

BODY ELECTRICAL

MULTIPLEX COMMUNICATION

■ DESCRIPTION

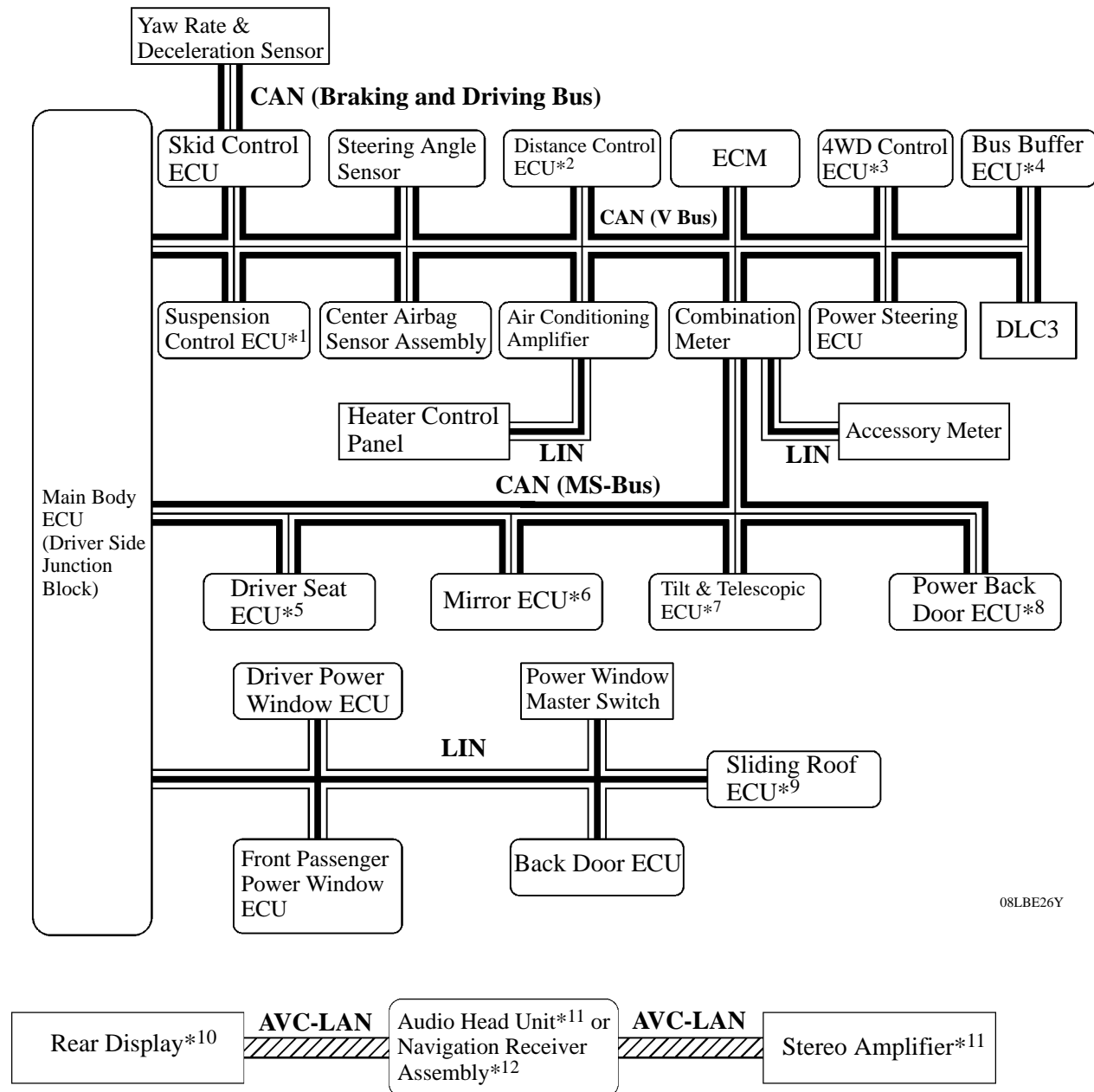
The multiplex communication system uses the 3 communication protocols (CAN, LIN, and AVC-LAN) to achieve a streamlined wiring harness configuration.

