ESP control module assembly wire harness and connector

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module assembly connector B-123.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if terminal contact pins of related connectors are in good condition.



Result

Proceed to
OK
NG

NG

Repair or replace ABS/ESP control module assembly wire harness and connector

OK

4

Check wire harness and connector (ABS/ESP control module assembly - power supply)

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module assembly connector B-123.
- Disconnect the negative battery cable.
- Turn ENGINE START STOP switch to ON.
- Using a digital multimeter, measure voltage between ABS/ESP control module assembly connector B-123 and body ground to check if system power supply circuit is normal according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (36) - Body ground (digital multimeter)	ENGINE START STOP switch is in ON	Not less than 12 V
B-123 (36) - Body ground (test lamp 21 W)	ENGINE START STOP switch is in ON	On

Result

Proceed to
OK
NG

NG

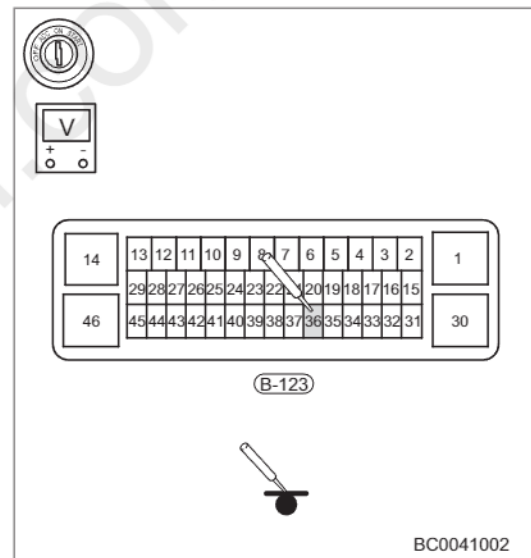
Repair or replace related wire harness and connector

OK

5

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

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module assembly connector B-123.



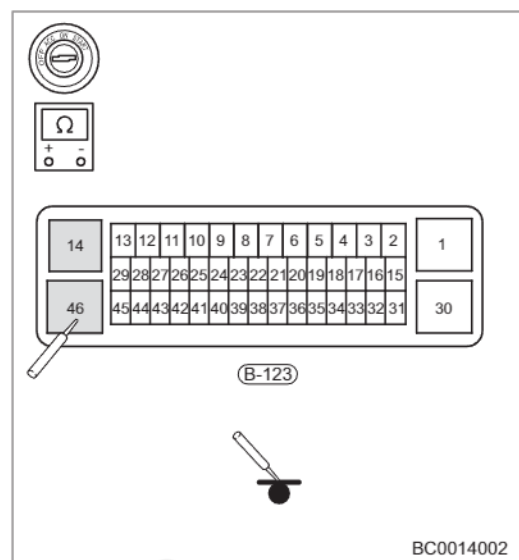
- (d) Using a digital multimeter, check for continuity between ABS/ESP control module assembly connector B-123 and body ground to check if system ground circuit is normal according to the table below.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (14) - Body ground	Always	$\leq 1 \Omega$
B-123 (46) - Body ground	Always	$\leq 1 \Omega$

Result

Proceed to
OK
NG



NG

Repair or replace ABS/ESP control module assembly wire harness and connector

OK

6 Reconfirm DTCs

- Use diagnostic tester to clear DTCs.
- Start the engine.
- Drive vehicle at 40 km/h or above, read ABS/ESP control module assembly DTC again with diagnostic tester.
- Check if the same DTCs are still output.

