

ANTI-LOCK BRAKE SYSTEM

PRECAUTION

NOTICE:

When disconnecting the cable from the negative (-) battery terminal, initialize the following systems after the cable is reconnected.

System	See procedure
Power window control system (with Jam protection function)	IN-23
Sliding roof system	

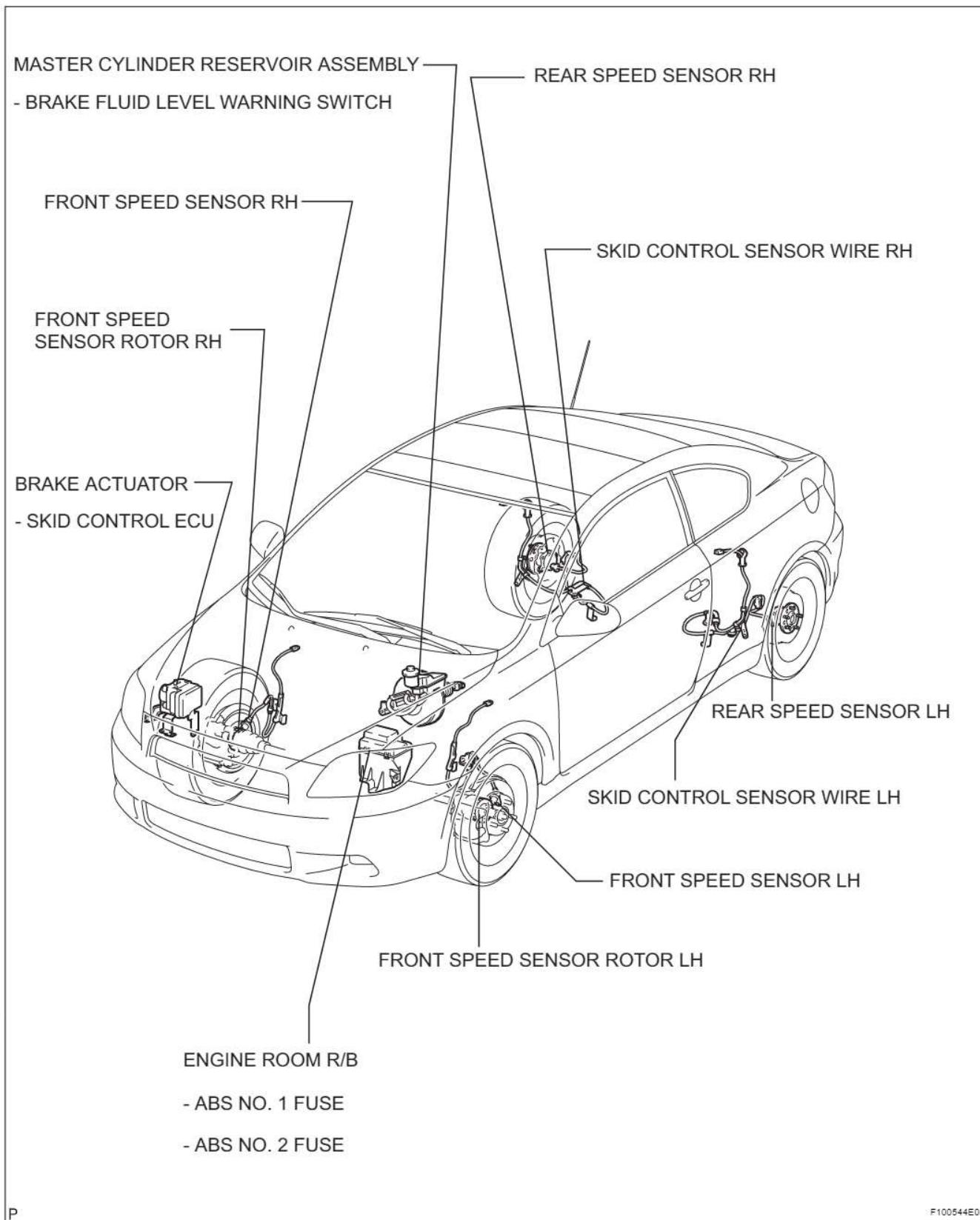
CAUTION:

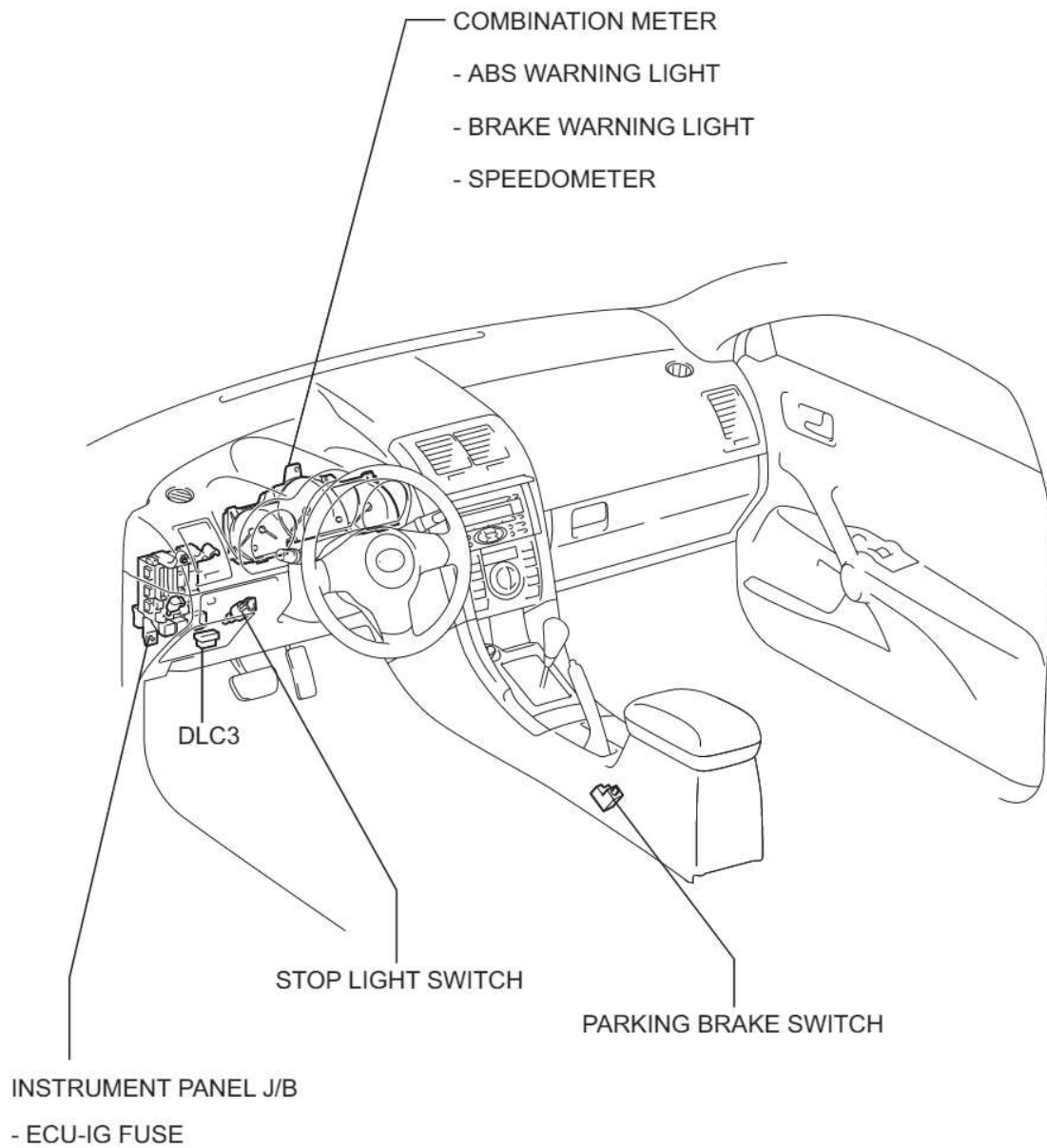
- When there is a malfunction in the contact point of the terminals or installation problems with parts, removing and installing of the suspected problem parts may return the system to the normal condition either completely or temporarily.
- In order to determine the malfunctioning area, be sure to check the conditions at the time the malfunction occurred, such as by DTC output and the freeze frame data output, and record it before disconnecting each connector or removing and installing parts.
- Since the ABS with EBD system may be influenced by a malfunction in the other systems, be sure to check for DTCs in the other systems.
- Be sure to remove and install the brake actuator and each sensor with the ignition switch OFF unless specified in the inspection procedure.
- When removing and installing the brake actuator and each sensor, be sure to check that the normal display is output in the test mode inspection and the DTC output inspection after installing all the parts.

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BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

PARTS LOCATION



BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM**BC-3****BC**

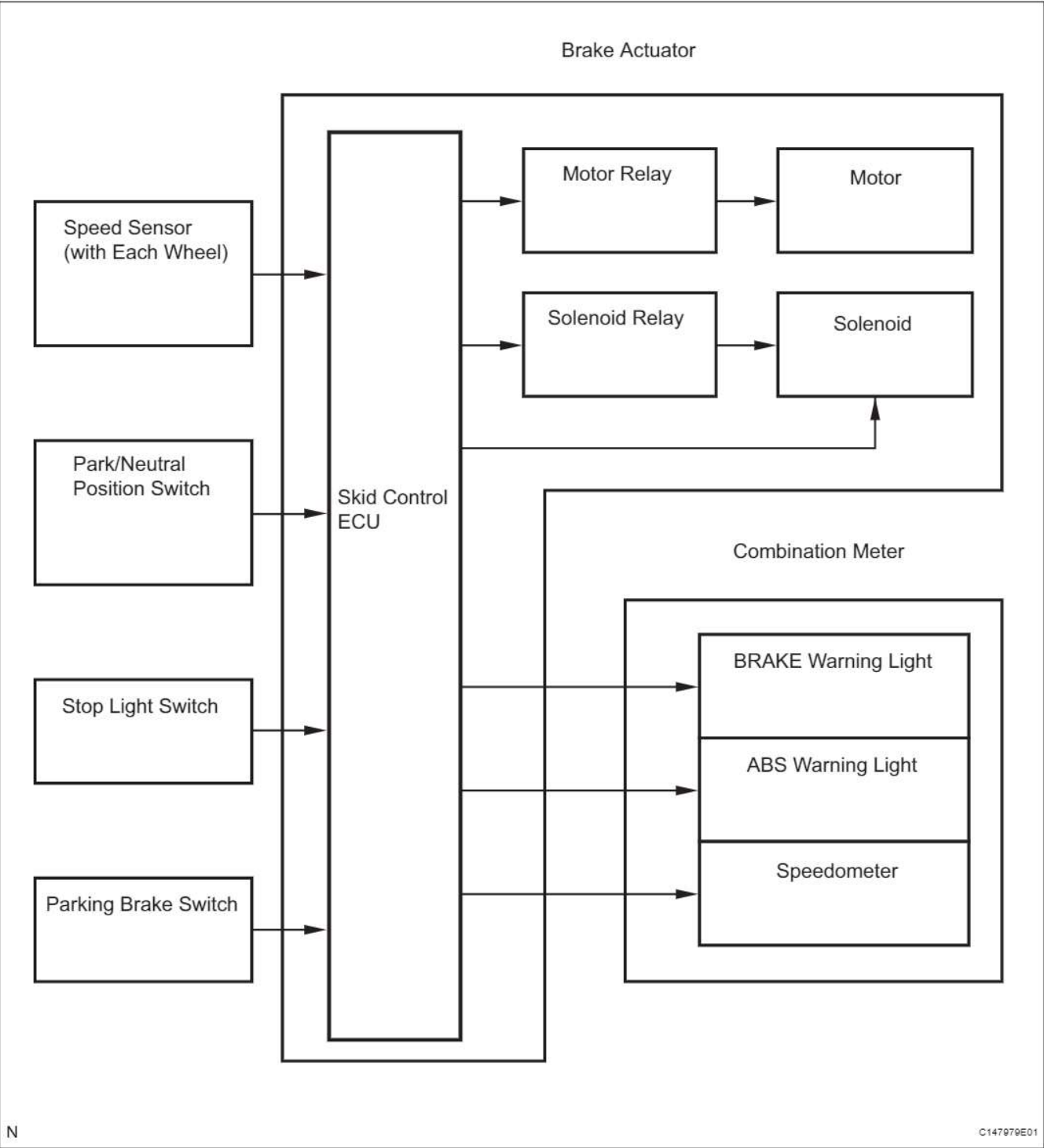
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BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

SYSTEM DIAGRAM



SYSTEM DESCRIPTION

1. SYSTEM DESCRIPTION

HINT:

The skid control ECU is a single unit with brake actuator.

(a) ABS

(Anti-lock Brake System)

The ABS helps prevent the wheels from locking when the brakes are applied firmly or when braking on a slippery surface.

(b) EBD

(Electronic Brake Force Distribution)

The EBD control utilizes ABS, realizing proper brake force distribution between front and rear wheels in accordance with driving conditions.

In addition, when braking while cornering, it also controls the brake forces of right and left wheels, helping to maintain vehicle behavior.

2. ABS WITH EBD OPERATION

- (a) Based on the signals received from the 4 wheel speed sensors, the skid control ECU calculates each wheel speed and deceleration, and checks wheel slipping condition. And according to the slipping condition, the ECU controls the pressure holding valve and pressure reduction valve in order to adjust the fluid pressure of each wheel cylinder.

3. FAIL SAFE FUNCTION

- (a) When a failure occurs in the ABS system, the ABS warning light comes on and operation is prohibited. In addition to this, when a failure which disables the EBD operation occurs, the BRAKE warning light comes on as well and operation is prohibited.

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:
*: Use the intelligent tester.

1

VEHICLE BROUGHT TO WORKSHOP

NEXT

2

INSPECT BATTERY VOLTAGE

Standard voltage:
11 to 14 V
If the voltage is below 11 V, recharge or replace the battery before proceeding.

NEXT

3

CHECK AND CLEAR DTC*

NEXT

4

PROBLEM SYMPTOM CONFIRMATION

Result

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B

Go to step 6

A

5

SYMPTOM SIMULATION

NEXT

6

CHECK FOR DTC*

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

B

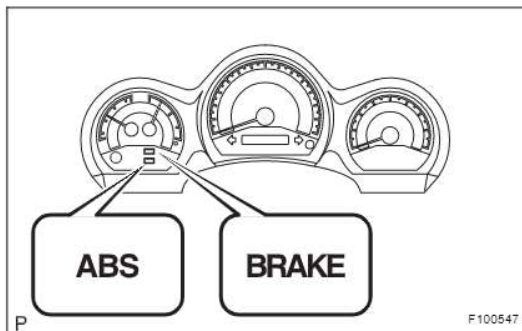
Go to step 9

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM**BC-7****A****7 PROBLEM SYMPTOMS TABLE****Result**

Result	Proceed to
Fault is not listed in problem symptoms table	A
Fault is listed in problem symptoms table	B

B**Go to step 9****A****8 OVERALL ANALYSIS AND TROUBLESHOOTING**

- (a) Terminals of ECU (See page [BC-11](#))
- (b) DATA LIST / ACTIVE TEST (See page [BC-16](#))

NEXT**Go to step 11****9 CHECK FOR FLUID LEAKAGE****NEXT****10 REPAIR OR REPLACE****NEXT****11 CONFIRMATION TEST****NEXT****END****BC****TEST MODE PROCEDURE****1. ABS WARNING LIGHT**

- (a) The ABS warning light operates as listed below.
 1. It comes ON when the ignition switch is ON.
 2. After that, it goes OFF in 3 seconds.

2. BRAKE WARNING LIGHT

- (a) The BRAKE warning light operates as listed below.
 1. It comes ON when the ignition switch is ON and the parking brake is set.

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BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

2. It comes ON when the ignition switch is ON and the brake fluid level of the reservoir tank is lower than the low level.

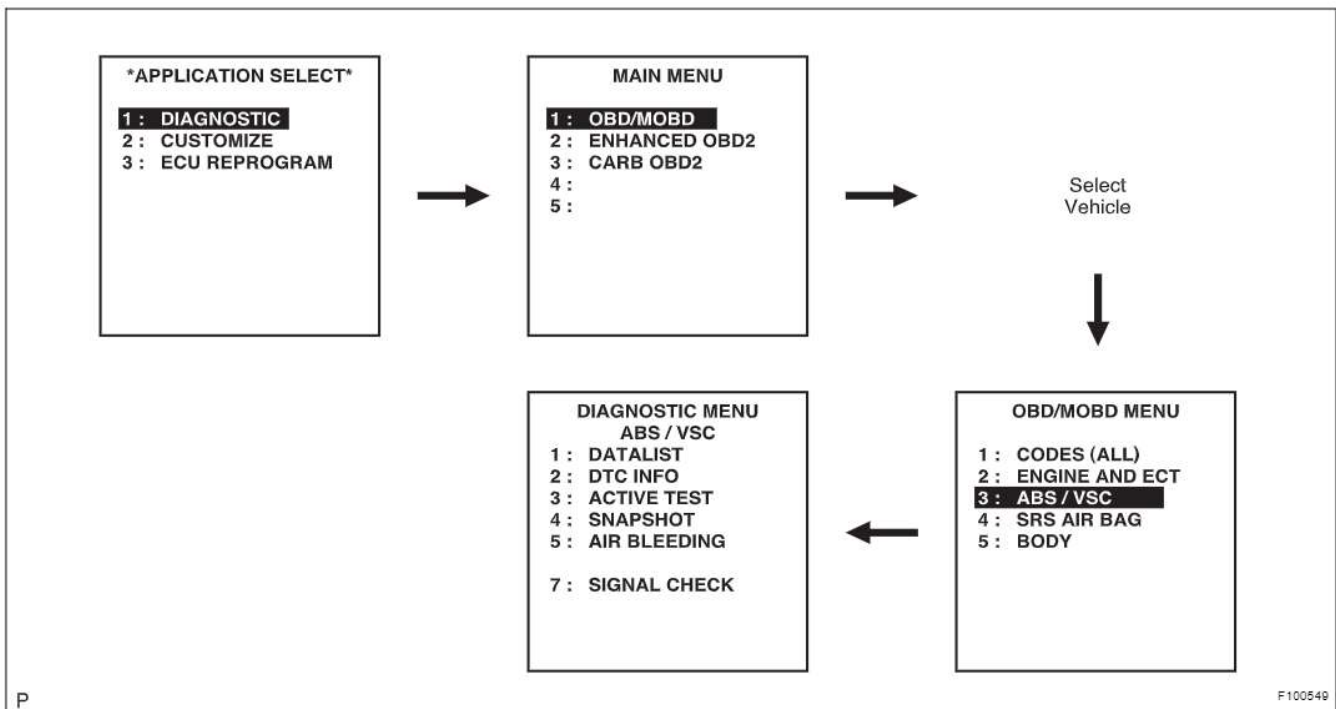
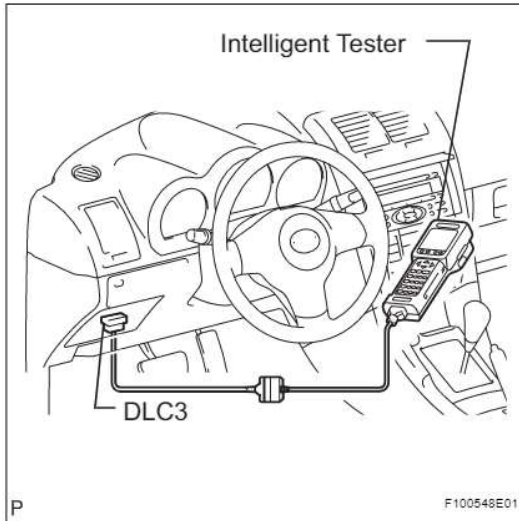
3. It goes OFF when the parking brake is not set.

3. TEST MODE FOR VEHICLE SPEED SENSOR SIGNAL (WITH INTELLIGENT TESTER)

HINT:

The manufacturer uses the test mode to check the vehicle speed sensor operation.

- (a) Connect the intelligent tester to the DLC3.
- (b) Allow the engine to idle.
- (c) Select the tester menus: DIAGNOSTIC, OBD/MOBD, ABS/VSC and SIGNAL CHECK. The ABS warning light will blink.



- (d) Drive the vehicle straightforward at 55 km/h (34 mph) or higher for several seconds. Then, do not turn the steering wheel and do not spin the wheels. The ABS warning light will go OFF when the signal check is complete.

- (e) Stop the vehicle and do not turn the ignition switch OFF.

(f) Check the DTCs.
If DTCs are set, perform the inspection procedure depends on DTCs.

DTC of speed sensor check function

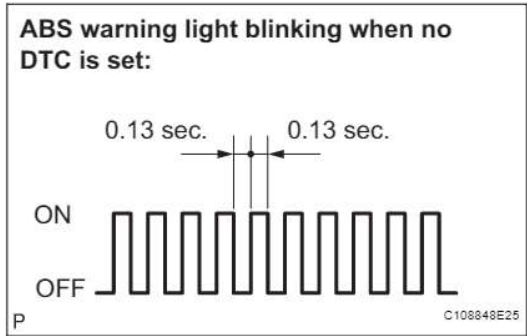
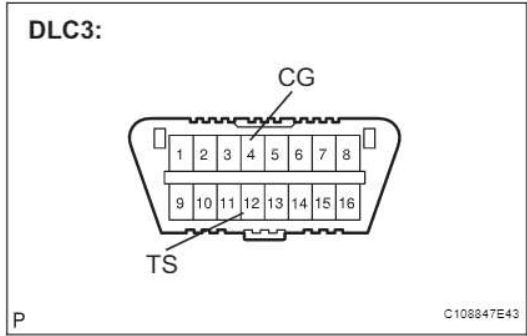
DTC*	Problem	Related DTC	See procedures
C1271	Low output voltage of right front speed sensor	C0200	BC-20
C1272	Low output voltage of left front speed sensor	C0205	BC-20
C1273	Low output voltage of right rear speed sensor	C0210	BC-27
C1274	Low output voltage of left rear speed sensor	C0215	BC-27
C1275	Abnormal change in output voltage of right front speed sensor	C1235	BC-20
C1276	Abnormal change in output voltage of left front speed sensor	C1236	BC-20
C1277	Abnormal change in output voltage of right rear speed sensor	C1238	BC-27
C1278	Abnormal change in output voltage of left rear speed sensor	C1239	BC-27

HINT:
*: These DTCs are set while the signal check mode only.

4. TEST MODE FOR VEHICLE SPEED SENSOR SIGNAL (WITHOUT INTELLIGENT TESTER)

HINT:
The manufacturer uses the test mode to check the vehicle speed sensor operation.

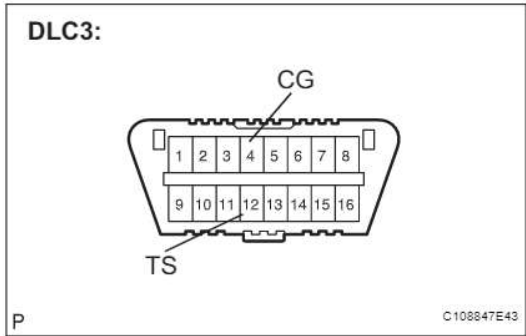
(a) Allow the engine to idle.



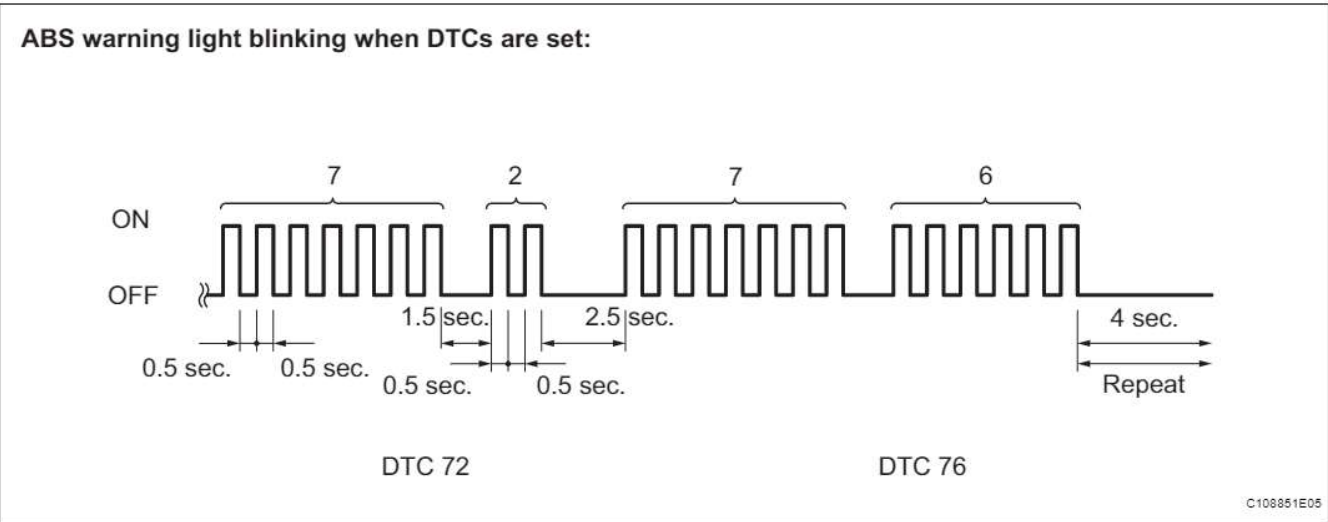
- (b) Using SST, connect terminals 12 (TS) and 4 (CG) of the DLC3. The ABS warning light will blink.
SST 09843-18040
- (c) Drive the vehicle straightforward at 55 km/h (34 mph) or higher for several seconds. Then, do not turn the steering wheel and do not spin the wheels. The ABS warning light will go OFF when the signal check is complete.
- (d) Stop the vehicle and do not turn the ignition switch OFF.

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BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM



- (e) Using SST, connect terminals 12 (TS) and 4 (CG) of the DLC3.
SST 09843-18040
- (f) Count the number of the ABS warning light blinks to check DTCs.



If DTCs are set, perform the inspection procedure depending on DTCs.

DTC of speed sensor check function

DTC*	Problem	Related DTC	See procedures
71	Low output voltage of right front speed sensor	31	BC-20
72	Low output voltage of left front speed sensor	32	BC-20
73	Low output voltage of right rear speed sensor	33	BC-27
74	Low output voltage of left rear speed sensor	34	BC-27
75	Abnormal change in output voltage of right front speed sensor	35	BC-20
76	Abnormal change in output voltage of left front speed sensor	36	BC-20
77	Abnormal change in output voltage of right rear speed sensor	38	BC-27
78	Abnormal change in output voltage of left rear speed sensor	39	BC-27

HINT:
*: These DTCs are set while the signal check mode only.

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM**BC-11****PROBLEM SYMPTOMS TABLE**

If the ABS has a problem even when DTCs are not output, use the table below to identify the potential causes of the symptoms.

