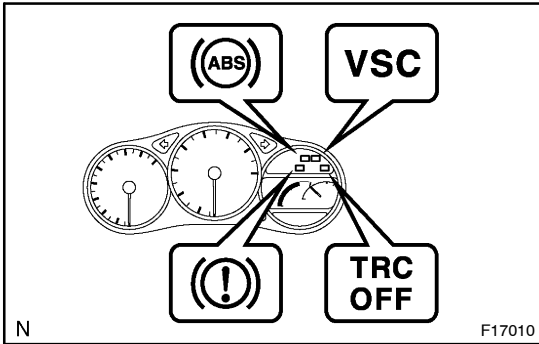




PRE-CHECK

1. DIAGNOSIS SYSTEM

(a) Inspect the battery voltage.

Battery voltage: 10 – 14 V

(b) Check the warning lights and indicator lights.

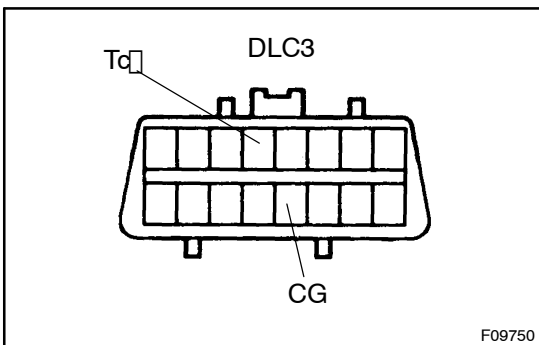
(1) Release the parking brake lever.

(2) When the ignition switch is ON, check that the ABS warning light, BRAKE warning light, TRC OFF indicator light and SLIP indicator light, VSC warning light go on for 3 sec.

HINT:

- If the ECU stores DTC, VSC warning light, ABS warning light, BRAKE warning light and TRC OFF indicator light are ON.
- If the check result is not normal, proceed to troubleshooting for the light circuit.

Trouble Area	See Page
ABS warning light circuit	DI-148
BRAKE warning light circuit	DI-157
VSC warning light circuit	DI-162
TRC OFF indicator light circuit	DI-151
SLIP indicator light circuit	DI-154



(c) In case of not using the hand-held tester:

Check the DTC of ABS system.

(1) Using SST, connect terminals Tc and CG of DLC3.
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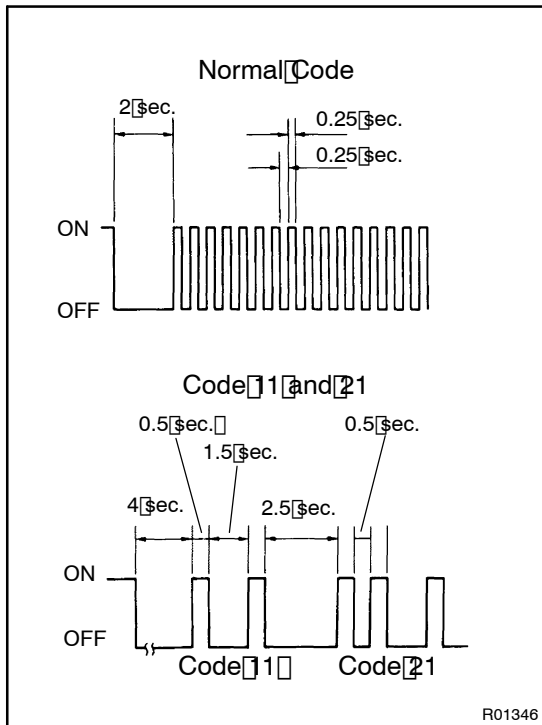
(2) Turn the ignition switch ON.

(3) Read the DTC from the ABS warning light and VSC warning light on the combination meter.

HINT:

- If no code appears, inspect the diagnostic circuit, ABS warning light circuit and VSC warning light circuit.