Result

Proceed to
OK
NG

OK

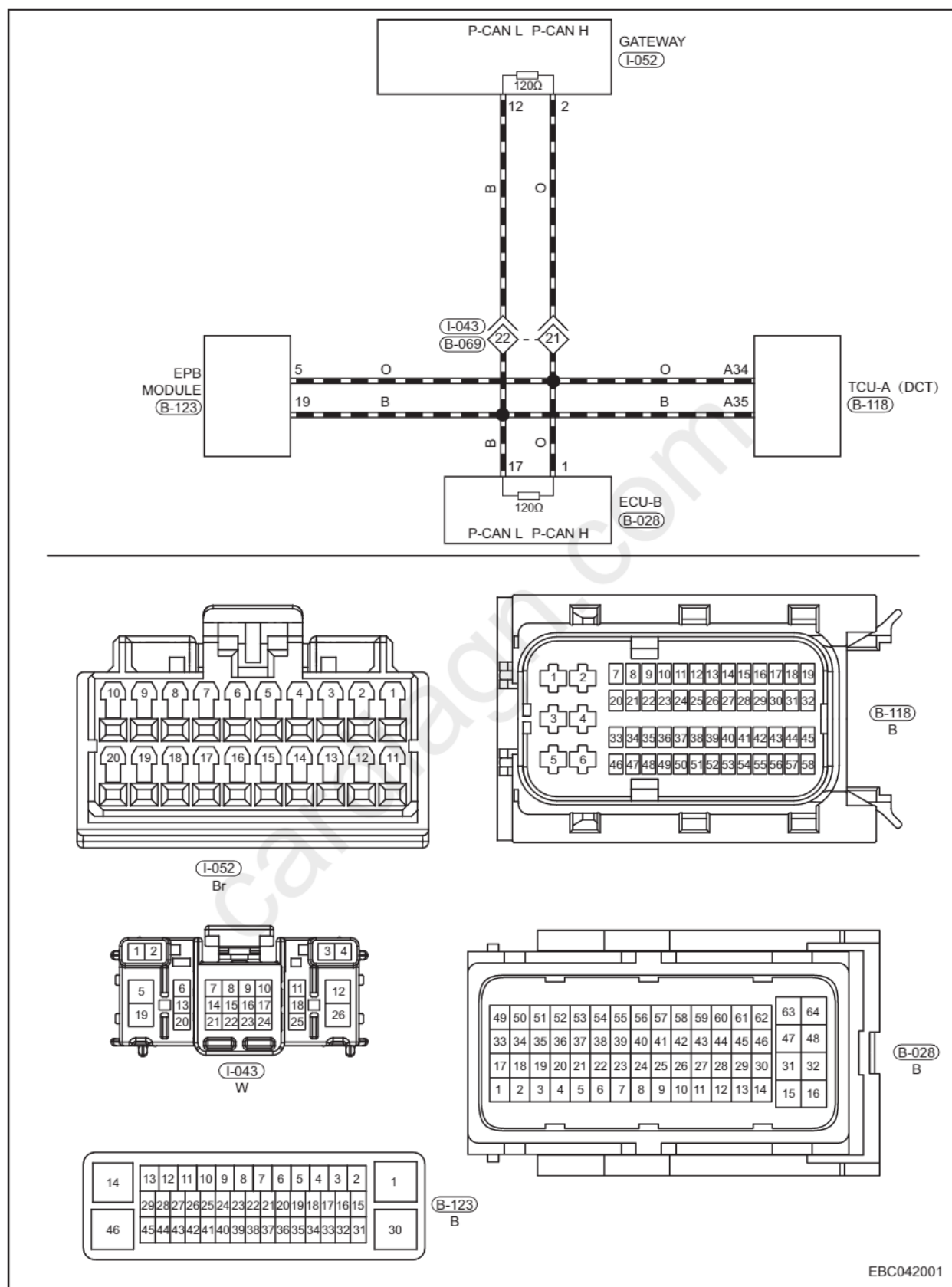
System operates normally

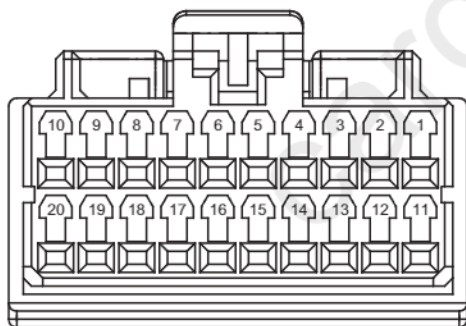
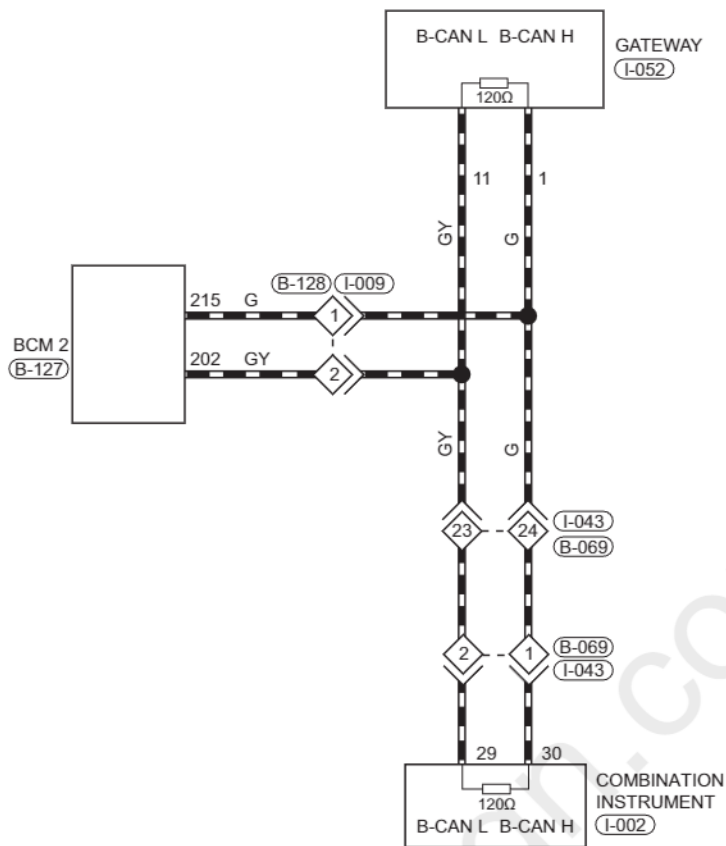
NG

Replace ABS/ESP control module assembly

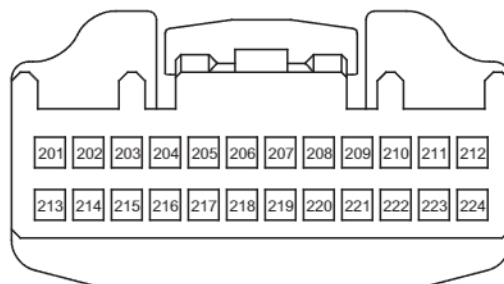
DTC	U0005-00	High Speed CAN Communication Bus (+) High
DTC	U0007-00	High Speed CAN Communication Bus (-) Low
DTC	U0073-88	Control Module Communication Bus Off
DTC	U0100-87	Lost Communication With Engine Control System Module
DTC	U0101-87	Lost Communication With Transmission Control Unit
DTC	U0140-87	Lost Communication With Body Control Module
DTC	U0401-81	Invalid Data Received From Engine Control System Module
DTC	U0402-81	Invalid Data Received From Transmission Control Unit
DTC	U0422-81	Invalid Data Received From Body Control Module
DTC	C1002-49	CAN Hardware