- CAN (Controller Area Network) is classified into two types according to communication speed. The HS-CAN (High Speed CAN) is used for the power train, chassis and body electrical systems, and the MS-CAN (Medium Speed CAN) is used for the body electrical system.
- LIN (Local Interconnect Network) is used for local area networking, of which the system has a respective bus for each body electrical system.
- AVC-LAN (Audio Visual Communication – Local Area Network) is used for communication only between the AV (Audio Visual) system components.
- HS-CAN consists of a V bus and a braking and driving bus, and MS-CAN consists of an MS bus. The main body ECU with gateway function is used to transmit data between the buses.
- Due to the introduction of the CAN communication system for the power train, chassis and body electrical systems, the BEAN (Body Electronics Area Network) that is used for the body electrical system on other vehicles is not used on this model.
- A customized body electronics system is used, enabling some of the control functions of the ECUs comprising the CAN to be set using a Techstream. For details, see page BE-17.

- *A bit is the basic unit of communication that is used to represent the information. A bit is represented by binary values of “0” or “1”.*
- *For CAN communication, a differential voltage drive is used to represent the binary values of “0” or “1”. This “differential voltage drive” reduces the effects of electrical interference.*

Differential Voltage Drive

■ SYSTEM DIAGRAM



- *1: Models with Rear Air Suspension System
- *2: Models with Dynamic Laser Cruise Control System
- *3: 4WD Models
- *4: Optional Equipment
- *5: Models with Power Seat System
- *6: Models with Memory System
- *7: Models with Power Tilt and Telescopic Steering Column
- *8: Models with Power Back Door System
- *9: Models with Sliding Roof System
- *10: Models with RSES
- *11: Models with JBL branded premium audio system
- *12: Models with Navigation with AV System

■ DIFFERENCES BETWEEN CAN, LIN, AVC-LAN AND BEAN

General

- The protocols, which are the rules for establishing data communication, differ between the CAN, LIN, AVC-LAN, and BEAN. If the ECUs in the networks use different frameworks for their data, such as communication speed, communication wire, and signals, they will be unable to understand each other. Therefore, protocols (rules) must be established among them.
- Compared to the LIN, AVC-LAN and BEAN, the CAN features high-speed data transmission. Therefore, the CAN is able to transmit larger amounts of data faster than other protocols. This feature makes it possible to transmit data accurately in the power train and chassis control system, which requires large amounts of data to be transmitted in short periods of time.

Protocol	CAN (ISO Standard)	LIN (LIN Consortium)	AVC-LAN (TOYOTA Original)	BEAN (TOYOTA Original)
Communication Speed	500 kbps*/ HS-CAN 250 kbps*/ MS-CAN (Max. 1 Mbps)	Max. 20 kbps*	Max. 17.8 kbps*/ AVC-LAN 7.5 Mbps*/ AVC-LAN plus	Max. 10 kbps*
Communication Wire	Twisted-pair Wire	AV Single Wire	Twisted-pair Wire	AV Single Wire
Drive Type	Differential Voltage Drive	Single Wire Voltage Drive	Differential Voltage Drive	Single Wire Voltage Drive
Data Length	1-8 Byte(s) (Variable)	2, 4, 8 Bytes (Variable)	0-32 Byte(s) (Variable)	1-11 Byte(s) (Variable)

*: bps: Abbreviation for “Bits Per Second”, indicating the number of bits that can be transmitted per second.