NOTICE:

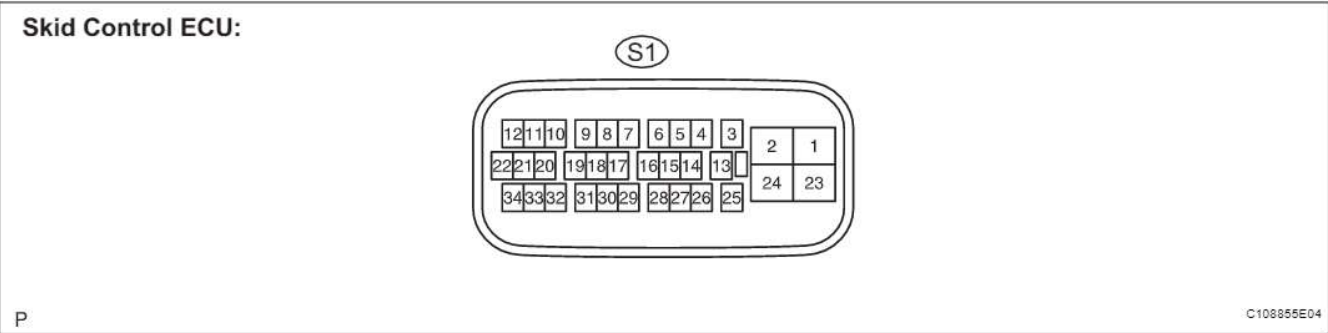
When replacing the brake actuator assembly or sensor, turn the ignition switch OFF.

Anti-lock Brake System

Symptom	Suspected Area	See page
ABS does not operate	1. Check brake fluid leakage	-
	2. Check power source circuit	BC-44
	3. Check brake actuator assembly	BC-72
	4. When above areas (1 to 3) are all normal but problem still occurs, replace brake actuator assembly	BC-73
ABS does not operate efficiently	1. Check brake fluid leakage	-
	2. Check brake actuator assembly	BC-72
	3. When above areas (1 and 2) are all normal but problem still occurs, replace brake actuator assembly	BC-73
ABS warning light remains ON	1. Check ABS warning light circuit	BC-53
ABS warning light does not come ON	1. Check ABS warning light circuit	BC-57
BRAKE warning light malfunction	1. Check BRAKE warning light circuit	BC-60
DTC check cannot be done	1. Check TC and CG terminal circuit	BC-65
Test mode cannot be done	1. Check TS and CG terminal circuit	BC-68

TERMINALS OF ECU

1. TERMINALS OF ECU



Symbols (Terminal No.)	Terminal Description
+BS (S1-1)	Solenoid valve power supply
GND1 (S1-24)	Skid control ECU ground
PN (S1-6)	NEUTRAL switch signal circuit
FL- (S1-8)	Front LH wheel speed signal input (-)
FL+ (S1-9)	Front LH wheel speed signal input (+)
STP (S1-10)	Stop light switch input
RL+ (S1-11)	Rear LH wheel speed signal input (+)
RL- (S1-12)	Rear LH wheel speed signal input (-)
WA (S1-13)	ABS warning light output
D/G (S1-14)	Diagnosis tester communication line
TS (S1-15)	Sensor diagnosis check input
TC (S1-16)	Diagnosis tester communication line
PKB (S1-18)	Parking brake switch input
+BM (S1-23)	Motor relay power supply
GND2 (S1-2)	Actuator pump motor ground
IG1 (S1-25)	ECU power supply
SP1 (S1-26)	Speed signal output for meter
FR- (S1-30)	Front RH wheel speed signal input (-)
FR+ (S1-31)	Front RH wheel speed signal input (+)
BRL (S1-32)	BRAKE warning light output
RR+ (S1-33)	Rear RH wheel speed signal input (+)
RR- (S1-34)	Rear RH wheel speed signal input (-)

2. TERMINALS INSPECTION

Disconnect the connector and measure the voltage on the wire harness side.

HINT:

Voltage cannot be measured with the connector connected to the skid control ECU as the connector is water resistant.

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

BC-13

Skid Control ECU:
(harness side connector)



F100550E02

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
+BS (S1-1) - GND1, 2 (S1-24, 2)	B - W-B	Solenoid valve power supply	Always	11 to 14 V
STP (S1-10) - GND1, 2 (S1-24, 2)	L - W-B	Stop light switch input	Stop light switch ON	11 to 14 V
WA (S1-13) - GND1, 2 (S1-24, 2)	SB - W-B	ABS warning light output	Ignition switch ON, ABS warning light ON	11 to 14 V
PKB (S1-18) - GND1, 2 (S1-24, 2)	LG - W-B	Parking brake switch input	Ignition switch ON, parking brake switch ON	Below 2.0 V
PKB (S1-18) - GND1, 2 (S1-24, 2)	LG - W-B	Parking brake switch input	Ignition switch ON, parking brake switch OFF	11 to 14 V
+BM (S1-23) - GND1, 2 (S1-24, 2)	W - W-B	Motor relay power supply	Always	11 to 14 V
BRL (S1-32) - GND1, 2 (S1-24, 2)	V - W-B	BRAKE warning light output	Ignition switch ON, BRAKE warning light ON	7 to 10 V
IG1 (S1-25) - GND1, 2 (S1-24, 2)	Y - W-B	ECU power supply	Ignition switch ON	11 to 14 V

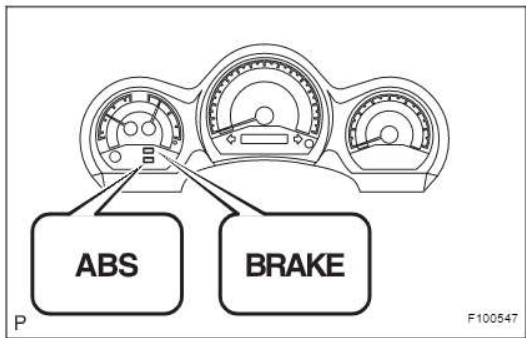
DIAGNOSIS SYSTEM

1. DIAGNOSIS

CAUTION:

When releasing the parking brake lever, set the chocks to hold the vehicle for safety.

- (a) Release the parking brake lever.
- (b) If the skid control ECU detects a malfunction, the ABS and BRAKE warning lights will come on to warn the driver. The table below indicates which lights come on when there is a malfunction in a particular function.



Item/Trouble Area	ABS System	EBD System	Skid Control ECU
ABS Warning light	○	○	○
BRAKE Warning light	-	○	○

○: Light ON

-: Light OFF

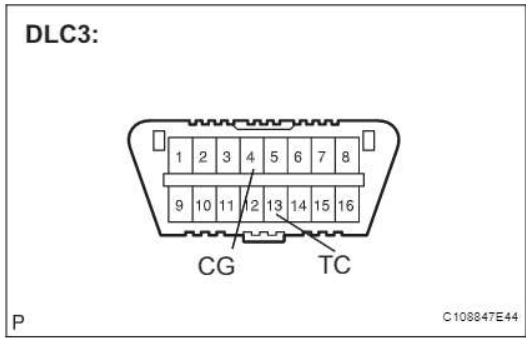
- (c) The DTCs are simultaneously stored in memory. The DTCs can be read by connecting the SST between terminals TC and CG of the DLC3 and observing the blinking of the ABS warning light, or by connecting the intelligent tester.

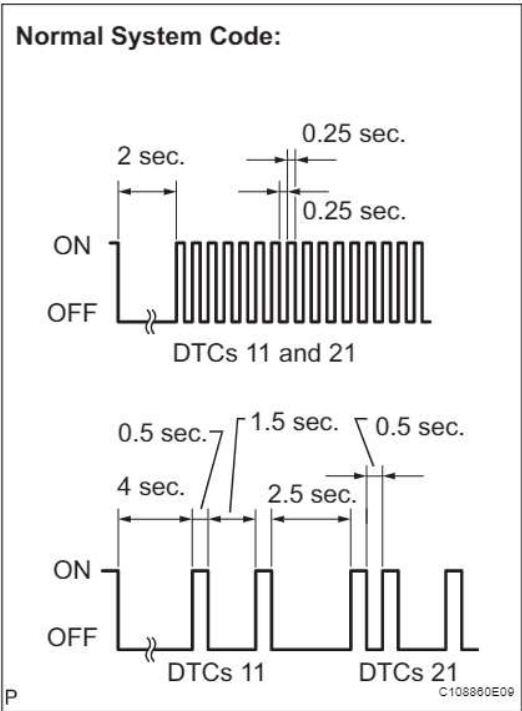
SST 09843-18040

DTC CHECK / CLEAR

1. CHECK DTC (USING SST CHECK WIRE)

- (a) Check DTCs.
 - (1) Using SST, connect terminals 13 (TC) and the 4 (CG) of the DLC3.
- SST 09843-18040
- (2) Turn the ignition switch to the ON position.

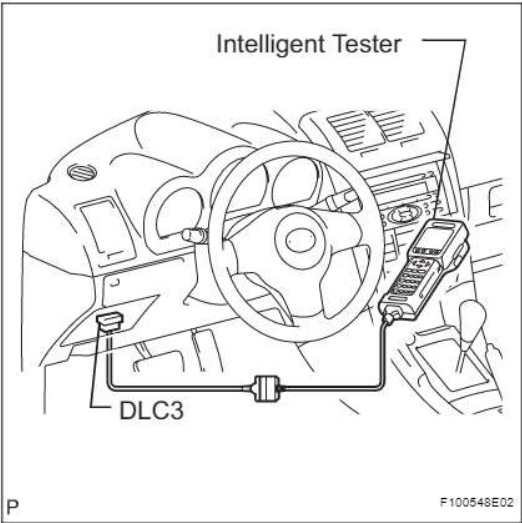




- (3) Read the DTC from the ABS warning light on the combination meter assembly.
- HINT:
- If no code appears, inspect the TC and CG terminal circuit or ABS warning light circuit.

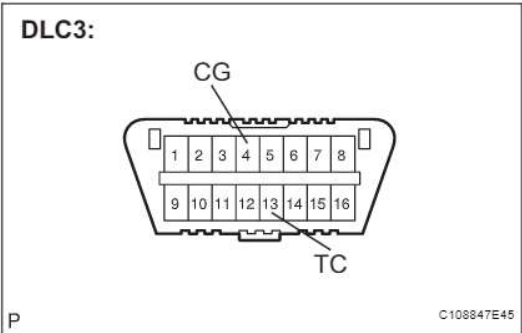
Trouble Area	See procedure
TC and CG terminal circuit	BC-65
ABS warning light circuit	BC-53 BC-57

- As examples, the blinking patterns for a normal system code and DTCs 11 and 21 are shown.
- (4) Codes are explained in the code table.
- (5) After completing the check, disconnect terminals TC and CG of the DLC3, and turn off the display. If 2 or more malfunctions are indicated at the same time, the lowest numbered code will be displayed first.



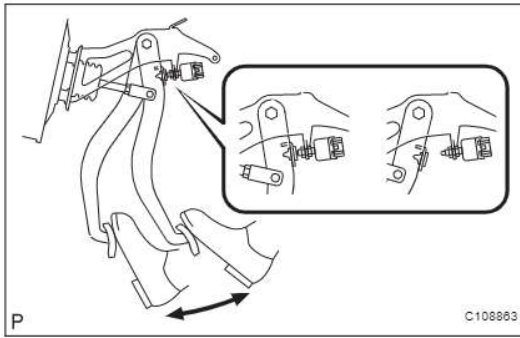
2. CHECK DTC (USING INTELLIGENT TESTER)

- (a) Check DTCs.
- (1) Connect the intelligent tester to the DLC3.
 - (2) Turn the ignition switch to the ON position.
 - (3) Read the DTCs by following the prompts on the tester screen.
- HINT:
- Refer to the intelligent tester operator's manual for further details.



3. CLEAR DTC (USING SST CHECK WIRE)

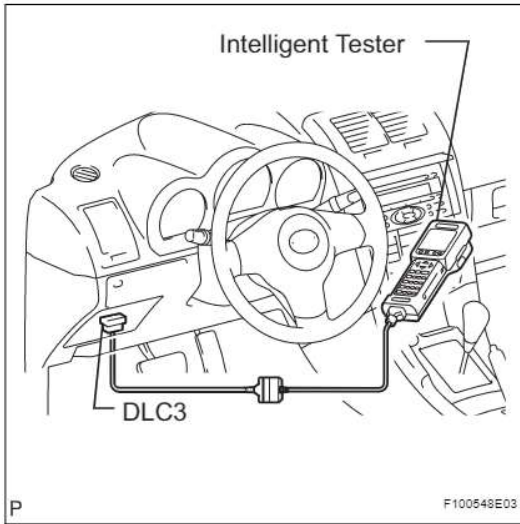
- (a) Clear the DTCs.
- (1) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.
- SST 09843-18040**
- (2) Turn the ignition switch to the ON position.

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- (3) Clear the DTCs stored in ECU by depressing the brake pedal 8 times or more within 5 seconds.
- (4) Check that the warning light indicates the normal system code.
- (5) Remove the SST from the terminals of the DLC3.

HINT:

Clearing the DTCs cannot be performed by removing the battery cable or ECU-IG fuse.

**4. CLEAR DTC (USING INTELLIGENT TESTER)**

- (a) Clear DTCs.
 - (1) Connect the intelligent tester to the DLC3.
 - (2) Turn the ignition switch to the ON position.
 - (3) Operate the intelligent tester to erase the codes.
- HINT:**
Refer to the intelligent tester operator's manual for further details.

5. END OF DTC CHECK / CLEAR

- (a) Turn the ignition switch to the ON position.
- (b) Check that the ABS warning light goes off in about 3 seconds.

FREEZE FRAME DATA

1. FREEZE FRAME DATA

HINT:

- Whenever a DTC is detected or the ABS operates, the skid control ECU stores the current vehicle (sensor) state as freeze frame data.
 - The skid control ECU stores the number of times (maximum: 31) the ignition switch has been turned from OFF to the ON position since the last time the ABS was activated. However, if the vehicle was stopped or at a low speed (7 km/h (4.3 mph) or less), or if a DTC is detected, the skid control ECU will not count the number since then.
 - Freeze frame data at the time the ABS operated: The skid control ECU stores and updates data whenever the ABS system operates. When the ECU stores data at the time a DTC is detected, the data stored when the ABS operated is erased.
 - Freeze frame data at the time a DTC is detected: When the skid control ECU stores data at the time a DTC is detected, no updates will be performed until the data is cleared.
- (a) Connect the intelligent tester to the DLC3.
 - (b) Turn the ignition switch to the ON position.
 - (c) From the display on the tester, select the "FREEZE FRAME DATA".

Tester Display	Measurement Item	Reference Value
VEHICLE SPD	Vehicle speed	Min.: 0, max.: 326.4 km/h
STOP LIGHT SW	Stop light switch signal	Stop light switch ON: ON; OFF: OFF
# IG ON	Numbers of operations of ignition switch ON after memorizing freeze frame data	0 to 31
SYSTEM	System status	ABS activated: ABS, NO SYS, FAIL SAFE
TROUBLE CODE	Freeze DTC	Min.: 0, max.: 255
SPD GRADE	Vehicle speed grade	Min.: -1.869, max.: 1.869
# CODES	Number of trouble code	Min.: 0, max.: 255

FAIL-SAFE CHART

1. FAIL SAFE OPERATION

If there is a problem with sensor signals or actuator systems, the skid control ECU prohibits power supply to the brake actuator and prohibits ABS control. The ABS control will be prohibited, but EBD control continues as much as possible. If EBD control is impossible, the BRAKE warning light comes on to warn the driver.

Malfunction	Symptom
ABS system	ABS control prohibited
EBD system	ABS and EBD control prohibited

HINT:
If the ABS system has a malfunction, the brake system will operate normally without ABS control.

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM**BC-19****DATA LIST / ACTIVE TEST****1. READ DATA LIST****HINT:**

According to the DATA LIST displayed on the intelligent tester, you can read the value and status of the switch, sensor, actuator and so on without parts removal.

Reading the DATA LIST as the first step of trouble-shooting is one of the methods to shorten labor time.

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch to the ON position.
- (c) From the display on the tester, read the DATA LIST.

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
AIR BLD SUPPORT	Air bleed support / SUPPORT or NOT SUP	Support / Not support	-
PKB SW	Parking brake switch / ON or OFF	ON: Parking brake applied OFF: Parking brake released	-
STOP LIGHT SW	Stop light switch / ON or OFF	ON: Brake pedal depressed OFF: Brake pedal released	-
ABS MOT RELAY	ABS motor relay / ON or OFF	ON: Motor relay ON OFF: Motor relay OFF	-
SOL RELAY	Solenoid relay / ON or OFF	ON: Solenoid relay ON OFF: Solenoid relay OFF	-
TEST MODE	Test mode operation / NORMAL or TEST	NORMAL: Normal mode TEST: During test mode	-
ABS OPERT RL	ABS operation (RL) / BEFORE or OPERATE	BEFORE: No ABS operation (RL) OPERATE: During ABS operation (RL)	Similar speed as indicated on speedometer
ABS OPERT RR	ABS operation (RR) / BEFORE or OPERATE	BEFORE: No ABS operation (RR) OPERATE: During ABS operation (RR)	Similar speed as indicated on speedometer
ABS OPERT FL	ABS operation (FL) / BEFORE or OPERATE	BEFORE: No ABS operation (FL) OPERATE: During ABS operation (FL)	-
ABS OPERT FR	ABS operation (FR) / BEFORE or OPERATE	BEFORE: No ABS operation (FR) OPERATE: During ABS operation (FR)	-
SRLR	ABS solenoid (SRLR) ON / OFF	ON: Operated OFF: Not operated	-
SRLH	ABS solenoid (SRLH) ON / OFF	ON: Operated OFF: Not operated	-
SRRR (SRR)	ABS solenoid (SRRR (SRR)) ON / OFF	ON: Operated OFF: Not operated	-
SRRH (SRH)	ABS solenoid (SRRH (SRH)) ON / OFF	ON: Operated OFF: Not operated	-
SFLR	ABS solenoid (SFLR) ON / OFF	ON: Operated OFF: Not operated	-
SFLH	ABS solenoid (SFLH) ON / OFF	ON: Operated OFF: Not operated	-
SFRR	ABS solenoid (SFRR) ON / OFF	ON: Operated OFF: Not operated	-
SFRH	ABS solenoid (SFRH) ON / OFF	ON: Operated OFF: Not operated	-
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 mph), max.: 326 km/h (202 mph)	Actual wheel speed	Similar speed as indicated on speedometer

BC

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BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 mph), max.: 326 km/h (202 mph)	Actual wheel speed	Similar speed as indicated on speedometer
WHEEL SPD RR	Wheel speed sensor (RR) reading / min.: 0 km/h (0 mph), max.: 326 km/h (202 mph)	Actual wheel speed	Similar speed as indicated on speedometer
WHEEL SPD RL	Wheel speed sensor (RL) reading / min.: 0 km/h (0 mph), max.: 326 km/h (202 mph)	Actual wheel speed	Similar speed as indicated on speedometer
VEHICLE SPD	Vehicle speed / min.: 0 km/h (0 mph), max.: 326 km/h (202 mph)	Actual wheel speed	Similar speed as indicated on speedometer
IG VOLTAGE	ECU power supply voltage / TOO HIGH / NORMAL / TOO LOW	TOO HIGH: 14 V or more NORMAL: 9.8 V to 14 V TOO LOW: Below 9.8 V	-
SPD SEN FR	FR speed sensor open detection / OPEN or NORMAL	OPEN: Momentary interruption	-
SPD SEN FL	FL speed sensor open detection / OPEN or NORMAL	OPEN: Momentary interruption	-
SPD SEN RR	RR speed sensor open detection / OPEN or NORMAL	OPEN: Momentary interruption	-
SPD SEN RL	RL speed sensor open detection / OPEN or NORMAL	OPEN: Momentary interruption	-

2. PERFORM ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the intelligent tester allows the relay, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one of the methods to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch to the ON position.
- According to the display on the tester, perform the ACTIVE TEST.

HINT:

Ignition switch must be turned to the ON position to proceed to the ACTIVE TEST using the intelligent tester.

Tester Display	Test Part	Control Range	Diagnostic Note
ABS MOT RELAY	Turns ABS motor relay	Relay ON / OFF	Operation of solenoid (clicking sound) can be heard
SOL RELAY	Turns solenoid relay	Relay ON / OFF	Operation of solenoid (clicking sound) can be heard
BRAKE WRN LIGHT	Turns BRAKE warning light	Warning light ON / OFF	Observe combination meter
ABS WRN LIGHT	Turns ABS warning light	Warning light ON / OFF	Observe combination meter
SRLR	Turns ABS solenoid (SRLR)	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLH	Turns ABS solenoid (SRLH)	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRR	Turns ABS solenoid (SRRR)	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRH	Turns ABS solenoid (SRRH)	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM**BC-21**

Tester Display	Test Part	Control Range	Diagnostic Note
SFLR	Turns ABS solenoid (SFLR)	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLH	Turns ABS solenoid (SFLH)	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRR	Turns ABS solenoid (SFRR)	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH	Turns ABS solenoid (SFRH)	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRR & SFRH	Turns ABS solenoid SFRR and SFRH	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR & SFLH	Turns ABS solenoid SFLR and SFLH	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SRH & SRR	Turns ABS solenoid SRRR and SRRH	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR & SRLH	Turns ABS solenoid SRLR and SRLH	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH & SFLH	Turns ABS solenoid SFRH and SFLH	Solenoid ON / OFF	Operation of solenoid (clicking sound) can be heard

BC

BC-22

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

DIAGNOSTIC TROUBLE CODE CHART

NOTICE:

When removing parts, turn the ignition switch OFF.

HINT:

- Using SST 09843-18040, connect terminals TC and CG of the DLC3.
- If any abnormality is not found when inspecting parts, inspect the ECU and ground points for poor contact.
- If a trouble code is displayed during the DTC check, check the circuit listed for that code. For details of each code, turn to the page referred to under the "See page" for respective "DTC Code" in the DTC chart.
- When two or more DTCs are recorded and the problem is not identified, perform circuit inspection of the other DTCs.

DTC chart of ABS:

DTC Code	Detection Item	Trouble Area	See page
C0200/31	Right Front Wheel Speed Sensor Signal Malfunction	1. Front speed sensor RH 2. Front speed sensor circuit 3. Front speed sensor rotor 4. Sensor installation	BC-20
C0205/32	Left Front Wheel Speed Sensor Signal Malfunction	1. Front speed sensor LH 2. Front speed sensor circuit 3. Front speed sensor rotor 4. Sensor installation	BC-20
C0210/33	Right Rear Wheel Speed Sensor Signal Malfunction	1. Rear speed sensor RH 2. Rear speed sensor circuit 3. Rear speed sensor rotor 4. Sensor installation	BC-27
C0215/34	Left Rear Wheel Speed Sensor Signal Malfunction	1. Rear speed sensor LH 2. Rear speed sensor circuit 3. Rear speed sensor rotor 4. Sensor installation	BC-27
C0226/21	SFR Solenoid Circuit	1. Brake actuator assembly 2. SFRR or SFRH circuit	BC-33
C0236/22	SFL Solenoid Circuit	1. Brake actuator assembly 2. SFLR or SFLH circuit	BC-33
C0246/23	SRR Solenoid Circuit	1. Brake actuator assembly 2. SRRR or SRRH circuit	BC-33
C0256/24	SRL Solenoid Circuit	1. Brake actuator assembly 2. SFLR or SRLH circuit	BC-33
C0273/13	Open or Short Circuit in ABS Motor Relay Circuit	1. ABS motor relay 2. ABS motor relay circuit 3. Brake actuator assembly	BC-36
C0274/14	Short to B+ in ABS Motor Relay Circuit	1. ABS motor relay 2. ABS motor relay circuit 3. Brake actuator assembly	BC-36
C0278/11	Open or Short Circuit in ABS Solenoid Relay Circuit	1. ABS motor relay 2. ABS motor relay circuit 3. Brake actuator assembly	BC-40
C0279/12	Short to B+ in ABS Solenoid Relay Circuit	1. ABS motor relay 2. ABS motor relay circuit 3. Brake actuator assembly	BC-40
C1235/35	Foreign Object is Attached on Tip of Front Speed Sensor RH	1. Front speed sensor RH 2. Front speed sensor rotor RH	BC-20
C1236/36	Foreign Object is Attached on Tip of Front Speed Sensor LH	1. Front speed sensor LH 2. Front speed sensor rotor LH	BC-20
C1238/38	Foreign Object is Attached on Tip of Rear Speed Sensor RH	1. Rear speed sensor RH 2. Rear speed sensor rotor RH	BC-27

BC

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM**BC-23**

DTC Code	Detection Item	Trouble Area	See page
C1239/39	Foreign Object is Attached on Tip of Rear Speed Sensor LH	1. Rear speed sensor LH 2. Rear speed sensor rotor LH	BC-27
C1241/41	Low Battery Positive Voltage	1. Battery 2. Charging system 3. Power source circuit	BC-44
C1249/49	Open in Stop Light Switch Circuit	1. Stop light switch 2. Stop light switch circuit	BC-47
C1251/51	Open in Pump Motor Circuit	1. ABS pump motor 2. Brake actuator assembly	BC-50

Test Mode DTC of ABS:

DTC Code	Detection Item	Trouble Area	See page
C1271/71	Low Output Signal of Front Speed Sensor RH (Test Mode DTC)	1. Front speed sensor RH 2. Sensor installation 3. Speed sensor rotor	BC-20
C1272/72	Low Output Signal of Front Speed Sensor LH (Test Mode DTC)	1. Front speed sensor LH 2. Sensor installation 3. Speed sensor rotor	BC-20
C1273/73	Low Output Signal of Rear Speed Sensor RH (Test Mode DTC)	1. Rear speed sensor RH 2. Sensor installation 3. Speed sensor rotor	BC-27
C1274/74	Low Output Signal of Rear Speed Sensor LH (Test Mode DTC)	1. Rear speed sensor LH 2. Sensor installation 3. Speed sensor rotor	BC-27
C1275/75	Abnormal Change in Output Signal of Front Speed Sensor RH (Test Mode DTC)	Speed sensor rotor	BC-20
C1276/76	Abnormal Change in Output Signal of Front Speed Sensor LH (Test Mode DTC)	Speed sensor rotor	BC-20
C1277/77	Abnormal Change in Output Signal of Rear Speed Sensor RH (Test Mode DTC)	Speed sensor rotor	BC-27
C1278/78	Abnormal Change in Output Signal of Rear Speed Sensor LH (Test Mode DTC)	Speed sensor rotor	BC-27

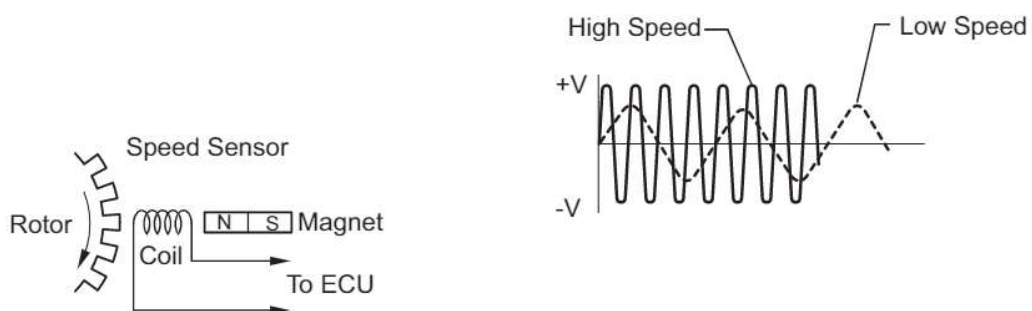
BC

BC-24

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

DTC	C0200/31	Right Front Wheel Speed Sensor Signal Malfunction
DTC	C0205/32	Left Front Wheel Speed Sensor Signal Malfunction
DTC	C1235/35	Foreign Object is Attached on Tip of Front Speed Sensor RH
DTC	C1236/36	Foreign Object is Attached on Tip of Front Speed Sensor LH
DTC	C1271/71	Low Output Signal of Front Speed Sensor RH (Test Mode DTC)
DTC	C1272/72	Low Output Signal of Front Speed Sensor LH (Test Mode DTC)
DTC	C1275/75	Abnormal Change in Output Signal of Front Speed Sensor RH (Test Mode DTC)
DTC	C1276/76	Abnormal Change in Output Signal of Front Speed Sensor LH (Test Mode DTC)

DESCRIPTION



C108865E02

The speed sensor detects wheel speed and transmits the appropriate signals to the ECU. These signals are used for control of the ABS control system. Each of the front and rear rotors has 48 serrations. When the rotors rotate, the magnetic field generated by the permanent magnet in the speed sensor induces AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM**BC-25**

DTCs C1271/71, C1272/72, C1275/75 and C1276/76 can be deleted when the speed sensor sends a vehicle speed signal or the test mode ends. DTCs C1271/71, C1272/72, C1275/75 and C1276/76 are out put only in the test mode.

