

FAIL-SAFE CHART

1. FAIL SAFE OPERATION

- If there is a problem with any sensor signals or actuator systems, the skid control ECU prohibits the power supply to the ABS and TRACTION actuator and informs the ECM of VSC system failure. The ABS and TRACTION actuator turns off the solenoids and the ECM shuts off VSC control (traction control signal) from the skid control ECU accordingly, the result being that it is as if the ABS, TRC and VSC systems were not installed.
- ABS control is prohibited, but EBD control continues as far as possible. If EBD control is impossible, the BRAKE warning light comes on to warn the driver (see page [BC-44](#)).
- If system components have any malfunctions before starting control, the operation stops immediately. If system components have any malfunctions during control, the control stops gradually so as not to trigger a sudden change in vehicle conditions. If it is impossible to control the systems, the warning light comes on to inform the driver of malfunctions in the systems (see page [BC-44](#)).

HINT:

- If the ABS system malfunctions, the brake system operates normally without the ABS system.
- If the brake actuator malfunctions, a gradual loss of brake performance is expected, and ABS system control is prohibited.

ABS, EBD and BA system

Malfunction Area	Fail-Safe Operation
ABS system	ABS, BA, TRC and VSC control prohibited
BA system	ABS, BA, TRC and VSC control prohibited
EBD system	ABS, EBD, BA, TRC and VSC control prohibited

TRC and VSC system:

Malfunction Area	Fail-Safe Operation
Engine control system (TRC and VSC systems)	Before control: Disables control During control: Uses only the brakes to effect control
Brake control system (VSC system)	Before control: Disables control During control: Uses only the engine to effect control
Brake control system (TRC system)	Before control: Disables control During control: Disables control (by gradually ending control)

DATA LIST / ACTIVE TEST

1. READ DATA LIST

HINT:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

- Connect the intelligent tester (with CAN VIM) to the DLC3.
- Turn the ignition switch ON.
- Turn the intelligent tester on.
- Read the DATA LIST according to the display on the tester.

Skid control ECU

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
ABS WARN LAMP	ABS warning light / ON or OFF	ON: ABS warning light ON OFF: ABS warning light OFF	-
VSC WARN LAMP	VSC warning light / ON or OFF	ON: VSC warning light ON OFF: VSC warning light OFF	-
BRAKE WARN LAMP	Brake warning light / ON or OFF	ON: Brake warning light ON OFF: Brake warning light OFF	-
SLIP INDI LAMP	Slip indicator light / ON or OFF	ON: Slip indicator light ON OFF: Slip indicator light OFF	-
D-HILL LIGHT*9	Downhill assist control indicator light / ON or OFF	ON: Downhill assist control switch ON OFF: Downhill assist control switch OFF	-
AUTO LSD LAMP*10	AUTO LSD indicator light / ON or OFF	ON: Traction control switch ON OFF: Traction control switch OFF	-
BUZZER	Skid control buzzer / ON or OFF	ON: Buzzer ON OFF: Buzzer OFF	-
STOP LAMP SW	Stop light switch / ON or OFF	ON: Brake pedal depressed OFF: Brake pedal released	-
PARKING BRAKE SW	Parking brake switch / ON or OFF	ON: Parking brake applied OFF: Parking brake released	-
BRK PEDAL SW	Brake pedal load sensing switch / ON or OFF	ON: Brake pedal depressed beyond the specified point OFF: Brake pedal not depressed beyond the specified point	-
IDLE SW	Main idle switch / ON or OFF	ON: Accelerator pedal released OFF: Accelerator pedal depressed	-
DAC SW*9	Downhill assist control switch / ON or OFF	ON: Downhill assist control switch ON ON: Downhill assist control switch ON	-
AUTO LSD SW*10	AUTO LSD switch / ON or OFF	ON: AUTO LSD switch ON ON: AUTO LSD switch ON	-
GEAR POSITION	Gear position information / P/N, R, 1st-6th, FAIL, NOT R	-	-
LEVER POSITION	Shift lever position information / P/N, R, D/M, 1st-6th/B, FAIL	-	-
SHIFT INFO	Shift information / ON or OFF	ON: During gear change	-
MAS CYL PRESS 1	Master cylinder pressure sensor 1 reading / min.: 0 V, max.: 5 V	When brake pedal released: 0.3 to 0.9 V	Reading increases when brake pedal depressed
ZERO M/C SEN	Memorized zero point value of master cylinder pressure sensor / min.: -12.5 MPa, max.: 12.4 MPa	Min.: -12.5 MPa Max.: 12.4 MPa	-

