

ABS WITH EBD SYSTEM

PRECAUTIONS

1. TROUBLESHOOTING PRECAUTION

- (a) When there is a malfunction in the contact point of the terminals or a problem with the installation of parts, removal or installation of the parts suspected to have a problem may return the system to the normal condition either completely or temporarily.
- (b) In order to determine which sections are malfunctioning, be sure to check the working conditions at the time the malfunction occurred, such as DTC output and freeze frame data output, and write them down before disconnecting the connectors or removing and installing the parts.
- (c) Since the system may be influenced by a malfunction in a system other than the brake control system, be sure to check for DTCs in other systems.

2. HANDLING AND OPERATING PRECAUTIONS

- (a) Unless otherwise noted as the inspection method, removal and installation of the actuator and other sensors must be performed with the ignition switch OFF.
- (b) When the actuator and other sensors are removed or installed, perform the test mode inspections, output any DTCs and confirm they the normal codes are displayed.

3. FAIL-SAFE FUNCTION

- (a) If a malfunction occurs in the ABS, each warning light comes on and ABS operation stops at the same time.

4. PRECAUTIONS ON DTCs

- (a) For some of the DTCs, the warning may not be cancelled by repairing only the faulty areas.
- (b) To cancel the warning (light), clear the DTCs or perform the following procedures.

DIAGNOSTIC TROUBLE CODE	OPERATION PROCEDURE
C0273/13 C1235/25 C1236/26 C1238/27 C1239/28 C1251/51	1. Replace with new parts or repair 2. IG ON 3. Run the vehicle (at 20 km/h or higher for 30 seconds) → The warning light goes off.

NOTICE:

- As the system does not operate due to the fail-safe function while the warning is being output (light on), be careful when driving the vehicle and braking.
- The current DTC will be recorded again.

OPERATION CHECK

1. INITIAL CHECK OF BRAKE SYSTEM INDICATOR LIGHTS

- (a) Turn the ignition switch to the ON position.



- (b) Check that the ABS and brake warning lights come on and go off after approximately 3 seconds.

HINT:

If the light does not come on, check to see if the bulb is blown and check the wire harness between the skid control computer (built in the actuator) and meter.

2. INSPECT BRAKE ACTUATOR OPERATION

- (a) PREPARE FOR INSPECTION

- (1) Connect the DS-II to the DLC and start the engine.
- (2) Turn the DS-II on and select the following items:
DIAGNOSIS / ABS / ACTIVE TEST.

- (b) INSPECTION ACTUATOR MOTOR START OPERATION

NOTICE:

- To protect the motor and solenoid, do not operate them for more than 5 seconds. If it is necessary to operate the motor and solenoid repeatedly, leave at least a 20 second interval between each operation.
- The operation time of the active test for each solenoid is approximately 2 seconds. The active test turns off automatically.
- Do not drive multiple solenoids concurrently.

- (1) Depress the brake pedal and hold it in that position.
- (2) Turn on the left rear valve motor, and inspect the brake pedal.

Standard:

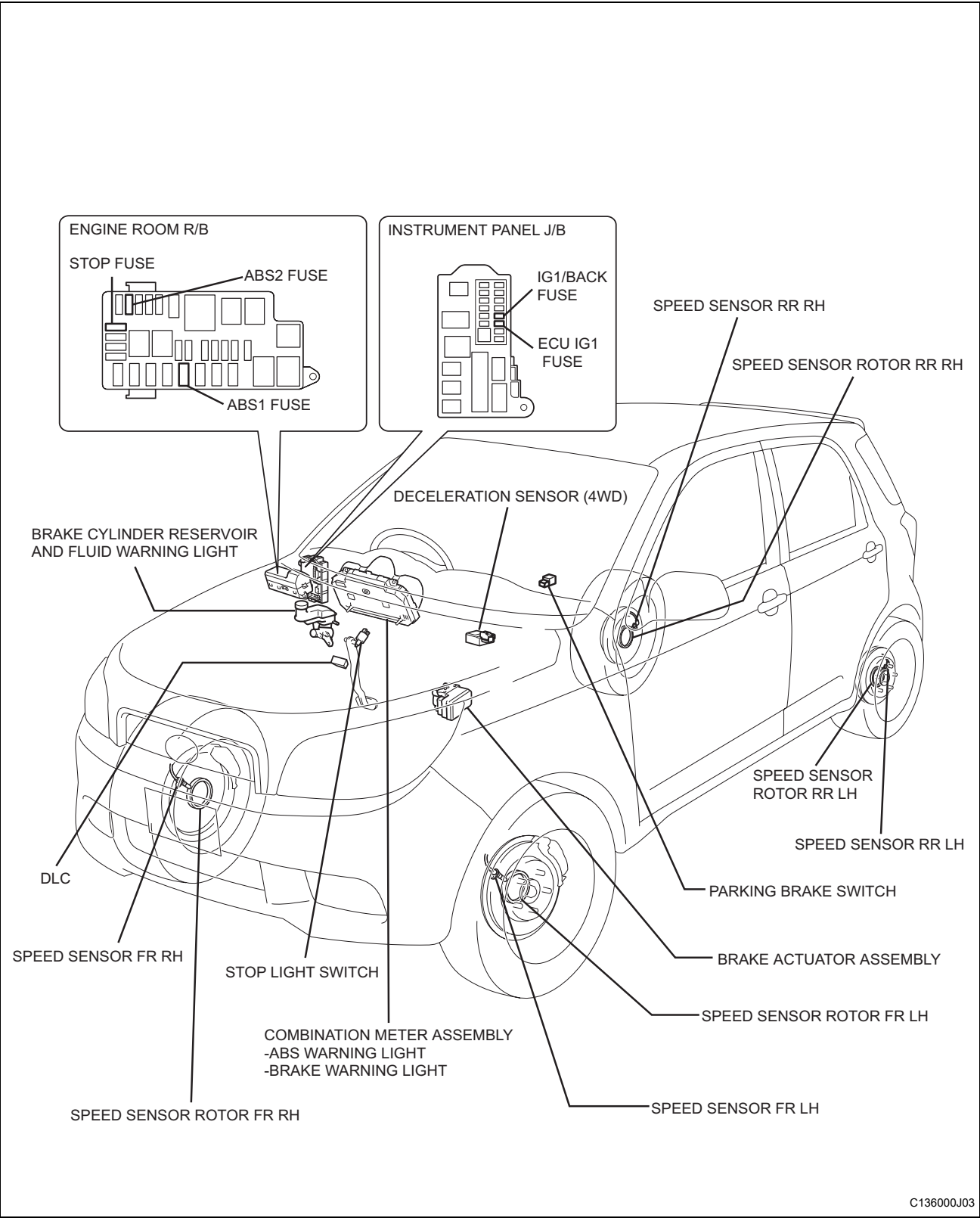
The pedal should return.

- (3) Inspect the other valve motors in the same manner.

HINT:

Rear right, front left and front right valve motors.

LOCATION



DIAGNOSTIC TROUBLE CODE CHART

DTC No.	Diagnostic Item	Code Memory	See Page
C0200/21	OPEN OR SHORT CIRCUIT IN FR WHEEL	○	BC-18
C0205/22	OPEN OR SHORT CIRCUIT IN FL WHEEL	○	BC-18
C0210/23	OPEN OR SHORT CIRCUIT IN RR WHEEL	○	BC-18
C0215/24	OPEN OR SHORT CIRCUIT IN RL WHEEL	○	BC-18
C0226/52	OPEN OR SHORT CIRCUIT IN FR PRESSURE RETENTION AND REDUCTION SOLENOID	○	BC-23
C0236/54	OPEN OR SHORT CIRCUIT IN FL PRESSURE RETENTION AND REDUCTION SOLENOID	○	BC-23
C0246/56	OPEN OR SHORT CIRCUIT RR PRESSURE RETENTION AND REDUCTION SOLENOID	○	BC-23
C0256/58	OPEN OR SHORT CIRCUIT IN RL PRESSURE RETENTION AND REDUCTION SOLENOID	○	BC-23
C0273/13	MOTOR RELAY OPEN CIRCUIT	○	BC-24
C0274/14	MOTOR RELAY SHORT CIRCUIT	○	BC-24
C0278/11	SOLENOID RELAY OPEN CIRCUIT	○	BC-27
C0279/12	SOLENOID RELAY SHORT CIRCUIT	○	BC-27
C1235/25	FR WHEEL CYCLE ERROR	○	BC-30
C1236/26	FL WHEEL CYCLE ERROR	○	BC-30
C1238/27	RR WHEEL CYCLE ERROR	○	BC-30
C1239/28	RL WHEEL CYCLE ERROR	○	BC-30
C1241/15	LOW OR EXCESSIVE POWER SUPPLY VOLTAGE	○	BC-34
C1244/32	OPEN OR SHORT CIRCUIT IN FRONT AND REAR G SENSOR OR SIDE SENSOR	○	BC-36
C1245/31	FRONT AND REAR G SENSOR OR SENSOR SIGNAL ERROR	○	BC-36
C1249/39	STOP LIGHT SW ERROR	○	BC-39
C1251/51	PUMP MOTOR SYSTEM/ RESERVOIR SYSTEM	○	BC-42

PROBLEM SYMPTOMS TABLE

1. If a malfunction occurs even though the normal code is output, check each circuit for each problem symptom according to the following table.

NOTICE:

Turn the ignition switch off before removing and installing the actuator assemblies and sensors.

HINT:

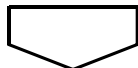
See the flowchart in order to determine which parts to inspect.

PROBLEM SYMPTOMS TABLE

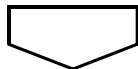
Symptom	Suspected Area	See Page
ABS WARNING LIGHT REMAINS ON	See ABS WARNING LIGHT REMAINS ON.	BC-43
BRAKE WARNING LIGHT REMAINS ON	See BRAKE WARNING LIGHT REMAINS ON in the troubleshooting flow chart.	BC-46
ABS ACTIVATION TIMING IS EARLY (ABS ACTIVATES BEFORE THE WHEELS LOCK)	See ABS ACTIVATION TIMING IS EARLY (ABS activates before the wheels are locked) in the troubleshooting flow chart.	BC-51
The brake pedal is low (there are fluid leaks or there is air in the system)	See BRAKE PEDAL IS LOW (FLUID LEAK OR AIR IN SYSTEM) in the troubleshooting flow chart.	BC-52
NOISE DURING INITIAL CHECK OF ACTUATOR TOO LOUD	See NOISE DURING INITIAL CHECK OF ACTUATOR TOO LOUD in the troubleshooting flow chart.	BC-54

HOW TO PROCEED WITH TROUBLESHOOTING

1	VEHICLE BROUGHT TO WORKSHOP
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2	CONDUCT CUSTOMER PROBLEM ANALYSIS AND CHECK SYMPTOMS
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3	CHECK DIAGNOSTIC TROUBLE CODE (See page BC-7)
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- (a) Check for DTCs.
 - (1) Check and record the DTCs.
- (b) Delete the DTCs.
- (c) Recheck for DTCs.
 - (1) Based on the DTCs recorded, reproduce the symptoms that caused the problem and recheck for the DTCs.

HINT:

- When diagnosis codes are output, see DIAGNOSTIC TROUBLE CODE CHART (BC-4).
- When DTC output is requested, if either the DS-II or the warning light in the indicator do not respond, then check the power source (+IG circuit) of the brake actuator assembly which has a built-in skid control computer.

Standard

Normal code is output, malfunctions can be checked and reproduced.	A
Normal code is output, malfunctions cannot be checked and reproduced.	B
DTCs are output.	C

B

CONDUCT MALFUNCTION REPRODUCTION
(See page IN-30)

C

GO TO STEP 6

A

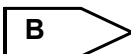
4

PROBLEM SYMPTOMS TABLE

- (a) Check if a malfunction corresponds to the items in the problem symptoms table. (See page BC-4)

Standard

Does not correspond to the items in the problem symptoms table	A
Corresponds to the items in the problem symptoms table	B

B

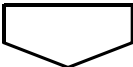
GO TO STEP 6

A

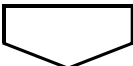
5

PERFORM TROUBLESHOOTING BASED ON PROBLEM SYMPTOM

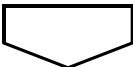
- (a) DATA LIST (See page BC-15).
(b) Active test (See page BC-15).
(c) ECU terminals (See page BC-13).
(d) Actuator operation check (See page BC-2).

6

ADJUST, REPAIR OR REPLACE

7

CONFIRMATION TEST

END

CUSTOMER PROBLEM ANALYSIS CHECK

Customer's Name		License Plate No.
		Registration Year
		VIN
Date Vehicle Brought In		Odometer Reading km
Customer Comments		
Date Problem First Occured		
Frequency Problem Occurs	Constant Occasional (__ times per day)	
IG per day	__ times	
Weather	Clear Cloudy Rainy Snowy Others	
Temperature	Approximately	
Road Conditions		
Symptoms	ABS does not operate	
	Others:	
	ABS warning light condition	On Off
	Brake fluid within standard level PKB released	On Off

C099122

Check for DTCs.

ABS system	Output Code
1st time	
2nd time	
times	
DTCs other than ABS system	

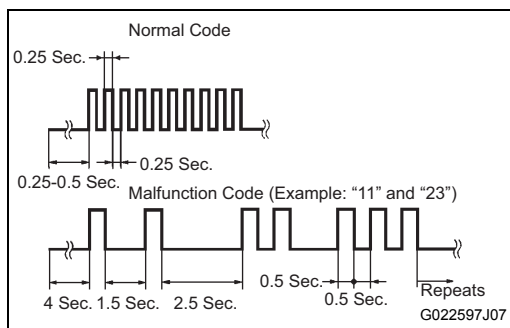
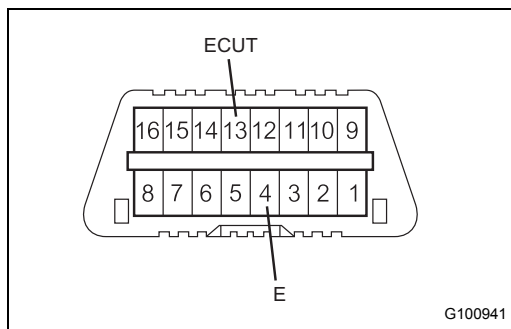
CHECK / CLEAR DTCs

1. CHECK FOR OUTPUT DTCs

- (a) Read the DTCs using the DS-II.
 - (1) Turn the ignition switch off.
 - (2) Connect the DS-II to the DLC.
 - (3) Turn the ignition switch to the ON position.
 - (4) Following the prompts on the DS-II screen, read the DTCs.

NOTICE:

If there are any errors found, clear the DTCs after repair.



- (b) Read the DTCs using the warning light.
- (1) Turn the ignition switch off.
 - (2) Short the circuit between terminals 13 (ECUT) and 4 (E) of the DLC.

NOTICE:

- Do not connect the SST to the wrong terminals. Doing so may cause malfunctions.
- Perform this procedure when the vehicle is stopped.

- (3) Turn the ignition switch to the ON position.

- (4) Count the number of times that the ABS warning light blinks.

HINT:

- If the system is normal, the warning light will blink repeatedly at an interval of 0.25 seconds on and 0.25 off.
- When there is only one DTC, the code will be displayed in 4 second intervals.
- When there are 2 or more DTCs, the different codes will be displayed in series at an interval of 2.5 seconds. When all the codes have been displayed, the series will return to the beginning and, after a four second pause, the codes will be output again.
- When 2 or more DTCs are present, the code with the lower number is indicated first.

- (5) Open the circuit between terminals 13 (ECUT) and 4 (E) of the DLC.