Circuit Diagram

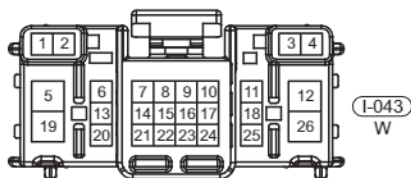




(I-052)
Br



(B-127)
Br



(I-043)
W

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
U0005-00	High Speed CAN Communication Bus (+) High	This DTC occurs when any of following conditions is met: - CAN bus communication, configuration information and line are malfunctioning. - ECM overtime. - ECM error. - TCU overtime. - TCU error.	- CAN controller malfunction - CAN configuration information unmatched - CAN communication off - CAN bus line malfunction - ECM software version unmatched - ECM damaged - TCU software version unmatched - BCM damaged - ESP (ABS) damaged
U0007-00	High Speed CAN Communication Bus (-) Low		
U0073-88	Control Module Communication Bus Off		
U0100-87	Lost Communication With Engine Control System Module		
U0101-87	Lost Communication With Transmission Control Unit		
U0140-87	Lost Communication With Body Control Module		
U0401-81	Invalid Data Received From Engine Control System Module		
U0402-81	Invalid Data Received From Transmission Control Unit		
U0422-81	Invalid Data Received From Body Control Module		
C1002-49	CAN Hardware		

Caution:

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

Procedure**1 Check wire harness and connector**

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module assembly connector B-123.
- Disconnect the Engine Control Module (ECM) connector B-028.
- Disconnect the Body Control Module (BCM) connector B-127.
- Disconnect the Transmission Control Module (TCM) connector B-118.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.

Result

Proceed to
OK
NG

NG

Repair or replace wire harness and connector

OK**25**

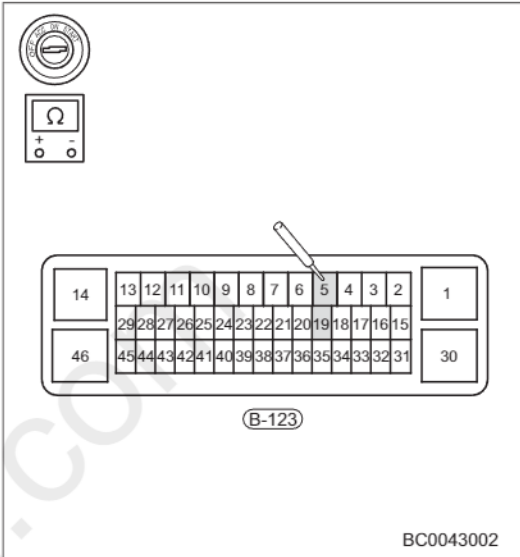
2

Check CAN communication control circuit (ABS/ESP control module assembly - Engine Control Module (ECM))

- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the negative battery cable.
- (c) Disconnect the ABS/ESP control module assembly connector B-123.
- (d) Disconnect the Engine Control Module (ECM) connector B-028.
- (e) Using a digital multimeter, measure CAN resistance value via ABS/ESP module B-123 connector to check if wire is open.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (5) - B-123 (19)	Always	≈ 120 Ω



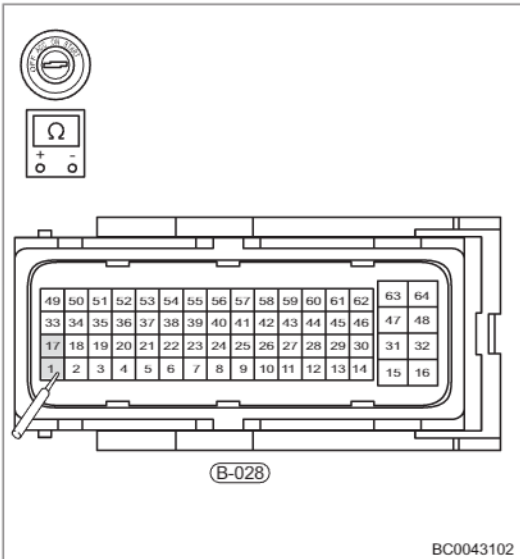
- (f) Using a digital multimeter, measure CAN resistance value via ECM module B-028 connector to check if wire is open.

OK

Multimeter Connection	Condition	Specified Condition
B-028 (1) - B-028 (17)	Always	≈ 120 Ω

Result

Proceed to
OK
NG



NG

Repair or replace engine wire harness and connector.

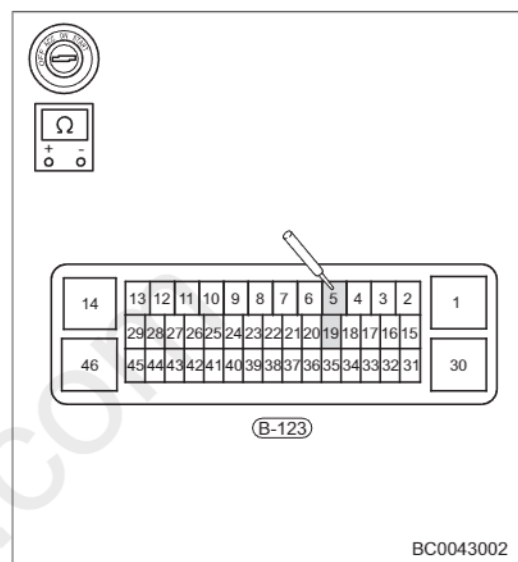
OK

3 Check CAN communication control circuit (ABS/ESP control module assembly - Transmission Control Module (TCM))

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect the ABS/ESP control module assembly connector B-123.
- Disconnect the Transmission Control Module (TCM) connector B-118.
- Using a digital multimeter, measure CAN resistance value via ABS/ESP module B-123 connector to check if wire is open.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (5) - B-123 (19)	Always	$\approx 120 \Omega$