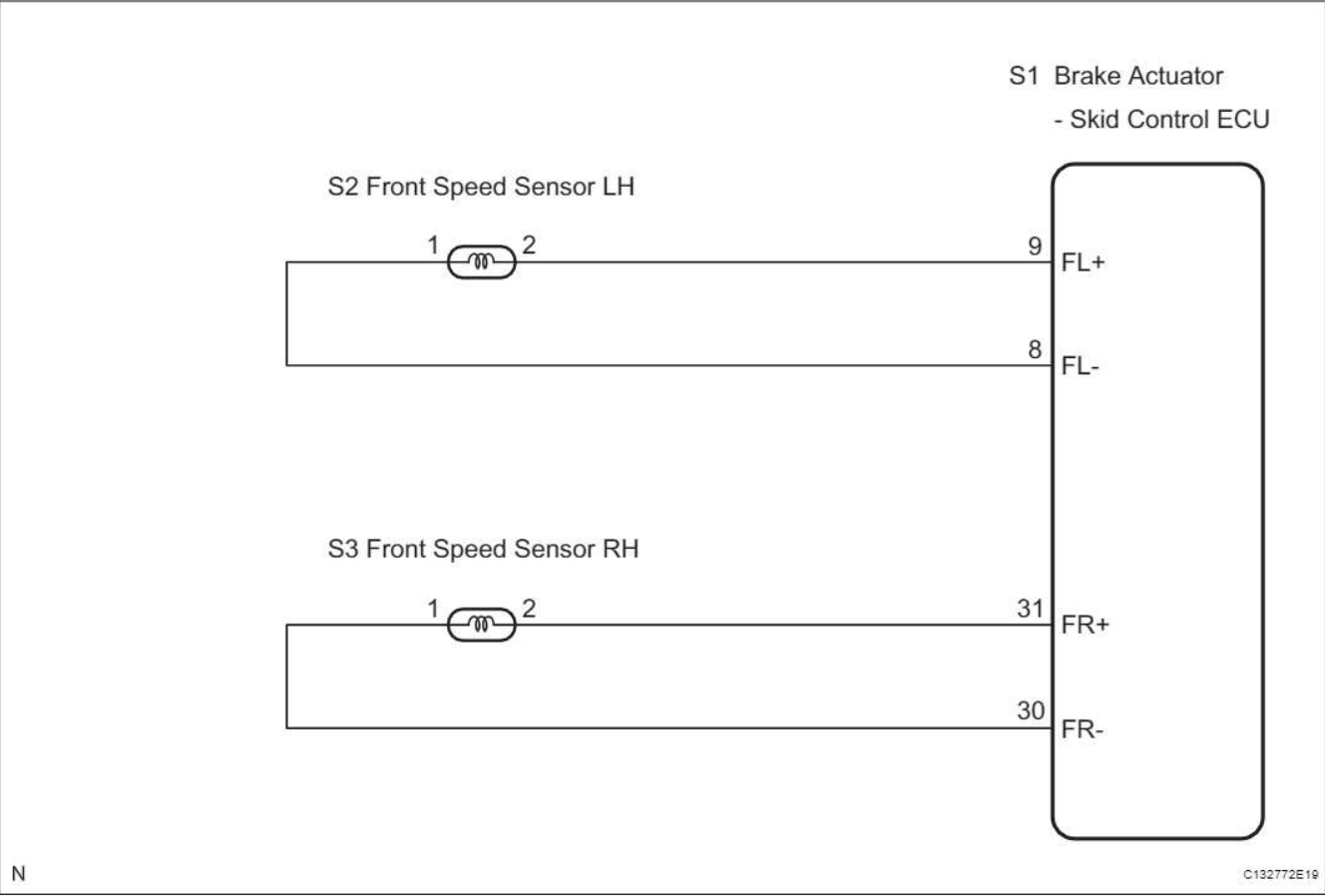
DTC Code	DTC Detection Condition	Trouble Area
C0200/31	Any of the following conditions is detected: - At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 15 sec. - Momentary interruption of sensor signal of faulty wheel has occurred 7 times or more at vehicle speed of 35 km/h (20 mph) or more. - Sensor signal circuit is open for 0.5 sec. or more.	- Front speed sensor RH - Front speed sensor RH circuit - Speed sensor rotor - Sensor installation
C0205/32	Any of the following conditions is detected: - At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 15 sec. - Momentary interruption of sensor signal of faulty wheel has occurred 7 times or more at vehicle speed of 35 km/h (20 mph) or more. - Sensor signal circuit is open for 0.5 sec. or more.	- Front speed sensor LH - Front speed sensor LH circuit - Speed sensor rotor - Sensor installation
C1235/35	At the vehicle speed of 20 km/h (12 mph) or more, the condition that noise is included in the speed sensor signal continues for 5 sec. or more.	- Front speed sensor RH - Speed sensor rotor
C1236/36	At the vehicle speed of 20 km/h (12 mph) or more, the condition that noise is included in the speed sensor signal continues for 5 sec. or more.	- Front speed sensor LH - Speed sensor rotor

BC

BC-26

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

WIRING DIAGRAM



INSPECTION PROCEDURE

1

CHOOSE DIAGNOSIS METHOD

(a) Choose the diagnosis method.

Method:

Method	Proceed to
Using intelligent tester	A
Not using intelligent tester	B

B

Go to step 4

2

READ VALUE OF INTELLIGENT TESTER (FRONT SPEED SENSOR)

- (a) Connect the intelligent tester to the DLC3.
- (b) Start the engine.
- (c) Select the tester menus: DIAGNOSTIC, OBD/MOBD, ABS/VSC and DATA LIST.

BC

A

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

BC-27

(d) Read the WHEEL SPD FR and WHEEL SPD FL status.

Tester Display	Measurement Item/Range	Normal Condition
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 mph), max.: 326 km/h (202 mph)	Actual wheel speed
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 mph), max.: 326 km/h (202 mph)	Actual wheel speed

OK:
There is almost no difference from the displayed speed value.

HINT:
There is tolerance of +/- 10% in the speedometer indication.

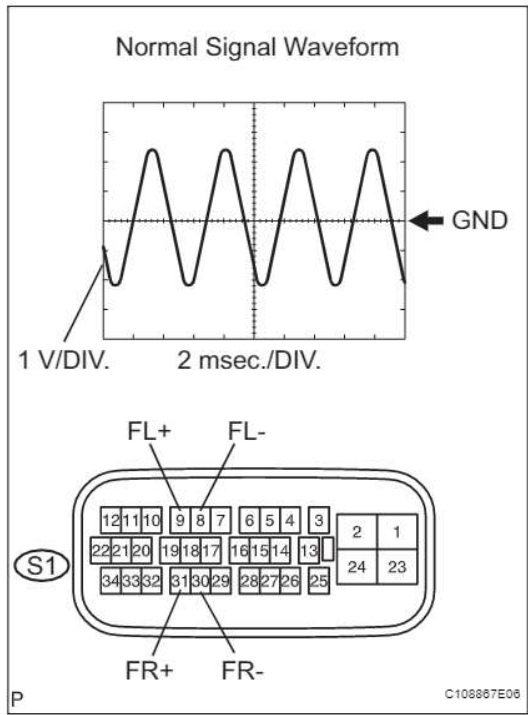
NG

Go to step 4

OK

3

INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



- (a) INSPECTION USING OSCILLOSCOPE:
- (1) Connect the oscilloscope between terminals FR+ and FR-, or FL+ and FL- of the skid control ECU connector.
 - (2) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.
- OK:**
A waveform as shown in the figure should be output.
- HINT:**
- As vehicle speed (wheel revolution speed) increases, a cycle of the waveform narrows and the fluctuation in the output voltage becomes greater.
 - When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter attached to it.

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

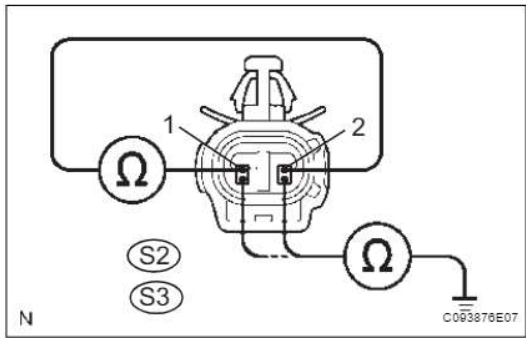
NG

BC-28

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

4

INSPECT FRONT SPEED SENSOR



- (a) Make sure that there is no looseness at the locking part and connecting part of connectors.
- (b) Disconnect the S2 and S3 speed sensor connectors.
- (c) Measure the resistance of the speed sensors.

Standard resistance:
LH

Tester Connection	Specified Condition
S2-2 (FL+) - S2-1 (FL-)	1.4 to 1.8 kΩ at 20°C (68°F)
S2-2 (FL+) - Body ground	10 kΩ or higher
S2-1 (FL-) - Body ground	10 kΩ or higher

RH

Tester Connection	Specified Condition
S3-2 (FR+) - S3-1 (FR-)	1.4 to 1.8 kΩ at 20°C (68°F)
S3-2 (FR+) - Body ground	10 kΩ or higher
S3-1 (FR-) - Body ground	10 kΩ or higher

HINT:
Check the speed sensor signal after replacement.

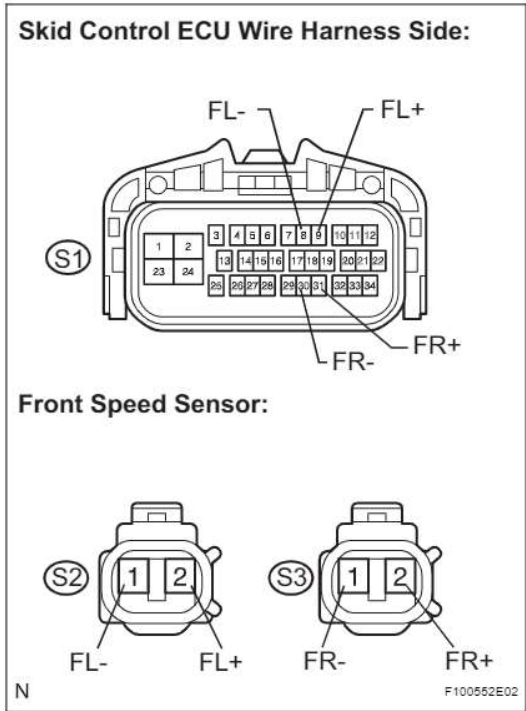
NG

REPLACE FRONT SPEED SENSOR

OK

5

CHECK WIRE HARNESS (SKID CONTROL ECU - FRONT SPEED SENSOR)



- (a) Disconnect the S1 skid control ECU connector.
- (b) Disconnect the S2 and S3 front speed sensor connectors.
- (c) Measure the resistance of the wire harness side connectors.

Standard resistance:
LH

Tester Connection	Specified Condition
S1-9 (FL+) - S2-2 (FL+)	Below 1 Ω
S1-8 (FL-) - S2-1 (FL-)	Below 1 Ω
S1-9 (FL+) - Body ground	10 kΩ or higher
S1-8 (FL-) - Body ground	10 kΩ or higher

RH

Tester Connection	Specified Condition
S1-31 (FR+) - S3-2 (FR+)	Below 1 Ω
S1-30 (FR-) - S3-1 (FR-)	Below 1 Ω
S1-31 (FR+) - Body ground	10 kΩ or higher
S1-30 (FR-) - Body ground	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

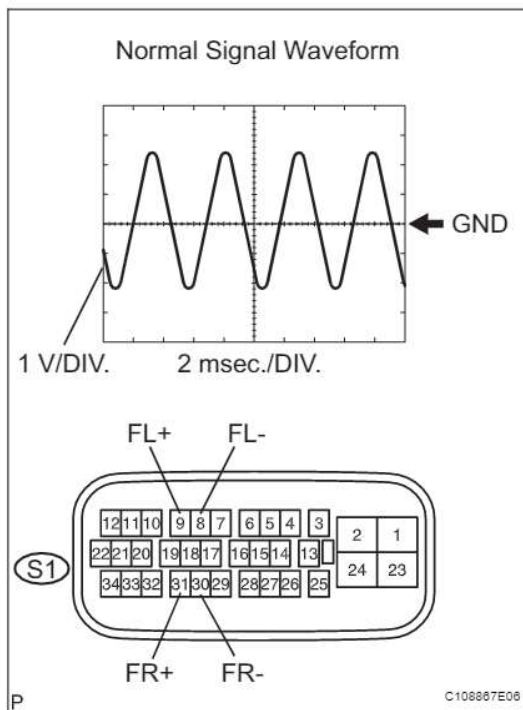
BC

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

BC-29

OK

6 INSPECT SPEED SENSOR AND SENSOR ROTOR SERRATIONS



(a) INSPECTION USING OSCILLOSCOPE:

- (1) Connect the oscilloscope to terminal FR+ and FR-, or FL+ and FL- of the skid control ECU connector.
- (2) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

OK:

A waveform as shown in the figure should be output.

HINT:

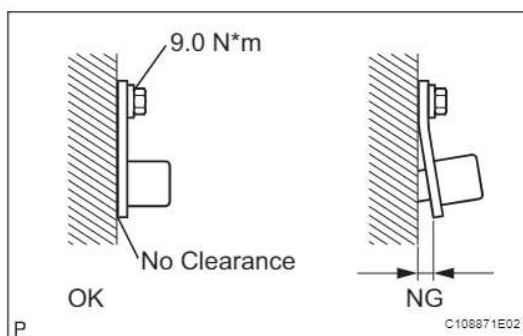
- As vehicle speed (wheel revolution speed) increases, a cycle of the waveform narrows and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter attached to it.

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

NG

7 INSPECT FRONT SPEED SENSOR INSTALLATION



(a) Check the speed sensor installation.

OK:

There is no clearance between the sensor and the front steering knuckle.

The installation bolt is tightened properly.

Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

HINT:

Check the speed sensor signal after replacement (See page BC-7).

NG

REPLACE FRONT SPEED SENSOR

OK

8 INSPECT SPEED SENSOR TIP

- (a) Remove the front speed sensor.
- (b) Check the sensor tip.

OK:

No scratches or foreign matter on the sensor tip.

BC

BC-30

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

HINT:

Check the speed sensor signal after cleaning / replacement (See page [BC-7](#)).

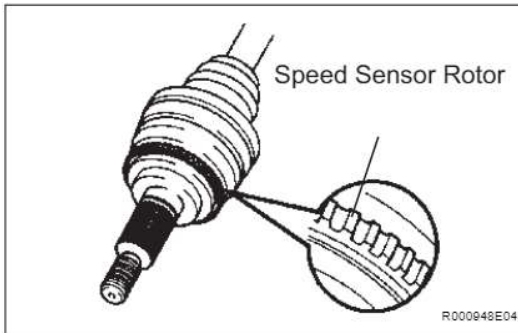
NG

CLEAN OR REPLACE SPEED SENSOR

OK

9

INSPECT SPEED SENSOR ROTOR



- (a) Remove the front drive outboard joint shaft assembly.
- (b) Check the sensor rotor serrations.

OK:

No scratches, missing teeth or foreign matter on the rotors.

HINT:

- If there is foreign matter in the rotor, remove it and check the output waveform after reassembly.
- Check the speed sensor signal after cleaning / replacement (See page [BC-7](#)).

NG

CLEAN OR REPLACE SENSOR ROTOR

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

BC-31

DTC	C0210/33	Right Rear Wheel Speed Sensor Signal Malfunction
DTC	C0215/34	Left Rear Wheel Speed Sensor Signal Malfunction
DTC	C1238/38	Foreign Object is Attached on Tip of Rear Speed Sensor RH
DTC	C1239/39	Foreign Object is Attached on Tip of Rear Speed Sensor LH
DTC	C1273/73	Low Output Signal of Rear Speed Sensor RH (Test Mode DTC)
DTC	C1274/74	Low Output Signal of Rear Speed Sensor LH (Test Mode DTC)
DTC	C1277/77	Abnormal Change in Output Signal of Rear Speed Sensor RH (Test Mode DTC)
DTC	C1278/78	Abnormal Change in Output Signal of Rear Speed Sensor LH (Test Mode DTC)

DESCRIPTION

Refer to DTC C0200/31, C0205/32, C1235/35, C1236/36 (See page [BC-20](#)).

DTCs C1273/73, C1274/74, C1277/77 and C1278/78 can be deleted when the speed sensor sends a vehicle speed signal or the test mode ends. DTCs C1273/73, C1274/74, C1277/77 and C1278/78 are out put only in the test mode.

DTC Code	DTC Detection Condition	Trouble Area
C0210/33	Any of the following conditions is detected: - At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 15 sec. - Momentary interruption of sensor signal of faulty wheel has occurred 7 times or more at vehicle speed of 35 km/h (20 mph) or over. - Sensor signal circuit is open for 0.5 sec. or more.	- Rear speed sensor RH - Rear speed sensor RH circuit - Speed sensor rotor - Sensor installation
C0215/34	Any of the following conditions is detected: - At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 15 sec. - Momentary interruption of sensor signal of faulty wheel has occurred 7 times or more at vehicle speed of 35 km/h (20 mph) or over. - Sensor signal circuit is open for 0.5 sec. or more.	- Rear speed sensor LH - Rear speed sensor LH circuit - Speed sensor rotor - Sensor installation

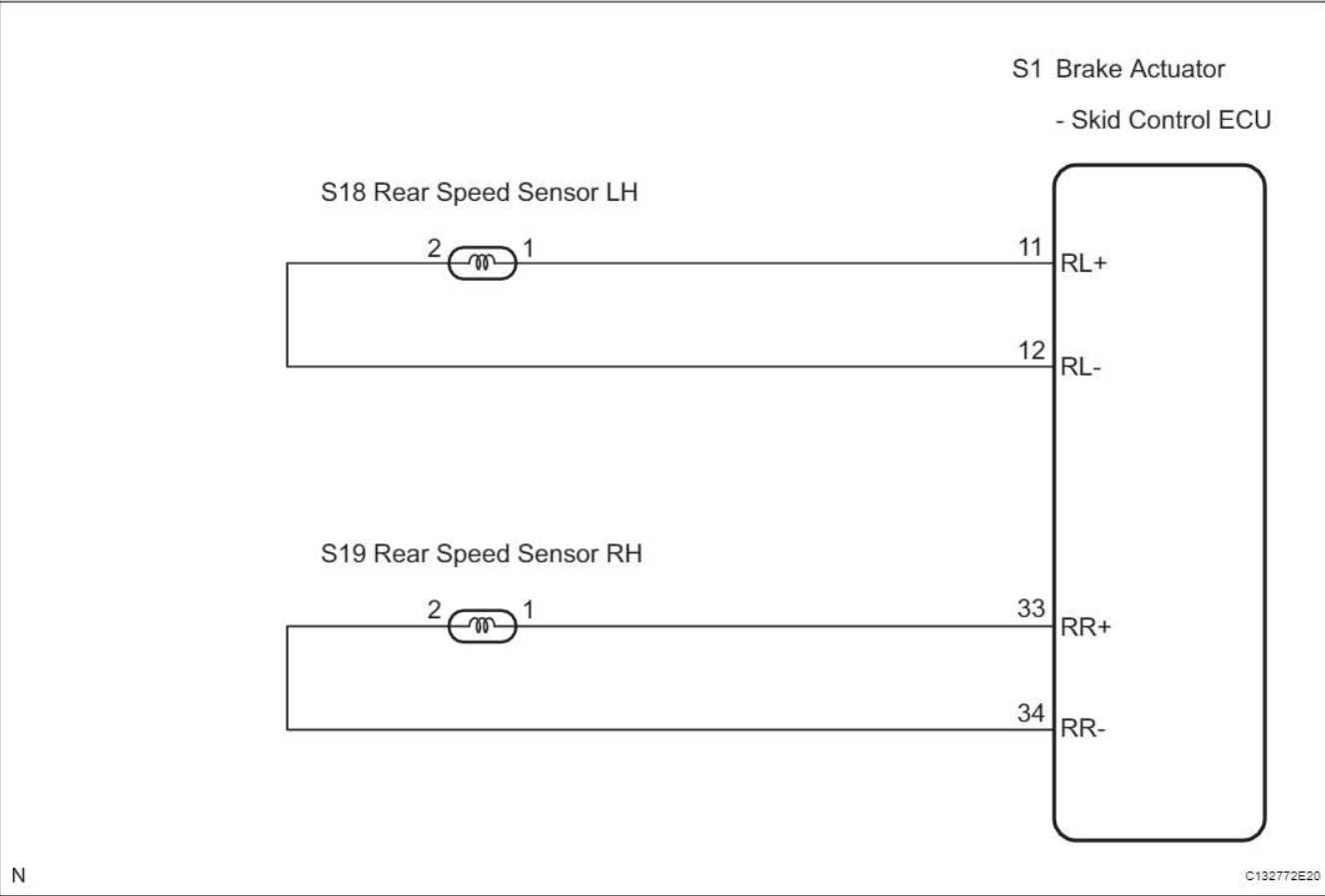
BC

BC-32

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

DTC Code	DTC Detection Condition	Trouble Area
C1238/38	At the vehicle speed of 20 km/h (12 mph) or more, the condition that noise is included in the speed sensor signal continues for 5 sec. or more.	• Rear speed sensor RH • Speed sensor rotor
C1239/39	At the vehicle speed of 20 km/h (12 mph) or more, the condition that noise is included in the speed sensor signal continues for 5 sec. or more.	• Rear speed sensor LH • Speed sensor rotor

WIRING DIAGRAM



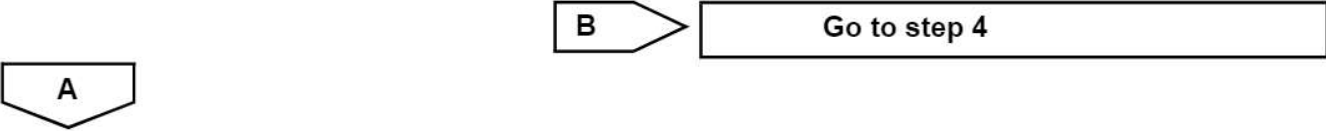
INSPECTION PROCEDURE

BC	1	CHOOSE DIAGNOSIS METHOD
----	---	-------------------------

(a) Choose the diagnosis method.

Method:

Method	Proceed to
Using intelligent tester	A
Not using intelligent tester	B



BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

BC-33

2 READ VALUE OF INTELLIGENT TESTER (REAR SPEED SENSOR)

- Connect the intelligent tester to the DLC3.
- Start the engine.
- Select the tester menus: DIAGNOSTIC, OBD/MOBD, ABS/VSC and DATA LIST.
- Read the WHEEL SPD RL and WHEEL SPD RR status.

Tester Display	Measurement Item/Range	Normal Condition
WHEEL SPD RL	Wheel speed sensor (RL) reading / min.: 0 km/h (0 mph), max.: 326 km/h (202 mph)	Actual wheel speed
WHEEL SPD RR	Wheel speed sensor (RR) reading / min.: 0 km/h (0 mph), max.: 326 km/h (202 mph)	Actual wheel speed

OK:

There is almost no difference from the displayed speed value.

HINT:

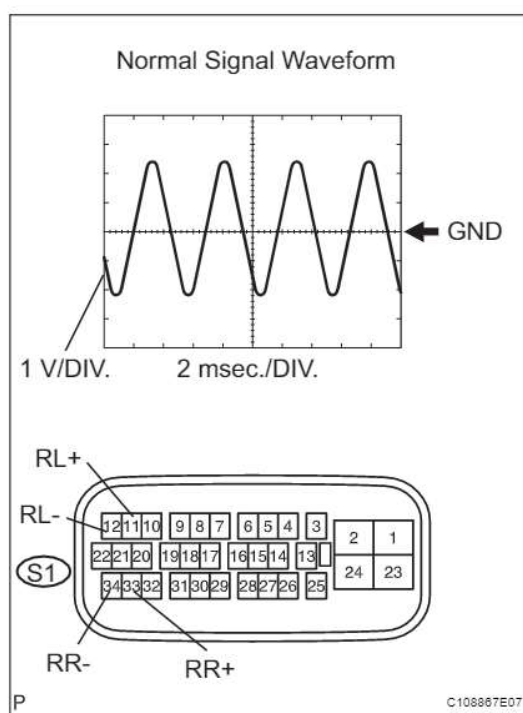
There is tolerance of +/- 10% in the speedometer indication.

NG

Go to step 4

OK

3 INSPECT SENSOR AND SENSOR ROTOR SERRATIONS



- INSPECTION USING OSCILLOSCOPE:
 - Connect the oscilloscope to terminal RR+ and RR-, or RL+ and RL- of the skid control ECU connector.
 - Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

OK:

A waveform as shown in the figure should be output.

HINT:

- As vehicle speed (wheel revolution speed) increases, a cycle of the waveform narrows and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter attached to it.