NOTICE:

If there are any errors found, clear the DTC after performing the repair of the affected systems.

2. Delete the DTCs.

- (a) DELETING DIAGNOSTIC TROUBLE CODES (DS-II)

- (1) Turn the ignition switch off.
- (2) Connect the DS-II to the DLC.
- (3) Turn the ignition switch to the ON position.
- (4) Following the prompts on the DS-II screen, clear the DTCs.

- (b) Procedure for clearing DTCs (by shorting the DLC terminals)

- (1) Turn the ignition switch off.
- (2) Short the circuit between terminals 13 (ECUT) and 4 (E) of the DLC.

NOTICE:

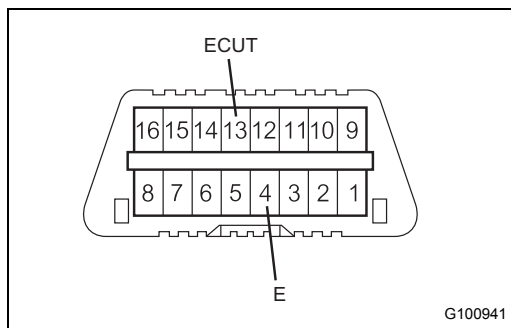
Do not connect the SST to the wrong terminals. Doing so may cause malfunctions.

- (3) Turn the ignition switch to the ON position, and depress the brake pedal 8 times or more within 5 seconds.

- (4) Check that the normal code is output.

HINT:

If the malfunction continues, it is possible that the DTC may not be cleared.



DIAGNOSIS SYSTEM

1. ABOUT DIAGNOSTIC TROUBLE CODE

- (a) When the skid control computer (built into the actuator assembly) detects a malfunction in the system, it will output (record) a DTC according to the system and circuit where the trouble occurred.
- (b) When the DTC is being output, the skid control computer will illuminate the ABS and brake warning lights to inform the driver of trouble.
- (c) DTCs can be read by the DS-II or the blinking of the warning light when the DLC terminals are shorted.

TEST MODE

1. TEST MODE INSPECTION

HINT:

- When entering the test mode, all test mode DTCs are stored, and the DTCs judged as normal by the computer during the inspection are cleared.
- When the system returns to the normal mode, all test mode DTCs will be cleared.
- If the sensor has a malfunction, the ABS warning light will come on and the ABS will not operate.

(a) Procedure for entering test mode (DS-II)

- (1) Turn the ignition switch off and connect the DS-II to the DLC.
- (2) For A/T vehicles, change the shift lever to the P range. For M/T vehicles, pull the parking brake lever.
- (3) Turn the ignition switch to the ON position, and following the prompts on the DS-II, enter the test mode.

(b) Procedure for entering the test mode (by shorting the DLC terminals)

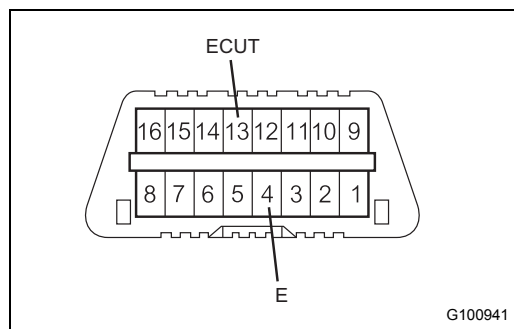
HINT:

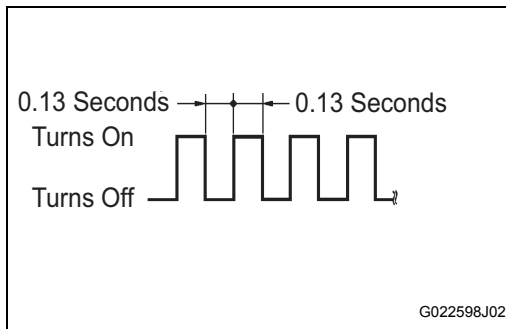
When clearing the memory using the stop light switch, the system will automatically enter the test mode, and the ABS warning light will blink. In this case, continue the test mode function, and check that each sensor has no malfunctions.

- (1) After clearing the memory using the stop light switch, turn the ignition switch to the ON position with the circuit open between terminals 13 (ECUT) and 4 (E) of the DLC. Then check that the ABS warning light blinks in the test mode.

NOTICE:

If the ABS warning light remains on, check for DTCs, as this may indicate that there are system errors.





- (c) Check the test mode display
- (1) Check that the test mode is entered by confirming that the ABS warning light comes on for several seconds and starts blinking.

Conditions for Continuing Test Mode Codes

DLC	IG ON	IG OFF	Ignition switch OFF → ON
Short circuit between terminals ECUT and E	Memory is retained	Memory is retained	Memory is retained
Open circuit between terminals ECUT and E	Memory is retained	Memory is retained	Memory is cleared

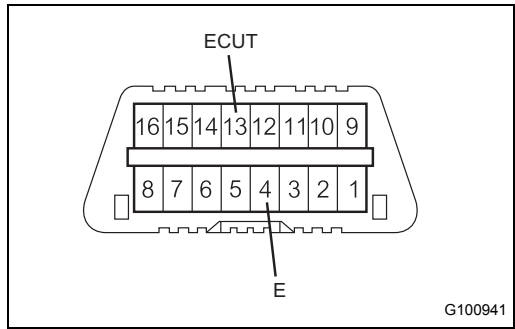
- (d) Check the speed sensor.
- (1) With the steering wheel centered, startoff without allowing the wheels to spin, accelerate the vehicle to at least 40 km/h, and check that the warning light goes off.

- (e) End the sensor check.
- (1) When every inspection item produces a normal result, the test mode DTCs will automatically be cleared and the ABS warning light will go off.

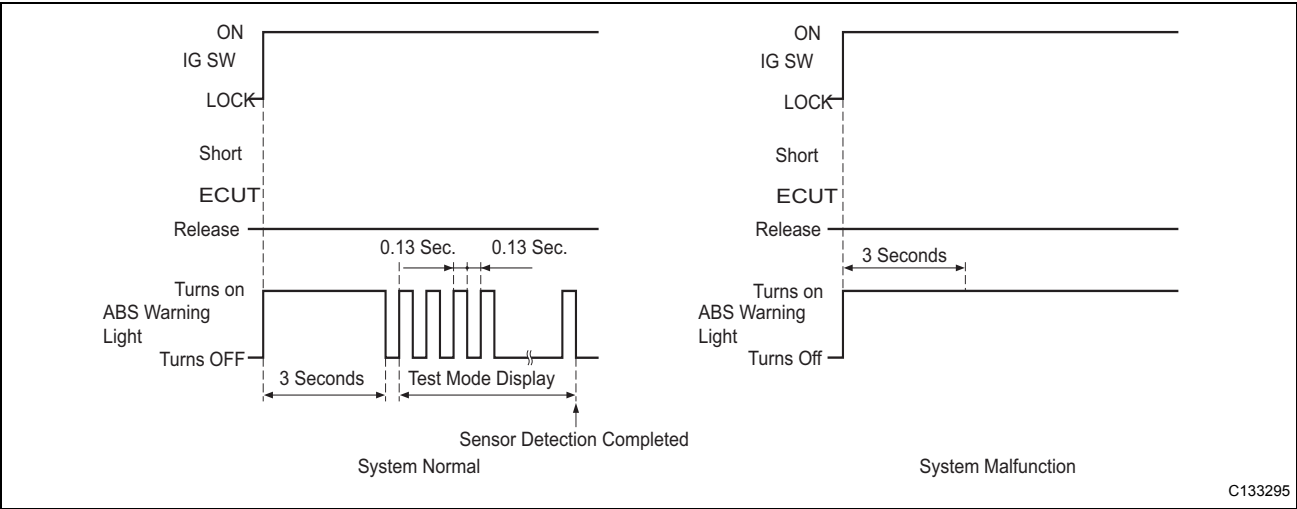
NOTICE:

If the vehicle does not run or the test mode inspection conditions are not met, the stored DTCs will not be cleared and the ABS warning light will continue to blink in the test mode.

- (f) Read the test mode DTCs (using the DS-II).
- (1) In the test mode, follow the prompts on the DS-II screen in order to read the test mode DTCs.



- (g) Read the test mode DTCs (by shorting the DLC terminals).
- (1) Count the number of times that the ABS warning light blinks.



- (h) Procedure for ending the test mode (DS-II)
- (1) Switch the system from the test mode to the normal mode by following the prompts on the DS-II.
- (2) Turn the ignition switch off and disconnect the DS-II.
- (i) Procedure for ending the test mode (by shorting the DLC terminals)
- (1) Confirm that the sensor check produces a normal result, then end the test mode.
- (2) Open the circuit between terminals 13 (ECUT) and 4 (E) of the DLC.

2. TEST MODE DTC LIST

HINT:
The test mode code, SAE, indicates the output code shown when using a diagnostic tool (DS-II). The light code on the right shows the output code indicated by the ABS warning light.(SAE: Society of Automotive Engineers)

ABS Test Mode Code List

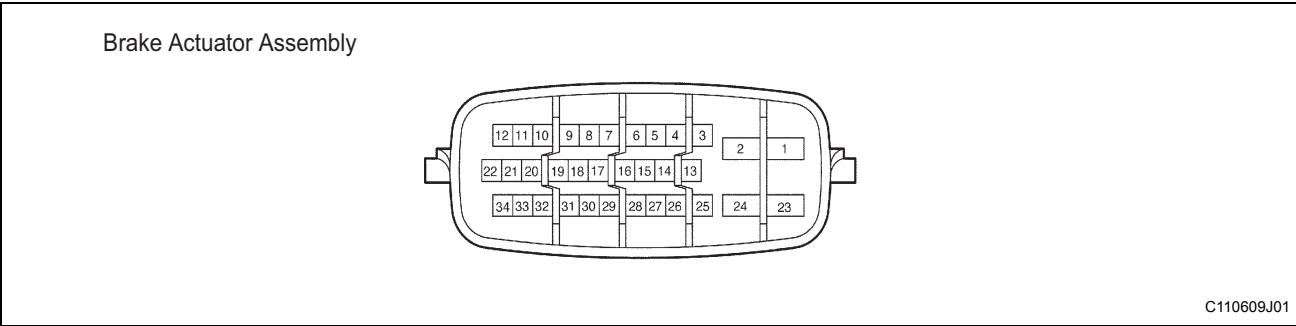
DTC No. (SAE/Light)	Description	Content to Judge	Inspection Item
C1271/81	FR wheel output voltage error	Judge if foreign matter is attached, and check the clearance between the sensor and the rotor.	• Open or short circuit in the speed sensors • Open or short circuit in the speed sensor wire harnesses • Poor contact pressure of the connector terminals, wiring resistance • Improper speed sensor installation • Speed sensor rotor malfunction

DTC No. (SAE/Light)	Description	Content to Judge	Inspection Item
C1272/82	FL wheel output voltage error	Judge if foreign matter is attached, and check the clearance between the sensor and the rotor.	• Open or short circuit in the speed sensors • Open or short circuit in the speed sensor wire harnesses • Poor contact pressure of the connector terminals, wiring resistance • Improper speed sensor installation • Speed sensor rotor malfunction
C1273/83	RR wheel output voltage error	Judge if foreign matter is attached, and check the clearance between the sensor and the rotor.	• Open or short circuit in the speed sensors • Open or short circuit in the speed sensor wire harnesses • Poor contact pressure of the connector terminals, wiring resistance • Improper speed sensor installation • Speed sensor rotor malfunction
C1274/84	RL wheel output voltage error	Judge if foreign matter is attached, and check the clearance between the sensor and the rotor.	• Open or short circuit in the speed sensors • Open or short circuit in the speed sensor wire harnesses • Poor contact pressure of the connector terminals, wiring resistance • Improper speed sensor installation • Speed sensor rotor malfunction
C1275/85	FR WHEEL CYCLE ERROR	Judge the stability of the waveforms from the sensors	• Speed sensor rotor malfunction • Foreign matter attachment to the tip of the speed sensor
C1276/86	FL WHEEL CYCLE ERROR	Judge the stability of the waveforms from the sensors	• Speed sensor rotor malfunction • Foreign matter attachment to the tip of the speed sensor
C1277/87	RR WHEEL CYCLE ERROR	Judge the stability of the waveforms from the sensors	• Speed sensor rotor malfunction • Foreign matter attachment to the tip of the speed sensor
C1278/88	RL WHEEL CYCLE ERROR	Judge the stability of the waveforms from the sensors	• Speed sensor rotor malfunction • Foreign matter attachment to the tip of the speed sensor
C1279/91(*1)	Front and rear or side G sensor	Detect and judge the gravity while the vehicle is accelerating and decelerating	• Improper connection of the deceleration sensor connector • Deceleration sensor is internally stuck • Improper deceleration sensor installation

(*1): 4WD vehicles

ECU TERMINALS

1. BRAKE ACTUATOR ASSEMBLY (WITH A BUILT-IN SKID CONTROL COMPUTER) TERMINALS



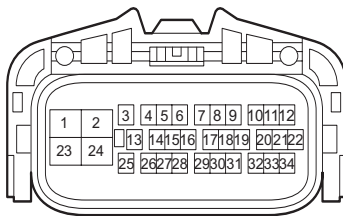
- HINT:
- As the skid control computer is included in the actuator and the connectors are watertight, the voltage of each terminal cannot be measured and the waveform cannot be checked using an oscilloscope with the skid control computer still installed in the vehicle.
 - Use the data list and active test functions of the DS-II to check the operation and communication of the actuator. (See page BC-15)

BRAKE ACTUATOR ASSEMBLY TERMINALS

Terminal No.	Terminal Symbol	Terminal Name
1	+BS	Power source for solenoid drive
2	GND1	Body ground
4	GL1	Deceleration sensor signal input
7	GGND	Deceleration sensor GND
8	FL-	Left-front wheel speed sensor negative input
9	FL+	Left-front wheel speed sensor positive input
10	STP	Stop light switch signal input
11	RL+	Left-rear wheel speed sensor positive input
12	RL-	Left-rear wheel speed sensor negative input
13	WA	ABS warning light output
14	SIO	Diagnosis tool communication line
16	ECUT	Test terminal input
18	PKB	Parking brake switch input
23	+BM	Power source for motor drive
24	GND2	Body ground
25	+IG	IG power source
26	VOUT	Vehicle speed output for meter
28	VCC	Deceleration sensor power source output
30	FR-	Right-front wheel speed sensor negative input
31	FR+	Right-front wheel speed sensor positive input
32	BRL	Brake warning light output
33	RR+	Right-rear wheel speed sensor positive input
34	RR-	Right-rear wheel speed sensor negative input

2. INSPECT BRAKE ACTUATOR ASSEMBLY CONNECTOR ON WIRE HARNESS SIDE

Brake Actuator Assembly
(Wire Harness Side Connector)



C107496J02

- Disconnect the brake actuator assembly connector.
- Using the tester, inspect the voltage and continuity between each terminal of the wire harness side connector of the actuator assembly and the body ground.