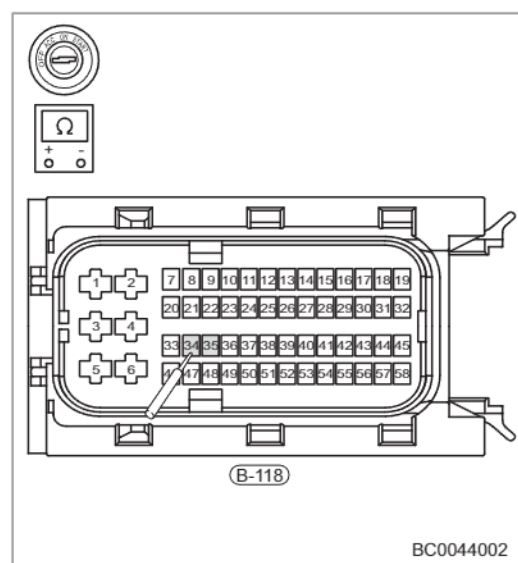
- Using a digital multimeter, measure CAN resistance value via TCM module B-118 connector to check if wire is open.

OK

Multimeter Connection	Condition	Specified Condition
B-118 (34) - B-118 (35)	Always	$\approx 120 \Omega$

Result

Proceed to
OK
NG



NG

Repair or replace engine wire harness and connector

OK

25



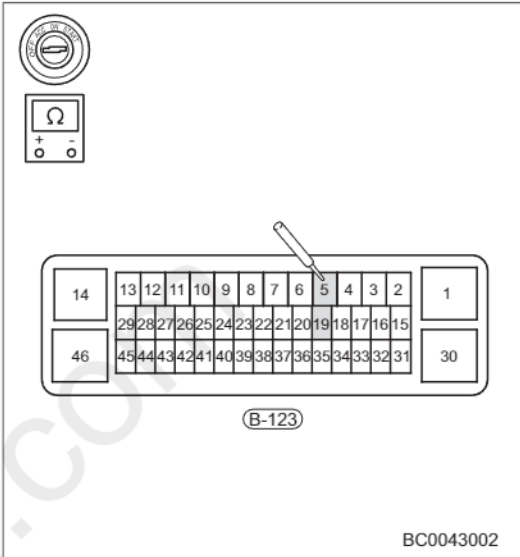
4

Check CAN communication control circuit (ABS/ESP control module assembly - Body Control Module (BCM))

- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the negative battery cable.
- (c) Disconnect the ABS/ESP control module assembly connector B-123.
- (d) Disconnect the Body Control Module (BCM) connector B-127.
- (e) Using a digital multimeter, measure CAN resistance value via ABS/ESP module B-123 connector to check if wire is open.

OK

Multimeter Connection	Condition	Specified Condition
B-123 (5) - B-123 (19)	Always	≈ 120 Ω



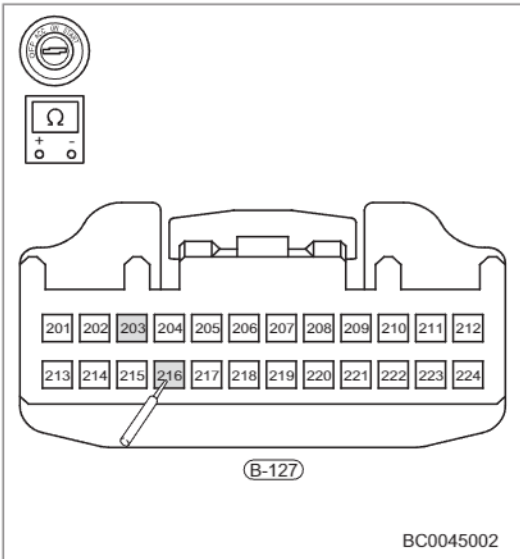
- (f) Using a digital multimeter, measure CAN resistance value via BCM module B-127 connector to check if wire is open.

OK

Multimeter Connection	Condition	Specified Condition
B-127 (216) - B-127 (203)	Always	≈ 120 Ω

Result

Proceed to
OK
NG



OK

Refer to CAN system

NG

Repair or replace body/instrument panel wire harness and connector

ON-VEHICLE SERVICE

Brake System Bleeding

Operation Step

Warning:

- When bleeding brake system, wear safety glasses. If brake fluid gets on your eyes or skin, wash off with water completely.
- If brake fluid gets on your eyes or skin, wash off with water completely.

Caution:

- Brake fluid should meet Chery specified type (DOT4). DO NOT mix 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 reservoir, wipe it off before removing reservoir cap.

1. Bleeding procedures for brake system with diagnostic tester are as follows:

- (a) Make sure all brake lines are installed and tightened properly.
- (b) Check that battery voltage is normal.
- (c) Turn ENGINE START STOP switch to OFF.
- (d) Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- (e) Turn ENGINE START STOP switch to ON.
- (f) Using diagnostic tester, read and clear DTCs stored in ABS/ESP control module assembly.
- (g) Using diagnostic tester, enter Brake Control System, select manual bleeding, and then perform operation according to information and procedures displayed on diagnostic tester.

Hint:

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



ABS/ESP Control Module Assembly

Removal

Warning/Caution/Hint

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

1. Turn off all electrical equipment and the ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Drain the brake fluid ([See page 26-9](#)).