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

NG

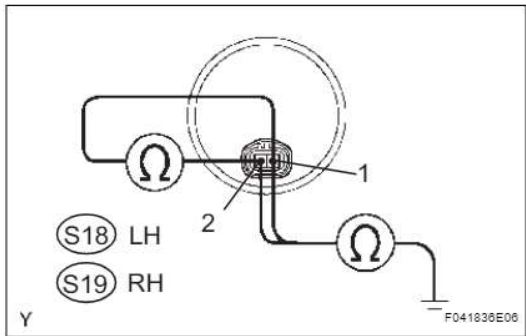
BC

BC-34

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

4

INSPECT REAR SPEED SENSOR

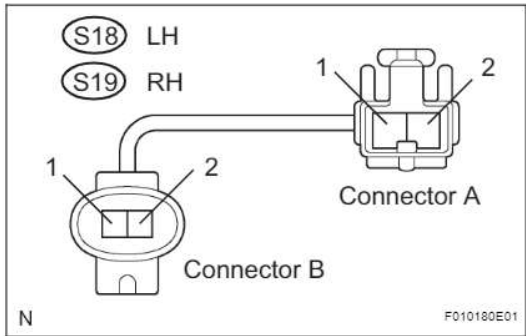


- (a) Disconnect the S18 and S19 rear speed sensor connectors.
- (b) Measure the resistance of the speed sensors.
- Standard resistance:**
- LH**

Tester Connection	Specified Condition
S18-1 (RL+) - S18-2 (RL-)	Less than 2.2 kΩ
S18-1 (RL+) - Body ground	10 kΩ or higher
S18-2 (RL-) - Body ground	10 kΩ or higher

RH

Tester Connection	Specified Condition
S19-1 (RR+) - S19-2 (RR-)	Less than 2.2 kΩ
S19-1 (RR+) - Body ground	10 kΩ or higher
S19-2 (RR-) - Body ground	10 kΩ or higher



- (c) Skid control sensor wire:
- (1) Remove the seat cushion and seatback.
- (2) Make sure that there is no looseness at the connector's locking part and connecting part.
- (3) Measure the resistance of the sensor wires.
- Standard resistance:**
- LH**

Tester Connection	Specified Condition
S18 (A-1) - S18 (A-2)	10 kΩ or higher
S18 (A-1) - S18 (B-1)	Below 1 Ω
S18 (A-2) - S18 (B-2)	Below 1 Ω
S18 (A-1) - Body ground	10 kΩ or higher
S18 (A-2) - Body ground	10 kΩ or higher

RH

Tester Connection	Specified Condition
S19 (A-1) - S19 (A-2)	10 kΩ or higher
S19 (A-1) - S19 (B-1)	Below 1 Ω
S19 (A-2) - S19 (B-2)	Below 1 Ω
S19 (A-1) - Body ground	10 kΩ or higher
S19 (A-2) - Body ground	10 kΩ or higher

HINT:
Check the speed sensor signal after replacement
(See page BC-7).

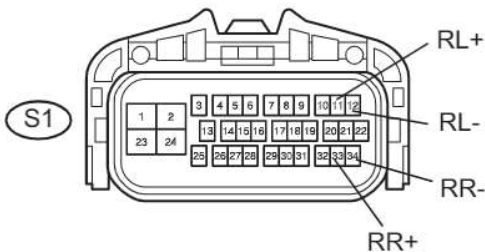
NG **REPLACE REAR SPEED SENSOR OR SKID CONTROL SENSOR WIRE**

OK

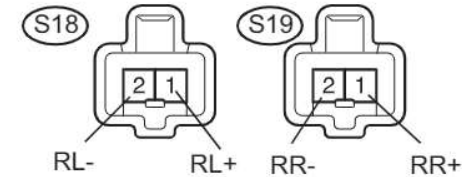
5

CHECK WIRE HARNESS (SKID CONTROL ECU - REAR SPEED SENSOR)

Skid Control ECU Wire Harness Side:



Rear Speed Sensor:



N

F100554E02

- (a) Disconnect the S1 skid control ECU connector.
(b) Disconnect the S18 and S19 rear speed sensor connectors.
(c) Measure the resistance of the wire harness side connectors.

Standard resistance:
LH

Tester Connection	Specified Condition
S1-11 (RL+) - S18-1 (RL+)	Below 1 Ω
S1-12 (RL-) - S18-2 (RL-)	Below 1 Ω
S1-11 (RL+) - Body ground	10 kΩ or higher
S1-12 (RL-) - Body ground	10 kΩ or higher

RH

Tester Connection	Specified Condition
S1-33 (RR+) - S19-1 (RR+)	Below 1 Ω
S1-34 (RR-) - S19-2 (RR-)	Below 1 Ω
S1-33 (RR+) - Body ground	10 kΩ or higher
S1-34 (RR-) - Body ground	10 kΩ or higher

NG

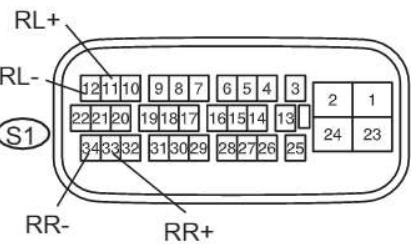
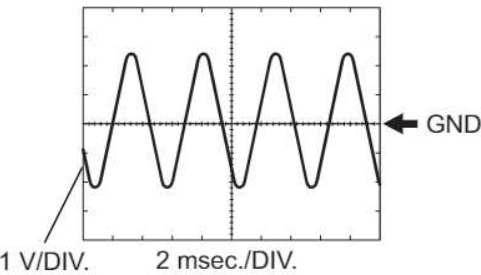
REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

6

INSPECT SENSOR AND SENSOR ROTOR SERRATIONS

Normal Signal Waveform



P

C108867E05

- (a) INSPECTION USING OSCILLOSCOPE:
(1) Connect the oscilloscope to terminal RR+ and RR-, or RL+ and RL- of the skid control ECU.
(2) Drive the vehicle at about 30 km/h (19 mph), and check the signal waveform.

OK:

A waveform as shown in the figure should be output.

HINT:

- As vehicle speed (wheel revolution speed) increases, a cycle of the waveform narrows and the fluctuation in the output voltage becomes greater.
- When noise is identified in the waveform on the oscilloscope, error signals are generated due to the speed sensor rotor's scratches, looseness or foreign matter attached to it.

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

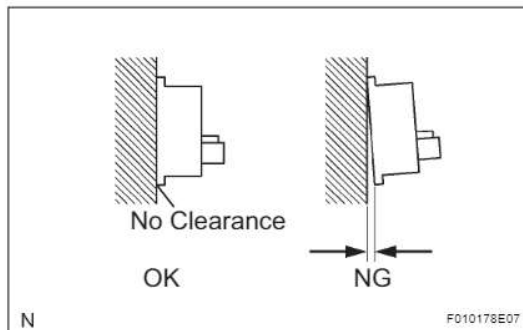
BC

BC-36

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

NG

7 INSPECT SENSOR INSTALLATION



- (a) Check the sensor installation.

OK:

There is no clearance between the sensor and rear axle carrier.

The installation bolt is tightened properly.

HINT:

Check the speed sensor signal after replacement (See page [BC-7](#)).

NG

REPLACE REAR SPEED SENSOR

OK

8 INSPECT REAR SPEED SENSOR TIP

- (a) Remove the rear speed sensor.

- (b) Check the sensor tip.

OK:

No scratches or foreign matter on the sensor tip.

HINT:

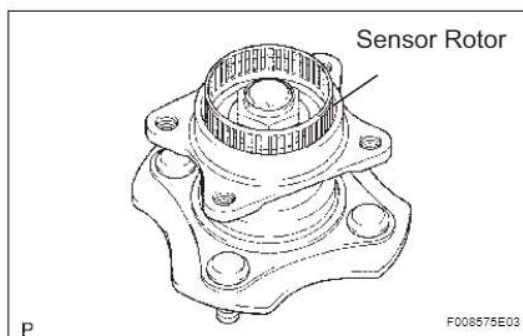
Check the speed sensor signal after cleaning/ replacement (See page [BC-7](#)).

NG

CLEAN OR REPLACE SPEED SENSOR

OK

9 INSPECT SENSOR ROTOR



- (a) Check the sensor rotor serrations.

OK:

No scratches, missing teeth or foreign matter on the rotor.

HINT:

Check the speed sensor signal after replacement (See page [BC-7](#)).

NG

REPLACE AXLE HUB AND BEARING ASSEMBLY

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

BC

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM**BC-37**

DTC	C0226/21	SFR Solenoid Circuit
DTC	C0236/22	SFL Solenoid Circuit
DTC	C0246/23	SRR Solenoid Circuit
DTC	C0256/24	SRL Solenoid Circuit

DESCRIPTION

These solenoid go on when signals are received from the ECU and controls the pressure acting on the wheel cylinders thus controlling braking force.

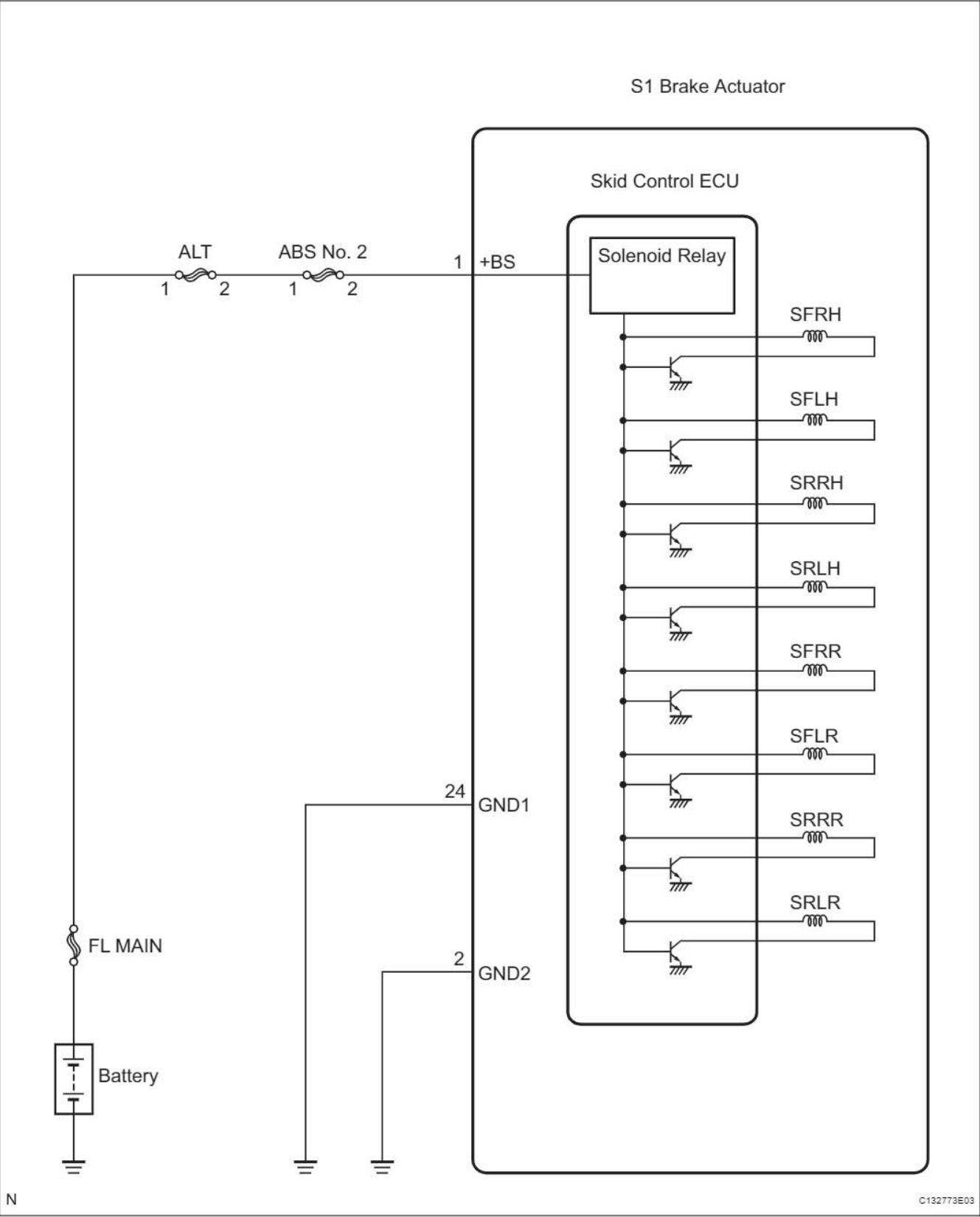
DTC Code	DTC Detection Condition	Trouble Area
C0226/21	Solenoid circuit is open / short for 0.05 seconds or more when ignition switch is ON (IG terminal voltage is 11 to 14 V)	• SFR solenoid circuit • Brake actuator assembly
C0236/22	Solenoid circuit is open / short for 0.05 seconds or more when ignition switch is ON (IG terminal voltage is 11 to 14 V)	• SFL solenoid circuit • Brake actuator assembly
C0246/23	Solenoid circuit is open / short for 0.05 seconds or more when ignition switch is ON (IG terminal voltage is 11 to 14 V)	• SRR solenoid circuit • Brake actuator assembly
C0256/24	Solenoid circuit is open / short for 0.05 seconds or more when ignition switch is ON (IG terminal voltage is 11 to 14 V)	• SRL solenoid circuit • Brake actuator assembly

BC

BC-38

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

WIRING DIAGRAM



INSPECTION PROCEDURE

1	RECONFIRM DTC
---	---------------

These codes are detected when a problem is determined in the brake actuator assembly. The solenoid circuit is in the brake actuator assembly. Therefore, solenoid circuit inspection and solenoid unit inspection cannot be performed. Be sure to check if the DTC is output before replacing the brake actuator assembly.

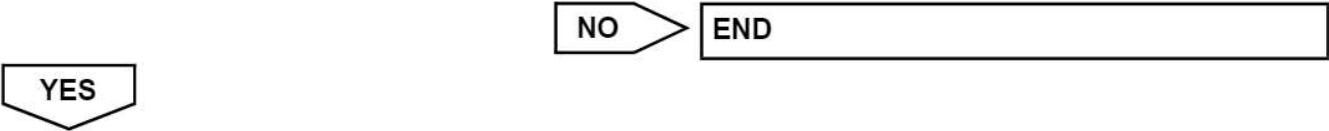
(a) Clear the DTCs (See page [BC-13](#)).

(b) Turn the ignition switch to the ON position.

(c) Are the same DTCs recorded (See page [BC-13](#))?

HINT:

- The skid control ECU inspects the solenoid relay circuit when the stop light switch is turned off and the vehicle is running at a speed of 4 mph (6 km/h) or more.
- These DTCs may be recorded due to a malfunction in the connector terminal connection, etc.



REPLACE BRAKE ACTUATOR ASSEMBLY

BC-40

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

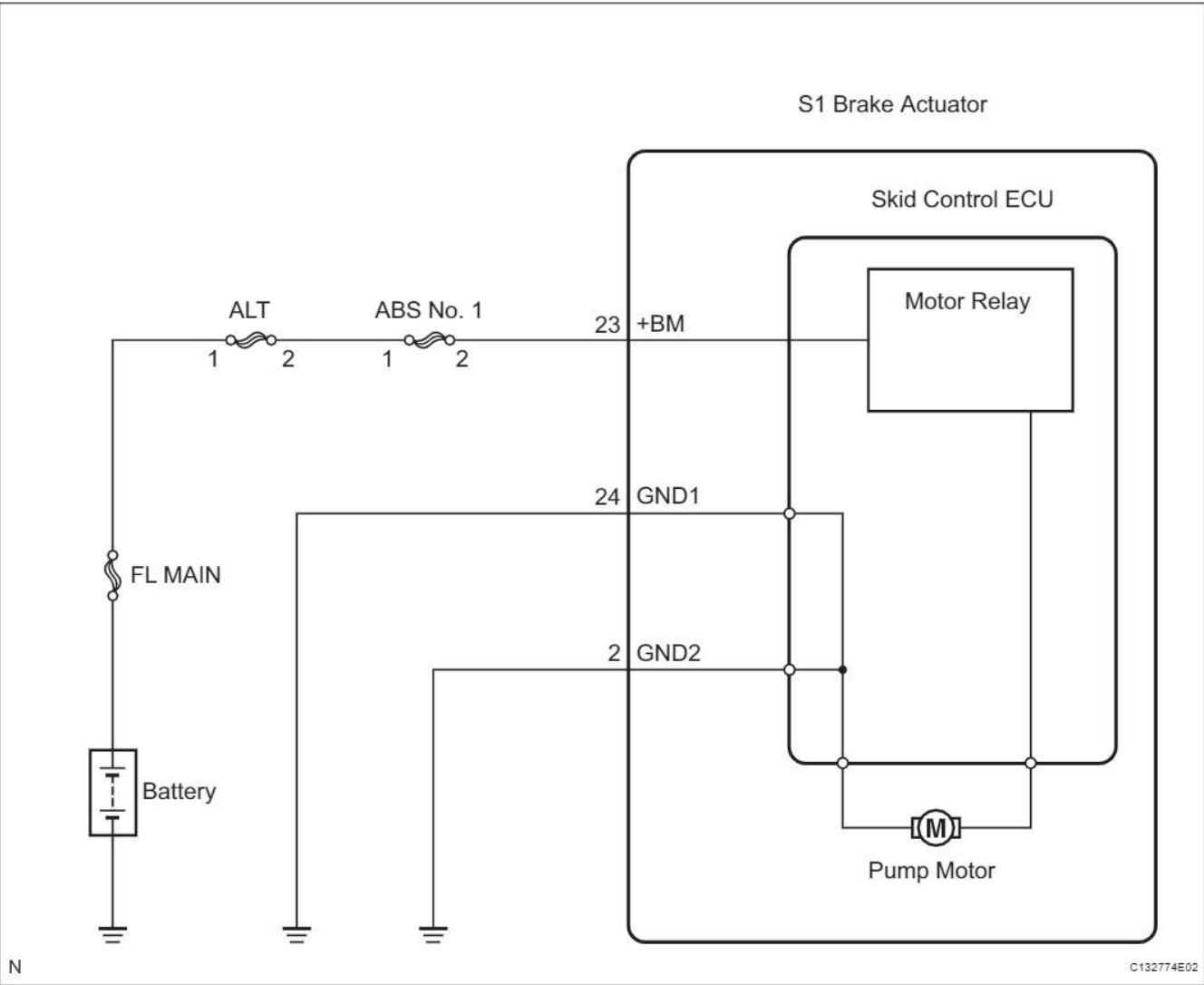
DTC	C0273/13	Open or Short Circuit in ABS Motor Relay Circuit
DTC	C0274/14	Short to B+ in ABS Motor Relay Circuit

DESCRIPTION

The ABS motor relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the motor relay on and operates the ABS pump motor.
If the voltage supplied to the motor relay (+BM) is below the DTCs detection threshold due to battery / generator shortage, the DTCs may be stored.

DTC Code	DTC Detection Condition	Trouble Area
C0273/13	The motor relay contact is OFF for 0.2 sec. or more immediately after the motor relay is turned ON.	• ABS motor relay • ABS motor relay circuit • Brake actuator assembly
C0274/14	The motor relay contact is ON for 2.5 sec. or more when the IG terminal voltage is 10 to 14 V and the motor relay is OFF.	• ABS motor relay • ABS motor relay circuit • Brake actuator assembly

WIRING DIAGRAM



BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

BC-41

INSPECTION PROCEDURE

1 CHOOSE DIAGNOSIS METHOD

- (a) Choose the diagnosis method.

Method:

Method	Proceed to
Using intelligent tester	A
Not using intelligent tester	B

B

Go to step 3

A

2 PERFORM ACTIVE TEST BY INTELLIGENT TESTER (ABS MOTOR RELAY)

- (a) Connect the intelligent tester to the DLC3.
 (b) Start the engine.
 (c) Select the tester menus: DIAGNOSTIC, OBD/MOBD, ABS/VSC and ACTIVE TEST.
 (d) Read the ABS MOT RELAY status.

Tester Display	Vehicle Condition/Test Details	Diagnostic Note
ABS MOT RELAY	Turns ABS motor relay ON / OFF	Operation sound of motor can be heard

OK:

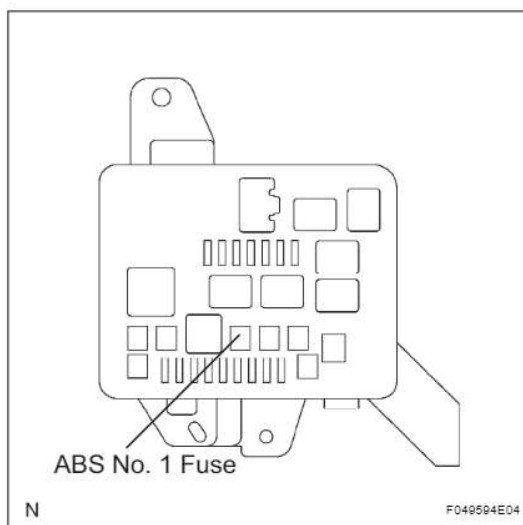
The operation sound of the ABS motor should be heard.

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

NG

3 INSPECT FUSE (ABS NO. 1)



- (a) Remove the ABS No. 1 fuse from the engine room relay block.
 (b) Measure the resistance of the fuse.

Standard resistance:**Below 1 Ω**

NG

REPLACE FUSE

BC

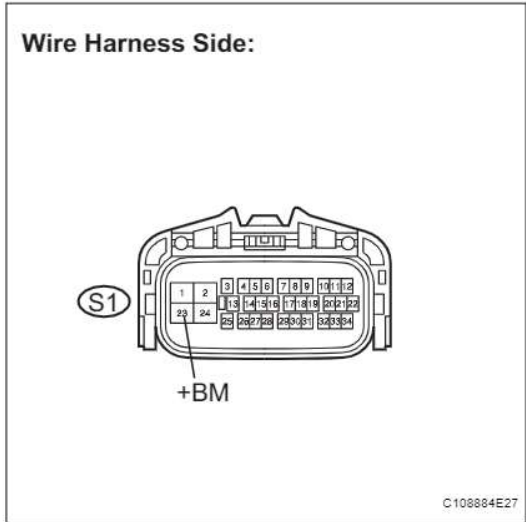
BC-42

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

OK

4

CHECK SKID CONTROL ECU CONNECTOR (+BM VOLTAGE)



- (a) Disconnect the S1 skid control ECU connector.
(b) Measure the voltage of the wire harness side connector.
Standard voltage

Tester Connection	Condition	Specified Condition
S1-23 (+BM) - Body ground	Always	11 to 14 V

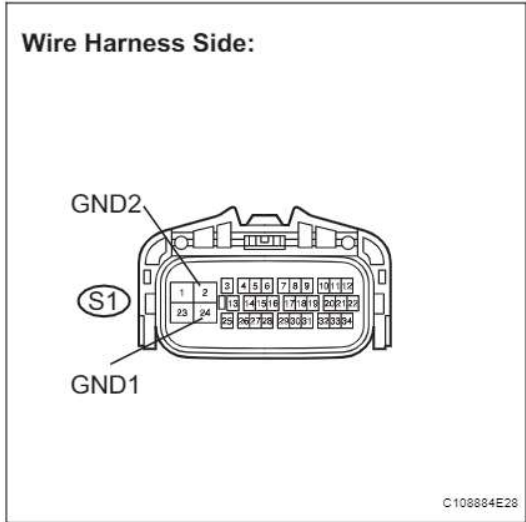
NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

5

CHECK SKID CONTROL ECU CONNECTOR (GROUND)



- (a) Disconnect the S1 skid control ECU connector.
(b) Measure the resistance of wire harness side connector.
Standard resistance

Tester Connection	Specified Condition
S1-24 (GND1) - Body ground	Below 1 Ω
S1-2 (GND2) - Body ground	Below 1 Ω

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

BC

OK

6

RECONFIRM DTC

- (a) Clear the DTCs (See page [BC-13](#)).
(b) Drive the vehicle at a speed of 6 km/h (4 mph) or more.
(c) Are the same DTCs recorded? (See page [BC-13](#))
HINT:
- The skid control ECU inspects the motor relay circuit when the stop light switch is turned off and the vehicle is running at a speed of 6 km/h (4 mph) or more.

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

BC-43

- These DTCs may be recorded due to a malfunction in the connector terminal connection, etc.

NO **END**

YES

REPLACE BRAKE ACTUATOR ASSEMBLY

BC

BC-44**BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM**

DTC	C0278/11	Open or Short Circuit in ABS Solenoid Relay Circuit
------------	-----------------	--

DTC	C0279/12	Short to B+ in ABS Solenoid Relay Circuit
------------	-----------------	--

DESCRIPTION

This relay supplies power to each ABS solenoid.

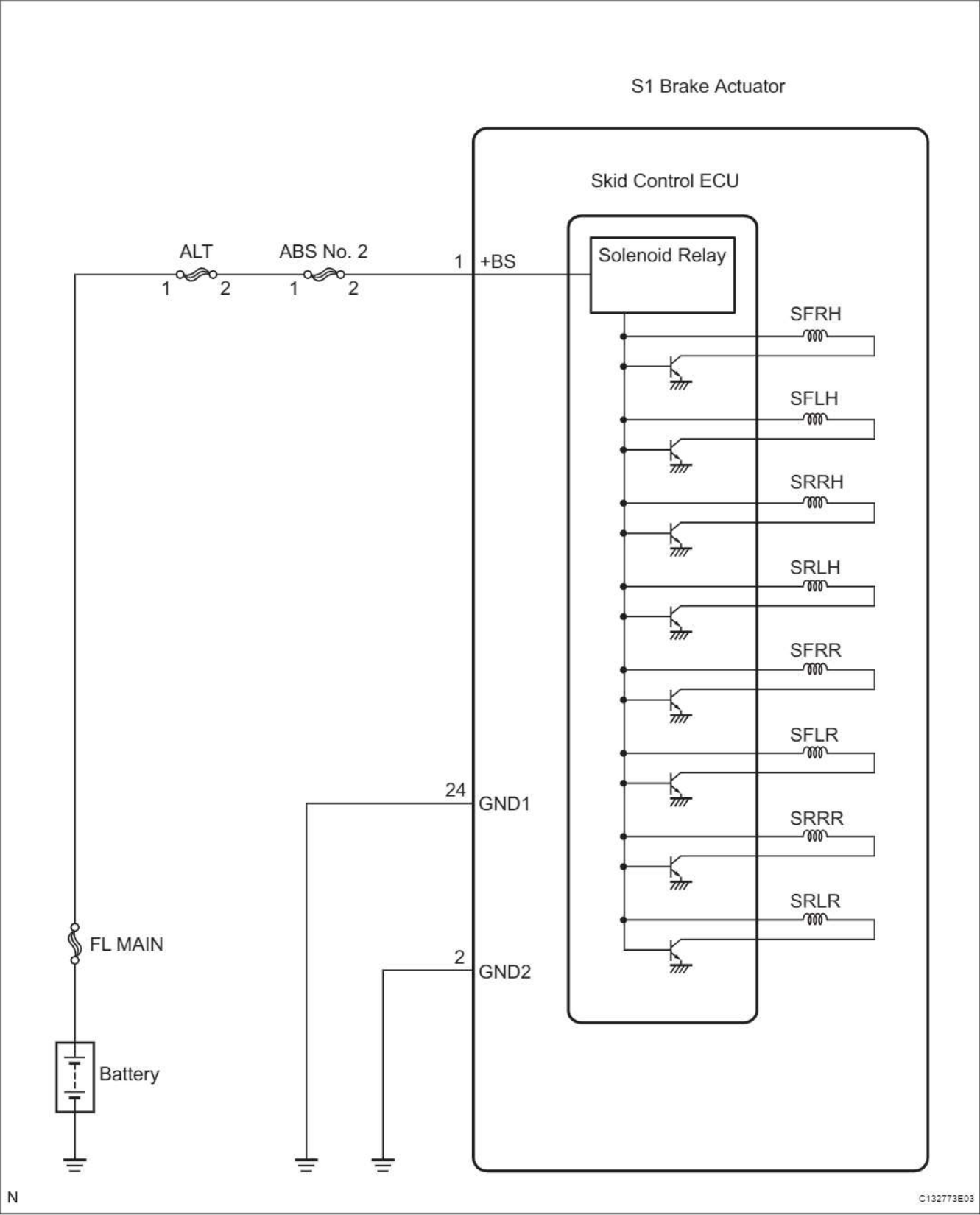
Immediately after the ignition switch is turned to the ON position, the relay turns on if the solenoid is determined to be normal as a result of self-diagnosis during initial check.