Standard

Terminal No.	Terminal Symbol	Input / Output	Tester Item	Measurement Condition	Standard
1	+BS (Power source for solenoid drive) ↔ Body ground	Input	Voltage	Always	10 to 14 V
2	GND1 (Body ground) ↔ Body ground	Input	Continuity	Always	Continuity
10	STP (Stop light switch input) ↔ Body ground	Input	Voltage	Stop light switch OFF → ON	1.5 V or less → 8 V or more
13	WA (ABS warning light output) ↔ Body ground	Output	Voltage	ABS warning light is on	10 to 14 V
18	PKB (Parking brake switch) ↔ Body ground	Input	Voltage	Parking brake engaged → Released	1 V or less → 10 to 14 V
23	+BM (Power source for motor drive) ↔ Body ground	Input	Voltage	Always	10 to 14 V
24	GND2 (Body ground) ↔ Body ground	Input	Continuity	Always	Continuity
25	+IG (IG power source) ↔ Body ground	Input	Voltage	IG ON	10 to 14 V
26	VOUT (Vehicle speed signal output for meter) ↔ Body ground	Output	Voltage	IG ON	10 to 14 V
32	BRL (Brake warning light output) ↔ Body ground	Output	Voltage	When the brake warning light is on	10 to 14 V

ECU DATA LIST / ACTIVE TEST

1. CHECK USING THE DS-II

(a) DATA LIST

- (1) Turn the ignition switch off and connect the DS-II to the DLC.
- (2) Turn the ignition switch to the ON position and follow the prompts on the DS-II screen to check the ECU data.

NOTICE:

As the computer data values may vary widely depending on slight measurement errors, the measurement environment, and the state of the vehicle due to wear and tear, it is very difficult to indicate a specific standard value (reference value). Therefore, in some cases, an error may occur within the range of reference values.

DATA LIST

Item (DS-II Display)	Item Description	Inspection Condition	Reference value	Problem Area
Retention solenoid FR	Indicates the condition of the front right retention solenoid	ABS not activated ↔ Activated	OFF ↔ ON	- Actuator systems - Solenoid relay
Pressure reduction solenoid FR	Indicates the condition of the front right pressure reduction solenoid	ABS not activated ↔ Activated	OFF ↔ ON	- Actuator systems - Solenoid relay
Retention solenoid FL	Indicates the condition of the front left retention solenoid	ABS not activated ↔ Activated	OFF ↔ ON	- Actuator systems - Solenoid relay
Pressure reduction solenoid FL	Indicates the condition of the front left pressure reduction solenoid	ABS not activated ↔ Activated	OFF ↔ ON	- Actuator systems - Solenoid relay
Retention solenoid RR	Indicates the condition of the rear right retention solenoid	ABS not activated ↔ Activated	OFF ↔ ON	- Actuator systems - Solenoid relay
Pressure reduction solenoid RR	Indicates the condition of the rear right pressure reduction solenoid	ABS not activated ↔ Activated	OFF ↔ ON	- Actuator systems - Solenoid relay
Retention solenoid RL	Indicates the condition of the rear left retention solenoid	ABS not activated ↔ Activated	OFF ↔ ON	- Actuator systems - Solenoid relay
Pressure reduction solenoid RL	Indicates the condition of the rear left pressure reduction solenoid	ABS not activated ↔ Activated	OFF ↔ ON	- Actuator systems - Solenoid relay
Solenoid relay	Indicates the activation of the solenoid relay	When the ignition is ON	OFF ↔ ON	Solenoid relay system
ABS motor relay	Indicates the activation of the ABS motor relay	When the ignition is ON	OFF ↔ ON	ABS motor relay system
STOP SW	Indicates activation of the stop light switch	Brake pedal depressed ↔ Not depressed	ON ↔ OFF	- Stop light switch - Stop light system
PKB	Indicates activation of the parking brake	Parking brake engaged ↔ Released	ON ↔ OFF	Parking brake switch system
FR control	Indicates if it is controlled or not	When ABS is activated	Controlled ↔ Not controlled	- Actuator systems - Skid control computer
FL control	Indicates if it is controlled or not	When ABS is activated	Controlled ↔ Not controlled	- Actuator systems - Skid control computer
RR control	Indicates if it is controlled or not	When ABS is activated	Controlled ↔ Not controlled	- Actuator systems - Skid control computer
RL control	Indicates if it is controlled or not	When ABS is activated	Controlled ↔ Not controlled	- Actuator systems - Skid control computer

Item (DS-II Display)	Item Description	Inspection Condition	Reference value	Problem Area
Wheel speed FR	Indicates the wheel speed	1. When the vehicle is stopped 2. When driving at a constant speed	1. 0 km/h 2. No significant fluctuation	Wheel speed sensor signal system
Wheel speed FL	Indicates the wheel speed	1. When the vehicle is stopped 2. When driving at a constant speed	1. 0 km/h 2. No significant fluctuation	Wheel speed sensor signal system
Wheel speed RR	Indicates the wheel speed	1. When the vehicle is stopped 2. When driving at a constant speed	1. 0 km/h 2. No significant fluctuation	Wheel speed sensor signal system
Wheel speed RL	Indicates the wheel speed	1. When the vehicle is stopped 2. When driving at a constant speed	1. 0 km/h 2. No significant fluctuation	Wheel speed sensor signal system
Air bleeding condition	Indicates whether bleeding is possible	1. Possible 2. Not possible	1. ○ 2. ×	-
ECU code	Indicates the ABS ECU part number code	-	-	-
During the test mode	Indicates the state (normal mode or test mode)	1. Normal mode 2. Test mode	1. Normal mode 2. Test mode	-
Meter vehicle speed Vout	Indicates the vehicle speed output to the meter from the system	1. When the vehicle is stopped 2. When driving at a constant speed	1. 0 km/h 2. No significant fluctuation	Wheel speed sensor signal system
ECU power source voltage	Indicates the status of the ECU power source voltage	1. Under normal condition 2. Under high voltage 3. Under low voltage	1. Normal 2. High voltage 3. Low voltage	Power supply voltage system
Number of DTCs	Indicates the number of DTCs	-	0 to 255	-

(b) ACTIVE TEST INSPECTION

- (1) Turn the ignition switch off and connect the DS-II to the DLC.
- (2) Turn the ignition switch to the ON position and follow the prompts on the DS-II screen to display the active test.
- (3) Select the data list items to be checked during the active test, then press the ENTER key.
- (4) Select the active test items to be performed and press the ENTER key. Operate the keys on the screen display to switch each test ON/OFF.

NOTICE:

- Although the motor automatically stops in approximately 5 seconds in order to protect the motor, do not run the motor repeatedly.
- The drive of each solenoid is automatically shut down in approximately 2 seconds in order to protect the solenoid. But the solenoid can be operated again after an interval.
- Do not depress the brake pedal when only the pressure reduction valve is turned on.
- Do not drive 2 or more solenoids simultaneously except when the retention valves and pressure reduction valves of each wheel are operated.

HINT:

For the active test of the solenoids, two solenoids can be driven simultaneously by entering the ALL SOLENOID DRIVE SELECTION from the SOLENOID SELECTION screen.

ACTIVE TEST

Item	Test Contents	Restraint Condition
Brake Warning Light	ON ↔ OFF available	Available at SPD = 0 km/h
ABS warning light	ON ↔ OFF available	Available at SPD = 0 km/h
Secondary repair air	ON/OFF for secondary solenoid, pump motor driving (used to bleed air from the actuator)	Available at SPD = 0 km/h
Valve motor rear left	Rear left wheel pressure reduction and retention solenoids ON ↔ OFF, pump motor driving	Available at SPD = 0 km/h
Valve motor rear right	Rear right wheel pressure reduction and retention solenoids ON ↔ OFF, pump motor driving	Available at SPD = 0 km/h
Valve motor front left	Front left wheel pressure reduction and retention solenoids ON ↔ OFF, pump motor driving	Available at SPD = 0 km/h
Valve motor front right	Front right wheel pressure reduction and retention solenoids ON ↔ OFF, pump motor driving	Available at SPD = 0 km/h

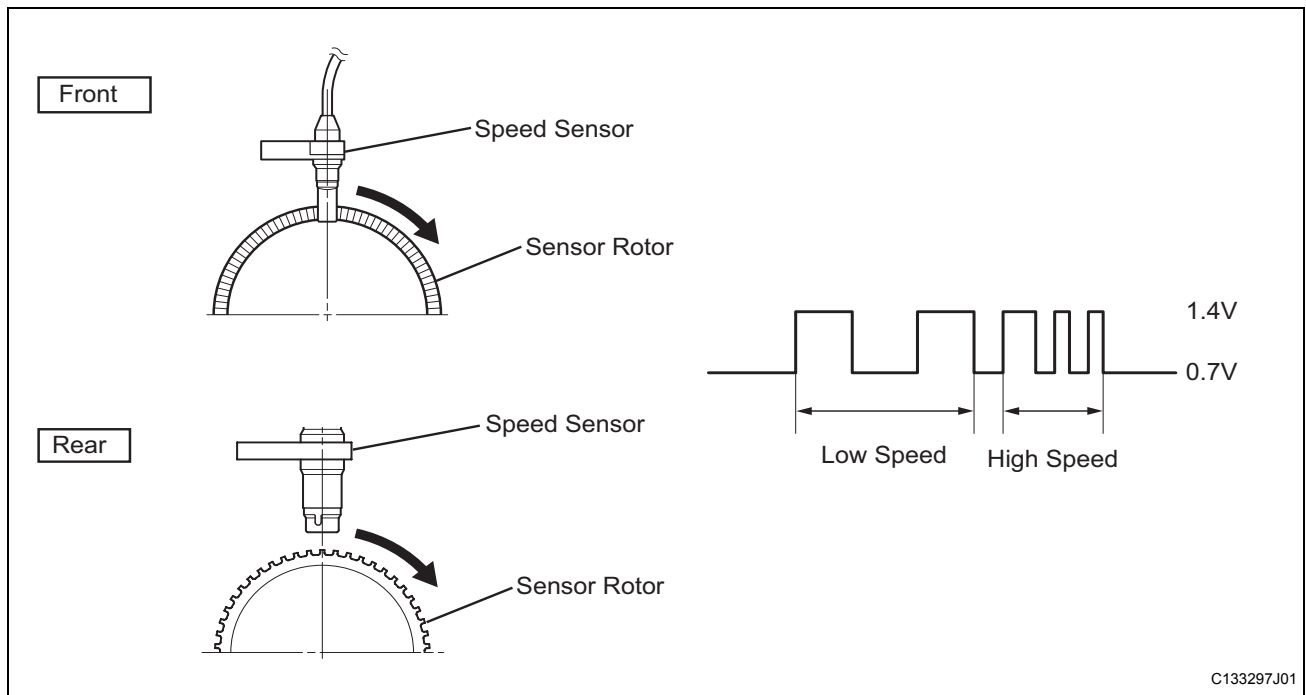
DTC	C0200/21	OPEN OR SHORT CIRCUIT IN FR WHEEL
DTC	C0205/22	OPEN OR SHORT CIRCUIT IN FL WHEEL
DTC	C0210/23	OPEN OR SHORT CIRCUIT IN RR WHEEL
DTC	C0215/24	OPEN OR SHORT CIRCUIT IN RL WHEEL

DESCRIPTION

The speed sensors detect the wheel speed and send the signals to the skid control computer. These signals are used for the ABS control.

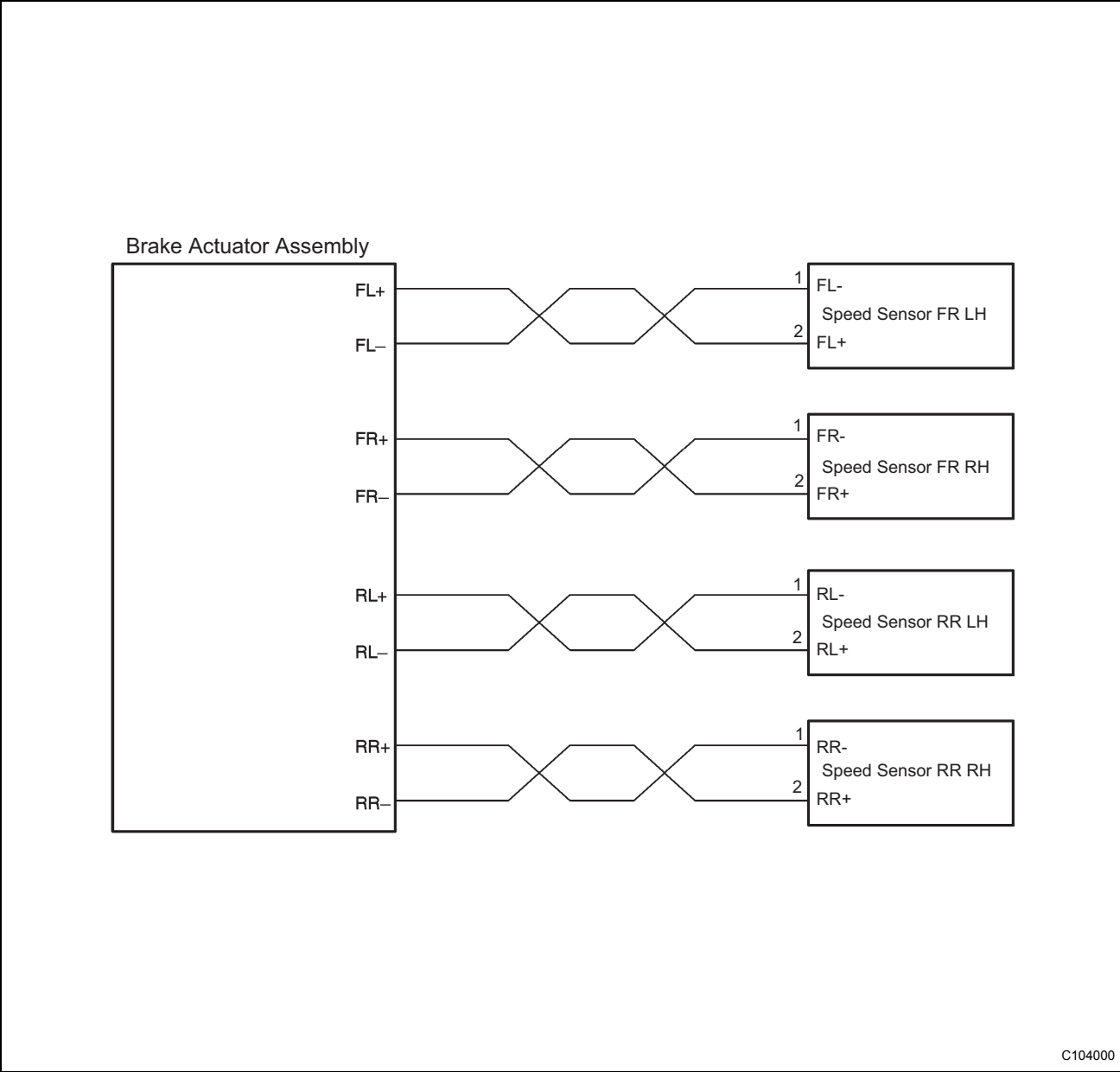
The speed sensors detect changes in the magnetic field of the magnetic rotor, which has the north and south poles evenly allocated in the circumferential direction, and generate the vehicle speed pulse.

Using this vehicle speed pulse, the skid control computer detects the speed of each wheel.