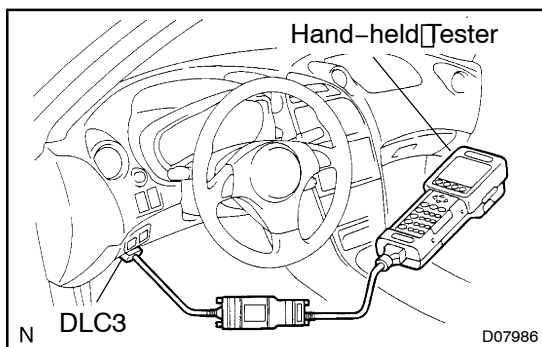
Trouble Area	See page
ABS warning light circuit	DI-148
VSC warning light circuit	DI-159



- As an example, the blinking patterns for the normal code and codes 11 and 21 are shown on the left.

- Codes are examples in the code table on [page DI-66](#).
- After completing the check, disconnect terminal Tc and CG of DLC3, and turn off the display.

If 2 or more malfunctions are detected at the same time, the lowest numbered DTC will be displayed 1st.

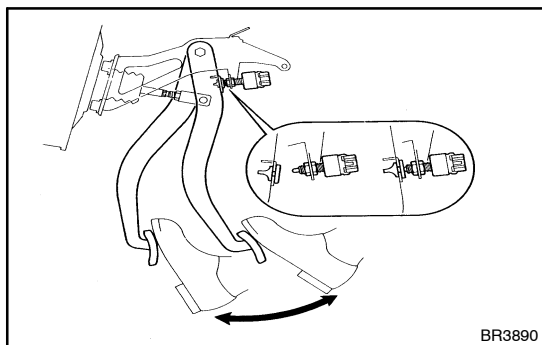


- In case of using the hand-held tester:
Check the DTC.

- Hook up the hand-held tester to the DLC3.
- Turn the ignition switch ON.
- Read the DTC by following the prompts on the tester screen.

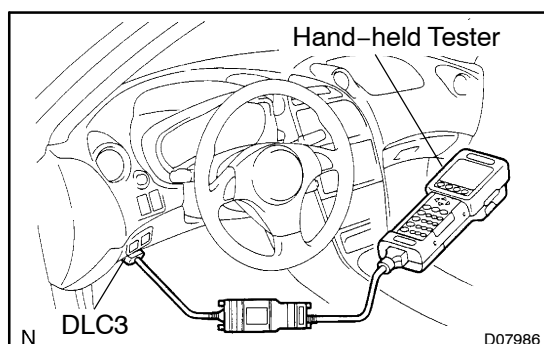
HINT:

Please refer to the hand-held tester operator's manual for further details.



- In case of not using the hand-held tester:
Clear the DTC.

- Using SST, connect terminals Tc and CG of DLC3.
SST 09843-18040
- Turn the ignition switch ON.
- Clear the DTC stored in ECU by depressing the brake pedal 8 times or more within 5 sec.
- Check that the warning light show the normal code.
- Remove the SST from the terminals of DLC3.
SST 09843-18040



(f) In case of using the hand-held tester:

Clear the DTC.

- (1) Hook up the hand-held tester to the DLC3.
- (2) Turn the ignition switch ON.
- (3) Operate the hand-held tester to erase the codes.

HINT:

Please refer to the hand-held tester operator's manual for further details.

2. DATA LIST

HINT:

According to the DATA LIST displayed by the hand-held tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as a first step of troubleshooting is one of the method to shorten the labor time.

- (a) Connect the hand-held tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) According to the display on tester, read the "DATA LIST".

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
ABS MOT RELAY	ABS motor relay / ON or OFF		
SOL RELAY	Solenoid relay / ON or OFF		
VSC / TRAC OFF SW	VSC / TRAC OFF switch / ON or OFF		
IDLE SW	Main idle switch / ON or OFF	ON : Accelerator pedal released OFF : Accelerator pedal depressed	
STOP LIGHT SW	Stop light switch / ON or OFF	ON : Brake pedal depressed OFF : Brake pedal released	
PKB SW	Parking brake switch / ON or OFF	ON : Parking brake applied OFF : Parking brake released	
ABS OPERT FR	ABS operation (FR) / BEFORE or OPERATE	BEFORE : No ABS operation (FR) OPERATE : During ABS operation (FR)	
ABS OPERT FL	ABS operation (FL) / BEFORE or OPERATE	BEFORE : No ABS operation (FL) OPERATE : During ABS operation (FL)	
ABS OPERT RR	ABS operation (RR) / BEFORE or OPERATE	BEFORE : No ABS operation (RR) OPERATE : During ABS operation (RR)	
ABS OPERT RL	ABS operation (RL) / BEFORE or OPERATE	BEFORE : No ABS operation (RL) OPERATE : During ABS operation (RL)	