The relay turns off if an open / short is detected.

If the voltage supplied to the motor relay (+BS) is below the DTC detection threshold due to battery / generator shortage, the DTCs may be stored.

DTC Code	DTC Detection Condition	Trouble Area
C0278/11	When solenoid relay is turned on, relay contact is OFF for 0.2 sec. or longer.	• ABS solenoid relay • ABS solenoid relay circuit • Brake actuator assembly
C0279/12	IG voltage is 10 to 14 V, and when solenoid relay is turned off, relay contact is ON for 0.2 sec. or longer.	• ABS solenoid relay • ABS solenoid relay circuit • Brake actuator assembly

WIRING DIAGRAM

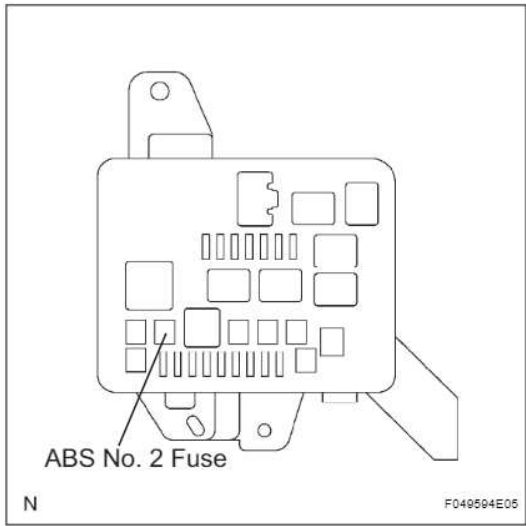


BC

INSPECTION PROCEDURE

1

INSPECT FUSE (ABS NO. 2)



- (a) Remove the ABS No. 2 fuse from the engine room relay block.
- (b) Measure the resistance of the fuse.
- Standard resistance:
Below 1 Ω

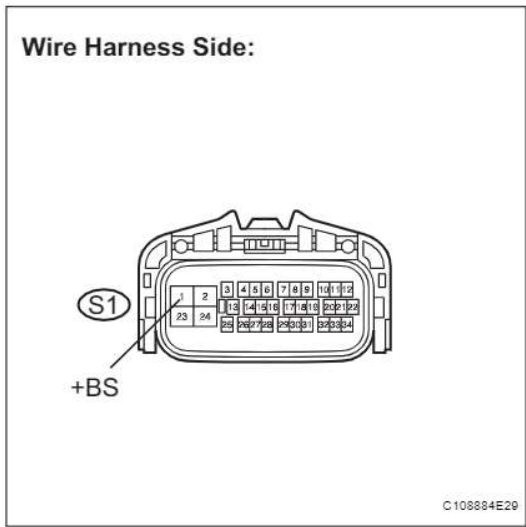
NG

REPLACE FUSE

OK

2

CHECK SKID CONTROL ECU CONNECTOR (+BS VOLTAGE)



- (a) Disconnect the S1 skid control ECU connector.
- (b) Measure the voltage of the wire harness side connector.
- Standard voltage

Tester Connection	Condition	Specified Condition
S1-1 (+BS) - Body ground	Always	11 to 14 V

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

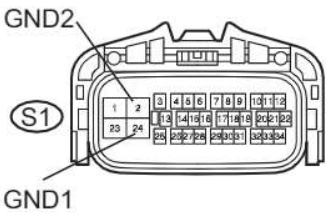
BC

OK

3

CHECK SKID CONTROL ECU CONNECTOR (GROUND)

Wire Harness Side:



C108884E28

- (a) Disconnect the S1 skid control ECU connector.
(b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
S1-24 (GND1) - Body ground	Below 1 Ω
S1-2 (GND2) - Body ground	Below 1 Ω

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

4

RECONFIRM DTC

- (a) Clear the DTCs (See page [BC-13](#)).
(b) Drive the vehicle at a speed of 6 km/h (4 mph) or more.
(c) Are the same DTCs recorded (See page [BC-13](#))?

HINT:

- The skid control ECU inspects the solenoid relay circuit when the stop light switch is turned off and the vehicle is running at a speed of 6 km/h (4 mph) or more.
- These DTCs may be recorded due to a malfunction in the connector terminal connection, etc.

NO

END

YES

REPLACE BRAKE ACTUATOR ASSEMBLY

BC-48

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

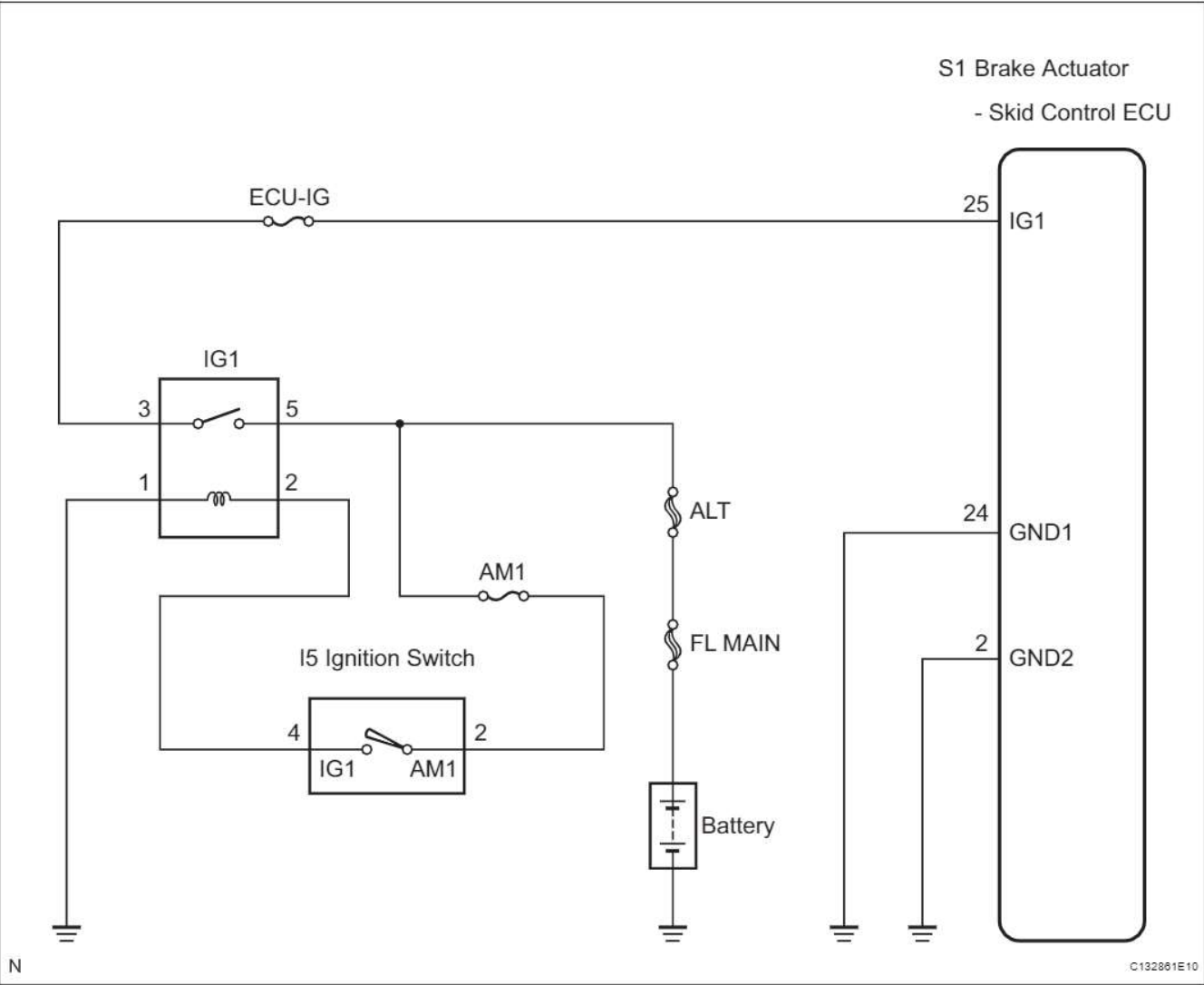
DTC	C1241/41	Low Battery Positive Voltage
-----	----------	------------------------------

DESCRIPTION

If there is a problem with the brake actuator assembly (skid control ECU) power supply circuit, the skid control ECU outputs the DTC and prohibits operation under the fail safe function.
If the voltage supplied to the IG1 terminal is not within the DTC detection threshold due to malfunctions, such as the battery and alternator circuit, this DTC is stored.

DTC Code	DTC Detection Condition	Trouble Area
C1241/41	Vehicle speed is 3 km/h (2 mph) or more and IG1 terminal voltage is 9.5 V or less for at least 10 sec.	- Battery - Charging system - Power source circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

1	INSPECT BATTERY
---	-----------------

(a) Check battery voltage.

Standard voltage:
11 to 14 V

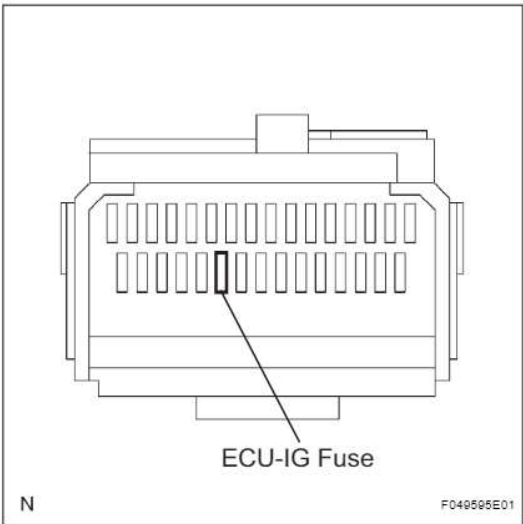
NG

INSPECT CHARGING SYSTEM

OK

2

INSPECT FUSE (ECU-IG)



- (a) Remove the ECU-IG fuse from the instrument panel junction block.
- (b) Measure the resistance of the fuse.

Standard resistance:
Below 1 Ω

NG

REPLACE FUSE

OK

3

CHECK SKID CONTROL ECU CONNECTOR (IG1 VOLTAGE)

- (a) WHEN USING INTELLIGENT TESTER:
- (1) Connect the intelligent tester to the DLC3.
 - (2) Start the engine.
 - (3) Select the tester menus: DIAGNOSTIC, OBD/ MOBD, ABS/VSC and DATA LIST.
 - (4) Read the IG VOLTAGE status.

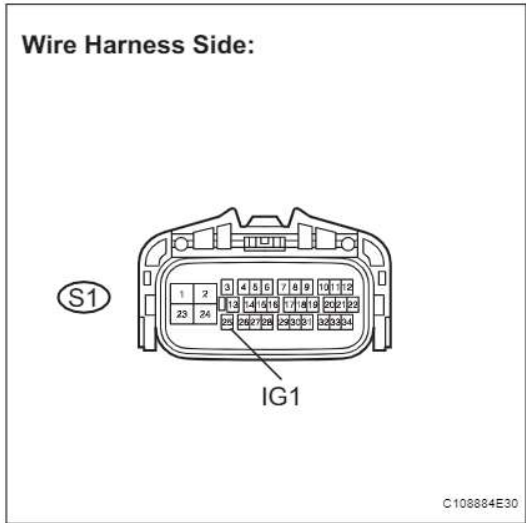
Tester Display	Measurement Item/Range	Normal Condition
IG VOLTAGE	ECU power supply voltage / TOO HIGH / NORMAL / TOO LOW	TOO HIGH: 14 V or more NORMAL: 9.8 to 14 V TOO LOW: Below 9.8 V

OK:
The tester displays Normal (IG VOLTAGE of the ABS ECU is 9.8 to 14 V).

BC

BC-50

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM



- (b) WHEN NOT USING INTELLIGENT TESTER:
- (1) Disconnect the S1 skid control ECU connector.
 - (2) Turn the ignition switch to the ON position.
 - (3) Measure the voltage of the wire harness side connector.

Standard voltage

Tester Connection	Condition	Specified Condition
S1-25 (IG1) - Body ground	Ignition switch ON	11 to 14 V

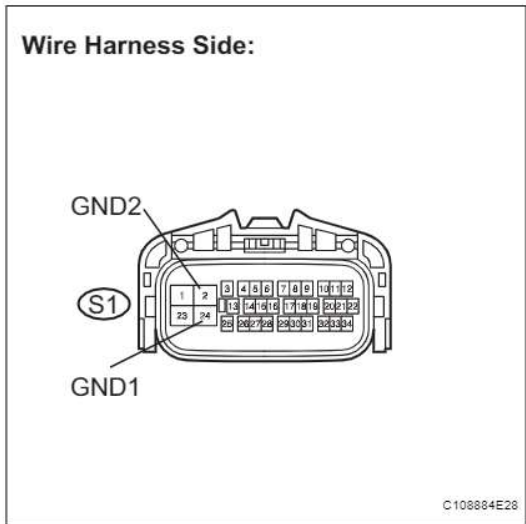
NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

4

CHECK SKID CONTROL ECU CONNECTOR (GROUND)



- (a) Disconnect the S1 skid control ECU connector.
- (b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
S1-24 (GND1) - Body ground	Below 1 Ω
S1-2 (GND2) - Body ground	Below 1 Ω

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

BC

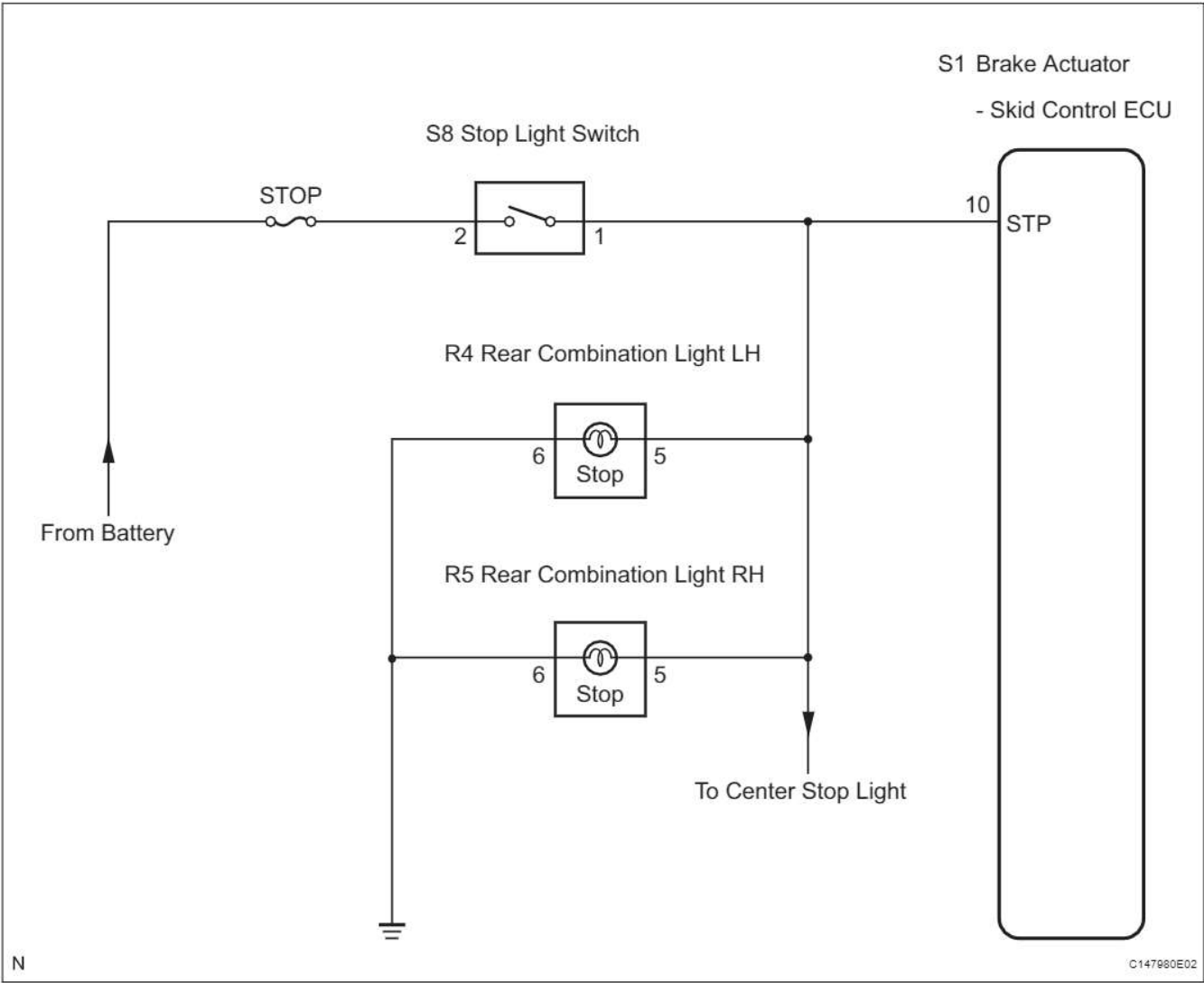
DTC	C1249/49	Open in Stop Light Switch Circuit
-----	----------	-----------------------------------

DESCRIPTION

The skid control ECU inputs the stop light switch signal and detects the status of the brake operation. The skid control ECU has an open detection circuit. If an open in the stop light switch input line or GND side stop light circuit is detected when the stop light switch is off, this DTC is output.

DTC Code	DTC Detection Condition	Trouble Area
C1249/49	An open in the stop light switch circuit continues for at least 0.3 sec. when the IG1 terminal voltage is between 9.5 to 17.2 V and the brake pedal is released (STP OFF)	- Stop light switch - Stop light switch circuit

WIRING DIAGRAM



BC-52

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

INSPECTION PROCEDURE

1

CHECK STOP LIGHT SWITCH OPERATION

- (a) Check that the stop light comes on when the brake pedal is depressed and goes off when the brake pedal is released.
HINT:
Check the stop light bulb because it may be burnt out.
OK:
Stop light switch function is normal.

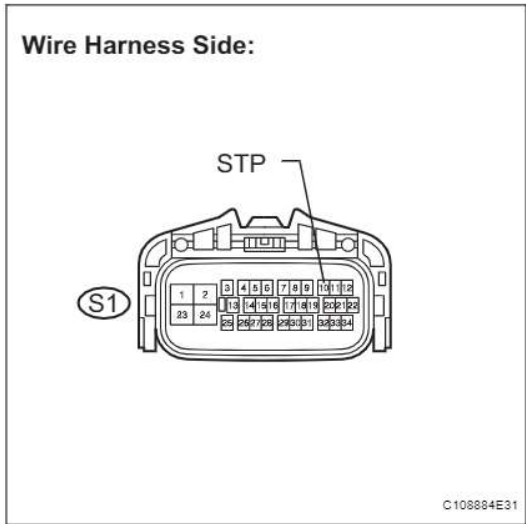
NG

Go to step 3

OK

2

CHECK SKID CONTROL ECU CONNECTOR (STP VOLTAGE)



- (a) Disconnect the S1 skid control ECU connector.
(b) Measure the voltage of the wire harness side connector.
Standard voltage

Tester Connection	Condition	Specified Condition
S1-10 (STP) - Body ground	Brake pedal is depressed	11 to 14 V
S1-10 (STP) - Body ground	Brake pedal is released	Below 1 V

NG

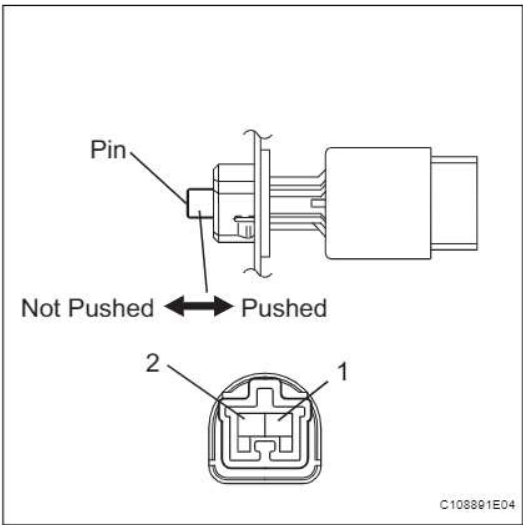
Go to step 4

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

3

INSPECT STOP LIGHT SWITCH ASSEMBLY



- (a) Remove the stop light switch assembly.
- (b) Measure the resistance of the stop light switch.

Standard resistance

Tester Connection	Switch Condition	Specified Condition
1 - 2	Switch pin not pushed	Below 1 Ω
1 - 2	Switch pin pushed	10 kΩ or higher

NG

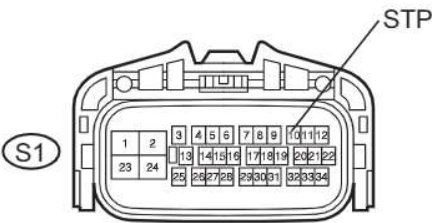
REPLACE STOP LIGHT SWITCH ASSEMBLY

OK

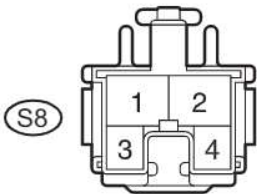
4

CHECK WIRE HARNESS (STOP LIGHT SWITCH ASSEMBLY - SKID CONTROL ECU)

Skid Control ECU Wire Harness Side:



Stop Light Switch Assembly:



- (a) Disconnect the S1 skid control ECU connector.
- (b) Disconnect the stop light switch assembly connector.
- (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
S1-10 (STP) - S8-1	Below 1 Ω
S1-10 (STP) - Body ground	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

BC

BC-54

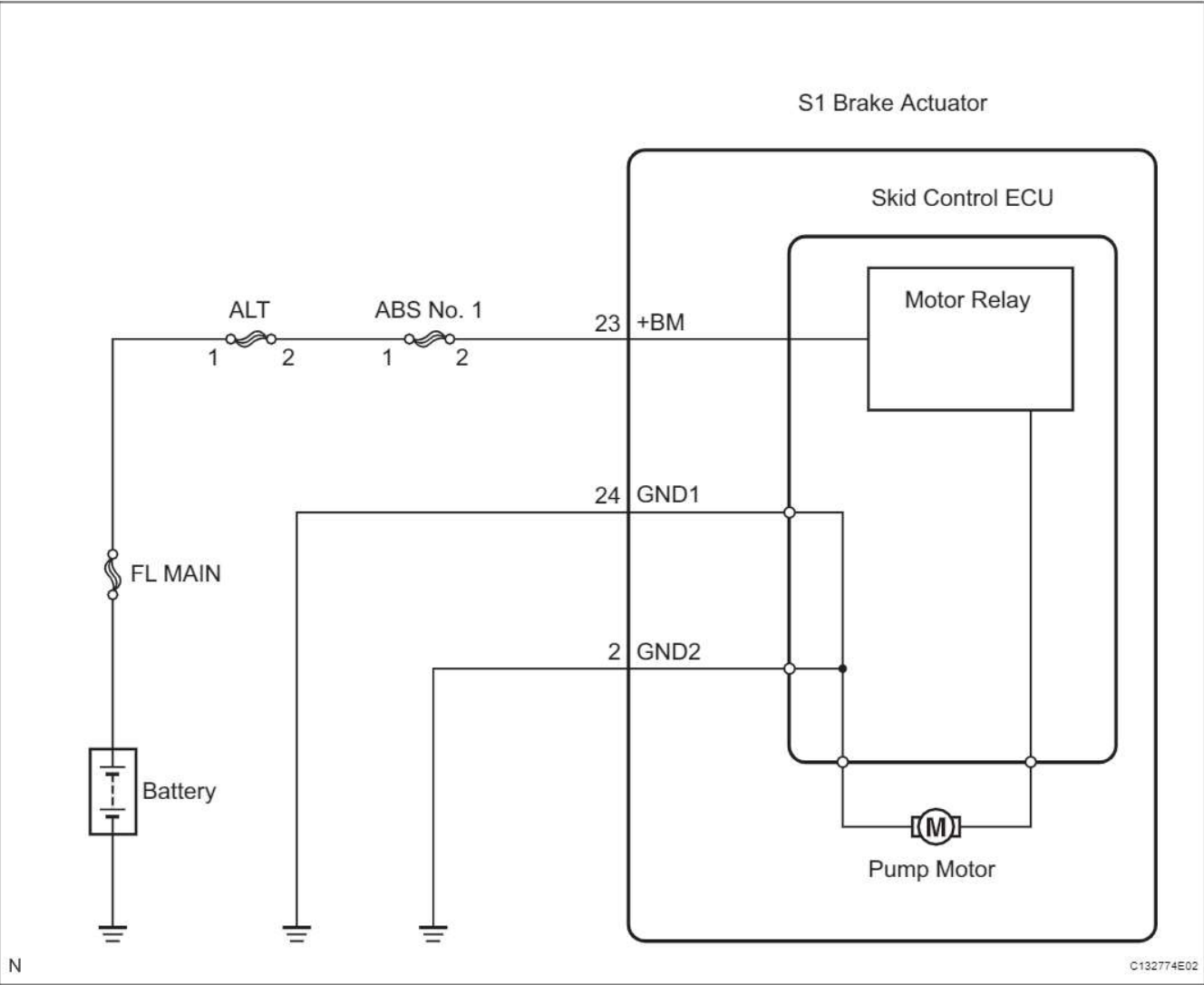
BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

DTC	C1251/51	Open in Pump Motor Circuit
-----	----------	----------------------------

DESCRIPTION

DTC Code	DTC Detection Condition	Trouble Area
C1251/51	When one of following conditions is met: • Actuator pump motor does not operate properly. • Open in actuator pump motor circuit continues for at least 2 sec.	• ABS pump motor • Brake actuator assembly

WIRING DIAGRAM



BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

BC-55

INSPECTION PROCEDURE

1 CHOOSE DIAGNOSIS METHOD

- (a) Choose the diagnosis method.