■ CAN

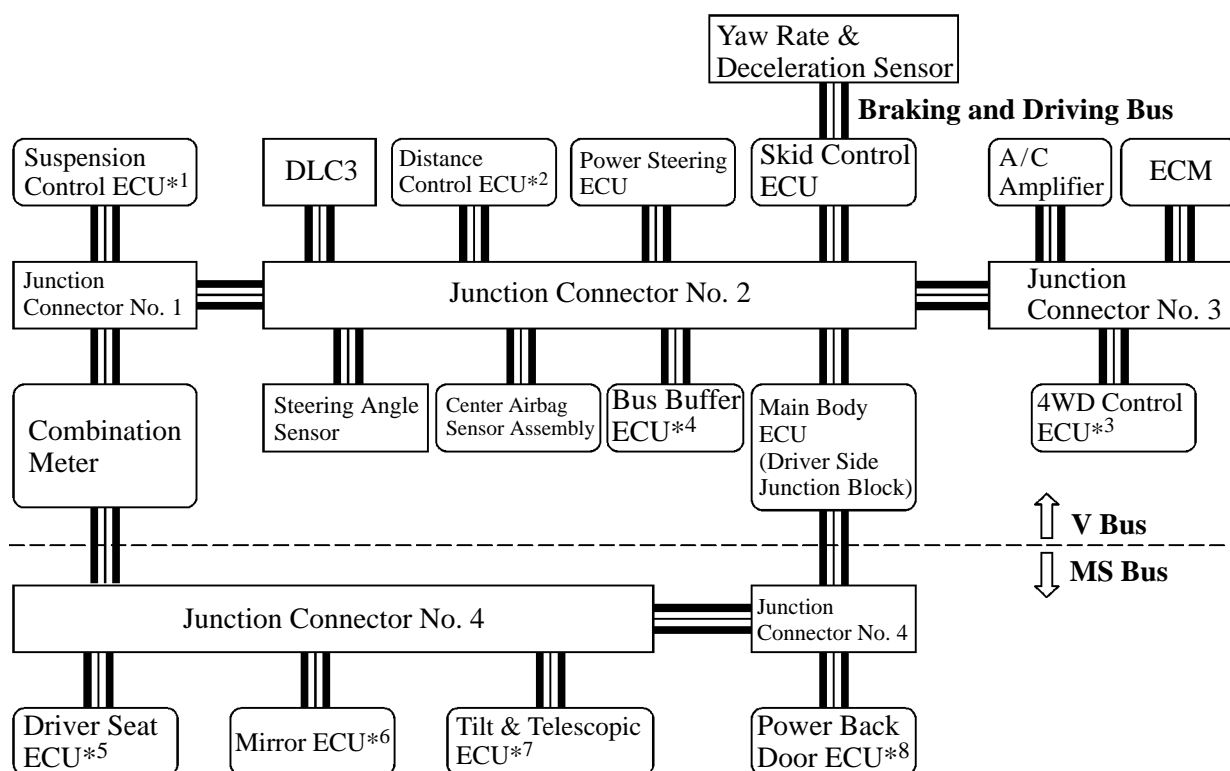
1. General

The CAN (Controller Area Network) uses two different CAN buses: V bus and braking and driving bus for high-speed communication (500 kbps) and MS bus for medium-speed communication (250 kbps).

- The CAN has terminating resistors of 120 Ω which are necessary for accurate judgment of communication on the main bus.
- The terminating resistors for the V bus are located in the ECM and the combination meter.
- The terminating resistors for the MS bus are located in the main body ECU and the combination meter.
- The combination meter is connected to MS bus only for the terminating resistor. The combination meter does not communicate using the MS bus.
- The main body ECU has a gateway function and is used to transmit data between the V bus and the MS bus.