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
WHEEL SPD FR	Wheel speed sensor (FR) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed indicated on speedometer
WHEEL SPD FL	Wheel speed sensor (FL) reading / min.: 0 km/h (0 MPH, max.: 326 km/h (202 MPH)	Actual wheel speed	Speed 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	Speed 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	Speed indicated on speedometer
DECELERAT SENS	Deceleration sensor 1 reading / min.: -1.869 G, max.: 1.869 G	Approximately $0 \pm 0.13G$ at still condition	Reading changes when vehicle is bounced
DECELERAT SENS2	Deceleration sensor 2 reading / min.: -1.869 G, max.: 1.869 G	Approximately $0 \pm 0.13G$ at still condition	Reading changes when vehicle is bounced
IG VOLTAGE	ECU power supply voltage / NORMAL or TOO LOW	NORMAL : 9.5 V or over TOO LOW : Below 9.5 V	
SFRR	ABS solenoid (SFRR) / ON or OFF		
SFRH	ABS solenoid (SFRH) / ON or OFF		
SFLR	ABS solenoid (SFLR) / ON or OFF		
SFLH	ABS solenoid (SFLH) / ON or OFF		
SRRR (SRR)	ABS solenoid (SRRR (SRR)) / ON or OFF		
SRRH (SRH)	ABS solenoid (SRRH (SRH)) / ON or OFF		
SRLR	ABS solenoid (SRLR) / ON or OFF		
SRLH	ABS solenoid (SRLH) / ON or OFF		
SMF (BA-SOL)	TRAC solenoid (SMF) / ON or OFF		
SMR	TRAC solenoid (SMR) / ON or OFF		
ENGINE SPD	Maximum revolution sensor reading / min.: 0rpm, max.: 6000 rpm	Actual engine speed	
VEHICLE SPD	Maximum wheel speed sensor reading / min.: 0 km/h (0 MPH), max.: 326 km/h (202 MPH)	Actual vehicle speed	Speed indicated on speedometer
YAW RATE	Yaw rate sensor reading / min.: -128 deg / s, max.: 127 deg / s		

Item	Measurement Item / Range (Display)	Normal Condition	Diagnostic Note
YAW ZERO VALUE	Yaw rate sensor reading / min.: -128 deg / s, max.: 127 deg / s		
STEERING ANG	Steering angle sensor reading / min.: -1152 deg, max.: 1150.875 deg		
MAS CYL PRS 1	Master cylinder pressure sensor 1 reading / min.: 0 V, max.: 5 V	When brake pedal is released : 0.3 – 0.9 V	Reading increases when brake pedal is depressed
AIR BLD SUPPORT	Air bleed support / SUPPORT or NOT SUP	w / BA : Supported w / VSC : Not supported	
TEST MODE	Test mode / NORMAL or TEST	NORMAL : Normal mode TEST : During test mode	
#CODES	Number of DTC recorded / min.: 0, max.: 255	Min.: 0, max.: 39	

3. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the labor time.

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

- Connect the hand-held tester to the DLC3.
- Turn the ignition switch ON.
- According to the display on tester, perform the "ACTIVE TEST".

HINT:

IG must be turned ON to proceed Active Test using a hand-held tester.

*1: For VSC equipped vehicles only

Item	Vehicle Condition / Test Details	Diagnostic Note
SFRR	Turns ABS solenoid (SFRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH	Turns ABS solenoid (SFRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR	Turns ABS solenoid (SFLR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLH	Turns ABS solenoid (SFLH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRR	Turns ABS solenoid (SRRR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRRH	Turns ABS solenoid (SRRH) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR	Turns ABS solenoid (SRLR) ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLH	Turns ABS solenoid (SRLH) ON / OFF	Operation of solenoid (clicking sound) can be heard