Method:

Method	Proceed to
Using intelligent tester	A
Not using intelligent tester	B

B

Go to step 3

A

2 PERFORM ACTIVE TEST BY INTELLIGENT TESTER

- (a) Connect the intelligent tester to the DLC3.
 (b) Turn the ignition switch to the ON position.
 (c) Select the tester menus: DIAGNOSTIC, OBD/MOBD, ABS/VSC and ACTIVE TEST.
 (d) Read the ABS MOT RELAY status.

Tester Display	Vehicle Condition/Test Details	Diagnostic Note
ABS MOT RELAY	Turns ABS motor relay ON / OFF	Operation sound of motor can be heard

OK:

The operation sound of the ABS motor should be heard.

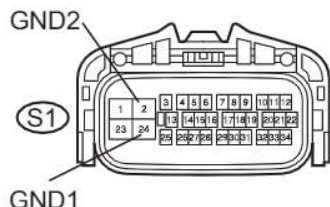
OK

REPLACE BRAKE ACTUATOR ASSEMBLY

NG

3 CHECK SKID CONTROL ECU CONNECTOR (GROUND)

Wire Harness Side:



- (a) Disconnect the S1 skid control ECU connector.
 (b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
S1-24 (GND1) - Body ground	Below 1 Ω
S1-2 (GND2) - Body ground	Below 1 Ω

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

BC

BC-56

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

4

RECONFIRM DTC

- (a) Clear the DTCs (See page [BC-13](#)).
- (b) Drive the vehicle at a speed of 6 km/h (4 mph) or more.
- (c) Are the same DTCs recorded? (See page [BC-13](#))

HINT:

- The skid control ECU inspects the motor relay circuit when the stop light switch is turned off and the vehicle is running at a speed of 6 km/h (4 mph) or more.
- This DTC may be recorded due to a malfunction in the connector terminal connection, etc.

NO

END

YES

REPLACE BRAKE ACTUATOR ASSEMBLY

BC

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM**BC-57****ABS Warning Light Remains ON**

When reading DTCs by SST (check wire), if the ABS warning light remains on, troubleshoot by following the inspection procedure.

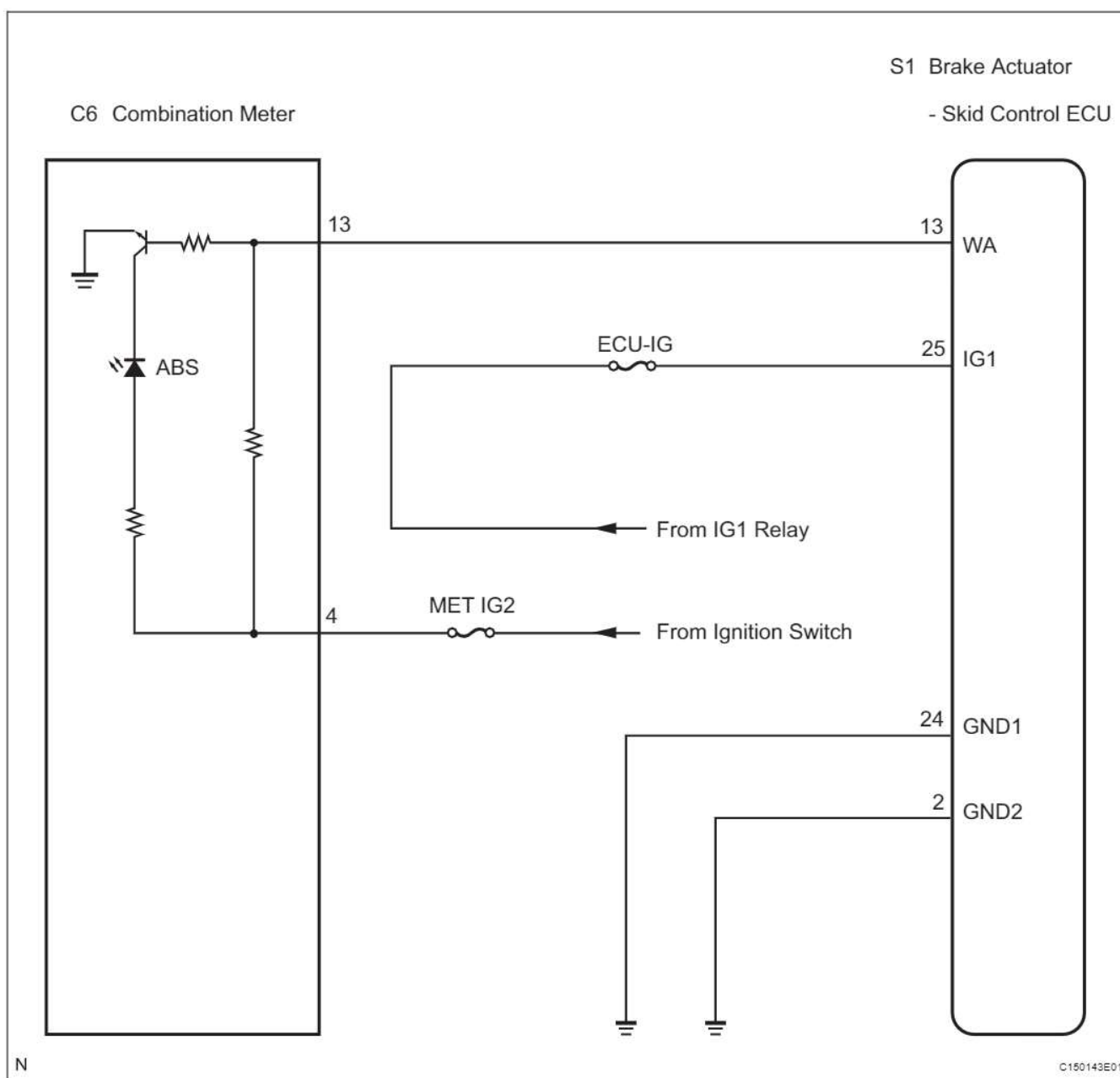
DESCRIPTION

If any of the following is detected, the ABS warning light remains on:

1. The skid control ECU connectors are disconnected from the skid control ECU.
2. There is a malfunction in the skid control ECU internal circuit.
3. There is an open or short in the wire harness between the combination meter and skid control ECU.

HINT:

The intelligent tester may not be usable when there is a malfunction in the skid control ECU.

WIRING DIAGRAM**BC**

BC-58

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

INSPECTION PROCEDURE

1	CHECK DTC
----------	------------------

(a) Is DTC output for ABS?

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

B**REPAIR CIRCUIT INDICATED BY OUTPUT CODE****A**

2	INSPECT SKID CONTROL ECU CONNECTOR
----------	---

(a) Check the ECU connector's connecting condition.

OK:

The connector should be securely connected.

NG**CONNECT CONNECTOR TO ECU****OK**

3	CHECK SKID CONTROL ECU (IG1 VOLTAGE)
----------	---

(a) WHEN USING INTELLIGENT TESTER:

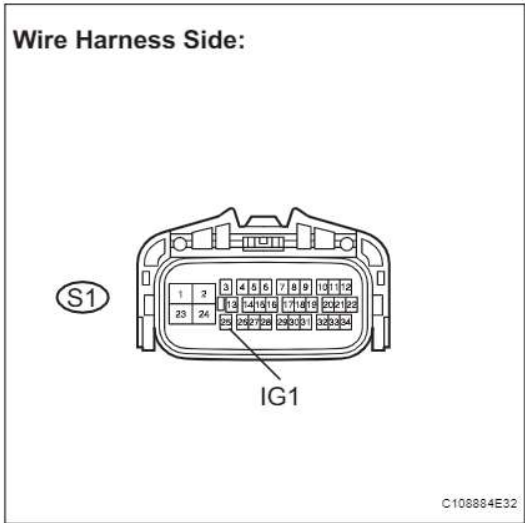
- (1) Connect the intelligent tester to the DTC3.
- (2) Start the engine.
- (3) Select the tester menus: DIAGNOSTIC, OBD/ MOBD, ABS/VSC and DATA LIST.
- (4) Read the IG VOLTAGE status.

Tester Display	Measurement Item/Range	Normal Condition
IG VOLTAGE	ECU power supply voltage / TOO LOW / NORMAL / TOO HIGH	TOO LOW: Below 9.8 V NORMAL: 9.8 to 14.0 V TOO HIGH: 14.0 V or more

OK:

The tester displays Normal (IG VOLTAGE of the ABS ECU is 9.8 to 14 V).

BC



OK

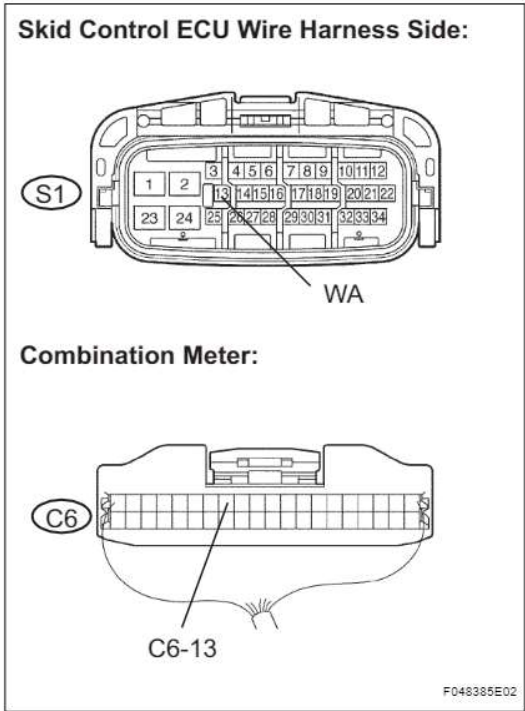
- (b) WHEN NOT USING INTELLIGENT TESTER:
- (1) Disconnect the S1 skid control ECU connector.
 - (2) Turn the ignition switch to the ON position.
 - (3) Measure the voltage of the wire harness side connector.

Standard voltage

Tester Connection	Condition	Specified Condition
S1-25 (IG1) - Body ground	Ignition switch ON	11 to 14 V

NG REPAIR OR REPLACE HARNESS AND CONNECTOR

4 CHECK WIRE HARNESS (SKID CONTROL ECU - COMBINATION METER)



OK

- (a) Disconnect the S1 skid control ECU connector.
- (b) Disconnect the C6 combination meter connector.
- (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
S1-13 (WA) - C6-13	Below 1 Ω
S1-13 (WA) - Body ground	10 k Ω or higher

NG REPAIR OR REPLACE HARNESS AND CONNECTOR

BC-60

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

5

CHECK WIRE HARNESS (SKID CONTROL ECU - BODY GROUND)

Wire Harness Side:

C108884E28

(a) Disconnect the S1 skid control ECU connector.
(b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
S1-24 (GND1) - Body ground	Below 1 Ω
S1-2 (GND2) - Body ground	Below 1 Ω

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

6

INSPECT COMBINATION METER ASSEMBLY

(a) Check combination meter assembly (See page [ME-6](#)).

NG

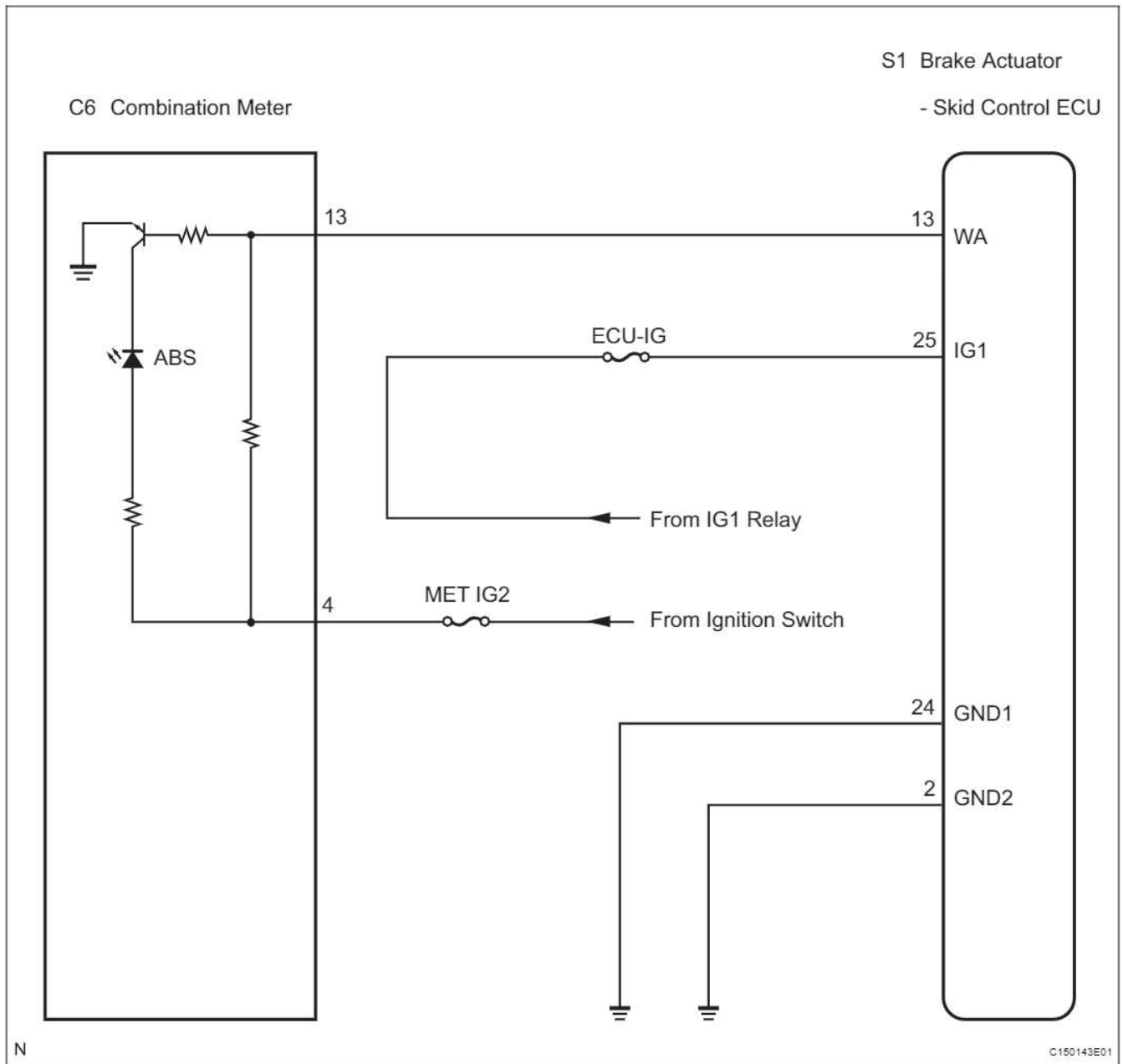
CHECK COMBINATION METER ASSEMBLY

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

BC-61

ABS Warning Light does not Come ON**WIRING DIAGRAM****INSPECTION PROCEDURE****1 CHECK ABS WARNING LIGHT CIRCUIT**

- (a) WHEN USING INTELLIGENT TESTER:
- (1) Connect the intelligent tester to the DLC3.
 - (2) Start the engine.
 - (3) Select the tester menus: DIAGNOSTIC, OBD/MOBD, ABS/VSC and ACTIVE TEST.

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BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

(4) Read the ABS WARN LIGHT status.

Tester Display	Vehicle Condition/Test Details	Diagnostic Note
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter

OK:
The ABS warning light turns on or off in accordance with the intelligent tester.

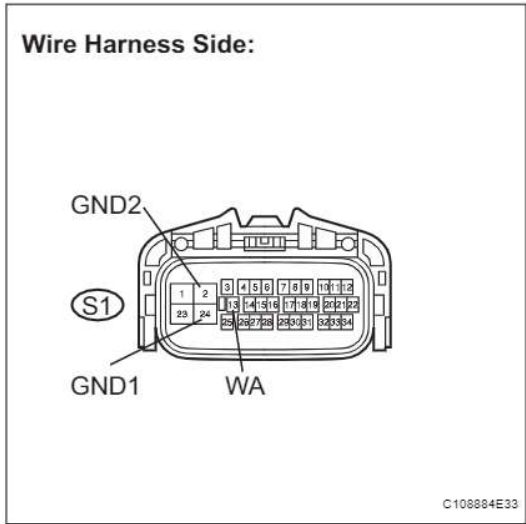
- (b) WHEN NOT USING INTELLIGENT TESTER:
- (1) Turn the ignition switch OFF and disconnect the S1 skid control ECU connector.
 - (2) Ground terminal WA of the skid control ECU.
 - (3) Turn the ignition switch to the ON position.
 - (4) Check the ABS warning light.

OK

WA - GND Condition	Illumination Condition
Connected	OFF
Disconnected	ON

OK

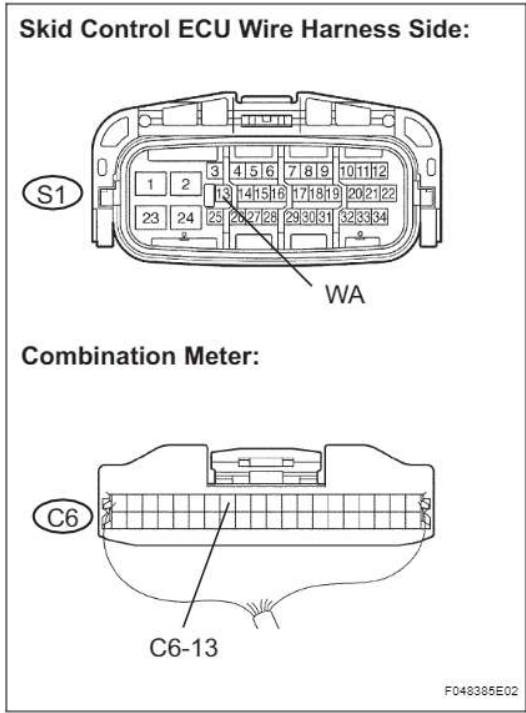
REPLACE BRAKE ACTUATOR ASSEMBLY



NG

2

CHECK WIRE HARNESS (SKID CONTROL ECU - COMBINATION METER)



- (a) Disconnect the S1 skid control ECU connector.
- (b) Disconnect the C6 combination meter connector.
- (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
S1-13 (WA) - C6-13	Below 1 Ω
S1-13 (WA) - Body ground	10 kΩ or higher

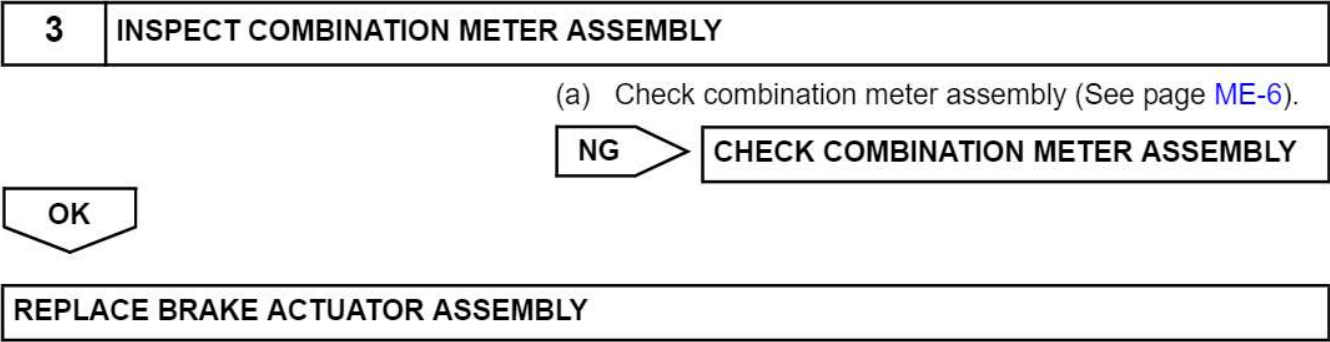
NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

BC-63



BC

BC-64

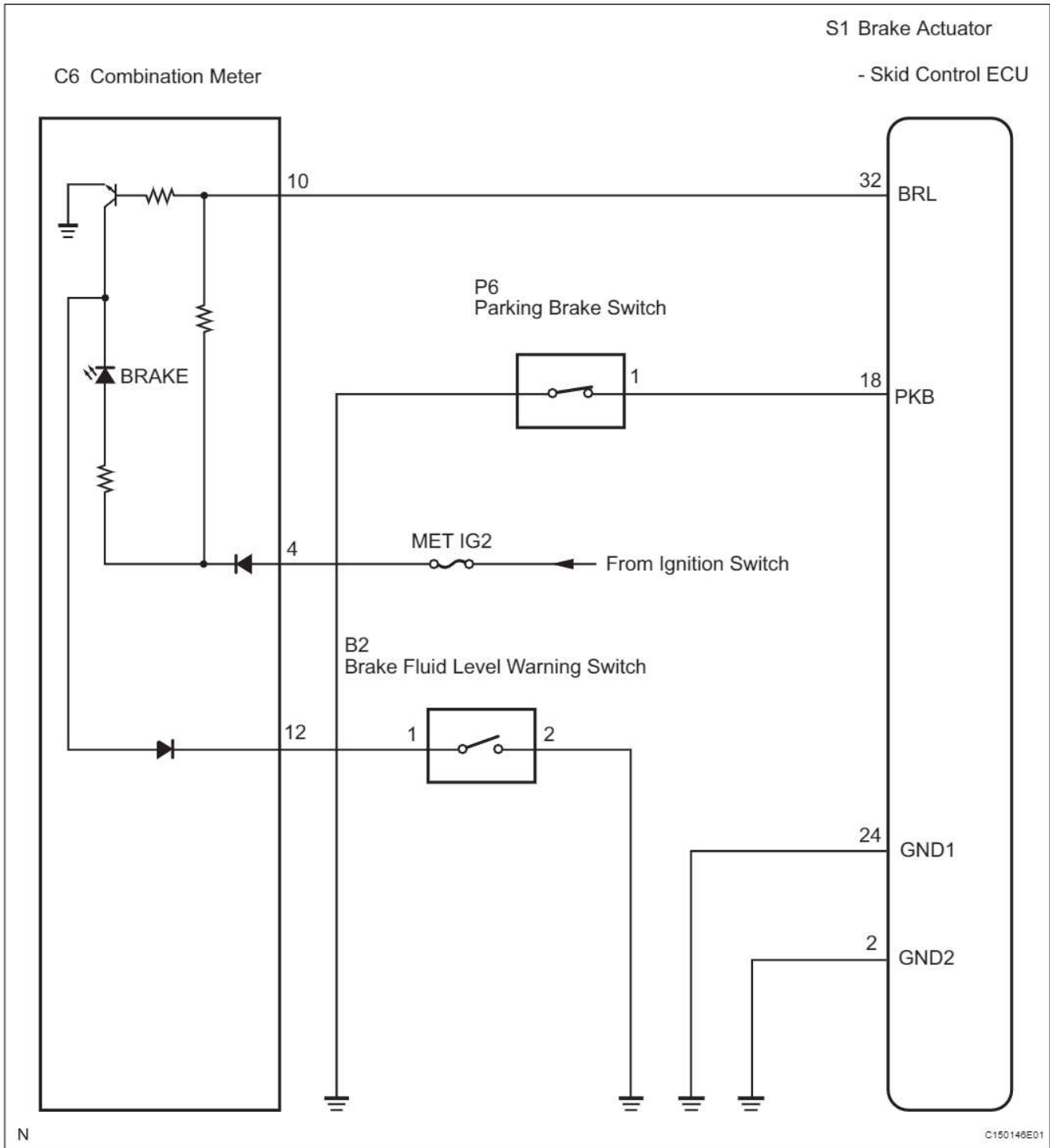
BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

Brake Warning Light Circuit

DESCRIPTION

The BRAKE warning light turns on when the brake fluid is insufficient, the parking brake is applied or the EBD is defective.

WIRING DIAGRAM



INSPECTION PROCEDURE

CAUTION:
When releasing the parking brake, set the chocks to hold the vehicle for safety.

1

CHECK BRAKE FLUID

(a) Check that the brake fluid level is proper.

NG

ADD BRAKE FLUID

OK

2

CHECK DTC FOR ABS

(a) Are the DTC recorded (See page [BC-13](#))?

YES

REPAIR CIRCUIT INDICATED BY OUTPUT CODE

NO

3

CHECK BRAKE WARNING LIGHT

- (a) WHEN USING INTELLIGENT TESTER:
- (1) Connect the intelligent tester to the DLC3.
 - (2) Start the engine.
 - (3) Select the tester menus: DIAGNOSTIC, OBD/ MOBD, ABS/VSC and ACTIVE TEST.
 - (4) Read the BRAKE WARN LIGHT status.

Tester Display	Vehicle Condition/Test Details	Diagnostic Note
BRAKE WARN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter

OK:
The BRAKE warning light turns on or off in accordance with the intelligent tester.

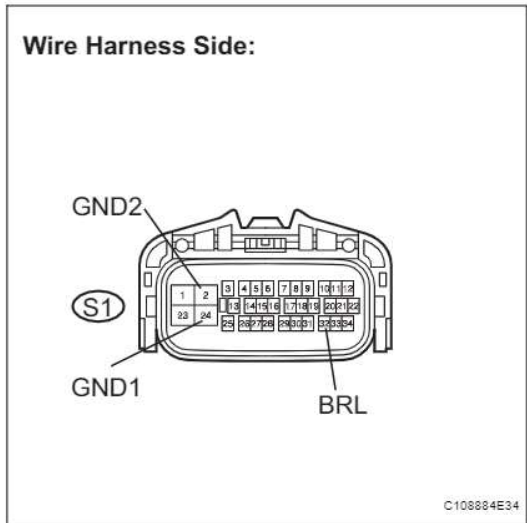
- (b) WHEN NOT USING INTELLIGENT TESTER:
- (1) Turn the ignition switch OFF and disconnect the S1 skid control ECU connector.
 - (2) Ground terminal BRL of the skid control ECU.
 - (3) Turn the ignition switch to the ON position.
 - (4) Check the BRAKE warning light.