Hint:

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

Warning:

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

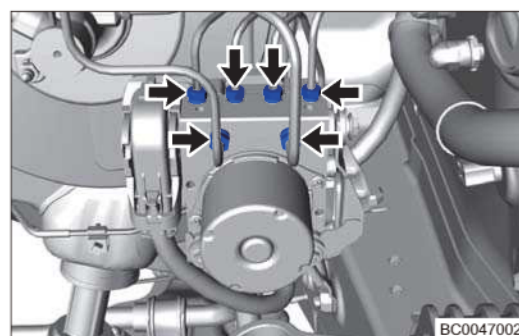
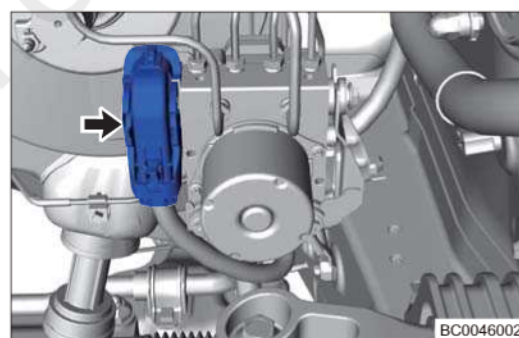
4. Remove the engine trim cover assembly.
5. Remove the battery assembly ([See page 16-12](#)).
6. Remove the air filter assembly ([See page 10-8](#)).
7. Remove the ABS/ESP control module assembly.
 - (a) Press the lock area of ABS/ESP control module assembly connector, toggle the connector lock bracket downward and disconnect the ABS/ESP control module assembly connector (arrow).
 - (b) Using a fixing wrench, carefully disconnect 6 brake pipe coupling bolts (arrow).

Tightening torque

$18 \pm 2 \text{ N}\cdot\text{m}$

Warning:

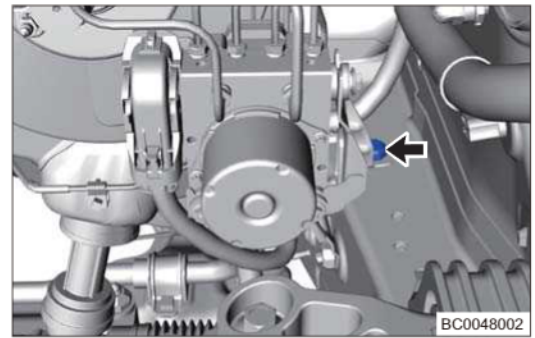
- When removing brake line, prevent foreign matter from entering ABS/ESP control module assembly threaded holes.
- After disconnecting brake line, sealing measure should be taken to prevent foreign matter from entering.



- (c) Remove fixing bolt (arrow) between ABS/ESP control module assembly mounting bracket and body.

Tightening torque

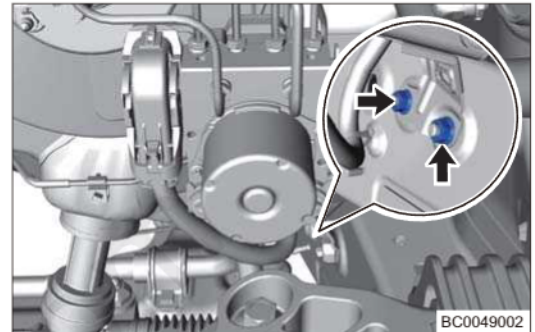
$23 \pm 3.5 \text{ N}\cdot\text{m}$



- (d) Remove coupling bolts (arrow) between ABS/ESP control module assembly mounting bracket and body.

Tightening torque

$23 \pm 3.5 \text{ N}\cdot\text{m}$



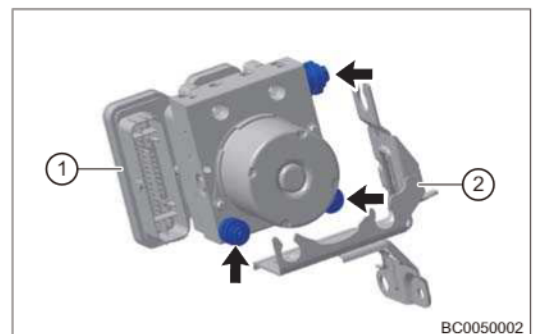
- (e) Remove the ABS/ESP control module assembly with mounting bracket.

Disassembly

1. Remove the ABS/ESP control module assembly.
 - (a) Remove 3 fixing nuts (arrow) between ABS/ESP control module assembly and mounting bracket.

Tightening torque

$8 \pm 2 \text{ N}\cdot\text{m}$



- (b) Disengage ABS/ESP control module assembly (1) from mounting bracket (2).

Installation

1. Installation is in the reverse order of removal.

Caution:

- ABS/ESP control module assembly contains hydraulic control module and electronic control module. As a unit, they cannot be repaired or replaced individually.
- Check insulator for aging or damage. Replace if necessary.
- When installing fixing bolts and screws, be sure to tighten to specified torques.
- Perform ABS bleeding procedures for brake system after completing installation ([See page 26-9](#)).
- Using diagnostic tester, enter brake control system, record and clear trouble code, then drive vehicle to perform a road test, confirming that ABS/ESP system operates normally and brake pedal feel is good.
- It is necessary to perform yaw rate sensor calibration after replacing ESP assembly.
- After replacing ESP assembly, perform "Assembly Inspection" with diagnostic tester, otherwise, malfunction may be lit.



Front Wheel Speed Sensor (Front Left Wheel as Example)

Removal

Warning/Caution/Hint

Caution:

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

Hint:

- Use same procedures for right and left sides.
 - Procedures listed below are for left side.
1. Turn off all electrical equipment and ENGINE START STOP switch.
 2. Disconnect the negative battery cable.
 3. Remove the front left wheel ([See page 24-8](#)).
 4. Remove the front left wheel speed sensor.