DTC No.	DTC Detection Condition	Trouble Area
C0200/21 C0205/22 C0210/23 C0215/24	- An open circuit in the speed sensor signal circuit continues for 0.5 seconds or more. - With the IG1 terminal voltage 9.5 V or more, the sensor power supply voltage decreases for 0.5 seconds or more.	- Open or short circuit in the speed sensor - Improper speed sensor installation or improper clearance between the sensor rotor - Open or short circuit in the wire harness - Improper connector contact pressure, deformation and corrosion of terminals - Foreign matter attached to the speed sensor - Sensor rotor malfunction (foreign matter attached, damaged) - Speed sensor circuit wiring resistance - Actuator assembly

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

1	INSPECTION WITH DATA LIST (WHEEL SPEED)
---	---

BC

- (a) Using the DS-II, check the output values of the speed sensor corresponding to the DTC. (See page BC-15)

Standard:

ECU DATA LIST

Item	Item Description	Inspection Condition	Standard
Wheel speed FR	Indicates the wheel speed	1. When the vehicle is stopped 2. When driving at a constant speed	1. 0 km/h 2. No significant fluctuation

Item	Item Description	Inspection Condition	Standard
Wheel speed FL	Indicates the wheel speed	1. When the vehicle is stopped 2. When driving at a constant speed	1. 0 km/h 2. No significant fluctuation
Wheel speed RR	Indicates the wheel speed	1. When the vehicle is stopped 2. When driving at a constant speed	1. 0 km/h 2. No significant fluctuation
Wheel speed RL	Indicates the wheel speed	1. When the vehicle is stopped 2. When driving at a constant speed	1. 0 km/h 2. No significant fluctuation

NG

GO TO STEP 3

OK

2

TEST MODE INSPECTION (SPEED SENSOR CHECK)

- (a) Perform the test mode inspection and check for the test mode code and DTC. (See page BC-9)

Standard:

The normal code is output.

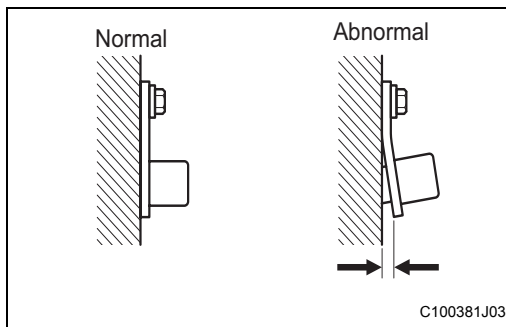
OK

GO TO STEP 7

NG

3

INSPECT SPEED SENSOR INSTALLATION



- (a) Check the speed sensor installation.

Standard:

The yaw rate sensor is installed properly.

NG

REPAIR OR SPEED SENSOR INSTALLATION
OR REPLACE

OK

4

INSPECT SPEED SENSOR

- (a) Remove the speed sensor of the corresponding wheel, and check if the sensor tip and rotor have any foreign matter attached and are not damaged.

Standard:

No foreign matter or damage on the sensor tip

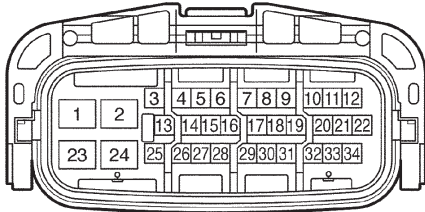
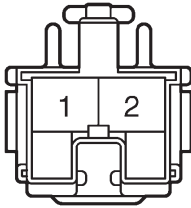
NG

CLEAN OR REPLACE SPEED SENSOR

OK

5

INSPECT WIRE HARNESS AND CONNECTOR (BETWEEN SPEED SENSOR AND ACTUATOR ASSEMBLY)

Brake Actuator Assembly
(Wire Harness Side Connector)Stop Light Switch Assembly
(Wire Harness Side Connector)

C136976J01

- Check if the actuator assembly and speed sensor connectors are engaged properly.
- Turn the ignition switch off, disconnect the connectors of the actuator assembly and speed sensor.
- Check that the connector case and terminals are not deformed or corroded.

Standard:**There should be no deformation or corrosion.**

- Using the tester, inspect the continuity of the wire harness between the actuator assembly and the speed sensor. Also check the insulation between the actuator assembly and the body ground.

Continuity check

Inspection Terminal (Actuator assembly ↔ Speed sensor)	Standard
31 (FR+) ↔ 1 (FR-)	Continuity
30 (FR-) ↔ 2 (FR+)	Continuity
9 (FL+) ↔ 1 (FL-)	Continuity
8 (FL-) ↔ 2 (FL+)	Continuity
33 (RR+) ↔ 1 (RR-)	Continuity
34 (RR-) ↔ 2 (RR+)	Continuity
11 (RL+) ↔ 1 (RL-)	Continuity
12 (RL-) ↔ 2 (RL+)	Continuity

Insulation Check

Inspection Terminal (Actuator Assembly)	Standard
31 (FR+) ↔ Body ground	No continuity
30 (FR-) ↔ Body ground	No continuity
9 (FL+) ↔ Body ground	No continuity
8 (FL-) ↔ Body ground	No continuity
33 (RR+) ↔ Body ground	No continuity
34 (RR-) ↔ Body ground	No continuity
11 (RL+) ↔ Body ground	No continuity
12 (RL-) ↔ Body ground	No continuity

NG

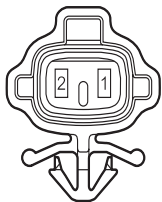
REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

BC

6**INSPECT BRAKE ACTUATOR ASSEMBLY**

Speed Sensor (Vehicle Side Connector)



C133956J01

- (a) Disconnect the speed sensor connector.
- (b) Turn the ignition switch to the ON position.
- (c) Using the tester, measure the voltage between the 2 (FR+), 2 (FL+), 2 (RR+), and 2 (RL+) terminals of the wire harness side connector of the speed sensor and the body ground.

Standard:**6.7 to 16 V****NG****REPLACE BRAKE ACTUATOR ASSEMBLY****OK****7****RECHECK FOR DTCS.**

- (a) Clear the DTCs. (See page BC-7)
- (b) Perform a road test, then recheck for the DTCs. (See page BC-7)

Standard:**The normal code is output.****OK****SYSTEM RETURNS TO NORMAL (DTC IS STORED DUE TO POOR CONNECTION OF CONNECTOR TERMINALS, BUT RECONNECTING CONNECTOR RETURNS SYSTEM TO NORMAL)****NG****8****REPLACE SPEED SENSOR**

- (a) Replace the speed sensor that corresponds to the DTC with a new one.

9**RECHECK FOR DTCS.**

- (a) Clear the DTCs. (See page BC-7)
- (b) Perform a road test, then recheck for the DTCs. (See page BC-7)

Standard:**The normal code is output.****NG****REPLACE BRAKE ACTUATOR ASSEMBLY****OK****BC****END**

DTC	C0226/52	OPEN OR SHORT CIRCUIT IN FR PRESSURE RETENTION AND REDUCTION SOLENOID
DTC	C0236/54	OPEN OR SHORT CIRCUIT IN FL PRESSURE RETENTION AND REDUCTION SOLENOID
DTC	C0246/56	OPEN OR SHORT CIRCUIT RR PRESSURE RETENTION AND REDUCTION SOLENOID
DTC	C0256/58	OPEN OR SHORT CIRCUIT IN RL PRESSURE RETENTION AND REDUCTION SOLENOID

DESCRIPTION

Based on the signals from the brake actuator assembly (skid control computer), each solenoid adjusts the pressures acting on each wheel cylinder, and controls the vehicle. As the solenoid relay is forcibly turned off by the fail-safe function during DTC output, the solenoid will not turn on.

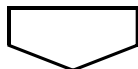
DTC No.	DTC Detection Condition	Trouble Area
C0226/52 C0236/54 C0246/56 C0256/58	Open or short circuit in the solenoid continues for 0.05 seconds or more	Open or short circuit in the solenoid circuit in the brake actuator

HINT:

DTC No.	Corresponding Solenoid
C0226/52	SFRH, SFRR
C0236/54	SFLH, SFLR
C0246/56	SRRH, SRRR
C0256/58	SRLH, SRLR

INSPECTION PROCEDURE

1	REPLACE BRAKE ACTUATOR ASSEMBLY
----------	--



END

DTC	C0273/13	MOTOR RELAY OPEN CIRCUIT
DTC	C0274/14	MOTOR RELAY SHORT CIRCUIT

DESCRIPTION

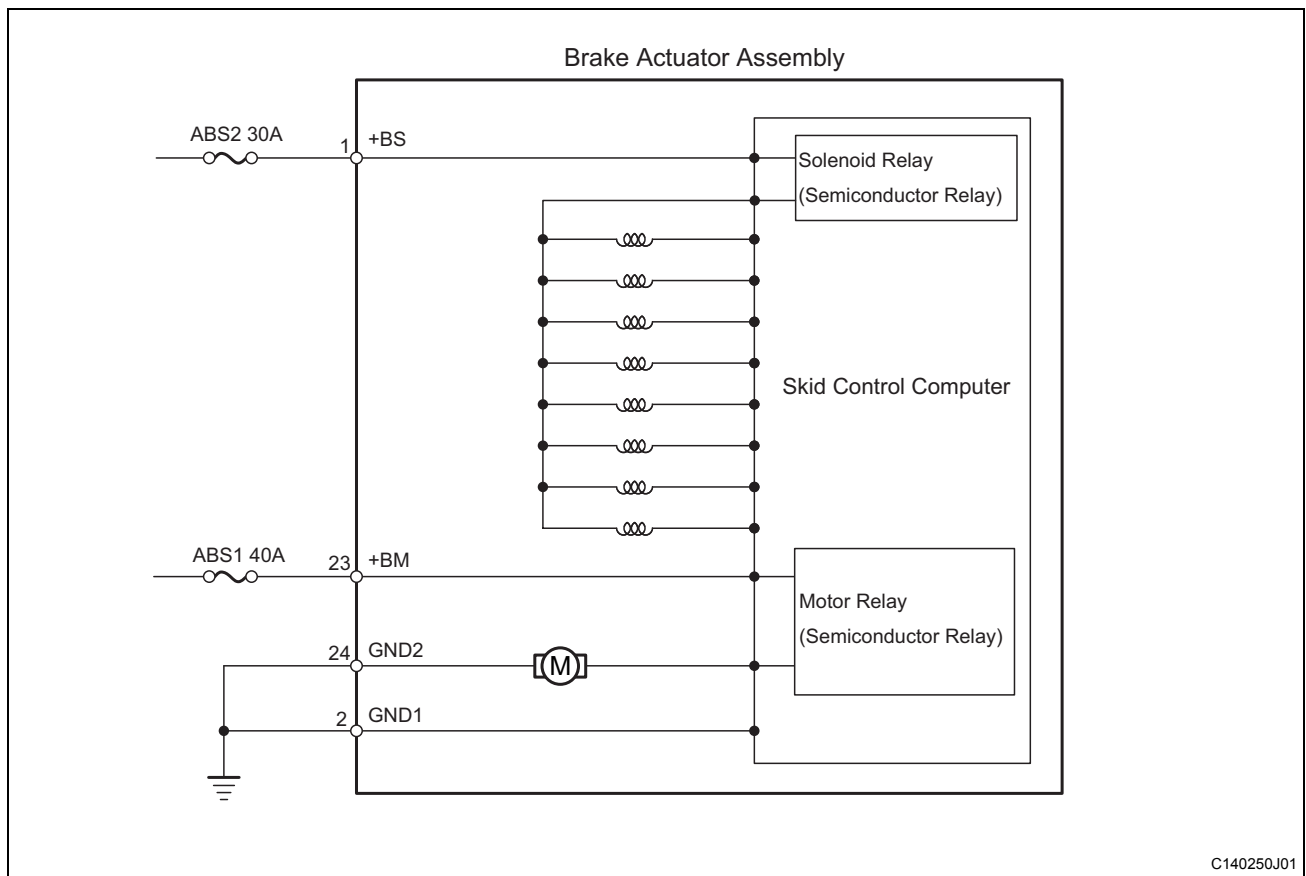
The ABS motor relay supplies power to the ABS pump motor.

During ABS operation, the skid control computer turns on the ABS motor relay to activate the ABS pump motor.

This code may be recorded when the voltage applied to the motor relay (+BM) falls below the DTC detection condition due to insufficient output from the battery or alternator.

DTC No.	DTC Detection Condition	Trouble Area
C0273/13	- With the IG terminal voltage 9.5-17.2 V during the initial check, or when the controlled relay is ON, the relay contact is OFF for 0.2 seconds or more. - With the IG terminal voltage 9.5 V or less, the relay contact is not ON when requested for 0.2 seconds or more.	- Lowered voltage to the motor relay power source (+BM) - Open in wire harnesses - Improper connector contact pressure, deformation and corrosion of the terminals - Open circuit in the motor relay in the brake actuator
C0274/14	When the motor relay is OFF, the motor relay internal contact is ON for 4 seconds or more.	Short circuit in the motor relay in the brake actuator

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

1

INSPECT FUSE (ABS1 40A)

- (a) Check if the fuse (ABS1 40A) is normal.

Standard:

The fuse is normal.

NG

REPLACE FUSES

OK

2

INSPECT WIRE HARNESS AND CONNECTOR (ABS MOTOR POWER SOURCE SYSTEM)

- (a) Check if the brake actuator assembly connector is properly engaged.

Standard:

The connectors are properly connected.

- (b) Turn the ignition switch off, and disconnect the brake actuator assembly connector.
- (c) Check that the connector case and terminals are not deformed or corroded.

Standard:

There should be no deformation or corrosion.

- (d) Using the tester, check the continuity between terminals 2 (GND1) and 24 (GND2) of the of the brake actuator assembly wire harness side connector and the body ground.

Standard:

Continuity

HINT:

If both the GND1 and 2 terminals have a malfunction, check the bolt of the ground point for looseness.

- (e) Using the tester, inspect the voltage between terminal 23 (+BM) of the wire harness side connector of the actuator assembly and the body ground.

Standard:

10 to 14 V

NG

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

3

RECHECK FOR DTCS.

- (a) Clear the DTCS. (See page BC-7)
- (b) Turn the ignition switch from the OFF to the ON position, and check that the ABS warning light comes on for 3 seconds and then goes off.
- (c) If the ABS warning light remains on, check for DTCS. (See page BC-7)

DTC is not output	Go to step A
DTC is output	Go to step B

HINT:

- If the normal code is output, gently jiggle the connector and the wire harness of the actuator, and check for DTCs.
- If a DTC is output due to vibration, check and repair the corresponding connector or wire harness.