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
DECELERAT SEN	Deceleration sensor 1 reading / min.: -18.52 m/s ² , max.: 18.39 m/s ²	Min.: -18.52 m/s ² Max.: 18.39 m/s ²	-
ZERO DECELERAT	Memorized zero point value of deceleration sensor 1 / min.: -25.11 m/s ² , max.: 24.91 m/s ²	Min.: -25.11 m/s ² Max.: 24.91 m/s ²	-
DECELERAT SEN 2	Deceleration sensor 2 reading / min.: -18.52 m/s ² , max.: 18.39 m/s ²	Min.: -18.52 m/s ² Max.: 18.39 m/s ²	-
ZERO DECELERAT 2	Memorized zero point value of deceleration sensor 2 / min.: -25.11 m/s ² , max.: 24.91 m/s ²	Min.: -25.11 m/s ² Max.: 24.91 m/s ²	-
YAW RATE SENS 1	Yaw rate sensor 1 reading / min.: -128 deg/s, max.: 127 deg/s	Min.: -128 deg/s Max.: 127 deg/s	-
YAW RATE SENS 2	Yaw rate sensor 2 reading / min.: -128 deg/s, max.: 127 deg/s	Min.: -128 deg/s Max.: 127 deg/s	-
ZERO YAW RATE	Memorized zero point value of yaw rate sensor 1 / min.: -128 deg/s, max.: 127 deg/s	Min.: -128 deg/s Max.: 127 deg/s	-
STEERING SEN	Steering sensor reading / min.: -3276.8 deg, max.: 3276.7 deg	Left turn: Increase Right turn: Decrease	-
ZERO STEERING	Memorized zero point value of steering sensor / min.: -3276.8 deg, max.: 3276.7 deg	Min.: -3276.8 deg Max.: 3276.7 deg	-
LATERAL G	Lateral G / min.: -25.11 m/s ² , max.: 24.91 m/s ²	Min.: -25.11 m/s ² Max.: 24.91 m/s ²	-
FORWARD&REA G	Forward and rearward G / min.: -25.11 m/s ² , max.: 24.91 m/s ²	Min.: -25.11 m/s ² Max.: 24.91 m/s ²	-
YAW RATE VALUE	Yaw rate value / min.: -128 deg/s, max.: 127 deg/s	Min.: -128 deg/s Max.: 127 deg/s	-
STEERING ANGLE	Steering angle value / min.: -3276.8 deg, max.: 3276.7 deg	Min.: -3276.8 deg Max.: 3276.7 deg	-
FR WHEEL SPD	Wheel speed sensor (FR) reading / min.: 0 km/h (0 mph), max.: 326.4 km/h (202.8 mph)	Actual wheel speed	Similar to speed indicated on speedometer
FL WHEEL SPD	Wheel speed sensor (FL) reading / min.: 0 km/h (0 mph), max.: 326.4 km/h (202.8 mph)	Actual wheel speed	Similar to speed indicated on speedometer
RR WHEEL SPD	Wheel speed sensor (RR) reading / min.: 0 km/h (0 mph), max.: 326.4 km/h (202.8 mph)	Actual wheel speed	Similar to speed indicated on speedometer
RL WHEEL SPD	Wheel speed sensor (RL) reading / min.: 0 km/h (0 mph), max.: 326.4 km/h (202.8 mph)	Actual wheel speed	Similar to speed indicated on speedometer
VEHICLE SPD	Maximum speed sensor reading / min.: 0 km/h (0 mph), max.: 326.4 km/h (202.8 mph)	Actual wheel speed	Similar to speed indicated on speedometer
FR WHEEL ACCEL	FR wheel acceleration / min.: -200.84 m/s ² , max.: 199.27 m/s ²	Min.: -200.84 m/s ² Max.: 199.27 m/s ²	-
FL WHEEL ACCEL	FL wheel acceleration / min.: -200.84 m/s ² , max.: 199.271 m/s ²	Min.: -200.84 m/s ² Max.: 199.27 m/s ²	-
RR WHEEL ACCEL	RR wheel acceleration / min.: -200.84 m/s ² , max.: 199.27 m/s ²	Min.: -200.84 m/s ² Max.: 199.27 m/s ²	-
RL WHEEL ACCEL	RL wheel acceleration / min.: -200.84 m/s ² , max.: 199.27 m/s ²	Min.: -200.84 m/s ² Max.: 199.27 m/s ²	-