2. Wiring Diagram

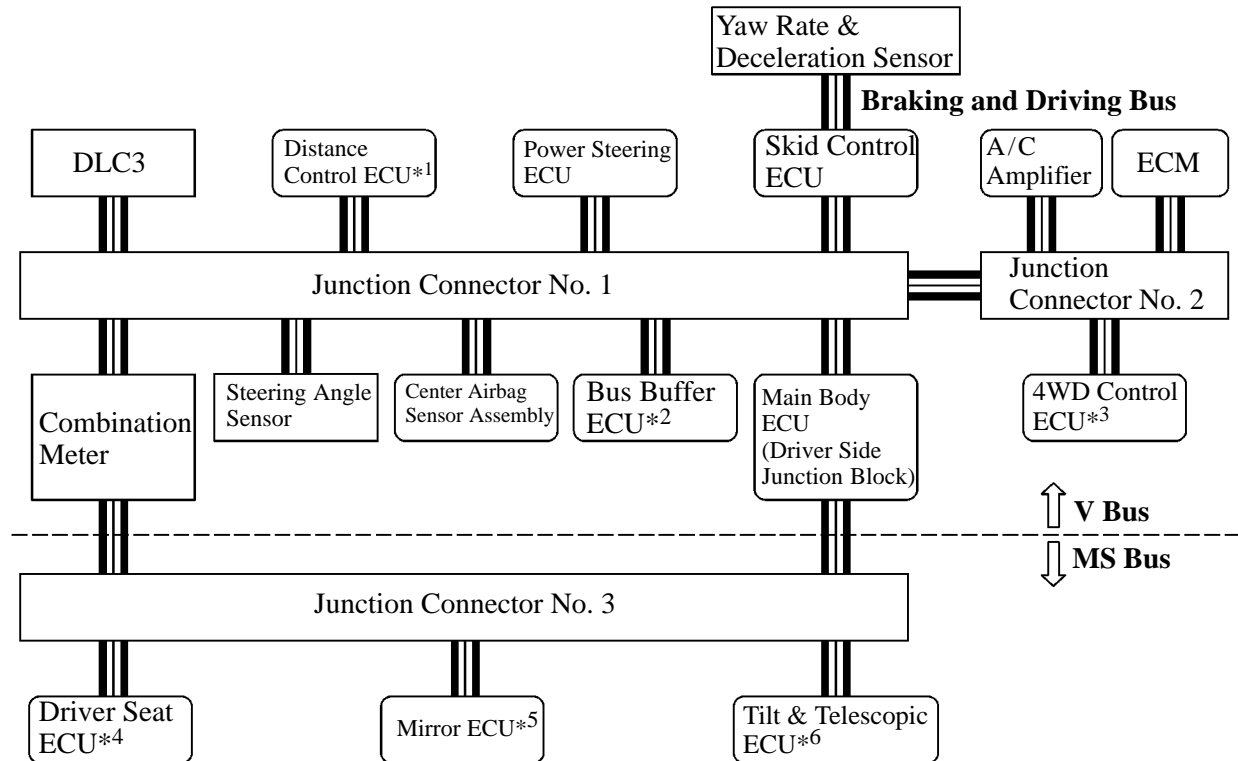
► Models with AHC and Power Back Door ◀



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- *1: Models with Rear Air Suspension System
- *2: Models with Dynamic Laser Cruise Control System
- *3: 4WD Models
- *4: Optional Equipment
- *5: Models with Power Seat System
- *6: Models with Memory System
- *7: Models with Power Tilt and Telescopic Steering Column
- *8: Models with Power Back Door System