OK

BRL - GND Condition	Illumination Condition
Connected	OFF
Disconnected	ON

OK

REPLACE BRAKE ACTUATOR ASSEMBLY



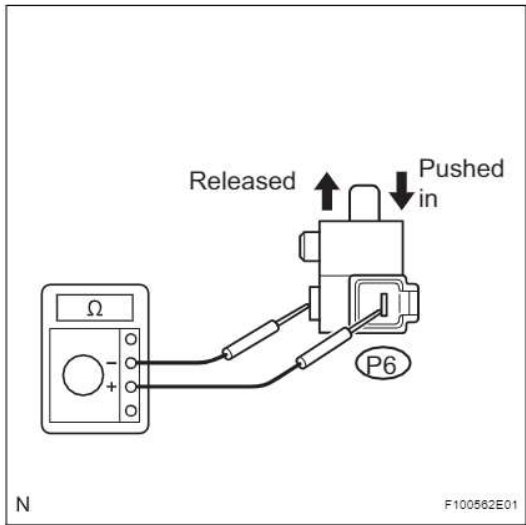
NG

BC-66

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

4

INSPECT PARKING BRAKE SWITCH ASSEMBLY



- (a) Remove the parking brake switch assembly.
- (b) Measure the resistance of the parking brake switch.
- Standard resistance

Tester Connection	Switch Condition	Specified Condition
P6-1 - Ground part	Released	Below 1 Ω
P6-1 - Ground part	Pushed in	10 kΩ or higher

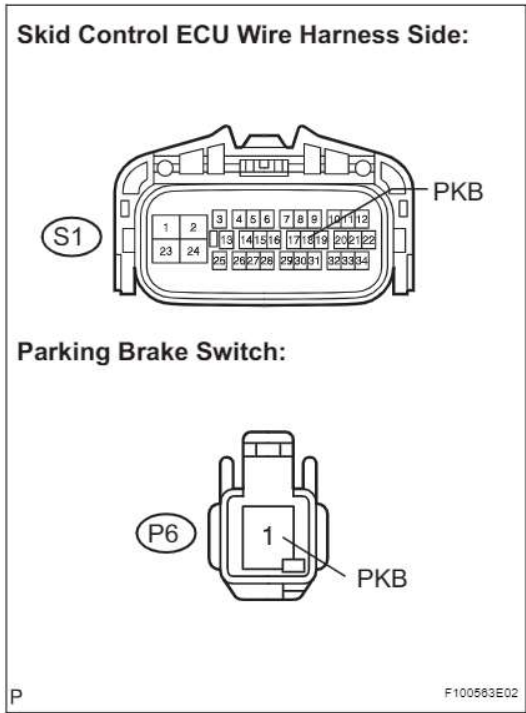
NG

REPLACE PARKING BRAKE SWITCH ASSEMBLY

OK

5

CHECK WIRE HARNESS (PARKING BRAKE SWITCH ASSEMBLY - SKID CONTROL ECU)



- (a) Disconnect the S1 skid control ECU connector.
- (b) Disconnect the P6 parking brake switch assembly connector.
- (c) Measure the resistance of the wire harness side connectors.
- Standard resistance

Tester Connection	Specified Condition
S1-18 (PKB) - P6-1 (PKB)	Below 1 Ω
S1-18 (PKB) - Body ground	10 kΩ or higher

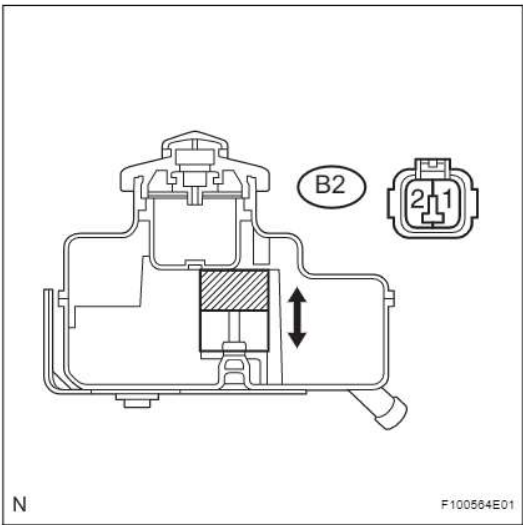
NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

6

INSPECT BRAKE FLUID LEVEL WARNING SWITCH



- (a) Remove the reservoir tank cap and strainer.
- (b) Disconnect the brake fluid level warning switch connector.
- (c) Measure the resistance of the brake fluid level warning switch.

Standard resistance

Tester Connection	Switch Condition	Specified Condition
B2-1 - B2-2	Float UP	10 kΩ or higher
B2-1 - B2-2	Float DOWN	Below 1 Ω

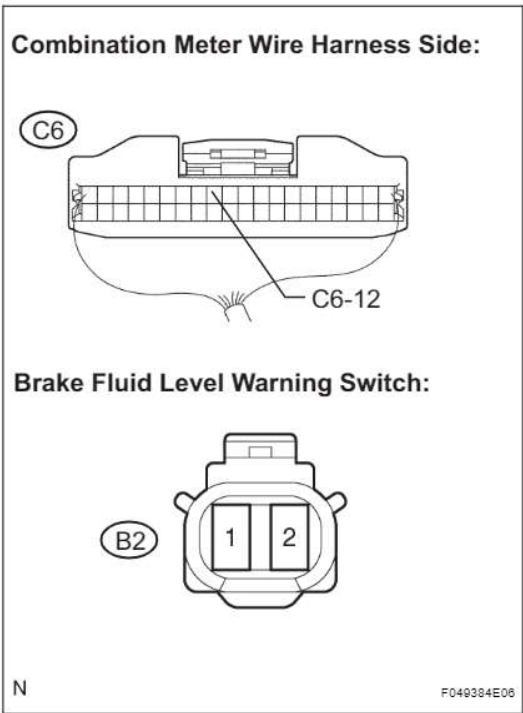
NG

REPLACE BRAKE MASTER CYLINDER
RESERVOIR SUB-ASSEMBLY

OK

7

CHECK WIRE HARNESS (BRAKE FLUID LEVEL WARNING SWITCH - COMBINATION METER)



- (a) Disconnect the C6 combination meter connector.
- (b) Disconnect the B2 brake fluid level warning switch connector.
- (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
C6-12 - B2-1	Below 1 Ω
C6-12 - Body ground	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS AND
CONNECTOR

OK

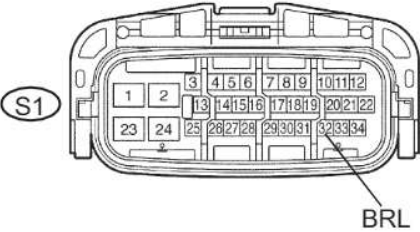
BC-68

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

8

CHECK WIRE HARNESS (SKID CONTROL ECU - COMBINATION METER)

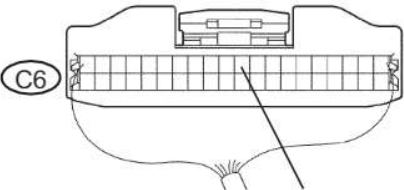
Skid Control ECU Wire Harness Side:



S1

BRL

Combination Meter:



C6

C6-10

F0493385E04

- (a) Disconnect the S1 skid control ECU connector.
- (b) Disconnect the C6 combination meter connector.
- (c) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
S1-32 (BRL) - C6-10	Below 1 Ω
S1-32 (BRL) - Body ground	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

9

INSPECT COMBINATION METER ASSEMBLY

- (a) Check combination meter assembly (See page [ME-6](#)).

NG

CHECK COMBINATION METER ASSEMBLY

OK

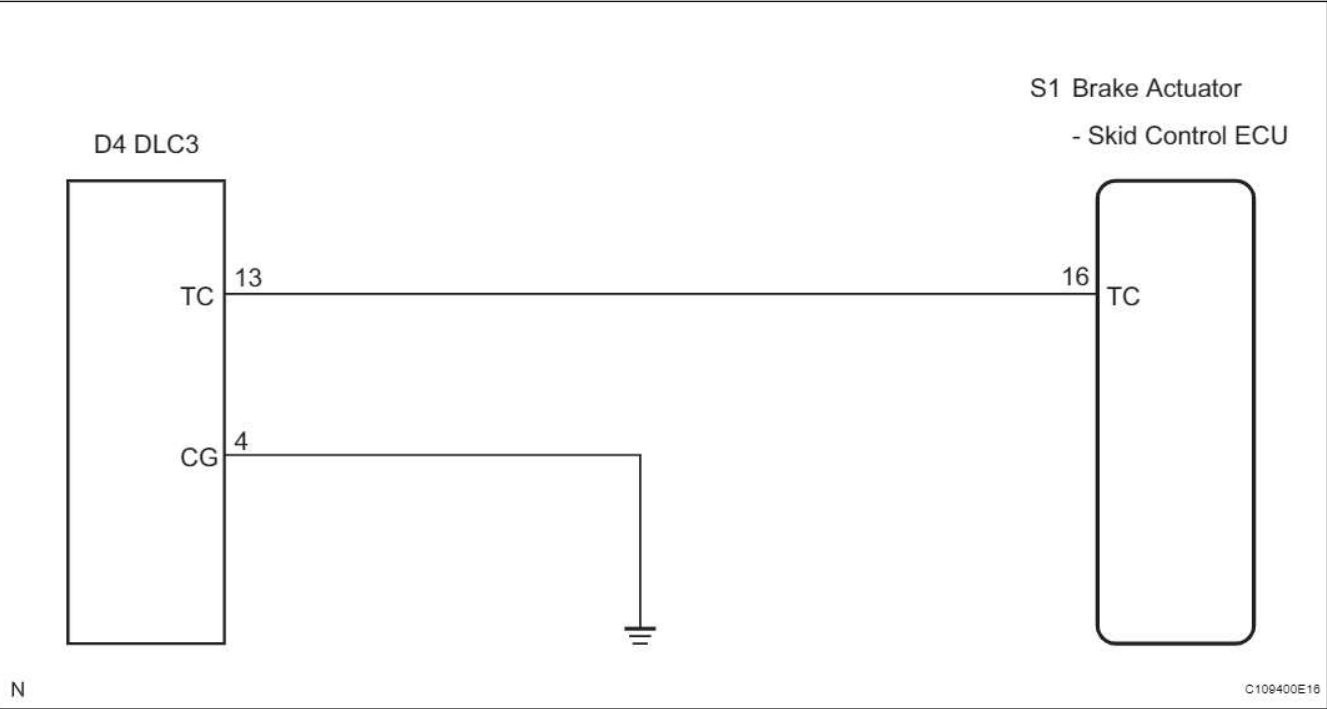
REPLACE BRAKE ACTUATOR ASSEMBLY

TC and CG Terminal Circuit

DESCRIPTION

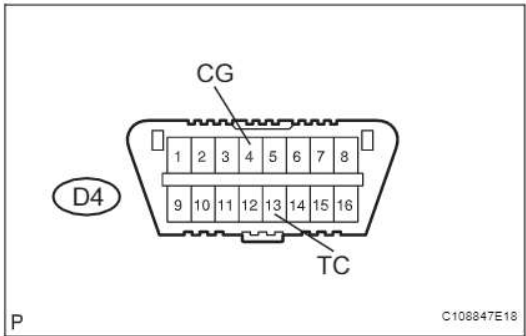
Connecting terminals TC and CG of the DLC3 causes the ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 CHECK DLC3 (TC VOLTAGE)



- (a) Turn the ignition switch to the ON position.
(b) Measure the voltage of the wire harness side connector.
- Standard voltage**

Tester Connection	Condition	Specified Condition
D4-13 (TC) - D4-4 (CG)	Ignition switch ON	11 to 14 V

NG

Go to step 3

BC

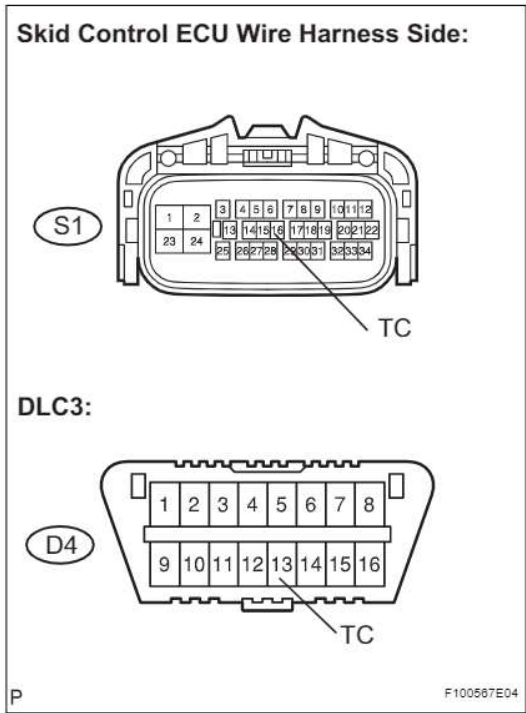
OK

BC-70

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

2

CHECK WIRE HARNESS (SKID CONTROL ECU - DLC3)



- (a) Disconnect the S1 skid control ECU connector.
(b) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
S1-16 (TC) - D4-13 (TC)	Below 1 Ω
S1-16 (TC) - Body ground	10 kΩ or higher

NG

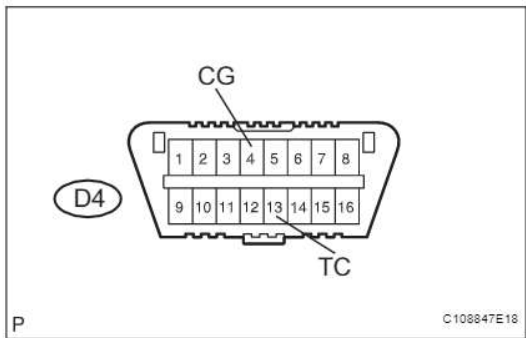
REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

3

CHECK WIRE HARNESS (DLC3 - BODY GROUND)



- (a) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
D4-4 (CG) - Body ground	Below 1 Ω

NG

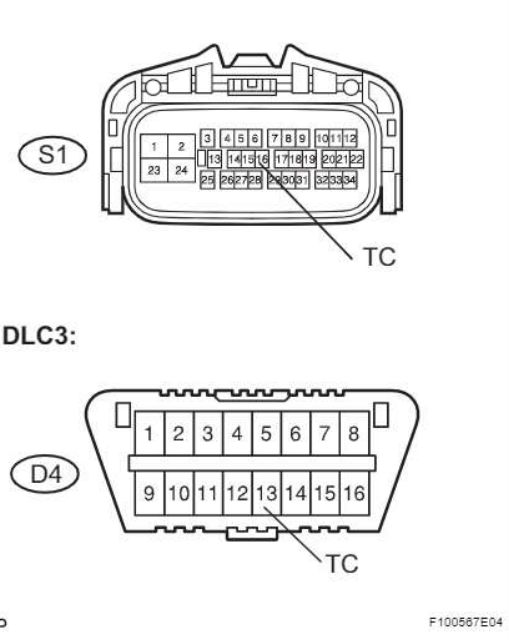
REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

4

CHECK WIRE HARNESS (SKID CONTROL ECU - DLC3)

Skid Control ECU Wire Harness Side:



- (a) Disconnect the S1 skid control ECU connector.
(b) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
S1-16 (TC) - D4-13 (TC)	Below 1 Ω
S1-16 (TC) - Body ground	10 k Ω or higher

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

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BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

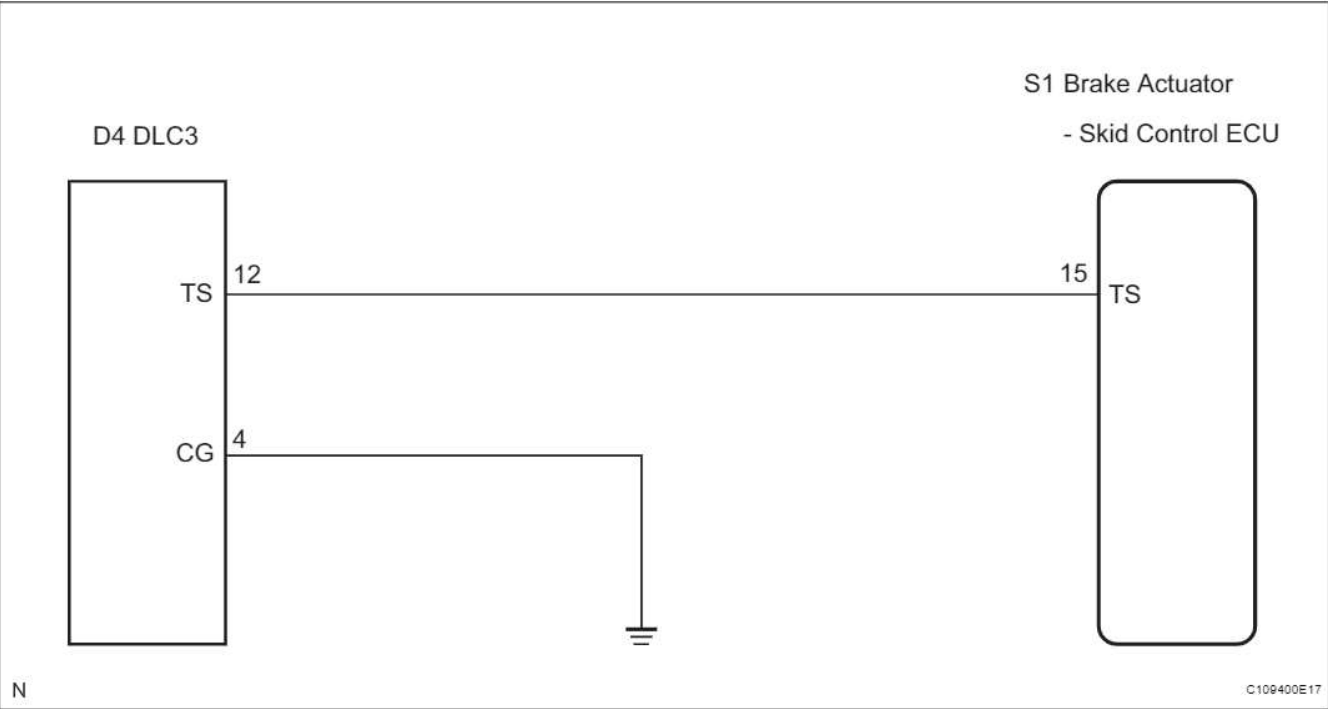
TS and CG Terminal Circuit

DESCRIPTION

In the sensor check mode, a malfunction in the speed sensor that cannot be detected when the vehicle is stopped is detected while driving.

Transition to the sensor check mode can be performed by connecting terminals TS and CG of the DLC3 and turning the ignition switch from OFF to the ON position.

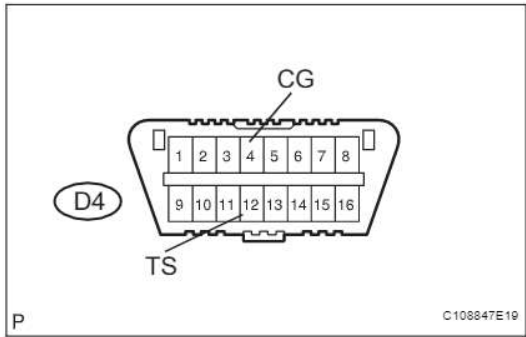
WIRING DIAGRAM



INSPECTION PROCEDURE

1

CHECK DLC3 (TS VOLTAGE)



- (a) Turn the ignition switch to the ON position.
- (b) Measure the voltage of the wire harness side connector.
- Standard voltage**

Tester Connection	Condition	Specified Condition
D4-12 (TS) - D4-4 (CG)	Ignition switch ON	11 to 14 V

NG

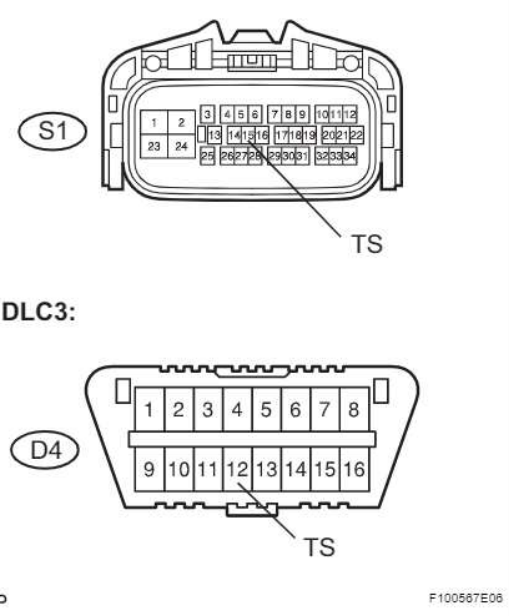
Go to step 3

OK

2

CHECK WIRE HARNESS (SKID CONTROL ECU - DLC3)

Skid Control ECU Wire Harness Side:



- (a) Disconnect the S1 skid control ECU connector.
(b) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
S1-15 (TS) - D4-12 (TS)	Below 1 Ω
S1-15 (TS) - Body ground	10 k Ω or higher

NG

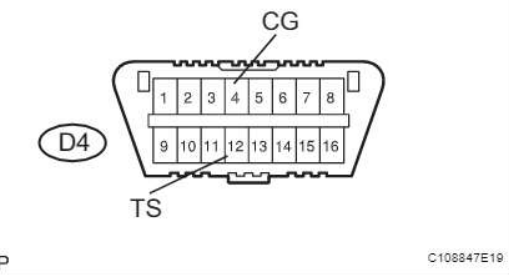
REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE BRAKE ACTUATOR ASSEMBLY

3

CHECK WIRE HARNESS (DLC3 - BODY GROUND)



- (a) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
D4-4 (CG) - Body ground	Below 1 Ω

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

BC

BC-74

BRAKE CONTROL – ANTI-LOCK BRAKE SYSTEM

4

CHECK WIRE HARNESS (SKID CONTROL ECU - DLC3)

Skid Control ECU Wire Harness Side:

S1

TS

DLC3:

D4

TS

P

F100567E06

(a) Disconnect the S1 skid control ECU connector.

(b) Measure the resistance of the wire harness side connectors.

Standard resistance

Tester Connection	Specified Condition
S1-15 (TS) - D4-12 (TS)	Below 1 Ω
S1-15 (TS) - Body ground	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

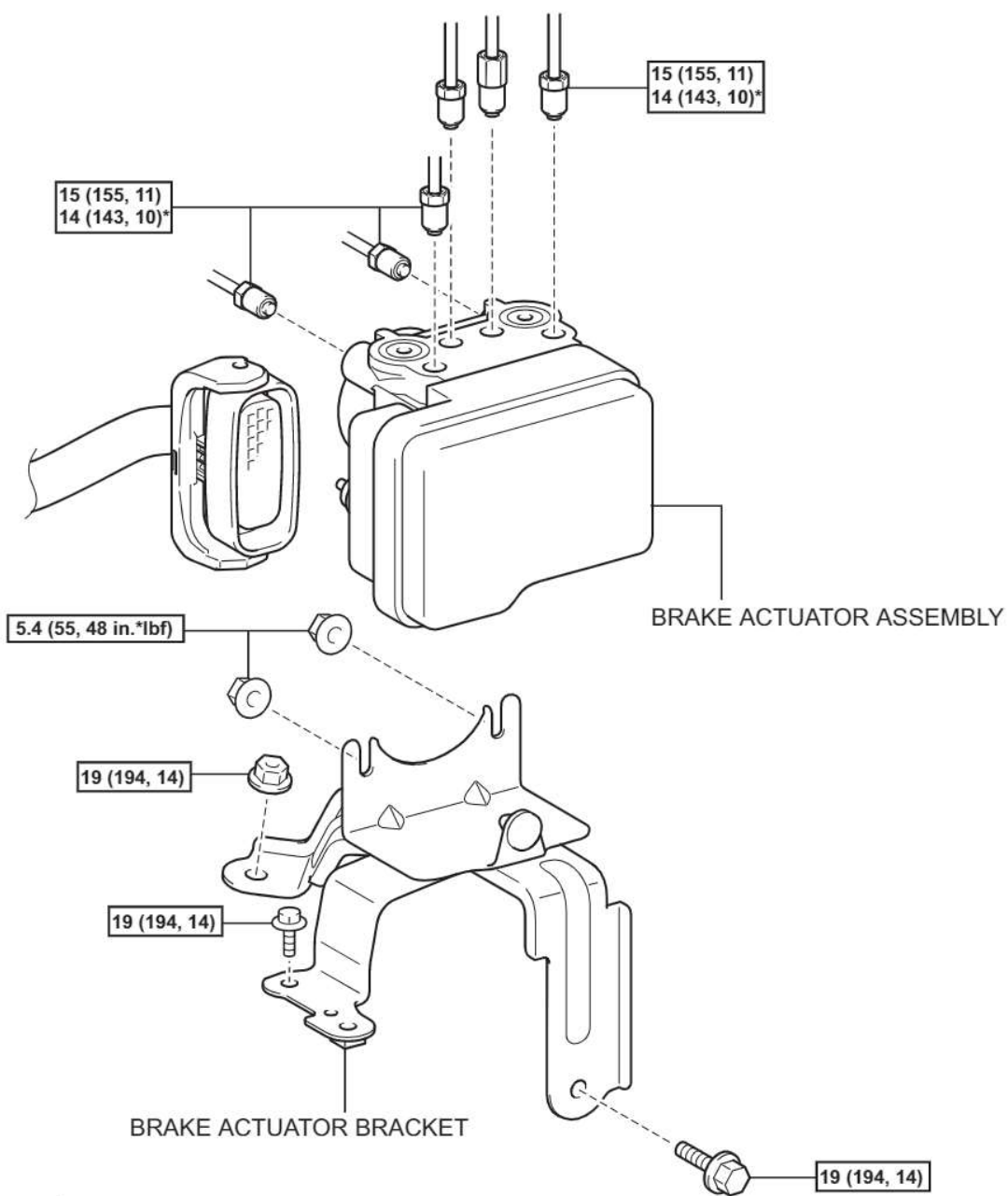
REPLACE BRAKE ACTUATOR ASSEMBLY

BC

<https://cardiagn.com/brake-control-07-scion-tc/>

74/86

BRAKE ACTUATOR
COMPONENTS



N*m (kgf*cm, ft.*lbf) : Specified torque

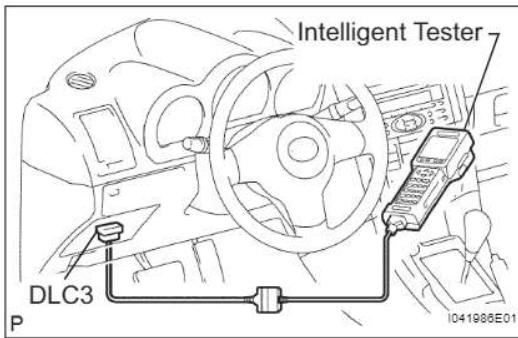
* For use with SST

BC

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BC-72

BRAKE CONTROL – BRAKE ACTUATOR



ON-VEHICLE INSPECTION

1. CONNECT INTELLIGENT TESTER

- Connect the intelligent tester to the DLC 3.
- Start the engine and run it idle.
- Select the ACTIVE TEST mode on the intelligent tester.

HINT:

Please refer to the intelligent tester operator's manual further details.

2. CHECK ACTUATOR MOTOR OPERATION

NOTICE:

Do not keep a motor relay ON for more than 5 seconds. When operating it consecutively, wait 20 seconds between each operation.