B

REPLACE BRAKE ACTUATOR ASSEMBLY

A

SYSTEM RETURNS TO NORMAL (DTC IS STORED DUE TO POOR CONNECTION OF CONNECTOR TERMINALS, BUT RECONNECTING CONNECTOR RETURNS SYSTEM TO NORMAL)

DTC	C0278/11	SOLENOID RELAY OPEN CIRCUIT
DTC	C0279/12	SOLENOID RELAY SHORT CIRCUIT

DESCRIPTION

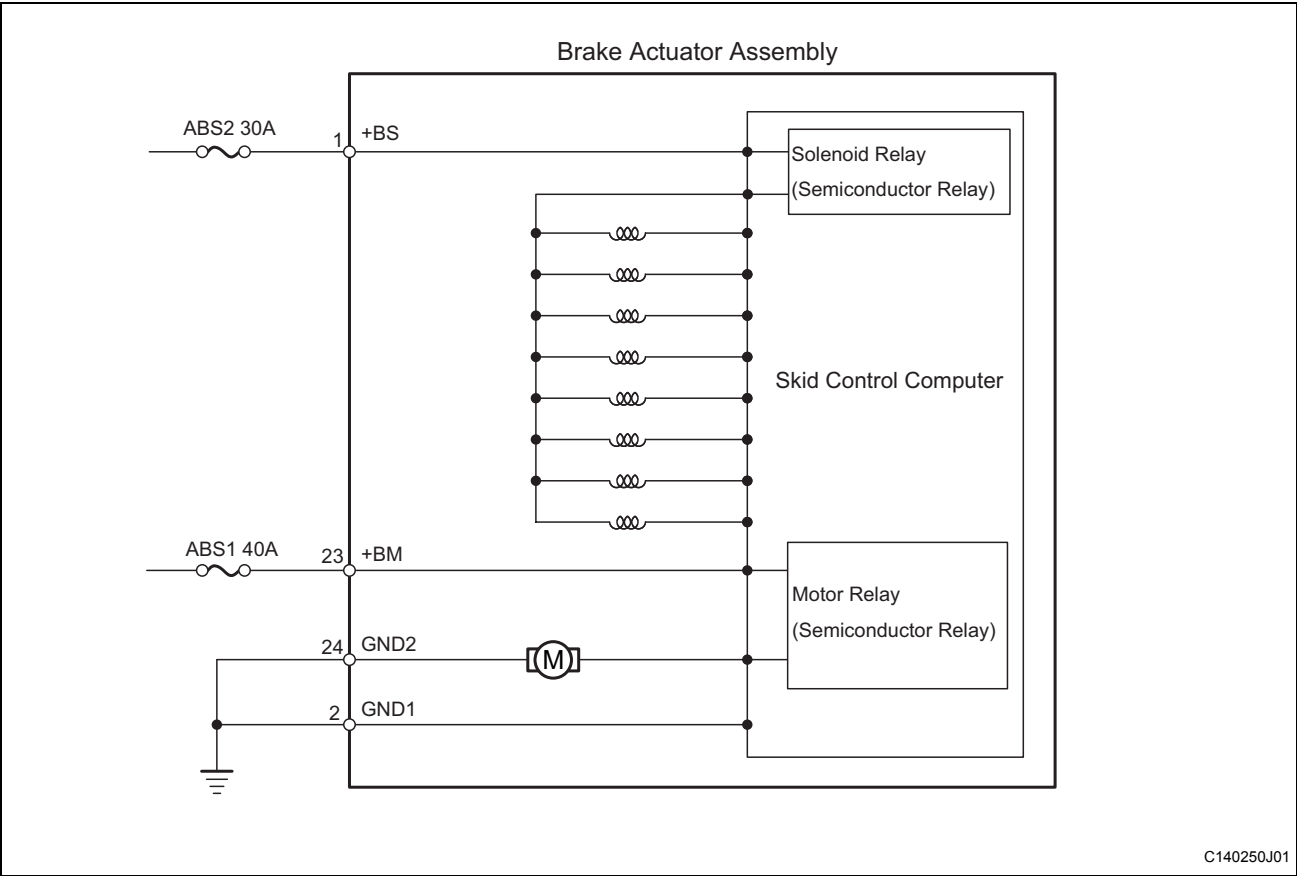
The solenoid relay supplies power to the ABS solenoid.

Immediately after the ignition is turned to the ON position, the solenoid relay is turned on if the solenoid is determined as normal by self diagnosis during the initial check. If an open or short circuit is detected, the solenoid relay is turned off.

This code may be recorded when the voltage applied to the solenoid relay (+BS) falls below the DTC detection condition due to insufficient output from the battery or alternator.

DTC No.	DTC Detection Condition	Trouble Area
C0278/11	- When IG terminal voltage is 9.5 to 17.2 V and the solenoid relay is ON, the relay contact is OFF for 0.2 seconds or more - When the IG terminal voltage is 9.5 V or less and the relay is ON, allow 0.2 seconds or more without the relay contact point ON	- Lowered voltage to the motor relay power source (+BS) - Open in wire harnesses - Improper connector contact pressure, deformation and corrosion of terminals - Open circuit in the solenoid relay in the brake actuator
C0279/12	When the solenoid relay is OFF, the solenoid relay internal contact is ON for 0.2 seconds or more.	Short circuit in the solenoid relay circuit in the brake actuator

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

1 INSPECT FUSE (ABS2 30A)

- (a) Check if the fuse (ABS2 30A) is normal.

Standard:**The fuse is normal.****NG****REPLACE FUSES****OK****2 CHECK WIRE HARNESS AND CONNECTOR**

- (a) Check if the brake actuator assembly connector is properly engaged.

Standard:**The connectors are properly connected.**

- (b) Turn the ignition switch off, and disconnect the brake actuator assembly connector.

- (c) Check that the connector case and terminals are not deformed or corroded.

Standard:**There should be no deformation or corrosion.**

- (d) Using the tester, check the continuity between terminals 2 (GND1) and 24 (GND2) of the of the brake actuator assembly wire harness side connector and the body ground.

Standard:**Continuity****HINT:**

If both the GND1 and 2 terminals have a malfunction, check the bolt of the ground point for looseness.

- (e) Using the tester, inspect the voltage between terminal 1 (+BS) of the wire harness side connector of the actuator assembly and the body ground.

Standard:**10 to 14 V****NG****REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR****OK****3 RECHECK FOR DTCS.**

- (a) Clear the DTCS. (See page BC-7)
- (b) Turn the ignition switch from the OFF to the ON position, and check that the ABS warning light comes on for 3 seconds and then goes off.
- (c) If the ABS warning light remains on, check for DTCS. (See page BC-7)

BC

DTC is not output	Go to step A
DTC is output	Go to step B

HINT:

- If the normal code is output, gently jiggle the connector and the wire harness of the actuator, and check for DTCs.
- If a DTC is output due to vibration, check and repair the corresponding connector or wire harness.

B**REPLACE BRAKE ACTUATOR ASSEMBLY****A**

SYSTEM RETURNS TO NORMAL (DTC IS STORED DUE TO POOR CONNECTION OF CONNECTOR TERMINALS, BUT RECONNECTING CONNECTOR RETURNS SYSTEM TO NORMAL)

DTC	C1235/25	FR WHEEL CYCLE ERROR
DTC	C1236/26	FL WHEEL CYCLE ERROR
DTC	C1238/27	RR WHEEL CYCLE ERROR
DTC	C1239/28	RL WHEEL CYCLE ERROR

DESCRIPTION

These DTCs are output if foreign matter attached to the speed sensor tip and sensor rotor is detected.

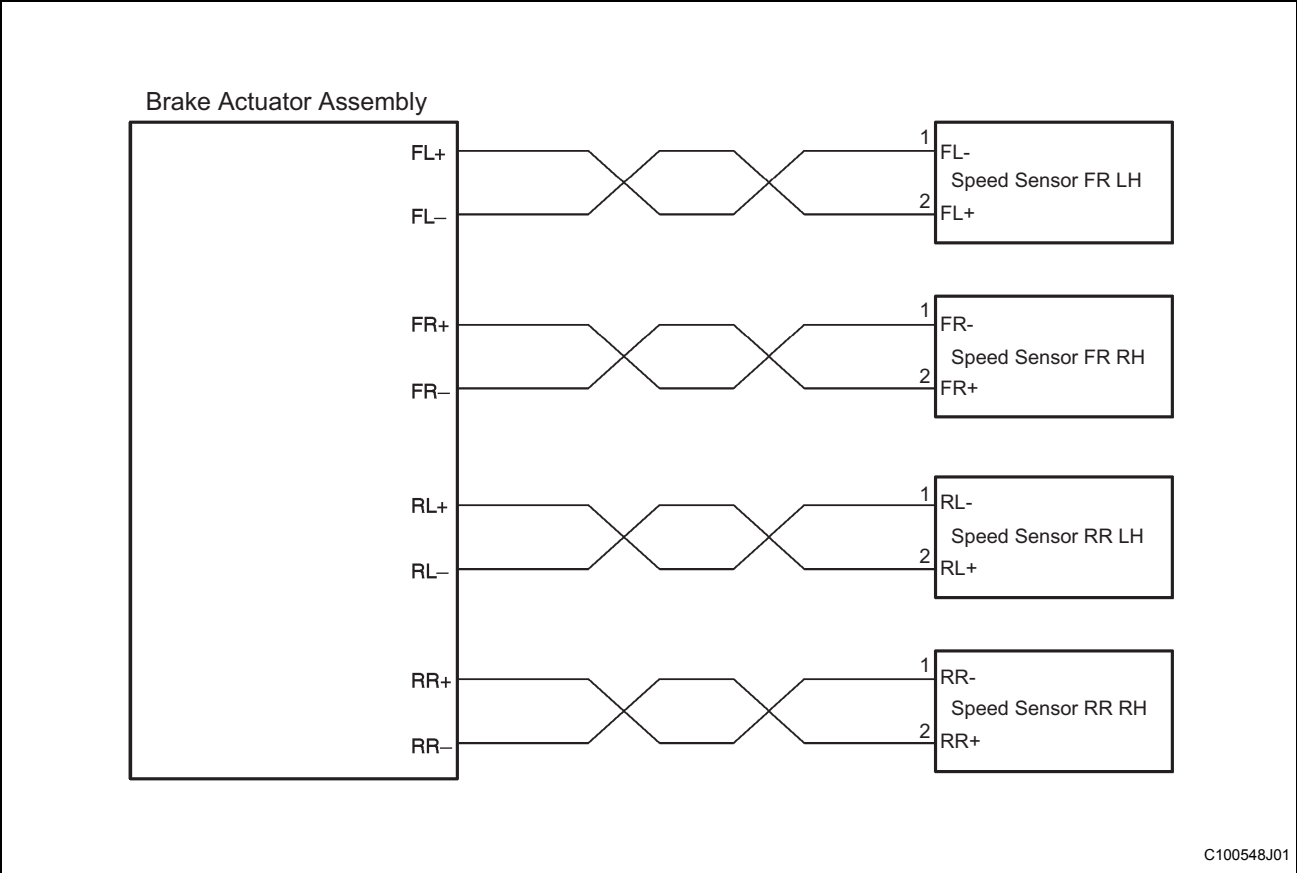
The skid control computer determines that foreign matter is attached based on errors in the waveforms input from the sensor.

These DTCs may output due to a malfunction in the speed sensor circuit connector terminals or wire harness.

If a DTC that is set due to an iron chip attachment and speed sensor system DTCs (C0200/21, C0205/22, C0210/23, C0215/24) are output simultaneously, troubleshoot the speed sensor system first. (See page BC-18)

DTC No.	DTC Detection Condition	Trouble Area
C1235/25 C1236/26 C1238/27 C1239/28	- At a vehicle speed of 10 km/h or more, the wheel speed sensor pulses are not input for 30 seconds or more. - At a vehicle speed of 10 km/h or more, with only one wheel speed 0 km/h, difference in the other three wheel speeds is 2 km/h for 0.35 seconds or more. - When the change in wheel speed exceeds 51.2 G, the condition that no pulses are input from the wheel speed sensors is detected 7 times.	- Sensor rotor malfunction (foreign matter attached, damaged) - Foreign matter attached to the speed sensor - Open or short circuit in the speed sensor - Open or short circuit in the wire harness - Improper connector contact pressure, deformation and corrosion of terminals - Speed sensor circuit wiring resistance - Actuator assembly

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

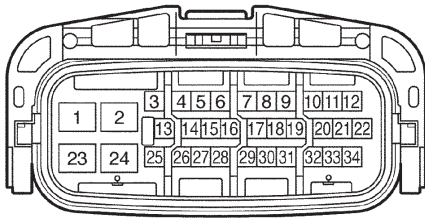
1	INSPECT WIRE HARNESS AND CONNECTOR (BETWEEN ACTUATOR ASSEMBLY AND SPEED SENSOR)
---	---

- (a) Check if the brake actuator assembly and speed sensor connectors are engaged properly.
- (b) Turn the ignition switch off, disconnect the connectors of the actuator assembly and speed sensor.
- (c) Check that the connector case and terminals are not deformed or corroded.

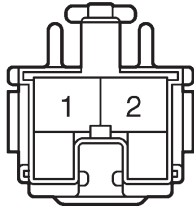
Standard:

There should be no deformation or corrosion.

Brake Actuator Assembly
(Wire Harness Side Connector)



Stop Light Switch Assembly
(Wire Harness Side Connector)



C136976J01

- (d) Using the tester, inspect the continuity of the wire harness between the actuator assembly and the speed sensor. Also check the insulation between the actuator assembly and the body ground.

Continuity check

Inspection Terminal (Actuator assembly ↔ Speed sensor)	Standard
31 (FR+) ↔ 1 (FR-)	Continuity
30 (FR-) ↔ 2 (FR+)	Continuity
9 (FL+) ↔ 1 (FL-)	Continuity
8 (FL-) ↔ 2 (FL+)	Continuity
33 (RR+) ↔ 1 (RR-)	Continuity
34 (RR-) ↔ 2 (RR+)	Continuity
11 (RL+) ↔ 1 (RL-)	Continuity
12 (RL-) ↔ 2 (RL+)	Continuity

Insulation Check

Inspection Terminal (Actuator Assembly)	Standard
31 (FR+) ↔ Body ground	No continuity
30 (FR-) ↔ Body ground	No continuity
9 (FL+) ↔ Body ground	No continuity
8 (FL-) ↔ Body ground	No continuity
33 (RR+) ↔ Body ground	No continuity
34 (RR-) ↔ Body ground	No continuity
11 (RL+) ↔ Body ground	No continuity
12 (RL-) ↔ Body ground	No continuity

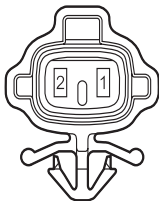
NG

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

2 INSPECT BRAKE ACTUATOR ASSEMBLY

Speed Sensor (Vehicle Side Connector)



C133956J01

- (a) Disconnect the speed sensor connector.
(b) Turn the ignition switch to the ON position.
(c) Using the tester, measure the voltage between the 2 (FR+), 2 (FL+), 2 (RR+), and 2 (RL+) terminals of the wire harness side connector of the speed sensor and the body ground.

Standard:

6.7 to 16 V

NG

REPLACE BRAKE ACTUATOR ASSEMBLY

OK

3 RECHECK FOR DTCS.

- (a) Perform a road test after clearing the DTCs, then recheck for DTCs.
(See page BC-7)

BC

DTC is not output	A
DTC is output	B

HINT:

- If the normal code is output, jiggle the connectors and wire harnesses of the actuator and sensor, and check for DTCs.
- If a DTC is output due to vibration, check and repair the corresponding connector or wire harness.

B

GO TO STEP 4

A

SYSTEM RETURNS TO NORMAL (DTC IS STORED DUE TO POOR CONNECTION OF CONNECTOR TERMINALS, BUT RECONNECTING CONNECTOR RETURNS SYSTEM TO NORMAL)

4

INSPECT SPEED SENSOR

- (a) Remove the speed sensor of the corresponding wheel, and check if the sensor tip has any foreign matter attached and is not damaged.