Item	Vehicle Condition / Test Details	Diagnostic Note
SMF (BA-SOL)	Turns TRAC solenoid SMF (BA-SOL) ON / OFF	Operation of solenoid (clicking sound) can be heard
SMR	Turns TRAC solenoid SMR ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRR & SFRH	Turns ABS solenoid SFRR & SFRH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFLR & SFLH	Turns ABS solenoid SFLR & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SRH & SRR	Turns ABS solenoid SRH & SRR ON / OFF	Operation of solenoid (clicking sound) can be heard
SRLR & SRLH	Turns ABS solenoid SRLR & SRLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SFRH & SFLH	Turns ABS solenoid SFRH & SFLH ON / OFF	Operation of solenoid (clicking sound) can be heard
SOL RELAY	Turns ABS solenoid relay ON / OFF	Operation of solenoid (clicking sound) can be heard
ABS MOT RELAY	Turns ABS motor relay ON / OFF	Operation of motor can be heard
ABS WARN LIGHT	Turns ABS warning light ON / OFF	Observe combination meter
VSC WARN LIGHT	Turns VSC warning light ON / OFF	Observe combination meter
VSC / TRC OFF IND	Turns VSC / TRAC OFF indicator ON / OFF	Observe combination meter
SLIP INDI LIGHT	Turns SLIP indicator light ON / OFF	Observe combination meter
BRAKE WRN LIGHT	Turns BRAKE warning light ON / OFF	Observe combination meter
VSC / BR WARN BUZ	Turns VSC / BRAKE warning buzzer ON / OFF	Buzzer can be heard

4. FREEZE FRAME DATA

- The vehicle (sensor) status at the occurrence of abnormality of the diagnosis code and during the ABS operating can be memorized and displayed using the hand-held tester.
- Only one record of freeze frame data is stored, however, freeze frame data during the ABS operating is always up-dated. After the storage of freeze frame data, up to 31 ignition "ON" operations are stored and displayed.

HINT:

If the ignition switch "ON" operation exceeds 31 times, "31" appears on the display.

- If the diagnosis code abnormality occurs, the freeze frame data at the occurrence of the abnormality is stored but the ABS actuation data is deleted.

Hand-held tester display	Measurement Item	Reference Value*
VEHICLE SPD	Vehicle speed	Speed indication of a meter
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 – 31
MAS CYL PRESS	Master cylinder pressure sensor output voltage	Release brake pedal: 0.3 – 0.9 V Depress brake pedal: 3.2 – 4.5 V

MASS PRESS GRADE	Master cylinder pressure sensor changing declivity	-30 ~ -200 MPa/s
SYSTEM	Operate system	ABS operate: ABS BA operate: BA
YAW RATE	Yaw rate angle sensor output value	-70 ~ 70
STEERING ANG	Steering angle sensor output value	Left turn: Increase Right turn: Drop
G (RIGHT & LEFT)	Right and left G	-1.5 ~ 1.5
G (BACK & FORTH)	Back and forth G	-1.5 ~ 1.5
VSC & TRC OFF SW	TRC OFF switch signal	TRC OFF SW ON: ON OFF: OFF

If no conditions are specifically stated for "Idling", it means the A/C switch is OFF and all accessory switches are OFF.

5. In case of not using the hand-held tester:

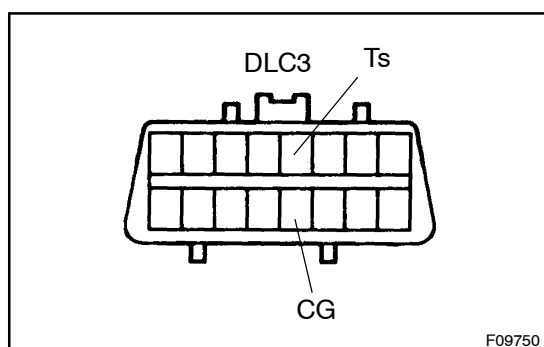
ABS SENSOR SIGNAL CHECK (TEST MODE)

NOTICE:

When having replaced the yaw rate sensor, deceleration sensor and/or ECU, perform zero point calibration of the yaw rate and deceleration sensors (See step 9.).

(a) Procedures for test mode:

- (1) Turn the ignition switch OFF.
- (2) Set the parking brake.



(3) Using SST, connect terminals Ts and CG of DLC3.

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(4) Check that the steering wheel is in the straight-ahead position.

(5) Turn the ignition switch ON.

(6) Check that the ABS warning light blinks.

HINT:

If the ABS warning light does not blink, inspect the ABS warning light circuit or Ts terminal circuit.