- (a) Remove the fixing 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

$9 \pm 1.5 \text{ N}\cdot\text{m}$

Caution:

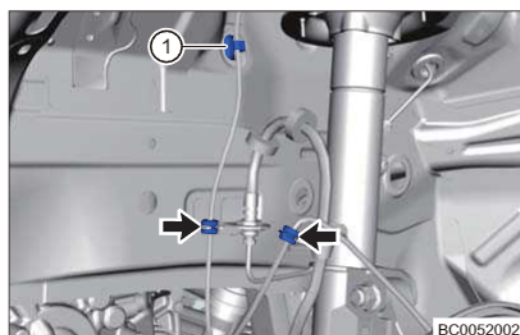
- Keep head and installation hole of sensor free of foreign matter.



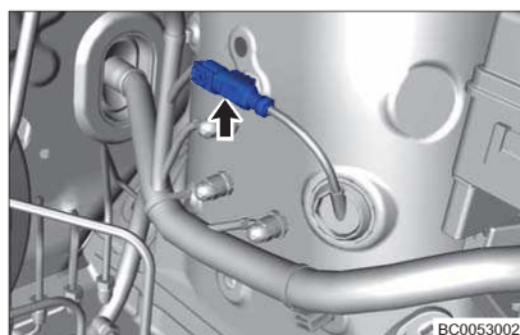
- (b) Disengage the attachment part (arrow) of front left wheel speed sensor wire harness from front left shock absorber assembly and fixing bracket, disengage fixing clip (1) from front left wheel speed sensor wire harness.

Hint:

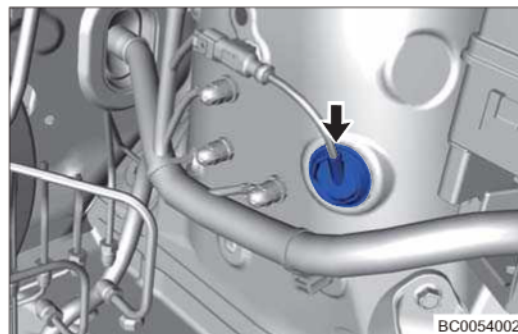
- Observe winding direction of sensor wire harness to prevent incorrect installation.



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



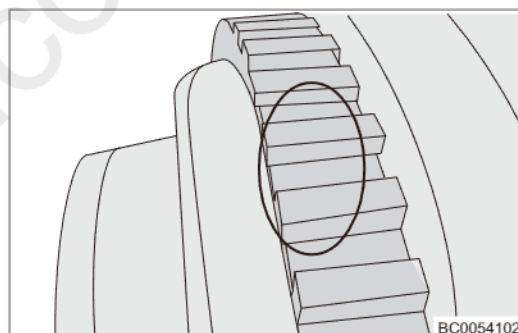
- (d) Detach the front left wheel speed sensor wire harness cover (arrow) from body.



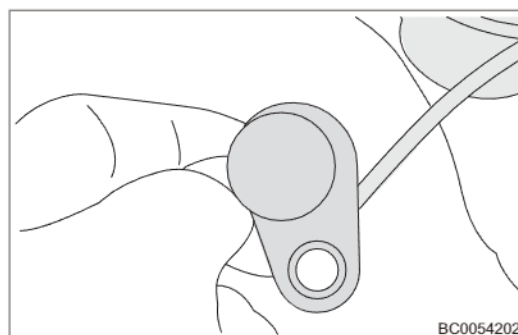
- (e) Remove the front left wheel speed sensor.

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 above conditions occurs, replace the rear wheel speed sensor with a new one.
 - (d) Check wheel speed sensor for proper installation.
 - (e) Using a diagnostic tester, read datastream of wheel speed sensor, record if each wheel speed is consistent with acceleration display, and if vehicle speed display is accurate.

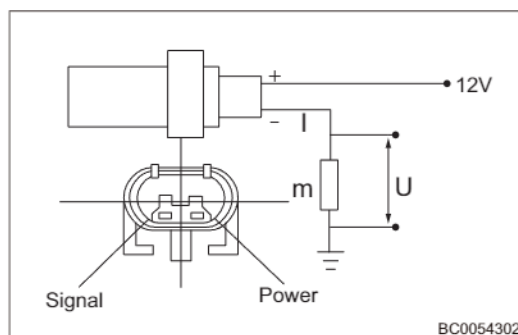


- (f) If wheel speed display is inconsistent, check the corresponding wheel speed sensor signal ring gear for missing teeth, dirt, demagnetization, off center.



2. Simple test for wheel speed sensor

- (a) Connect power supply terminal of sensor to 12 V power supply, connect sensor signal terminal and 75 Ω resistor in series and make it grounded, then rotate wheels and test voltage signal of resistor with an oscilloscope.



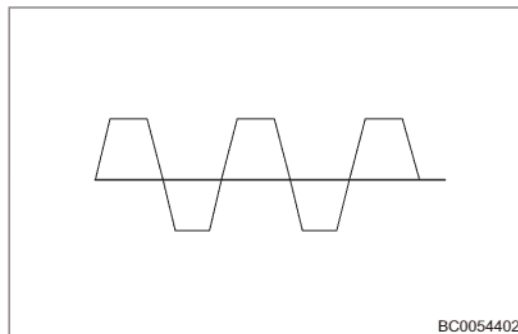
- (b) U switches between high and low levels without any obvious teeth missing as ring gear rotates.