Standard:

No foreign matter or damage on the sensor tip

NG

CLEAN OR REPLACE SPEED SENSOR

OK

CLEAN OR REPLACE SENSOR ROTOR

DTC	C1241/15	LOW OR EXCESSIVE POWER SUPPLY VOLTAGE
-----	----------	---------------------------------------

DESCRIPTION

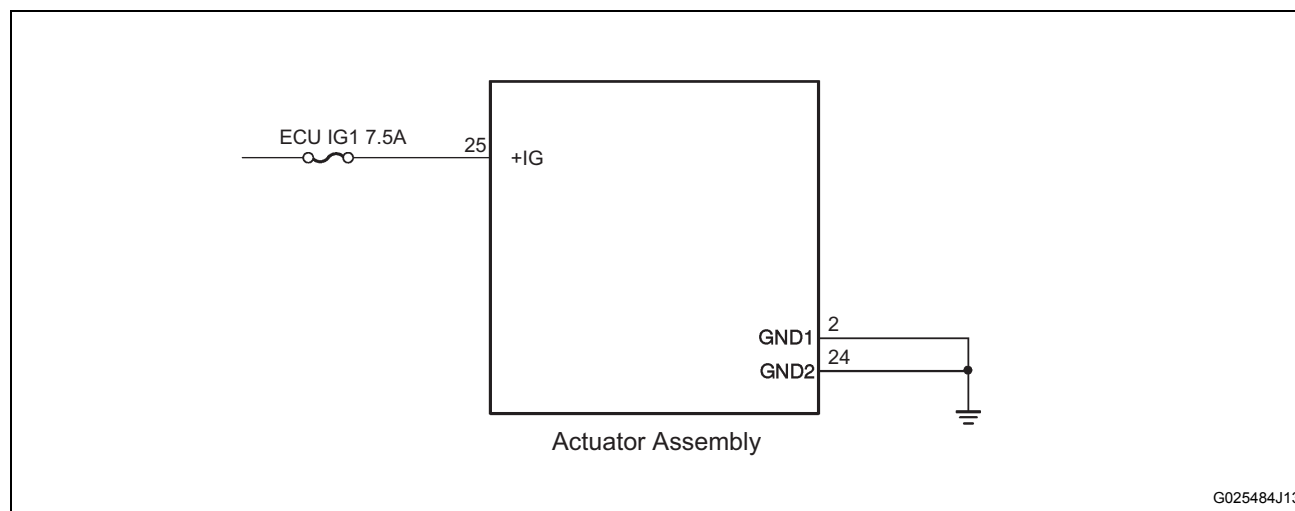
If a malfunction is detected in the power source circuit of the brake actuator assembly (skid control computer), the skid control computer will output this DTC and prohibit the operation using the fail-safe function.

This DTC is stored when the +G1 terminal voltage deviates from the DTC detection condition due to a malfunction in the power source or charging circuit such as the battery or alternator circuit.

The DTC will no longer be present when the voltage to the +IG terminal returns to normal.

DTC No.	DTC Detection Condition	Trouble Area
C1241/15	- When the vehicle speed is 3 km/h or more, the +IG terminal voltage is less than 10 V for 10 seconds or more. - The IG terminal voltage becomes 10 V or less while the solenoid relay is ON, and the relay contact is OFF for 0.2 seconds or more. - With the IG terminal voltage 10 V or less, the power source voltage for the wheel speed sensor decreases for 60 seconds or more.	- Alternator (regulator) - Open in wire harness - Improper connector contact pressure, deformation and corrosion of the terminals - Power source circuit in the brake actuator

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

1	INSPECT FUSE (ECU IG1 7.5A)
---	-----------------------------

(a) Inspect the fuse (ECU IG1 7.5A).

Standard:

The fuse is normal.

NG

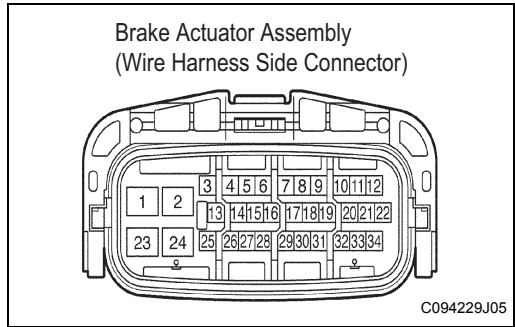
REPLACE FUSES

OK

BC

2

INSPECT WIRE HARNESS AND CONNECTOR (POWER SOURCE SYSTEM)



- (a) Check if the brake actuator assembly connector is properly engaged.

Standard:

The connectors are properly connected.

- (b) Turn the ignition switch off, and disconnect the brake actuator assembly connector.
- (c) Check that the connector case and terminals are not deformed or corroded.

Standard:

There should be no deformation or corrosion.

- (d) Using the tester, check the continuity between terminals 2 (GND1) and 24 (GND2) of the actuator assembly wire harness side connector and the body ground.

Standard:

Continuity

HINT:

If both the GND1 and 2 terminals have a malfunction, check the bolt of the ground point for looseness.

- (e) Turn the ignition switch to the ON position.
- (f) Using the tester, inspect the voltage between the 25 (+IG) terminal of the wire harness side connector of the actuator assembly and the body ground.

Standard:

10 to 16 V

NG

REPAIR OR REPLACE WIRE HARNESS AND CONNECTOR

OK

3

RECHECK FOR DTCs.

- (a) Perform a road test after clearing the DTCs, then recheck for DTCs. (See page BC-7)

DTC is not output	A
DTC is output	B

B

REPLACE BRAKE ACTUATOR ASSEMBLY

A

BC

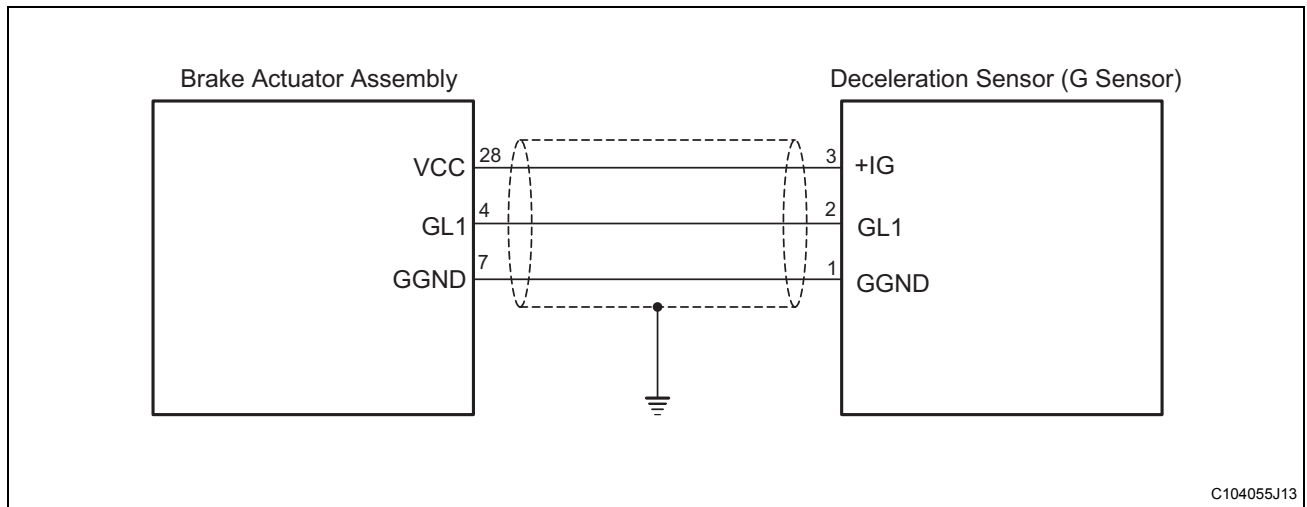
SYSTEM RETURNS TO NORMAL (DTC IS STORED DUE TO POOR CONNECTION OF CONNECTOR TERMINALS, BUT RECONNECTING CONNECTOR RETURNS SYSTEM TO NORMAL)

DTC	C1244/32	OPEN OR SHORT CIRCUIT IN FRONT AND REAR G SENSOR OR SIDE SENSOR
DTC	C1245/31	FRONT AND REAR G SENSOR OR SENSOR SIGNAL ERROR

DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1244/32	Open or short circuit in the deceleration sensor (G sensor) continues for 1 second or more	- Open or short circuit in the wire harness - Improper connector contact pressure, deformation and corrosion of terminals - Deceleration sensor (G sensor) - Brake actuator assembly
C1245/31	At a vehicle speed of 30 km/h or more, the difference between the forward and backward G calculated from the acceleration sensor value and that calculated from the vehicle speed sensor exceeds 0.35 G for 60 seconds or more.	- Improper installation of the deceleration sensor (G sensor) - Short circuit in the wire harness - Deceleration sensor (G sensor) - Brake actuator assembly

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

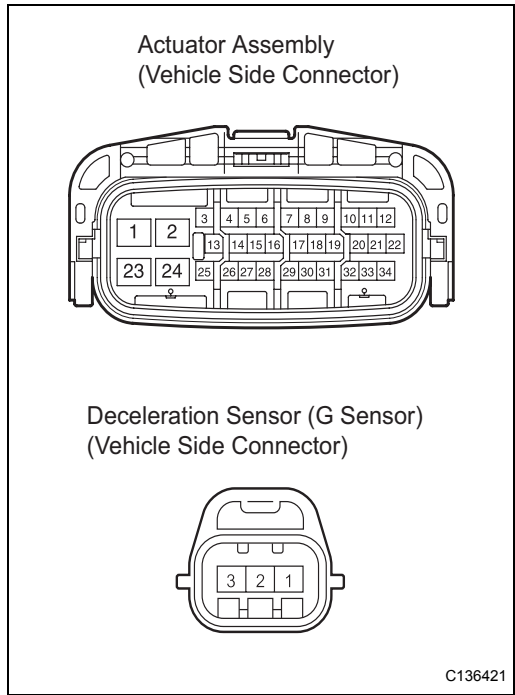
1	INSPECT WIRE HARNESS AND CONNECTOR (BETWEEN BRAKE ACTUATOR ASSEMBLY AND DECELERATION SENSOR [G SENSOR])
---	---

- (a) Check if the brake actuator assembly and deceleration sensor connectors are engaged properly.

Standard:

The connectors are properly connected.

- (b) Turn the ignition switch off and disconnect the brake actuator assembly and deceleration sensor connectors.
- (c) Check that the connector case and terminals are not deformed or corroded.



OK

2 INSPECT DECELERATION SENSOR

Standard:

There should be no deformation or corrosion.

- (d) Using the tester, check the wire harness between the brake actuator assembly and the deceleration sensor (G sensor).

Standard

Continuity check

Inspection Terminal (Brake Actuator Assembly ↔ Deceleration Sensor [G sensor])	Continuity
28 (VCC) ↔ 3 (+IG)	Continuity
4 (GL1) ↔ 2 (GL1)	Continuity
7 (GGND) ↔ 1 (GGND)	Continuity

Insulation Check

Inspection Terminal (Brake Actuator Assembly)	Continuity
28 (VCC) ↔ Body ground	No continuity
4 (GL1) ↔ Body ground	No continuity
7 (GGND) ↔ Body ground	No continuity

NG **REPAIR OR REPLACE WIRE HARNESS AND CONNECTOR**

- (a) Inspect the deceleration sensor (G sensor) power source voltage.
- (1) Check for improper installation of the deceleration sensor (G sensor) and that the connector is engaged properly.
 - (2) With the connector of the deceleration sensor (G sensor) connected, measure the voltage between terminal 3 (+IG) of the connector and the body ground.

Standard:

4.75 to 5.25 V

- (3) Disconnect the connector of the deceleration sensor (G sensor).
- (4) Check that the connector case and terminals are not deformed or corroded.

Standard:

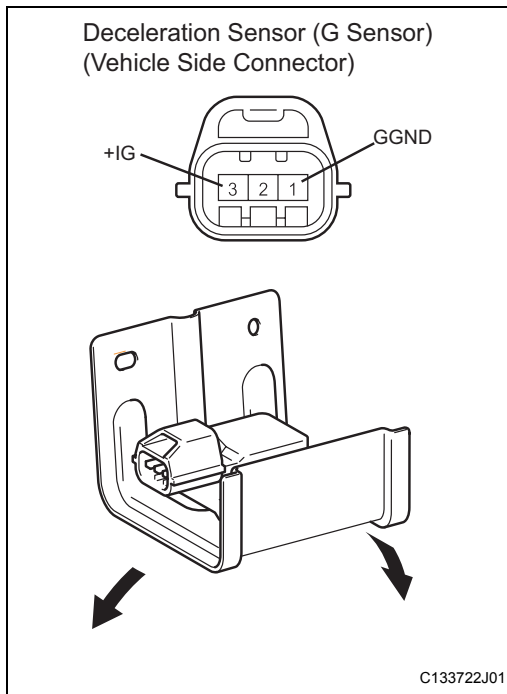
There should be no deformation or corrosion.

- (b) Inspect the deceleration sensor.

HINT:

If a malfunction is found in the vehicle side connector, repair the connector.

- (1) Connect 3 1.5 V dry cell batteries in series.



- (2) Connect the positive side to terminal 3 (+IG) and the negative side to terminal 1 (GGND), and apply a voltage of 4.5 V between terminal 3 (+IG) and terminal 1 (GGND).
- (3) Check the output voltage of terminal 2 (GL1) in each condition.

Standard

Sensor Condition	Output Voltage
Level condition	Approx. 2.5 V
Incline toward front and back	Varies between approx. 0.5 and 4.5 V

NOTICE:

- Do not apply a voltage of 6 V or more between terminals VCC and GND.
- When the sensor is extremely inclined, it may output a value outside of the range shown above.
- If the sensor is dropped, replace it with a new one.

Standard

OK	Go to step A
NG (abnormal sensor power source voltage)	Go to step B
NG (abnormal sensor output value)	Go to step C

B**REPLACE BRAKE ACTUATOR ASSEMBLY****C****REPLACE DECELERATION SENSOR****A****3****Recheck for DTCs.**

- (a) After clearing the DTCs, repeat a road test and braking test based on the problem analysis and freeze frame data, then recheck for DTCs. (See page BC-7)

DTC is not output	Go to step A
DTC is output	Go to step B

B**REPLACE BRAKE ACTUATOR ASSEMBLY****A**

SYSTEM RETURNS TO NORMAL (DTC IS STORED DUE TO POOR CONNECTION OF CONNECTOR TERMINALS, BUT RECONNECTING CONNECTOR RETURNS SYSTEM TO NORMAL)

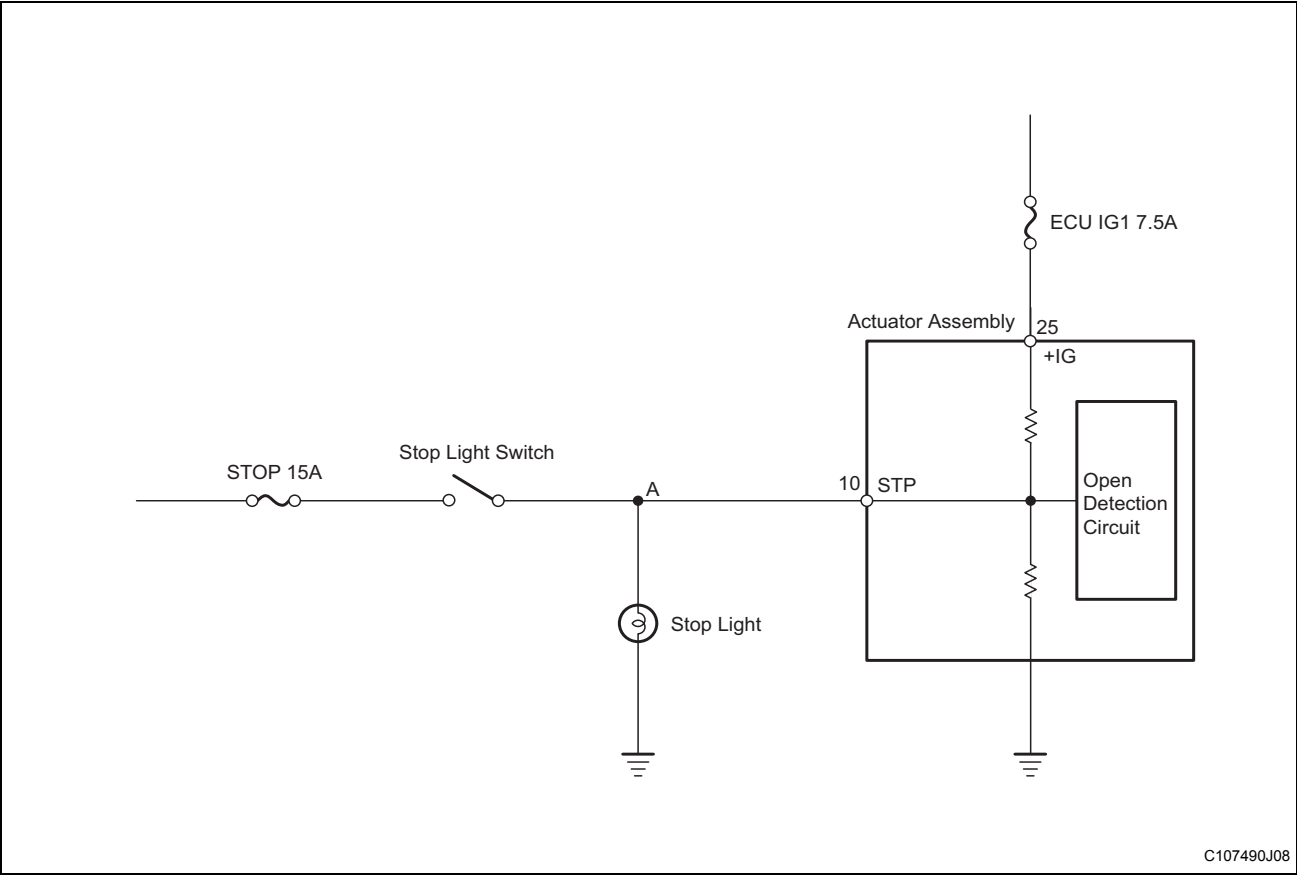
DTC	C1249/39	STOP LIGHT SW ERROR
-----	----------	---------------------

DESCRIPTION

The skid control computer receives stop light switch signals and detects the status of braking operation. The skid control computer has an internal open detection circuit. When the stop light switch is OF, this circuit outputs DTCs when an open circuit in the stop light signal input line or the stop light circuit (ground side) is detected.