Trouble Area	See page
Ts terminal circuit	DI-167
ABS warning light circuit	DI-148

(b) Check the deceleration sensor.

Keep the vehicle in a stationary condition on a level place for 1 sec. or more.

(c) Check the master cylinder pressure sensor.

- (1) Leaving the vehicle in a stationary condition and the brake pedal in free condition for 1 sec. or more, continue to depress the brake pedal with a force of 98 N (10 kgf, 22 lbf) or more for 1 sec. or more.
- (2) While the vehicle is stopped, release the brake pedal.
- (3) While the vehicle is stopped, quickly depress the brake pedal once or more and check the ABS warning light is lit for 3 sec.

HINT:

Repeat the operation until the ABS warning light is lit.

- (d) Check the speed sensor signal.

Drive the vehicle straightforward.

Drive the vehicle with the speed faster than 45 km/h (28 mph) for several seconds and check that the ABS warning light comes off.

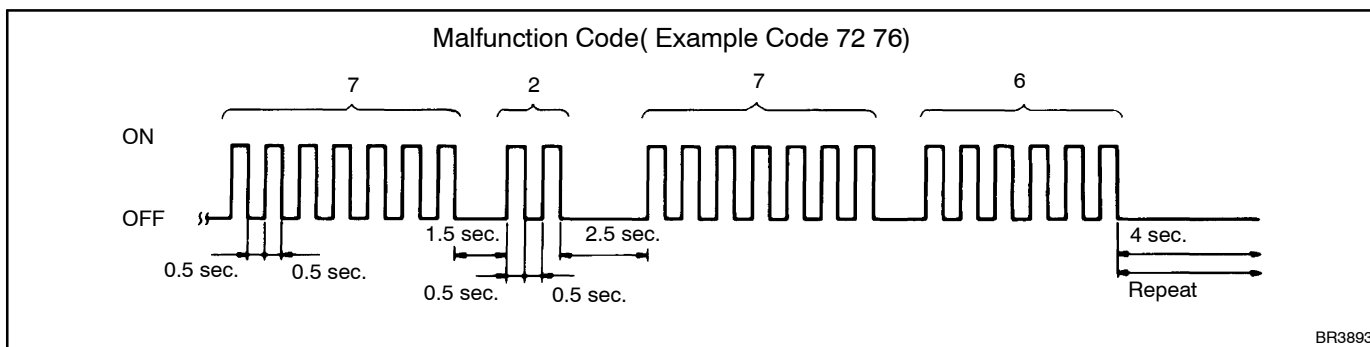
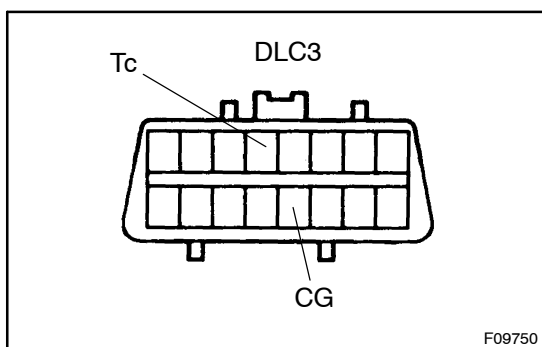
HINT:

The sensor check may not be completed if the wheels spin or the steering wheel is steered during this check.

- (e) Stop the vehicle.
- (f) Using SST, connect terminals Tc and CG of DLC3.
SST 09843-18040
- (g) Read the number of blinks of the ABS warning light.

HINT:

- See the list of DTC on the next page.
- If every sensor is normal, the normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
- If 2 or more malfunctions are detected at the same time, the lowest numbered will be displayed 1st.

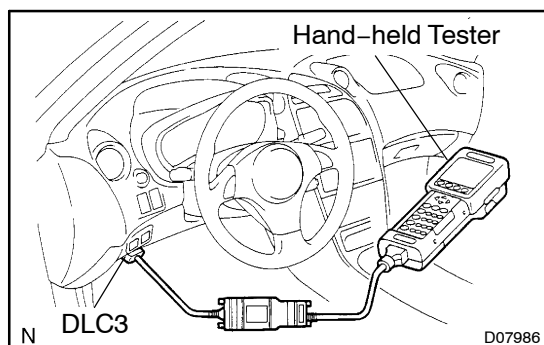


- (h) After doing the check, disconnect the SST from terminals Ts and CG, Tc and CG of DLC3 and turn the ignition switch OFF.
SST 09843-18040

6. In case of using the hand-held tester: ABS SENSOR SIGNAL CHECK (TEST MODE)

NOTICE:

When having replaced the yaw rate sensor, deceleration sensor and/or ECU, perform zero point calibration of the yaw rate and deceleration sensors (See step 9.). Make sure that this operation should be done before starting the following.