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
FR ABS STATUS	FR wheel ABS control status / ON or OFF	ON: During control	-
FL ABS STATUS	FL wheel ABS control status / ON or OFF	ON: During control	-
RR ABS STATUS	RR wheel ABS control status / ON or OFF	ON: During control	-
RL ABS STATUS	RL wheel ABS control status / ON or OFF	ON: During control	-
RR EBD STATUS	RR wheel EBD control status / ON or OFF	ON: During control	-
RL EBD STATUS	RL wheel EBD control status / ON or OFF	ON: During control	-
BA STATUS	BA control status / ON or OFF	ON: During control	-
TRAC STATUS	TRC control status / ON or OFF	ON: During control	-
TRAC ENG STATUS	TRC engine control status / ON or OFF	ON: During control	-
TRAC BRK STATUS	TRC brake control status / ON or OFF	ON: During control	-
FR VSC STATUS	FR wheel VSC control status / ON or OFF	ON: During control	-
FL VSC STATUS	FL wheel VSC control status / ON or OFF	ON: During control	-
RR VSC STATUS	RR wheel VSC control status / ON or OFF	ON: During control	-
RL VSC STATUS	RL wheel VSC control status / ON or OFF	ON: During control	-
ENG REVOLUTIONS	Engine revolutions / min.: 0 r/min, max.: 65535 r/min	-	-
ENGINE TORQUE	Real engine torque / min.: -1024 Nm, max.: 1023 Nm	-	-
ACCELERATOR %	Percentage of accelerator pedal opening angle / min.: 0%, max.: 128%	-	-
SOL RELAY	Solenoid relay / ON or OFF	ON: Solenoid relay ON OFF: Solenoid relay OFF	-
ELECTRONICALLY CONTROLLED BRAKE SYSTEM MTR RELAY	Electronically Controlled Brake System Motor relay (VSC1 relay) / ON or OFF	ON: Motor relay ON OFF: Motor relay OFF	-
FAIL MTR RELAY	Fail-safe motor relay / ON or OFF	ON: Motor relay ON OFF: Motor relay OFF	-
SM2	TRC / VSC solenoid (SM2) / ON or OFF	ON: Operates	-
SM1	TRC / VSC solenoid (SM1) / ON or OFF	ON: Operates	-
SFRH*1	ABS solenoid (SFRH) / ON or OFF	ON: Operates OFF: Does not operate	-
SFRR*2	ABS solenoid (SFRR) / ON or OFF	ON: Operates OFF: Does not operate	-
SFLH*3	ABS solenoid (SFLH) / ON or OFF	ON: Operates OFF: Does not operate	-
SFLR*4	ABS solenoid (SFLR) / ON or OFF	ON: Operates OFF: Does not operate	-
SRRH*5	ABS solenoid (SRRH) / ON or OFF	ON: Operates OFF: Does not operate	-
SRRR*6	ABS solenoid (SRRR) / ON or OFF	ON: Operates OFF: Does not operate	-
SRLH*7	ABS solenoid (SRLH) / ON or OFF	ON: Operates OFF: Does not operate	-

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SRLR*8	ABS solenoid (SRLR) / ON or OFF	ON: Operates OFF: Does not operate	-
FR SPD OPN	FR speed sensor open detection / ERROR or NORMAL	ERROR: Momentary interruption NORMAL: Normal	-
FL SPD OPN	FL speed sensor open detection / ERROR or NORMAL	ERROR: Momentary interruption NORMAL: Normal	-
RR SPD OPN	RR speed sensor open detection / ERROR or NORMAL	ERROR: Momentary interruption NORMAL: Normal	-
RL SPD OPN	RL speed sensor open detection / ERROR or NORMAL	ERROR: Momentary interruption NORMAL: Normal	-
EFI COM OPN	EFI communication open detection / ERROR or NORMAL	ERROR: Momentary interruption NORMAL: Normal	-
YAW RATE OPN	Yaw rate sensor open detection / ERROR or NORMAL	ERROR: Momentary interruption NORMAL: Normal	-
DECELERAT OPN	Deceleration sensor open detection / ERROR or NORMAL	ERROR: Momentary interruption NORMAL: Normal	-
STEERING OPN	Steering angle sensor open detection / ERROR or NORMAL	ERROR: Momentary interruption NORMAL: Normal	-
M/C OPN	Master cylinder pressure sensor open detection / ERROR or NORMAL	ERROR: Momentary interruption NORMAL: Normal	-
#DTC	Number of recorded DTCs/ min.: 0, max.: 255	Min.: 0 Max.: 255	-
INSPECTION MODE	Inspection mode / OTHER or INSPECT	-	-
#IG ON2	Number of ignition switch ON operations after entering the inspection mode / min.: 0, max.: 255	-	-