DTC No.	DTC Detection Condition	Trouble Area
C1249/49	With the IG terminal voltage 10 to 16 V, an open in the stop light switch circuit (between A and B, or between A and body ground) continues for 0.3 seconds or more.	- Defective stop light, open in the ground or resistor - Open in the wire harness between the stop light circuit and brake actuator - Improper connector contact pressure, deformation and corrosion of the terminals

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

BC

1	INSPECT FUSE (STOP 15A)
---	-------------------------

(a) Inspect the fuse (STOP 15A).

Standard:

The fuse is normal.

NG	REPLACE FUSE (STOP 15A)
----	-------------------------

OK

2 INSPECT STOP LIGHT OPERATION

- (a) Turn the ignition switch to the ON position, depress the brake pedal, and check that the stop light comes on.

Standard:

The illumination comes on.

NG

INSPECT STOP LIGHT CIRCUIT

OK

3 INSPECT WIRE HARNESS AND CONNECTOR (BRAKE ACTUATOR ASSEMBLY - STOP LIGHT SWITCH ASSEMBLY)

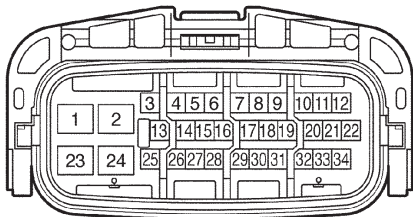
- (a) Turn the ignition switch off, and disconnect the brake actuator assembly and stop light switch connectors.
- (b) Check that the connector case and terminals are not deformed or corroded.

Standard:**There should be no deformation or corrosion.**

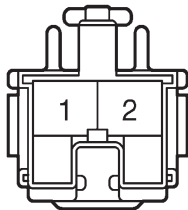
- (c) Using the tester, inspect the continuity of the wire harness between terminal 10 (STP) of the brake actuator assembly and terminal 1 of the stop light switch assembly. Also check the insulation between terminal 10 (STP) of the brake actuator assembly and the body ground.

Standard:**There should be continuity between the terminals.****There should be no continuity between the terminals and the body ground.**

Brake Actuator Assembly
(Wire Harness Side Connector)



Stop Light Switch Assembly
(Wire Harness Side Connector)



C100594J04

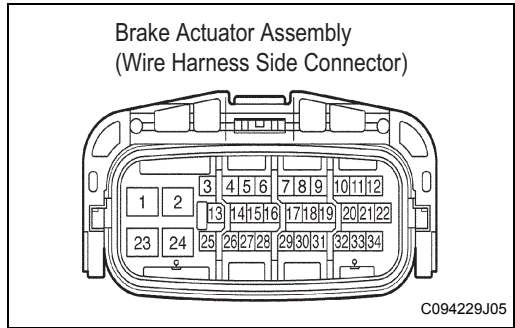
NG

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

4

INSPECT WIRE HARNESS AND CONNECTOR (GND1, GND2)



- (a) Turn the ignition switch off, and disconnect the brake actuator assembly connector.
- (b) Using the tester, check the continuity between terminals 2 (GND1) and 24 (GND2) of the of the brake actuator assembly wire harness side connector and the body ground.

Standard:

Continuity

HINT:

If there is a malfunction, check the bolt of the ground point for looseness.

NG

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

5

RECHECK FOR DTCs.

- (a) Perform a road test after clearing the DTCs, then recheck for DTCs.
(See page BC-7)

DTC is not output	Go to step A
DTC is output	Go to step B

B

REPLACE BRAKE ACTUATOR ASSEMBLY

A

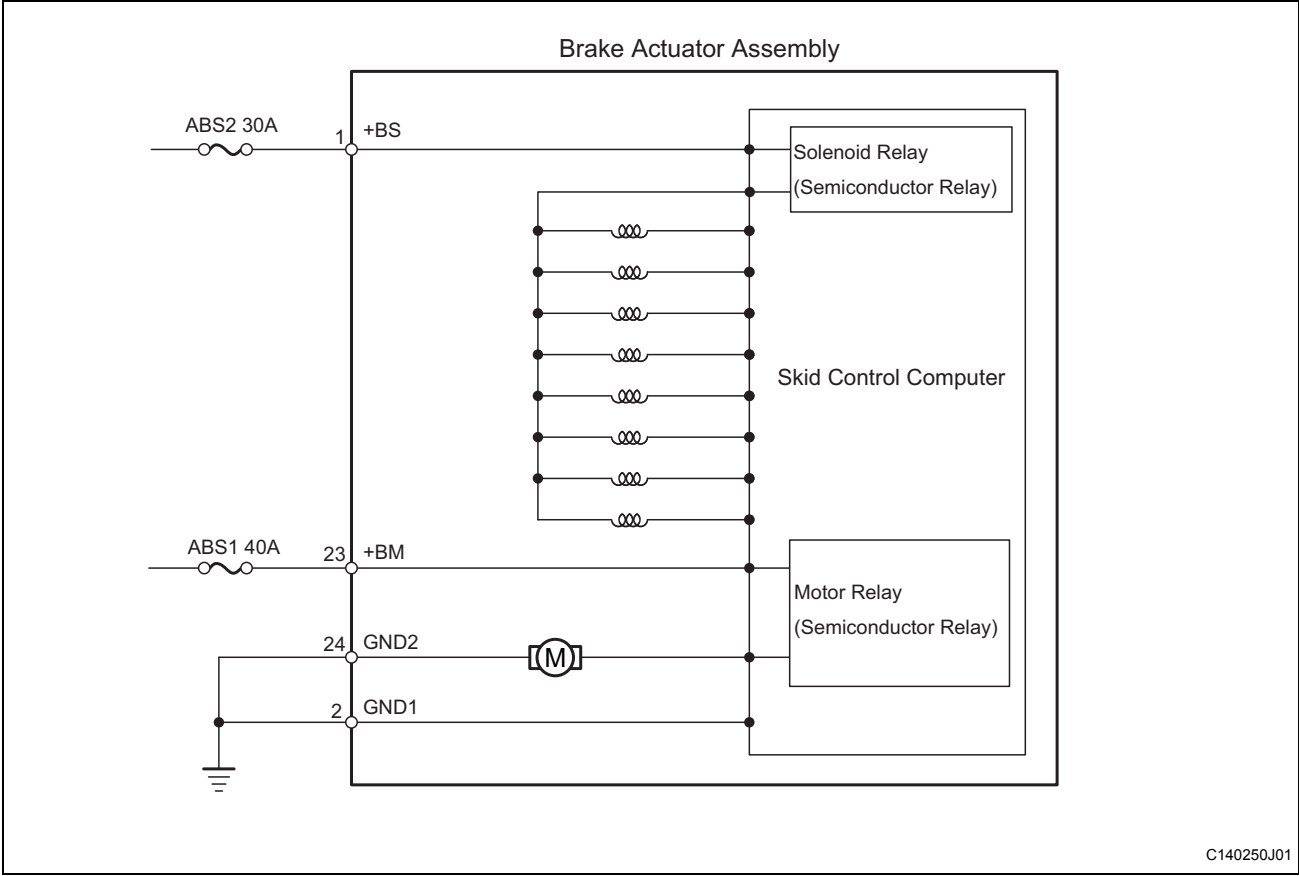
SYSTEM RETURNS TO NORMAL (DTC IS STORED DUE TO POOR CONNECTION OF CONNECTOR TERMINALS, BUT RECONNECTING CONNECTOR RETURNS SYSTEM TO NORMAL)

DTC	C1251/51	PUMP MOTOR SYSTEM/RESERVOIR SYSTEM
-----	----------	------------------------------------

DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1251/51	- The pump motor does not rotate normally in the initial check. - Open circuit in the actuator pump drive motor continues for 2 seconds or more	- Brake actuator assembly malfunction - Open in the motor circuit in the brake actuator

CIRCUIT DIAGRAM

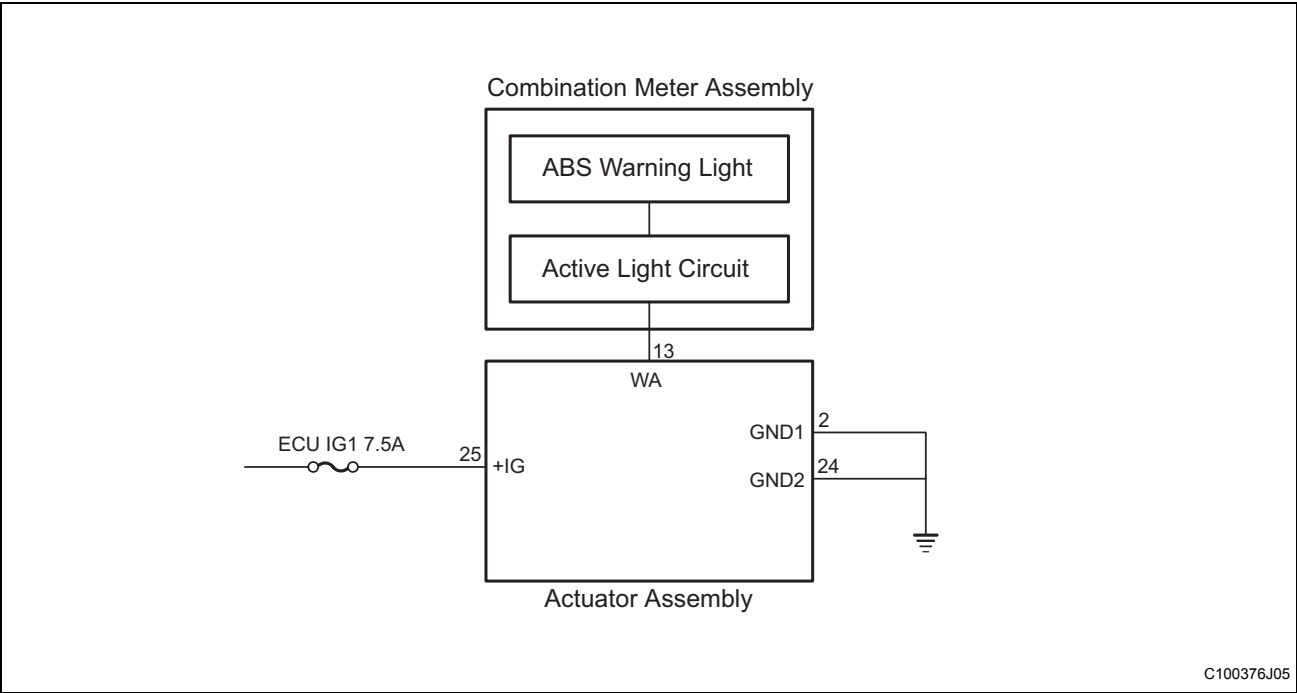


INSPECTION PROCEDURE

1	REPLACE BRAKE ACTUATOR ASSEMBLY
END	

ABS WARNING LIGHT REMAINS ON

CIRCUIT DIAGRAM



INSPECTION PROCEDURE

1	CONNECTION CONDITION OF EACH PART
---	-----------------------------------

- (a) Slightly jiggle the connector and wire harness of the brake actuator assembly vertically and horizontally and check the ABS warning light condition.

Standard:

There is no change in the warning light.

HINT:

If the lighting condition of the warning light is changed due to vibration, check for a malfunction in the contact point of terminals +IG and WA.

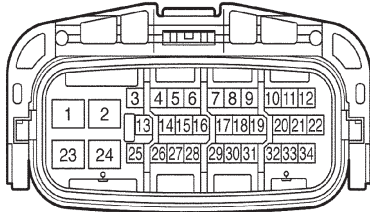
NG

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

2**INSPECT ABS WARNING LIGHT CONDITION**

Brake Actuator Assembly
(Wire Harness Side Connector)



C094229

- (a) Turn the ignition switch off.
- (b) Disconnect the brake actuator assembly connector.
- (c) Short terminal 13 (WA) of the wire harness side connector of the brake actuator assembly to the body ground.
- (d) Turn the ignition switch to the ON position, and check that the ABS warning light goes off.

Standard:

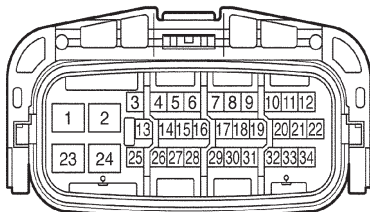
The brake warning light goes off.

HINT:

- If the ABS warning light turns off, this may indicate an improper ground or open circuit in the brake actuator assembly.
- If the ABS warning light does not turn off, this may indicate an open in the wire harness between the brake actuator assembly and the meter. It may also indicate that the meter circuit may have a malfunction.

NG**GO TO STEP 4****OK****3****INSPECT BRAKE ACTUATOR ASSEMBLY (WA, +IG, GND1, GND2)**

Brake Actuator Assembly
(Wire Harness Side Connector)



C094229

- (a) Turn the ignition switch off, and disconnect the actuator assembly connector.
- (b) Using the tester, check the continuity between terminals 2 (GND1) and 24 (GND2) of the wire harness side connector of the brake actuator assembly and the body ground.

Standard:**Continuity****HINT:**

If both the GND1 terminal and the 2 terminal have a malfunction, check the bolt of the ground point for looseness.

- (c) Turn the ignition switch to the ON position.
- (d) Using the tester, inspect the voltage between the 25 (+IG) terminal of the wire harness side connector of the brake actuator assembly and the body ground.

Standard:

10 to 14 V

- (e) Using the tester, inspect the voltage between the 13 (WA) terminal of the wire harness side connector of the brake actuator assembly and the body ground.