U low ≈ 0.54 V

U high ≈ 1.07 V

Caution:

- Poles cannot be connected inversely during test, otherwise, damage may be caused.
 - Above mentioned is a simple method and cannot replace the complete function test.
 - Causes that affect test may include: Ring gear quality, installation error, etc.
- (c) After any repair actions on wheel speed sensor, it is necessary to accelerate vehicle to 40 km/h or more to perform dynamic self-test of ABS/ESP system.
- (d) If malfunction still cannot be eliminated after completing dynamic self-test, replace wheel speed sensor.
- (e) After repair is finished, perform completion inspection.



Installation

1. Installation is in the reverse order of removal.

Caution:

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

Rear Wheel Speed Sensor (Rear Left Wheel as Example)

Removal

Warning/Caution/Hint

Caution:

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

Hint:

- Use same procedures for right and left sides.
 - Procedures listed below are for left side.
1. Turn off all electrical equipment and the ENGINE START STOP switch.
 2. Disconnect the negative battery cable
 3. Remove the rear left wheel (See page 24-8).
 4. Remove the rear left wheel speed sensor.

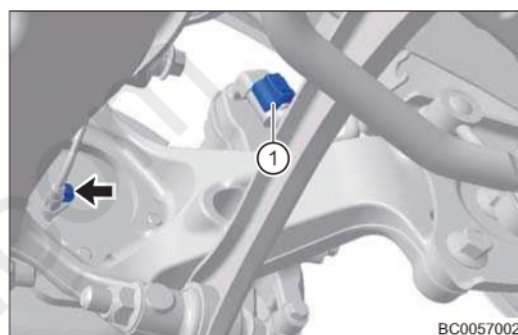
- (a) Remove rear left wheel speed sensor fixing bolt (arrow), and disconnect EPB caliper wire harness connector (1).

Tightening torque

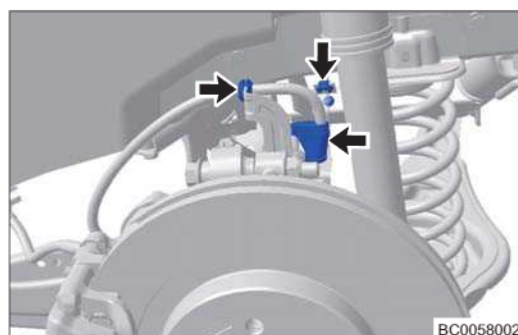
$9 \pm 1.5 \text{ N}\cdot\text{m}$

Caution:

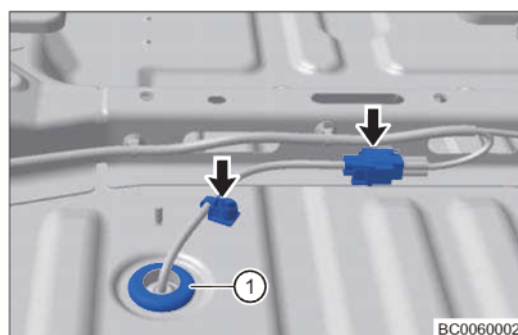
- Keep head and installation hole of sensor free of foreign matter.



- (b) Detach the attachment parts (arrow) of rear wheel speed sensor with caliper wire harness assembly from fixing bracket.



- (c) Remove the third row seat assembly.
- (d) Lift up the front floor carpet assembly.
- (e) Disconnect rear wheel speed sensor with caliper wire harness assembly connector and wire harness clips (arrow), and detach rubber plug (1) from vehicle body.

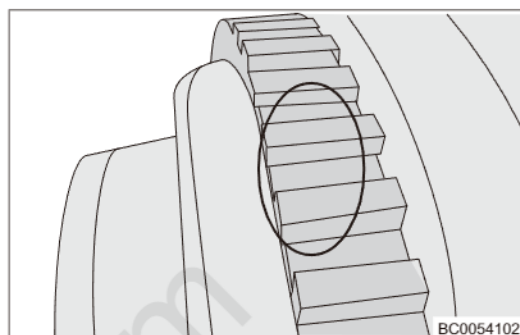


- (f) Remove the rear left wheel speed sensor.

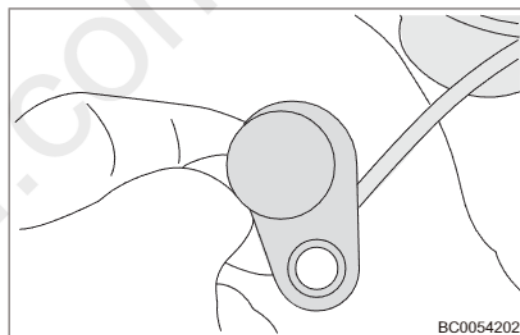


Inspection

1. Check the rear left 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 above conditions occurs, replace the rear wheel speed sensor with a new one.
 - (d) Check wheel speed sensor for proper installation.
 - (e) Using a diagnostic tester, read data flow of wheel speed sensor, record if each wheel speed is consistent with acceleration display, and if vehicle speed display is accurate.

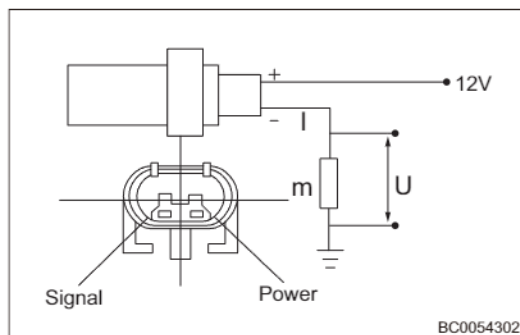


- (f) If wheel speed display is inconsistent, check the corresponding wheel speed sensor signal ring gear for missing teeth, dirt, demagnetization, off center.