- Hook up the hand-held tester to the DLC3.
- Do steps 3.–(a)–(2), (4) and (5) and from (b) to (e) on the previous pages.
- Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand-held tester operator's manual for further details.

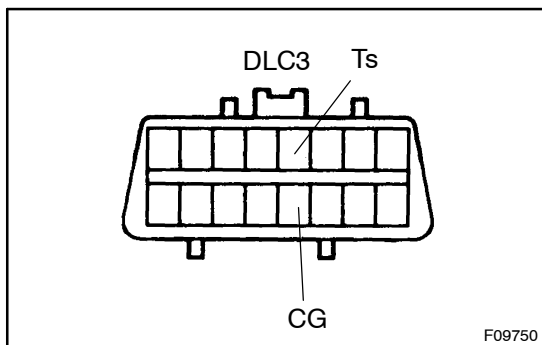
DTC of ABS sensor check function:

Code No.	Diagnosis	Trouble Area
C1271 / 71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation • Sensor rotor
C1272 / 72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation • Sensor rotor
C1273 / 73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation • Sensor rotor
C1274 / 74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation • Sensor rotor
C1275 / 75	Abnormal change in output voltage of right front speed sensor	Right front speed sensor rotor
C1276 / 76	Abnormal change in output voltage of Left front speed sensor	Left front speed sensor rotor
C1277 / 77	Abnormal change in output voltage of right rear speed sensor	Right rear speed sensor rotor
C1278 / 78	Abnormal change in output voltage of Left rear speed sensor	Left rear speed sensor rotor
C1279 / 79	Deceleration sensor is faulty	• Deceleration sensor • Sensor installation
C1281 / 81	Master cylinder pressure sensor output signal is faulty	Master cylinder pressure sensor

7. In case of not using the hand-held tester: VSC SENSOR SIGNAL CHECK (TEST MODE)

NOTICE:

When having replaced the yaw rate sensor, deceleration sensor and/or ECU, perform zero point calibration of the yaw rate and deceleration sensors (See step 9.).



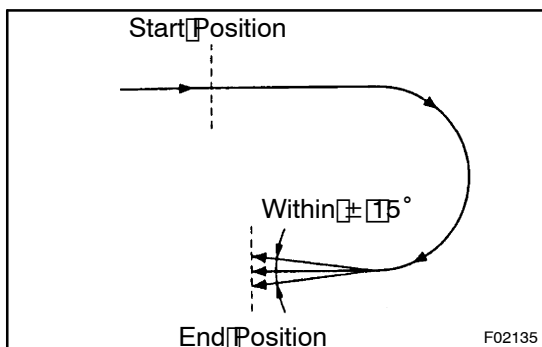
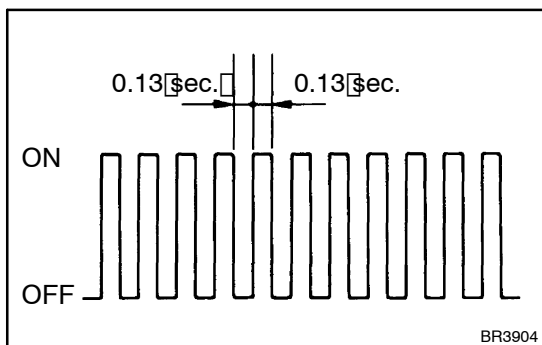
(a) Procedures for test mode:

- (1) Turn the ignition switch OFF.
- (2) Turn the steering wheel to the straight-ahead position.
- (3) Using SST, connect terminals Ts and CG of DLC3.
SST 09843-18040
- (4) Start the engine.

- (5) Check that the VSC warning light blinks.

HINT:

If the VSC warning light does not blink, inspect the VSC warning light circuit and Ts terminal circuit (See page DI-290, DI-307).