► Models without AHC and Power Back Door ◀

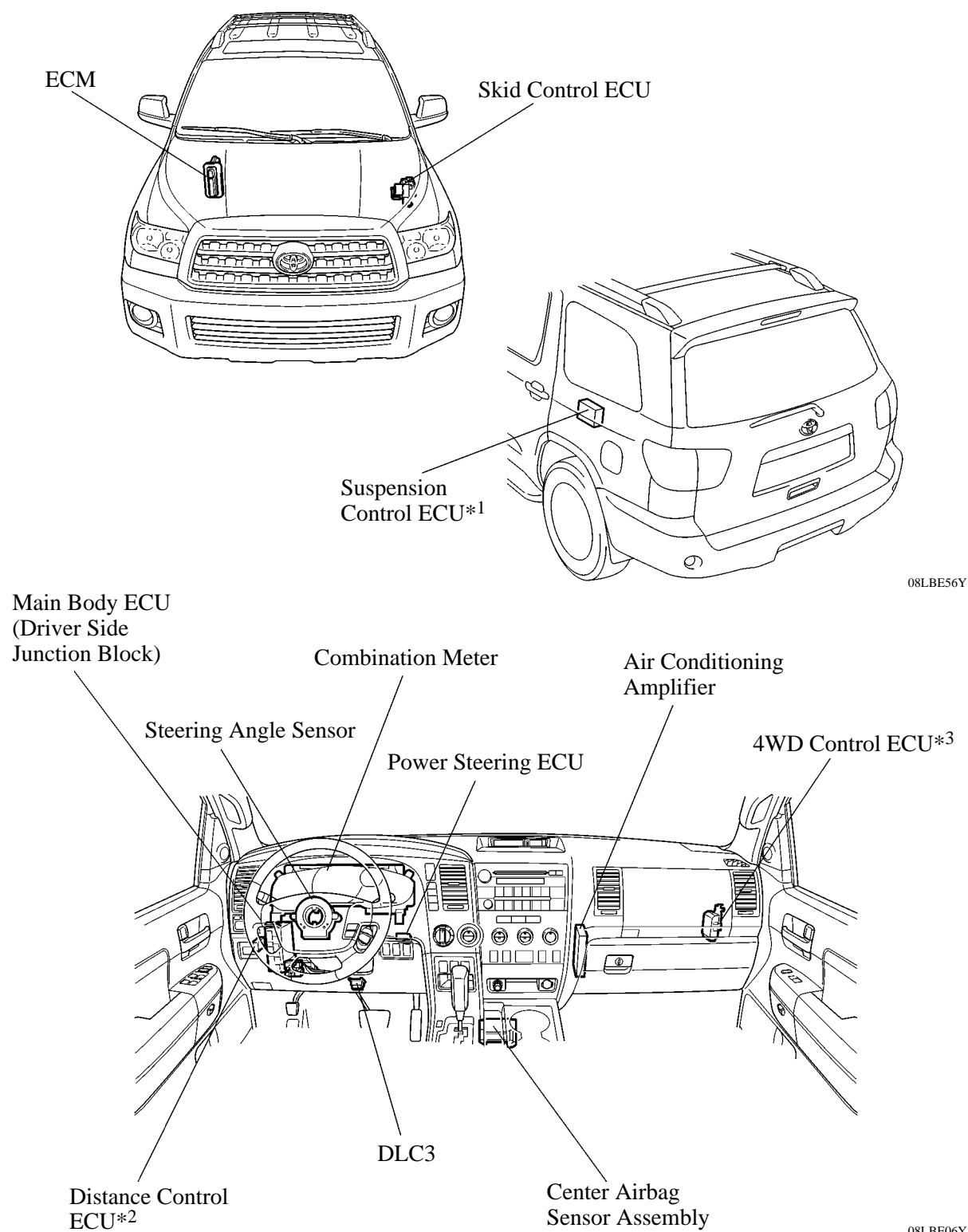


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- *1: Models with Dynamic Laser Cruise Control System
- *2: Optional Equipment
- *3: 4WD Models
- *4: Models with Power Seat System
- *5: Models with Memory System
- *6: Models with Power Tilt and Telescopic Steering Column