Standard:

10 to 14 V

Result

A	OK
B	NG (GND1, GND2, +IG)
C	NG (WA)

B

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

BC

C

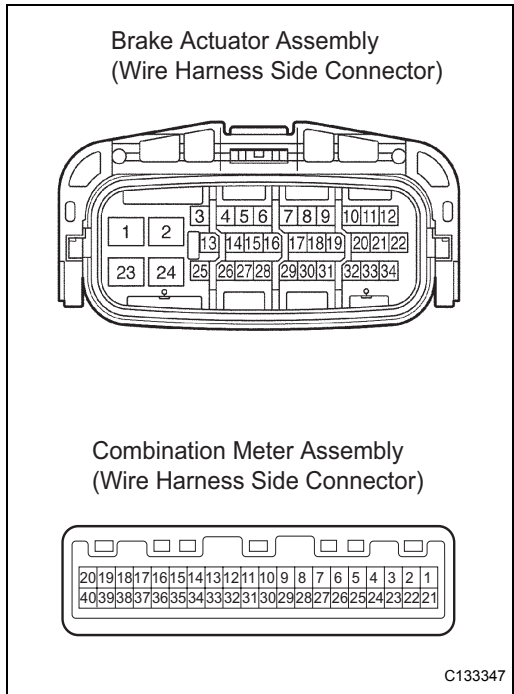
INSPECT AND REPLACE BRAKE ACTUATOR ASSEMBLY

A

SYSTEM RETURNS TO NORMAL (PROBLEM SYMPTOMS OCCUR DUE TO POOR CONNECTION OF CONNECTOR TERMINALS, BUT RECONNECTING CONNECTOR RETURNS SYSTEM TO NORMAL)

4

INSPECT WIRE HARNESS AND CONNECTOR (BETWEEN COMBINATION METER ASSEMBLY AND BRAKE ACTUATOR ASSEMBLY)



- (a) Turn the ignition switch off, and disconnect the brake actuator assembly and the connectors of the combination meter.
- (b) Using the tester, check the continuity of the wire harness between terminal 13 (WA) of the brake actuator assembly and terminal 25 (ABS) of the combination meter. (See page ME-16 for the meter terminals)

Standard:
Continuity

NG

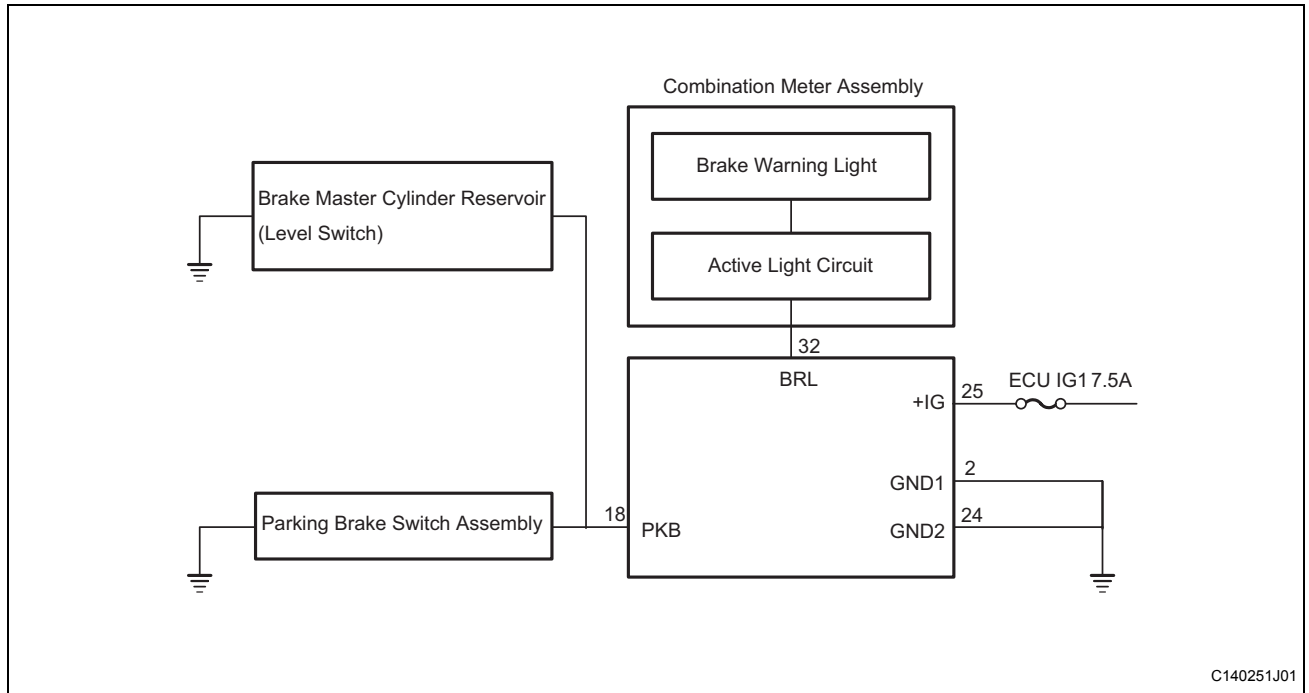
REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

GO TO METER AND GAUGE SYSTEM

BRAKE WARNING LIGHT REMAINS ON

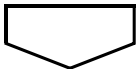
CIRCUIT DIAGRAM



INSPECTION PROCEDURE

1 PRE-CHECK

- (a) Check that the following conditions are satisfied:
- (1) The ABS warning light is turned off.
HINT:
If the ABS warning light remains on, release it first.
 - (2) The brake fluid level in the brake master cylinder reservoir is sufficient.
 - (3) The parking brake is completely released.



2 CONNECTION CONDITION OF EACH PART

- (a) Slightly jiggle each connector and wire harness vertically and horizontally, and check the brake warning light condition.

Standard:

There is no change in the warning light.

HINT:

If the lighting condition of the warning light is changed due to vibration of the connector and the wire harness of the brake actuator assembly, check for a malfunction in the contact point of terminals +IG and BRL. (See page BC-13 for the ECU terminals)

NG

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

3**INSPECT BRAKE MASTER CYLINDER RESERVOIR**

- (a) Disconnect the connector of the fluid level switch in the master cylinder reservoir, and check the lighting condition of the brake warning light.

Standard:**The brake warning light goes off.**

OK

REPLACE BRAKE MASTER CYLINDER RESERVOIR

NG

4**INSPECT WIRE HARNESS AND CONNECTOR (FLUID LEVEL SWITCH)**

- (a) Disconnect the connector of the fluid level switch in the master cylinder reservoir.
- (b) Using the tester, check the continuity between the terminals of the wire harness side connector of the fluid level switch in the master cylinder reservoir.

Standard:**No continuity**

NG

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

5**INSPECTION WITH DATA LIST (PKB)**

- (a) Using the DS-II, inspect the data list of the parking brake. (See page BC-15)

ECU DATA LIST

Item (Symbol)	Item Description	Inspection Condition	Standard
PKB	Indicates activation of the parking brake	Parking brake Engaged $\longleftrightarrow$ Released	ON $\longleftrightarrow$ OFF

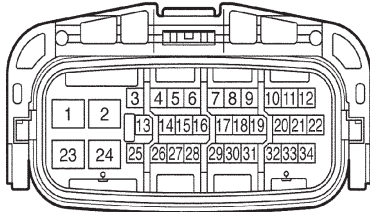
NG

GO TO STEP 9**BC**

OK

6**INSPECT BRAKE WARNING LIGHT CONDITION**

Brake Actuator Assembly
(Wire Harness Side Connector)



C094229

- (a) Turn the ignition switch off.
- (b) Disconnect the brake actuator assembly connector.
- (c) Short terminal 32 (BRL) of the wire harness side connector of the brake actuator assembly to the body ground.
- (d) Turn the ignition switch to the ON position, and check that the brake warning light goes off.

Standard:

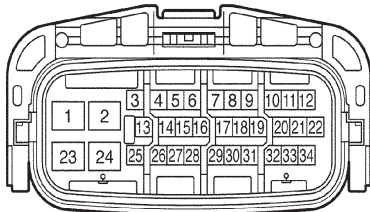
The brake warning light goes off.

HINT:

- If the brake warning light turns off, there may be an improper grounding or open circuit in the brake actuator assembly.
- If the ABS warning light does not turn off, this may indicate an open in the wire harness between the brake actuator assembly and the meter. It may also indicate that the meter circuit may have a malfunction.

NG**GO TO STEP 8****OK****7****INSPECT BRAKE ACTUATOR ASSEMBLY (+IG, GND1, GND2, BRL)**

Brake Actuator Assembly
(Wire Harness Side Connector)



C094229

- (a) Turn the ignition switch off, and disconnect the actuator assembly connector.
- (b) Using the tester, check the continuity between terminals 2 (GND1) and 24 (GND2) of the wire harness side connector of the brake actuator assembly and the body ground.

HINT:

If both the GND1 terminal and the 2 terminal have a malfunction, check the bolt of the ground point for looseness.

Standard:**Continuity**

- (c) Turn the ignition switch to the ON position.
- (d) Using the tester, inspect the voltage between the 25 (+IG) terminal of the wire harness side connector of the brake actuator assembly and the body ground.

Standard:

10 to 14 V

- (e) Using the tester, inspect the voltage between the 32 (BRL) terminal of the wire harness side connector of the brake actuator assembly and the body ground.

Standard:

10 to 14 V

Result

A	OK
B	NG (GND1, GND2, +IG)
C	NG (BRL)

B

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

BC

C

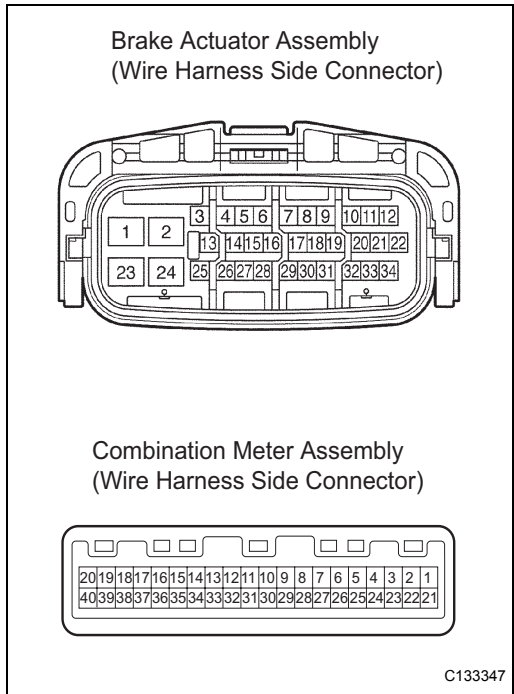
INSPECT AND REPLACE BRAKE ACTUATOR ASSEMBLY

A

SYSTEM RETURNS TO NORMAL (PROBLEM SYMPTOMS OCCUR DUE TO POOR CONNECTION OF CONNECTOR TERMINALS, BUT RECONNECTING CONNECTOR RETURNS SYSTEM TO NORMAL)

8

INSPECT WIRE HARNESS AND CONNECTOR (BETWEEN COMBINATION METER ASSEMBLY AND BRAKE ACTUATOR ASSEMBLY)



- (a) Turn the ignition switch off, and disconnect the brake actuator assembly and the connectors of the combination meter.
- (b) Using the tester, check the continuity of the wire harness between terminal 32 (BRL) of the brake actuator assembly and terminal 30 (BRAKE) of the combination meter. (See page ME-16 for the combination meter terminals)

Standard:
Continuity

NG

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

OK

GO TO METER AND GAUGE SYSTEM

9

INSPECT PARKING BRAKE SWITCH ASSEMBLY

BC

- (a) Using the tester, check the continuity between the parking brake switch assembly and the body ground when the switch shaft is operated.
- Standard:
- There should be continuity when the switch shaft is not pushed in.
- There should be no continuity when the switch shaft is pushed in.

NG

REPLACE PARKING BRAKE SWITCH
ASSEMBLY

OK

REPAIR OR REPLACE WIRE HARNESS OR CONNECTOR

ABS ACTIVATION TIMING IS EARLY (ABS ACTIVATES BEFORE THE WHEELS LOCK)

DESCRIPTION

Differences in the outputs from the wheel speed sensors may cause ABS to activate early. Early activation of ABS may cause braking distance to increase. Troubleshoot the problem as follows:

INSPECTION PROCEDURE

1**TEST MODE INSPECTION (SPEED SENSOR)**

- (a) Enter the test mode and check the speed sensors. Then check for test mode codes and DTCs. (See page BC-9)

Standard:

The normal code is output.

NG**INSPECT AND REPAIR CORRESPONDING
SPEED SENSORS****OK****CLEAN SPEED SENSORS AND ROTORS OF FOUR WHEELS**

BRAKE PEDAL LOW (FLUID LEAKS OR AIR IN SYSTEM)

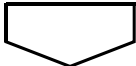
INSPECTION PROCEDURE

1

PRE-CHECK

- (a) Inspect the brake pedal.
 - (1) Operate the brake pedal and check for mechanical problems.
 - (2) Inspect the height, free play and pedal reserve distance of the brake pedal. (See page BR-12)

HINT:
To determine the location of problems, adjust the pedal height after each inspection.
- (b) Inspect the wheel brake.
 - (1) Check that the pads of the disc brake of each wheel brake are installed properly.
 - (2) Check for looseness of the bleeder plug and union bolt, damage to the gasket, and fluid leaks from the wheel cylinder.
- (c) Check for brake fluid leaks and air in system.
 - (1) Check the fluid level in the brake master cylinder reservoir.
 - (2) Operate the brake pedal repeatedly, and check that the pedal can be operated smoothly (there is no air in the system).
 - (3) Check for changes in the fluid level in the brake master cylinder reservoir.
 - (4) If the fluid level decreases, check for fluid leaks caused by damage to the flexible hoses and brake tubes, looseness of the union nut, or due to improper seal of the master cylinder.
- (d) Bleed air from the brake system.
 - (1) Bleed air from the brake pipe line and the actuator assembly. (See page BR-5)



2

CONDUCT ACTIVE TESTS (VALVE MOTOR)

- (a) Using the DS-II, activate the valve motor through active tests. Then inspect the brake pedal during actuator motor operation. (See page BC-2)

Standard:

The pedal should return.

NG

REPLACE BRAKE ACTUATOR ASSEMBLY

OK

3

INSPECT BRAKE MASTER CYLINDER ASSEMBLY

- (a) Remove the brake master cylinder assembly and check for fluid leaks. Also check that the pedal does not stay in the depressed position.

Standard:

There are no fluid leaks and the brake pedal is not low or soft.

BC

NG

REPAIR OR REPLACE BRAKE MASTER CYLINDER ASSEMBLY

OK

REPLACE BRAKE BOOSTER ASSEMBLY

NOISE DURING INITIAL CHECK OF ACTUATOR TOO LOUD**INSPECTION PROCEDURE****1****ROAD TEST**

- (a) After the ignition is turned to the ON position, compare the noise level that occurs when the vehicle speed reaches 10 km/h with the noise produced by similar vehicles.

Standard:

The noise level should be equivalent or lower.

HINT:

When the vehicle speed reaches 6 km/h, the operation sound of the solenoid and motor is generated due to the start of the initial check of the actuator.

OK**NO PROBLEM****NG****2****ADJUST ACTUATOR ASSEMBLY INSTALLATION**

- (a) Drain the brake fluid.
(b) Disconnect all brake tubes from the brake actuator assembly.
(c) Connect the brake tubes so that the tensions to the rubber mounting part of the actuator assembly become even.

NOTICE:

Add the brake fluid after connecting the brake tubes, and be sure to bleed air. (See page BR-5)

HINT:

The operation sound may be reduced by absorbing the tension to the brake tubes and rubber mounting parts.

- (d) Check for interference between the brake tubes and the body or other parts.

3**RECHECK SYMPTOMS**

- (a) Perform a road test and recheck the operation noise level.

Standard:

The noise level should be equivalent or lower.

OK**NO PROBLEM****NG****BC****REPLACE BRAKE ACTUATOR ASSEMBLY**