(b) Check the yaw rate sensor.

- (1) Drive the vehicle at the vehicle speed of approx. 5 km/h (3 mph). Turn the steering wheel either to left or right for 90° or more, and maintain 180° circular drive for the vehicle.

Stop the vehicle and set the parking brake. Check that the VSC warning buzzer sounds for 3 sec.

If the VSC warning buzzer sounds, the sensor check is in normal completion.

If the VSC warning buzzer does not sound, check the VSC warning buzzer circuit, then do the sensor check again.

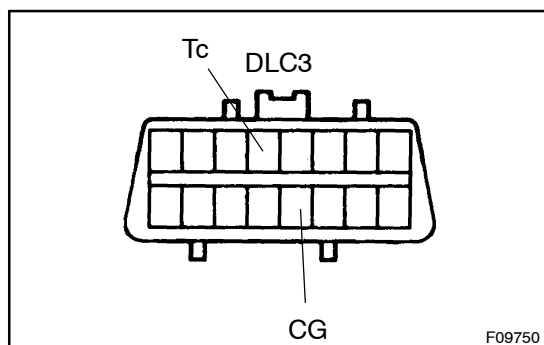
Trouble Area	See page
VSC warning buzzer circuit	DI-162

If the VSC warning buzzer still does not sound, there is malfunction in the VSC sensor, so check the DTC.

HINT:

- Drive the vehicle circularly by 180°. At the end of the turn, the direction of the vehicle should be within 180° ± 15° from its start position.

- Do not spin the wheels.
- (2) Check the steering angle sensor.
Turn the steering wheel to either left or right to the full lock position, from the vehicle stationary condition, and turn back the steering wheel to the neutral position.



- (c) Read the DTC.
- (1) Using SST, connect terminals Tc and CG of DLC3.
SST 09843-18040
 - (2) Read the number of blinks of the VSC warning light.

HINT:

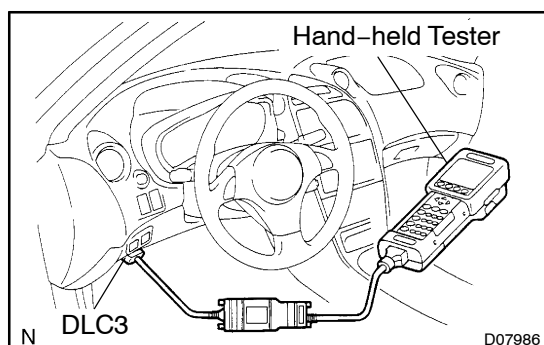
- See the list of DTC shown in the next page.
- If every sensor is normal, a normal code is output. (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated.)
- (3) After doing the check, disconnect the SST from terminals Ts and CG, Tc and CG of DLC3 and turn the ignition switch OFF.

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**8. In case of using the hand-held tester:
VSC SENSOR SIGNAL CHECK (TEST MODE)**

NOTICE:

When having replaced the yaw rate sensor, deceleration sensor and/or ECU, perform zero point calibration of the yaw rate and deceleration sensors (See step 9.). Make sure that this operation should be done before starting the following.



- (a) Hook up the hand-held tester to the DLC3.
- (b) Do steps 5.-(a)-(2), (a)-(4) and (b) on the previous pages.
- (c) Read the DTC by following the prompts on the tester screen.

HINT:

Please refer to the hand-held tester operator's manual for further details.

DTC of VSC sensor check function:

Code No.	Diagnosis	Trouble Area
C0371 / 71	Yaw rate sensor output signal malfunction	• Yaw rate sensor • Yaw rate sensor circuit

9. IF NECESSARY, PERFORM ZERO POINT CALIBRATION OF YAW RATE AND DECELERATION SENSORS**HINT:**

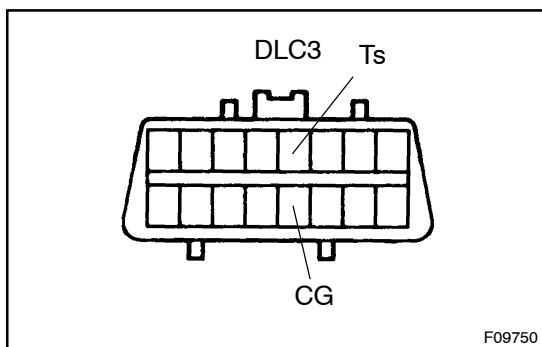
- When having replaced the yaw rate sensor, deceleration sensor or the ECU, make sure to perform yaw rate and deceleration sensors' zero point calibration. Be sure to complete this step 6. once it is started.
- During step 6., a not-replaced sensor also requires zero point calibration.