HINT:

- *1: SFRH (S: Solenoid, F: Front, R: Right, H: Holding)
- *2: SFRR (S: Solenoid, F: Front, R: Right, R: Reduction)
- *3: SFLH (S: Solenoid, F: Front, L: Left, H: Holding)
- *4: SFLR (S: Solenoid, F: Front, L: Left, R: Reduction)
- *5: SRRH (S: Solenoid, R: Rear, R: Right, H: Holding)
- *6: SRRR (S: Solenoid, R: Rear, R: Right, R: Reduction)
- *7: SRLH (S: Solenoid, R: Rear, L: Left, H: Holding)
- *8: SRLR (S: Solenoid, R: Rear, L: Left, R: Reduction)
- *9: w/ Downhill assist control
- *10: for 2WD (w/ AUTO LSD)

2. PARFORM ACTIVE TEST

HINT:

Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time. The DATA LIST can be displayed during the ACTIVE TEST.

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the intelligent tester on.
- (d) Perform the ACTIVE TEST according to the display on the tester.

HINT:

- The ignition switch must be turned ON to proceed to the ACTIVE TEST using the intelligent tester.
- The ACTIVE TESTs of the ABS solenoid, ABS motor relay, ABS warning light and BRAKE warning light are available when the vehicle is stopped.
- The motors stop automatically after 5 seconds of activation to prevent them from being damaged. When the motors are driven repeatedly, certain intervals are required.
- Each solenoid stops automatically after 2 seconds of activation to prevent them from being damaged, and can be operated again after a certain interval.
- Do not depress the brake pedal while only the pressure reduction solenoid valves are on.
- Do not drive 2 or more solenoids simultaneously except to operate the pressure holding solenoid valves and pressure reduction solenoid valves of each wheel.

Skid control ECU

Tester Display	Test Part	Control Range
ABS WARN LAMP	Turns ABS warning light ON / OFF	Observe combination meter
VSC WARN LAMP	Turns VSC warning light ON / OFF	Observe combination meter
BRAKE WARN LAMP	Turns Brake warning light ON / OFF	Observe combination meter
SLIP INDI LAMP	Turns Slip indicator light ON / OFF	Observe combination meter
D-HILL LIGHT*1	Turns downhill assist control indicator light ON / OFF	Observe combination meter
AUTO LSD LAMP*2	Turns AUTO LSD indicator light ON / OFF	Observe combination meter
BUZZER	Turns skid control buzzer ON / OFF	Buzzer can be heard
STP LAMP RELAY	Turns stop light relay (BRK relay) ON / OFF	Operation sound of motor can be heard
SOL RELAY	Turns ABS solenoid relay ON / OFF	-
MOTOR RELAY	Turns ABS motor relay ON / OFF	Operation sound of motor can be heard
SRLR	Turns ABS solenoid (SRLR) ON / OFF	Operation sound of solenoid (clicking sound) can be heard
SRLH	Turns ABS solenoid (SRLH) ON / OFF	Operation sound of solenoid (clicking sound) can be heard

Tester Display	Test Part	Control Range
SRRR	Turns ABS solenoid (SRRR) ON / OFF	Operation sound of solenoid (clicking sound) can be heard
SRRH	Turns ABS solenoid (SRRH) ON / OFF	Operation sound of solenoid (clicking sound) can be heard
SFLR	Turns ABS solenoid (SFLR) ON / OFF	Operation sound of solenoid (clicking sound) can be heard
SFLH	Turns ABS solenoid (SFLH) ON / OFF	Operation sound of solenoid (clicking sound) can be heard
SFRR	Turns ABS solenoid (SFRR) ON / OFF	Operation sound of solenoid (clicking sound) can be heard
SFRH	Turns ABS solenoid (SFRH) ON / OFF	Operation sound of solenoid (clicking sound) can be heard
SMR	Turns VSC / TRC solenoid (SMR) ON / OFF	Operation sound of solenoid (clicking sound) can be heard
SMF	Turns VSC / TRC solenoid (SMF (BA-SOL)) ON / OFF	Operation sound of solenoid (clicking sound) can be heard

HINT:

*1: w/ Downhill assist control

*2: for 2WD (w/ AUTO LSD)