3. Layout of Main Components

V Bus

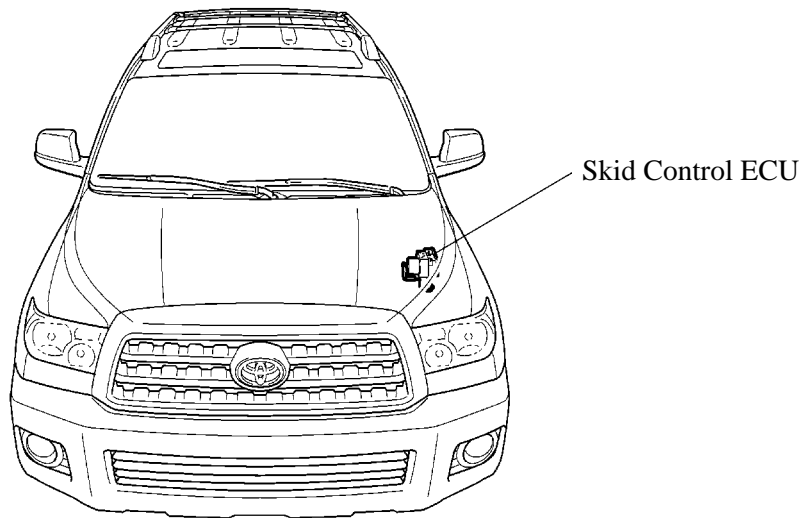


*1: Models with Rear Air Suspension System

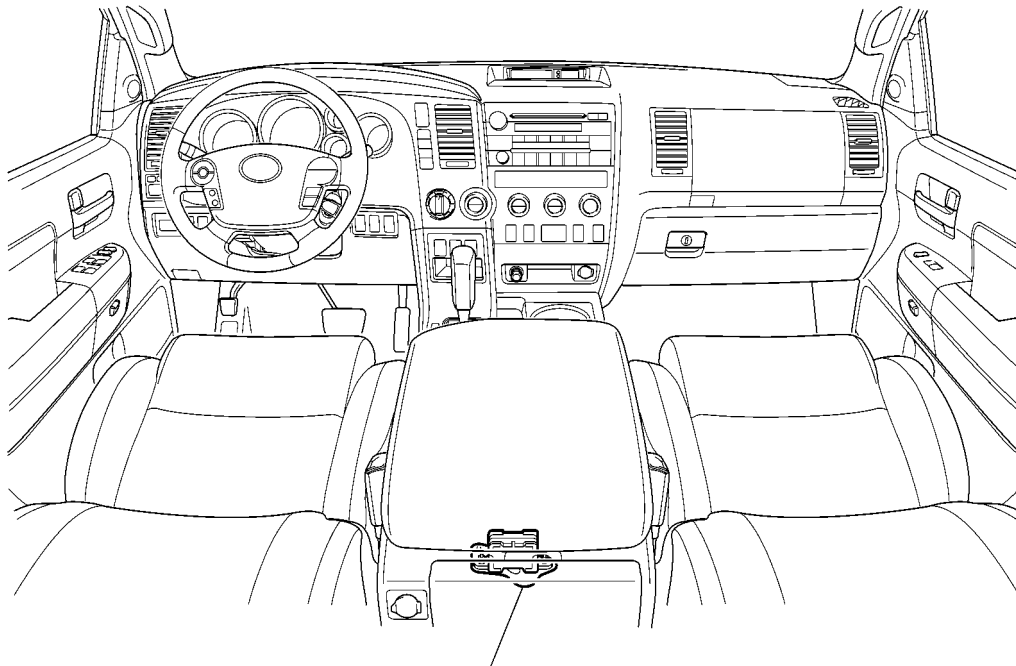
*2: Models with Dynamic Laser Cruise Control System

*3: 4WD Models

Braking and Driving Bus

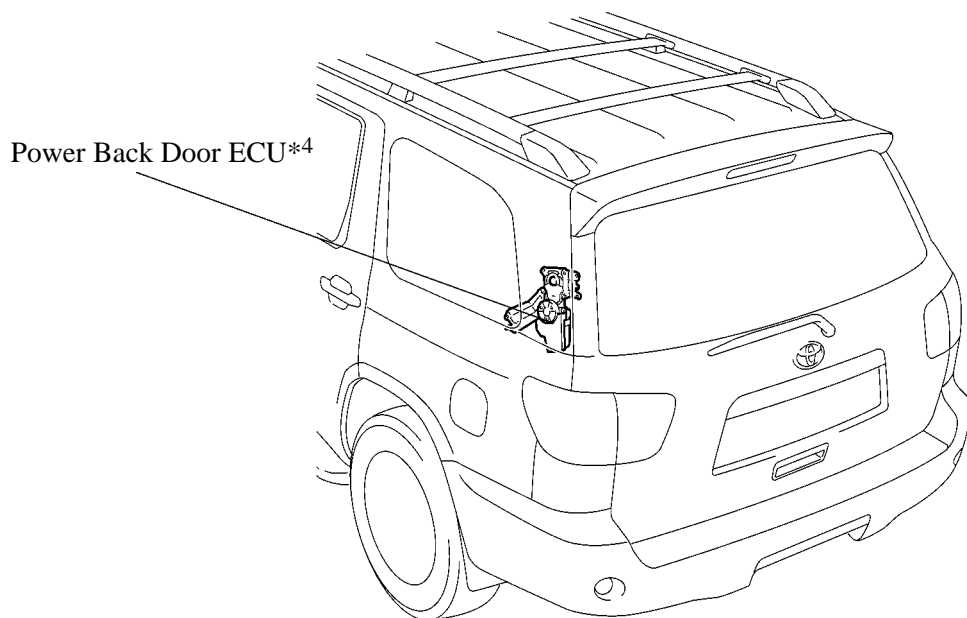
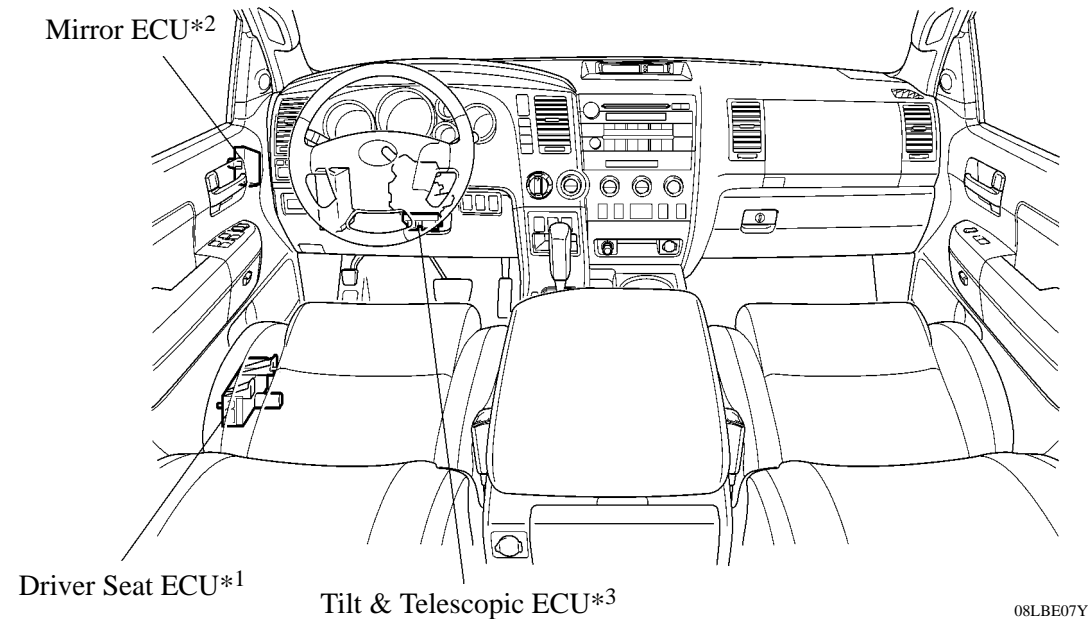