- Turn the motor relay ON and check the actuator motor operation noise.
- Turn the motor relay OFF.
- Fully depress the brake pedal and hold it for approximately 15 seconds. Check that the pedal's initial depth is maintained for the entire 15 seconds.
- Turn the motor relay ON and check that the pedal does not pulsate.
- Turn the motor relay OFF and release the pedal.

3. CHECK RIGHT FRONT WHEEL OPERATION

NOTICE:

- Be sure to follow the procedures below when turning ON a solenoid.
- Do not keep a solenoid ON for more 5 seconds. When operating it consecutively, wait 20 seconds between each operation.
- The pedal must not be depressed if only the reduction solenoid SFRR, SFLR, SRRR or SRLR is turned ON.

- With the pedal fully depressed, perform the following operations.
- Turn the SFRH and SFRR solenoids ON simultaneously, and check that the pedal cannot be depressed further.
- Turn the SFRH and SFRR solenoids OFF simultaneously, and check that the pedal can be depressed.
- Turn the motor relay ON and check that the pedal returns.
- Turn the motor relay OFF and release the pedal.

4. CHECK OTHER WHEEL OPERATION

- Using the same procedures, check the solenoids of the other wheels.

HINT:

Left front wheel: SFLH, SFLR

Right front wheel: SFRH, SFRR

Left rear wheel: SRLH, SRLR

Right rear wheel: SRLH, SRLR

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. **DRAIN BRAKE FLUID**

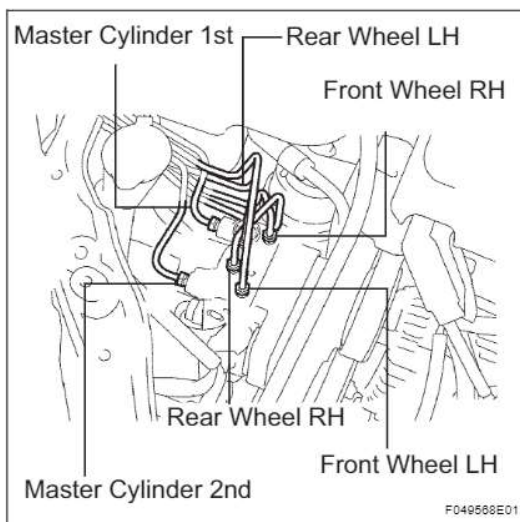
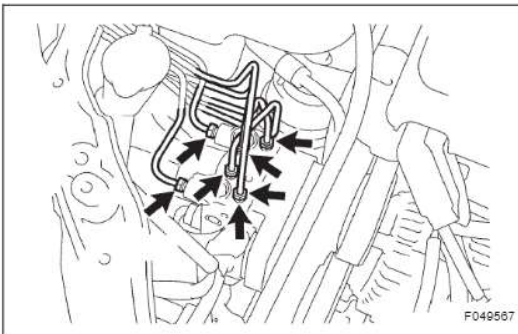
NOTICE:

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

3. **REMOVE FRONT WHEEL RH**
4. **REMOVE HOOD TO FRONT END PANEL SEAL** (See page [ET-4](#))
5. **REMOVE FRONT FENDER LINER LH** (See page [ET-2](#))
6. **REMOVE FRONT FENDER LINER RH** (See page [ET-2](#))
7. **REMOVE FRONT BUMPER COVER** (See page [ET-3](#))
8. **REMOVE HEADLIGHT UNIT RH** (See page [LI-9](#))
9. **REMOVE BRAKE ACTUATOR ASSEMBLY WITH BRACKET**

- (a) Disconnect the actuator connector.
- (b) Using SST, disconnect 6 brake tubes from the actuator.

SST 09023-00101



- (c) Place tags or marks to identify the installation locations of each brake tube.
- (d) Remove the 2 bolts, nut and actuator with bracket.

NOTICE:

Be careful not to damage the brake tubes and wire harness.

10. **REMOVE BRAKE ACTUATOR ASSEMBLY**

- (a) Remove the 2 nuts and brake actuator from the bracket.

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BRAKE CONTROL – BRAKE ACTUATOR

INSTALLATION

1. INSTALL BRAKE ACTUATOR ASSEMBLY

- (a) Install the brake actuator to the bracket with the 2 nuts.

Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)

2. INSTALL BRAKE ACTUATOR ASSEMBLY WITH BRACKET

- (a) Install the brake actuator with bracket with the 2 bolts and nut.

Torque: 19 N*m (194 kgf*cm, 14 ft.*lbf)

NOTICE:

- Be careful not to damage the brake tubes and wire harness.
- Install the bolts and nut in order shown in the illustration.

- (b) Connect the brake actuator connector.

NOTICE:

Make sure that the lever is locked securely.

- (c) Using SST, connect the 6 brake tubes to the correct locations on the actuator, as shown in the illustration.

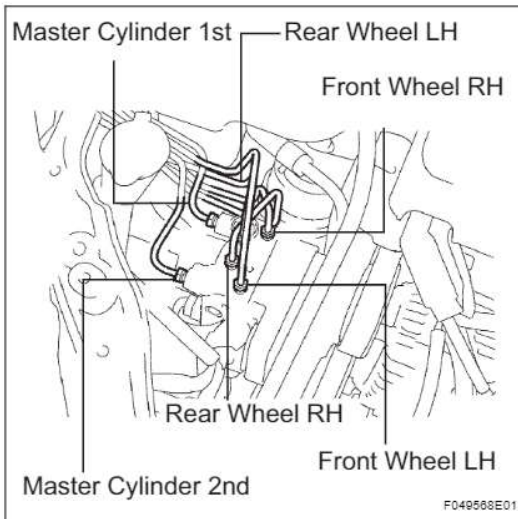
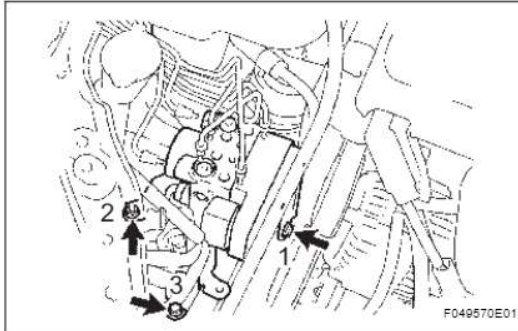
SST 09023-00101

Torque: 14 N*m (145 kgf*cm, 10 ft.*lbf) with SST

Torque: 15 N*m (155 kgf*cm, 11 ft.*lbf) without SST

HINT:

Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).



3. INSTALL HEADLIGHT UNIT RH (See page [LI-15](#))
4. INSTALL FRONT BUMPER COVER (See page [ET-5](#))
5. INSTALL FRONT FENDER LINER LH (See page [ET-4](#))
6. INSTALL FRONT FENDER LINER RH (See page [ET-5](#))
7. INSTALL HOOD TO FRONT END PANEL SEAL (See page [ET-4](#))
8. INSTALL FRONT WHEEL RH
Torque: 103 N*m (1,050 kgf*cm, 76 ft.*lbf)
9. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
10. FILL RESERVOIR WITH BRAKE FLUID (See page [BR-3](#))
11. BLEED AIR FROM BRAKE MASTER CYLINDER (See page [BR-3](#))
12. BLEED AIR FROM BRAKE LINE (See page [BR-4](#))
13. CHECK BRAKE FLUID LEVEL IN RESERVOIR (See page [BR-4](#))
14. CHECK FOR BRAKE FLUID LEAKAGE

15. CHECK BRAKE ACTUATOR WITH INTELLIGENT TESTER

- (a) Check the brake actuator with the intelligent tester (see page [BC-72](#)).

16. ADJUST VEHICLE PREPARATION FOR HEADLIGHT AIM (See page [LI-10](#))**17. PREPARATION FOR HEADLIGHT AIMING (Using Headlight Tester) (See page [LI-11](#))****18. PREPARATION FOR HEADLIGHT AIMING (Using Screen) (See page [LI-11](#))****19. INSPECT HEADLIGHT AIMING (See page [LI-13](#))****20. ADJUST HEADLIGHT AIMING (See page [LI-14](#))****21. PERFORM INITIALIZATION**

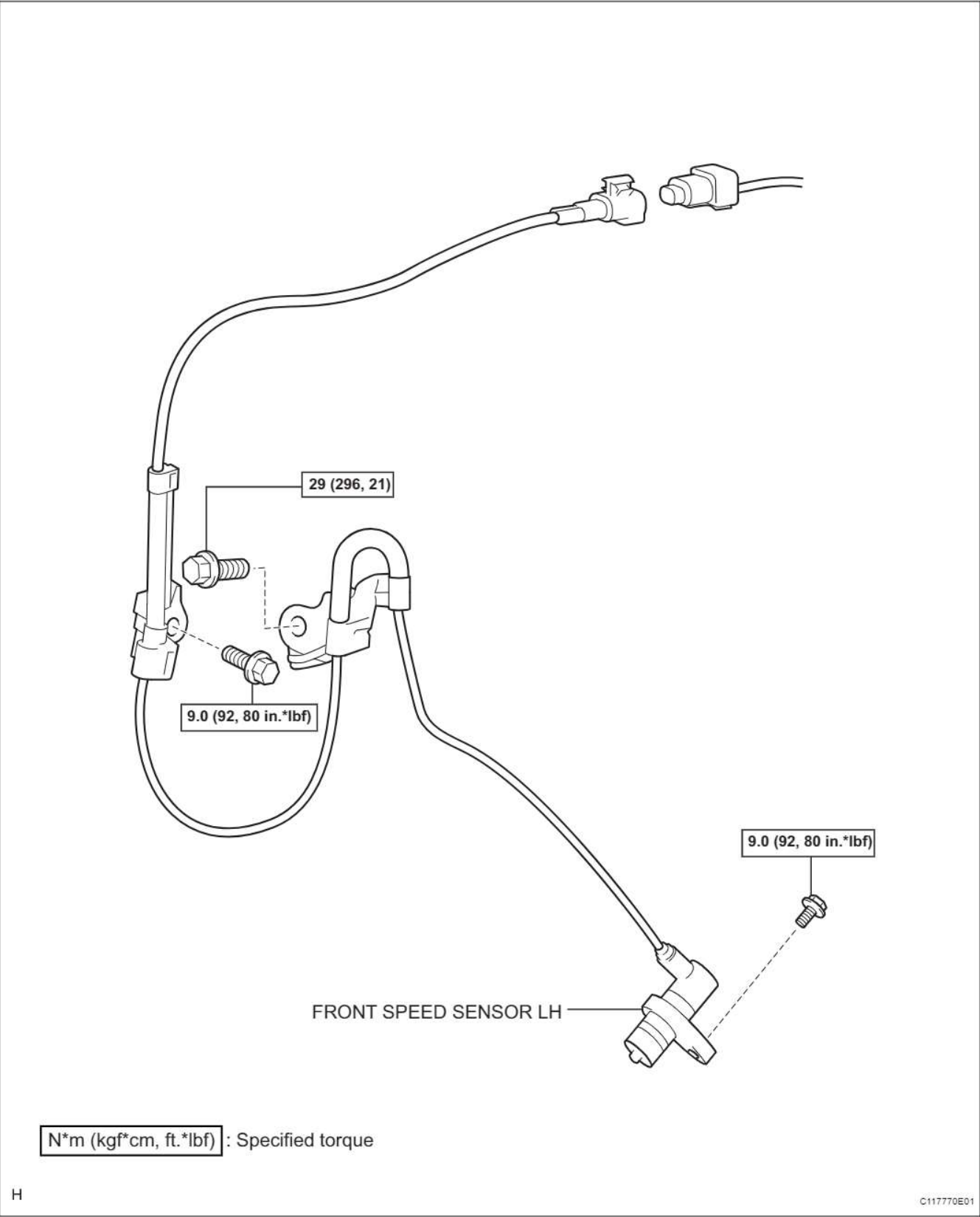
- (a) Perform initialization (see page [IN-23](#)).

NOTICE:

Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

FRONT SPEED SENSOR

COMPONENTS



BRAKE CONTROL – FRONT SPEED SENSOR**BC-77****REMOVAL****HINT:**

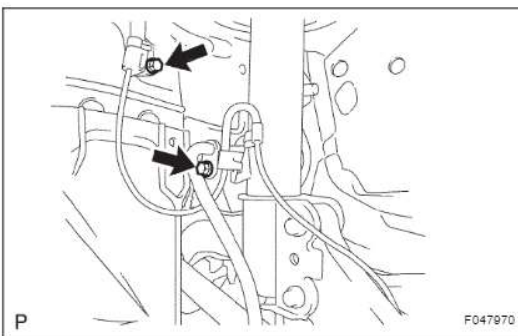
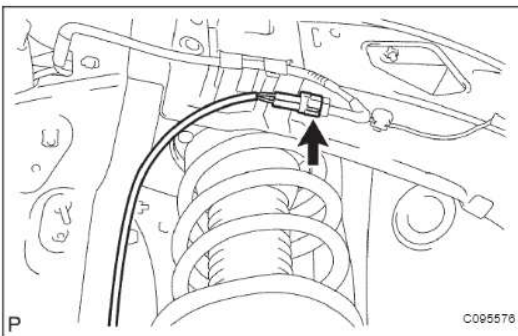
- Use the same procedures for the LH side and RH side.
- The procedures listed below are for the LH side.

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**CAUTION:**

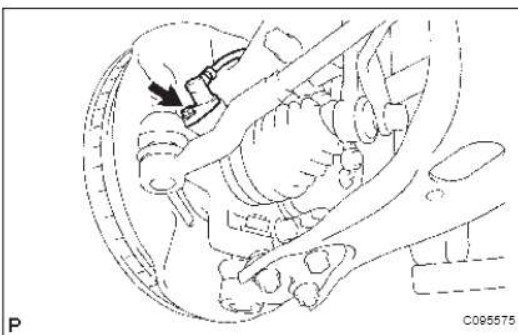
Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. REMOVE FRONT WHEEL**3. REMOVE FRONT FENDER LINER LH (See page ET-2)****4. REMOVE FRONT SPEED SENSOR LH**

(a) Detach the clamp and disconnect the connector.



(b) Remove the bolts and separate the speed sensor from the body.



(c) Remove the bolt and speed sensor.

NOTICE:

Keep the sensor tip and sensor installation hole free from foreign matter.

BC

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BRAKE CONTROL – FRONT SPEED SENSOR

INSTALLATION

HINT:

- Use the same procedures for the LH side and RH side.
- The procedures listed below are for the LH side.

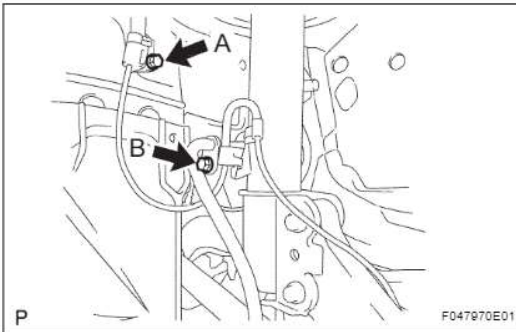
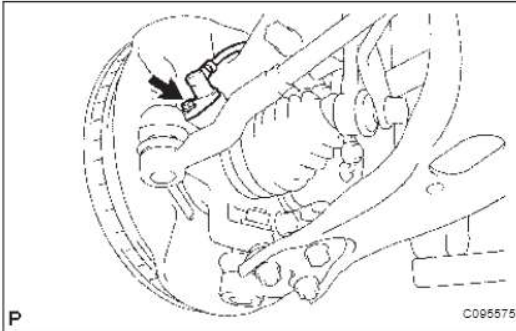
1. INSTALL FRONT SPEED SENSOR LH

- (a) Install the speed sensor with the bolt.

Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf)

NOTICE:

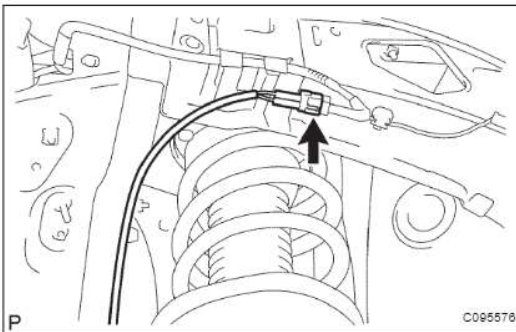
Keep the sensor tip and sensor installation hole free from foreign matter.



- (b) Install the speed sensor to the body with the 2 bolts.

Torque: 9.0 N*m (92 kgf*cm, 80 in.*lbf) for bolt A

29 N*m (296 kgf*cm, 21 ft.*lbf) for bolt B



- (c) Connect the connector and attach the clamp.

2. INSTALL FRONT FENDER LINER LH (See page [ET-5](#))

3. INSTALL FRONT WHEEL

Torque: 103 N*m (1,050 kgf*cm, 76 ft.*lbf)

4. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

5. PERFORM INITIALIZATION

- (a) Perform initialization (see page [IN-23](#)).

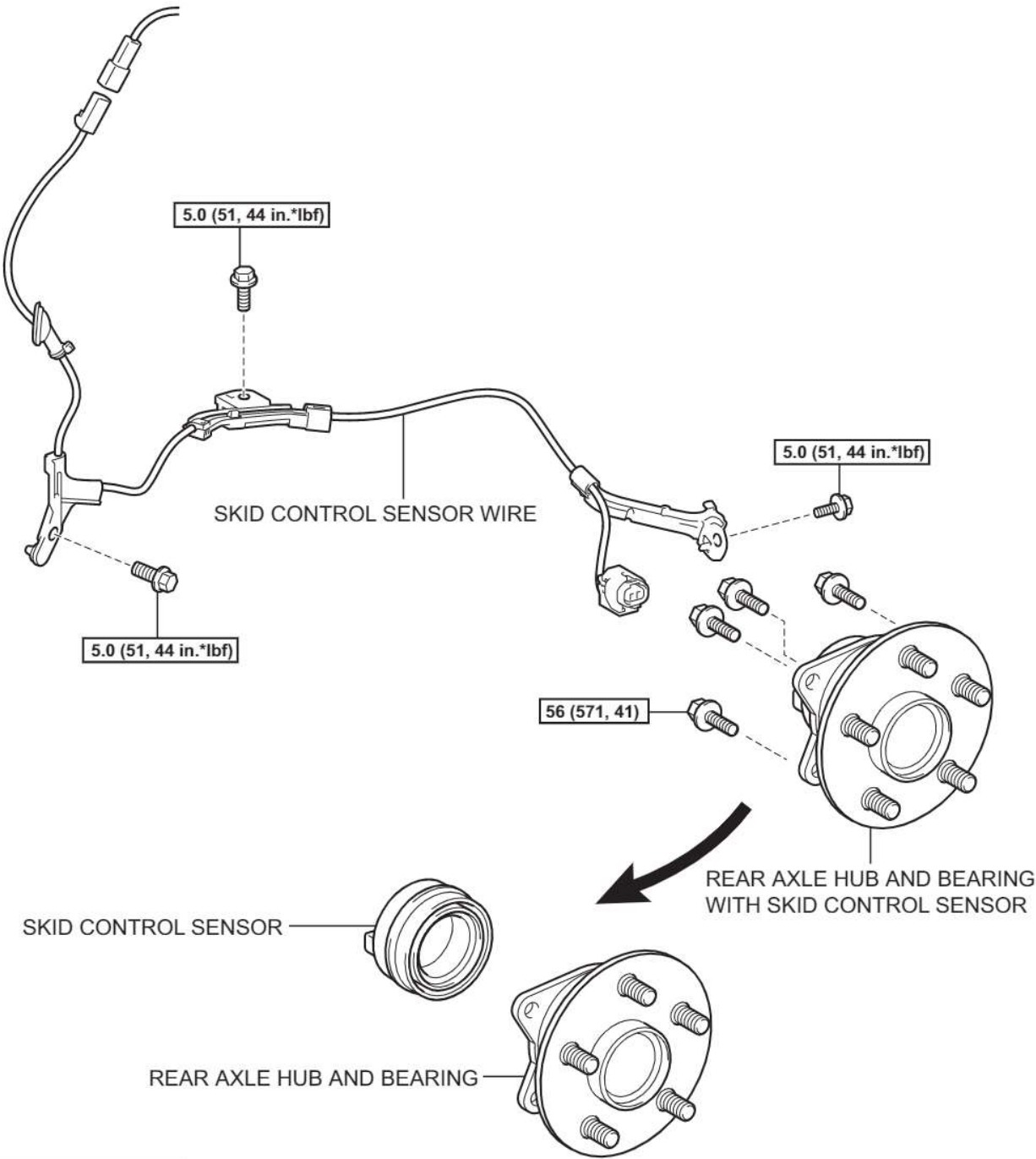
NOTICE:

Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

6. CHECK ABS SPEED SENSOR SIGNAL

- (a) Check the ABS speed sensor signal (see page [BC-12](#)).

SKID CONTROL SENSOR
COMPONENTS



N*m (kgf*cm, ft.*lbf) : Specified torque

BC

REMOVAL

HINT:

- Use the same procedures for the LH side and RH side.
- The procedures listed below are for the LH side.

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. REMOVE REAR WHEEL

3. DISCONNECT SKID CONTROL SENSOR WIRE (See page AH-17)

4. REMOVE REAR DISC BRAKE CYLINDER MOUNTING WITH REAR DISC BRAKE CYLINDER ASSEMBLY (See page AH-17)

5. REMOVE REAR DISC (See page BR-32)

6. REMOVE REAR AXLE HUB AND BEARING (See page AH-19)

7. REMOVE SKID CONTROL SENSOR

- Install the 4 hub nuts to the 4 rear axle hub bolts.
- Placing an aluminum plate below the rear axle hub and bearing assembly, place them into a vise.

NOTICE:

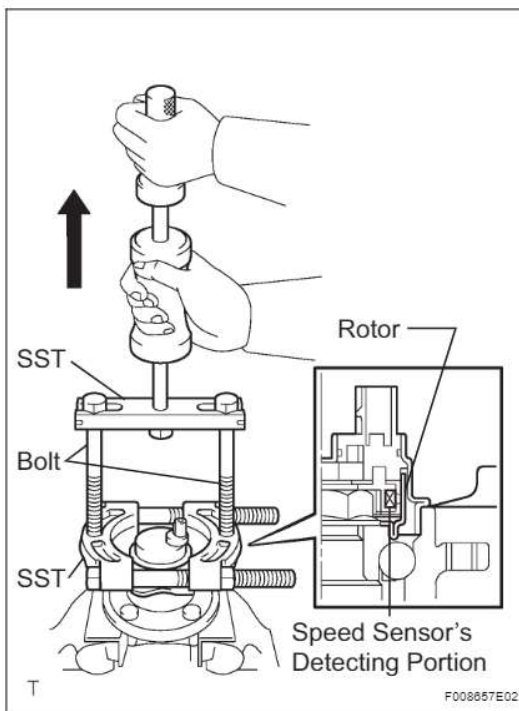
Replace the rear axle hub and bearing assembly if it is dropped or receives a strong shock.

- Using a 3 mm pin punch and hammer, remove the 2 pins from the SST (09520-00031) and disconnect the attachment (09521-00010).
- Using SST and 2 bolts, remove the skid control sensor from the rear axle hub and bearing assembly.

SST 09520-00031 (09520-00040), 09521-00020, 09950-00020

NOTICE:

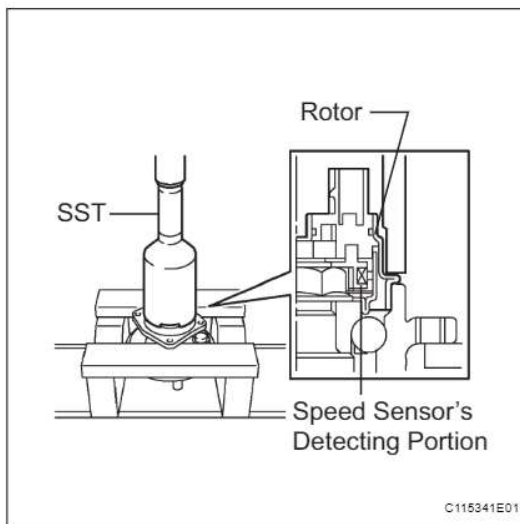
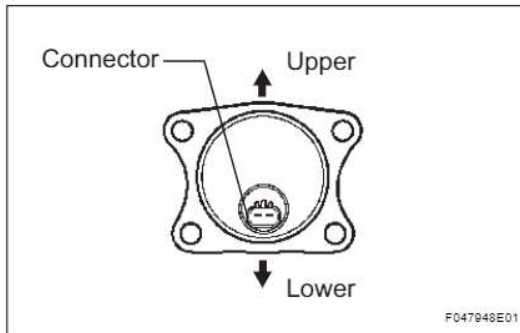
- Pull the skid control sensor off straight, be careful not to make contact with the skid control sensor rotor.
- If the sensor rotor is damaged or deformed, replace the rear axle hub and bearing assembly.
- Do not scratch the area where the skid control sensor contacts the rear axle hub and bearing assembly.
- Do not attach the foreign matter to the sensor rotor.



INSTALLATION

HINT:

- Use the same procedures for the LH side and RH side.
- The procedures listed below are for the LH side.



1. INSTALL SKID CONTROL SENSOR

- (a) Wipe off sealant attached to the skid control sensor's fitting surface with white gasoline.

NOTICE:

Prevent foreign matter from attaching to the sensor rotor.

- (b) Install a new skid control sensor to the rear axle hub and bearing assembly. The skid control sensor connector should be placed in the lowest position.

HINT:

The rear axle hub and bearing assembly should be placed with the narrow side facing the lower side.

- (c) Using SST and a press, press the skid control sensor so that it becomes flat with the rear axle hub and bearing assembly.

SST 09214-76011

NOTICE:

- Do not use a hammer on the skid control sensor.
- Check that there is no foreign matter such as iron chips on the sensor's detection portion.
- Slowly press the skid control sensor in straight.

2. INSTALL REAR AXLE HUB AND BEARING (See page [AH-19](#))

3. INSTALL REAR DISC (See page [BR-35](#))

4. INSTALL REAR DISC BRAKE CYLINDER MOUNTING WITH REAR DISC BRAKE CYLINDER ASSEMBLY (See page [AH-21](#))

5. CONNECT SKID CONTROL SENSOR WIRE (See page [AH-21](#))

6. INSTALL REAR WHEEL

Torque: 103 N*m (1,050 kgf*cm, 76 ft.*lbf)

7. CHECK AND ADJUST REAR WHEEL ALIGNMENT

- (a) Check and adjust the rear wheel alignment (see page [SP-9](#)).

8. CABLE TO NEGATIVE BATTERY TERMINAL BATTERY

9. PERFORM INITIALIZATION

- (a) Perform initialization (see page [IN-23](#)).

NOTICE:

Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.

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10. CHECK ABS SPEED SENSOR SIGNAL

- (a) Check the ABS speed sensor signal (see page [BC-12](#)).