2. Simple test for wheel speed sensor

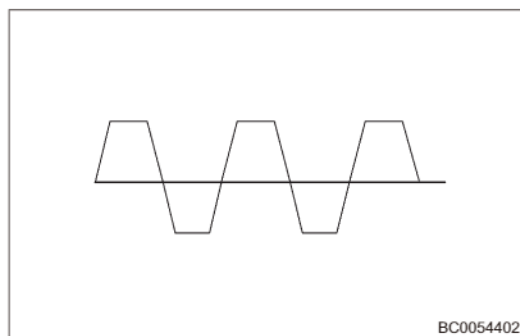
- (a) Connect power supply terminal of sensor to 12 V power supply, connect sensor signal terminal and 75 Ω resistor in series and make it grounded, then rotate wheels and test voltage signal of resistor with an oscilloscope.



- (b) U switches between high and low levels without any obvious teeth missing as ring gear rotates.
 $U_{\text{low}} \approx 0.54 \text{ V}$
 $U_{\text{high}} \approx 1.07 \text{ V}$

Caution:

- Poles cannot be connected inversely during test, otherwise, damage may be caused.
- Above mentioned is a simple method and cannot replace the complete function test.
- Causes that affect test may include: Ring gear quality, installation error, etc.



- (c) After any repair actions on wheel speed sensor, it is necessary to accelerate vehicle to 40 km/h or more to perform dynamic self-test of ABS/ESP system.
- (d) If malfunction still cannot be eliminated after completing dynamic self-test, replace wheel speed sensor.
- (e) After repair is finished, perform completion inspection.

Installation

1. Installation is in the reverse order of removal.

Caution:

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

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Steering Angle Sensor

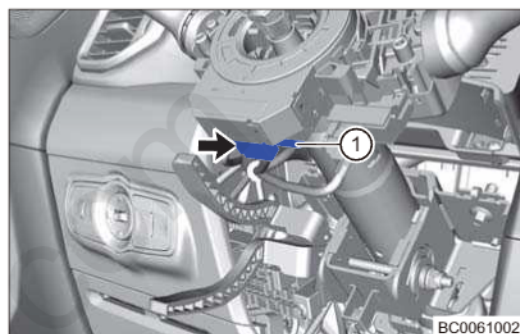
Removal

1. Turn off all electrical equipment and the ENGINE START STOP switch.
2. Disconnect the negative battery cable.

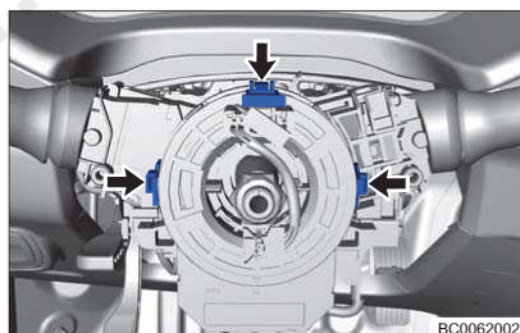
Caution:

- Wait at least 90 seconds after disconnecting the negative battery cable to disable supplementary restraint system.

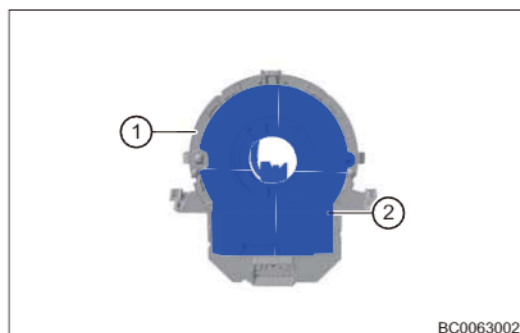
3. Position the front wheels straight ahead.
4. Remove the steering wheel assembly (See page 28-22).
5. Remove the combination switch cover (See page 47-11).
6. Remove the steering angle sensor.
 - (a) Disconnect the spiral cable wire harness connector (arrow) and angle sensor connector (1).



- (b) Detach the fixing claws (arrow) between spiral cable and steering column, and remove the spiral cable.



- (c) Detach the steering angle sensor fixing claws and separate the angle sensor (1) and spiral cable (2).

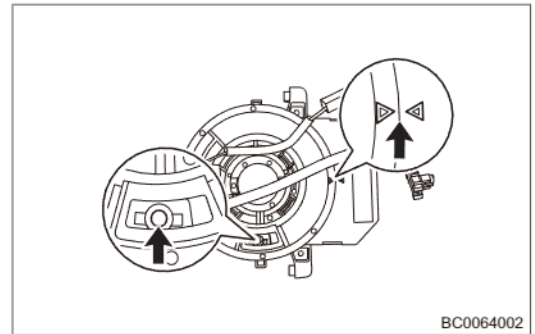


Installation

1. Installation is in the reverse order of removal.

Hint:

- Always install spiral cable correctly according to matchmarks on spiral cable and steering column (fully turn spiral cable clockwise slowly, then turn it counterclockwise until yellow ball appears in transparent neutral window and arrow marks align with each other), otherwise the spiral cable may be damaged.



Caution:

- Always install spiral cable correctly according to specified operating instructions.
- DO NOT rotate the spiral cable over specified turns to prevent it from breaking.
- Be sure to install fixing claws in place when installing spiral cable.
- Check that horn operates normally after installation.
- Check SRS warning light after installation, and make sure that supplemental restraint system operates normally.
- It is necessary to adjust front wheel alignment.

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