NOTICE:

- **While obtaining the zero point, do not give any vibration to the vehicle by tilting, moving or shaking it and keep it in a stationary condition. (Do not start the engine.)**
- **Be sure to do this on a level surface (within an inclination of 1 %).**

- (a) Clear the zero points of the yaw rate and deceleration sensors.

- (1) Turn the ignition switch ON in a stationary condition.



- (2) With the lit switch ON, using SST, repeat a cycle of short and open between terminals Ts and CG of DLC3 4 times or more within 8 sec. Check that the TRC OFF indicator light and VSC warning light is lit indicating the recorded zero point is erased.

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- (3) Turn the ignition switch OFF.

- (b) Obtain zero point of the yaw rate sensor.

- (1) Make the terminals Ts and CG of DLC3 disconnected.

- (2) Turn the ignition switch ON.

HINT:

The vehicle should be in a stationary condition with the shift lever in P range.

- (3) Check that the lit TRC OFF indicator light and VSC warning light goes off about 15 sec. after the ignition switch is turned ON.

HINT:

Even if the ignition is not turned OFF in step (a)–(4) and remains ON, the yaw rate sensor zero point calibration can be completed. In this case, the TRC OFF indicator light and VSC warning light is lit for about 15 sec. and then VSC warning light starts blinking.

- (4) After ensuring that the TRC OFF indicator light and VSC warning light remains OFF for 2 sec., turn the ignition switch OFF.

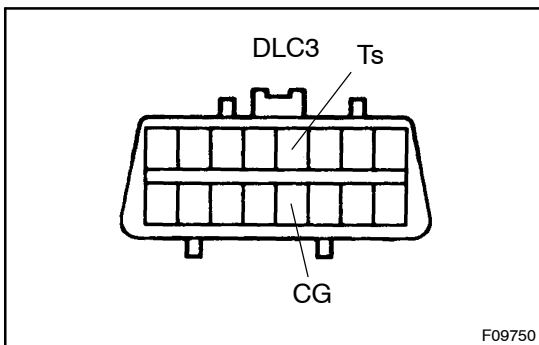
HINT:

If the ignition switch is not turned OFF in step (a)–(4), make sure that the VSC warning light light blinks for 2 sec. Then turn the ignition switch OFF.

- (c) Perform deceleration sensor zero point calibration.

NOTICE:

After step (b) (the yaw rate sensor zero point calibration), the VSC warning light goes off. At this time, if the vehicle is driven without performing step (c) (deceleration sensor zero point calibration), deceleration sensor zero point calibration malfunction will be detected and the TRC OFF indicator light and VSC warning light will light up. Therefore, perform step (c) right after step (b).



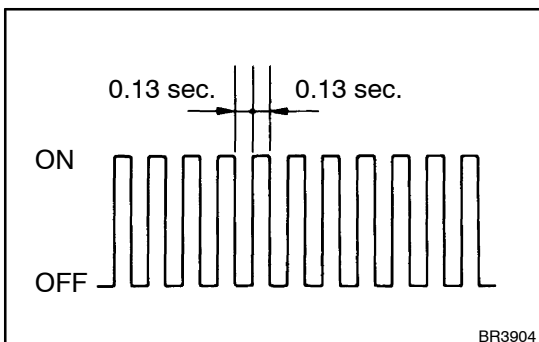
- (1) Using SST, connect the terminals Ts and CG of DLC3.

SST 09843-18040

- (2) Turn the ignition switch ON.

HINT:

Place the vehicle in a stationary condition.



- (3) After turning the ignition switch ON, check that the VSC warning light is lit for about 4 sec. and then starts quick blinking at 0.13 sec. intervals.
- (4) After ensuring the blinking of the VSC warning light for 2 sec., turn the ignition switch OFF.
- (5) Remove the SST and make the terminals Ts and CG of DLC3 disconnected.

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