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Yaw Rate & Deceleration Sensor

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MS Bus

- *1: Models with Power Seat System
- *2: Models with Memory System
- *3: Models with Power Tilt and Telescopic Steering Column
- *4: Models with Power Back Door System

4. Diagnosis

If a malfunction occurs on the CAN communication bus, ECUs that are connected to the CAN communication bus store the DTC (Diagnostic Trouble Code) in memory.

- The 5-digit DTCs can be read after connecting a Techstream to DLC3.
- DLC3 is equipped with a CAN-H terminal and a CAN-L terminal on the V bus to allow CAN diagnosis. It is possible to determine if there is an open or short circuit in the main wires of the V bus by measuring the resistance value between these terminals.

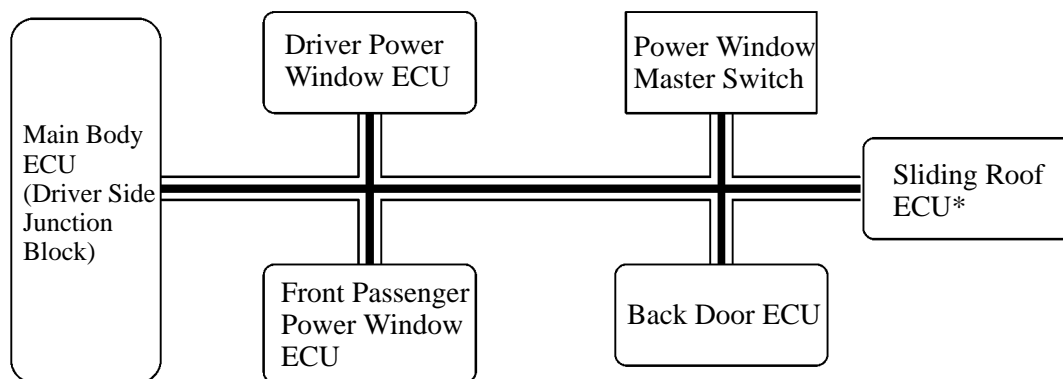
For details, see the 2008 Sequoia Repair Manual (Pub. No. RM08L0U).

■ LIN

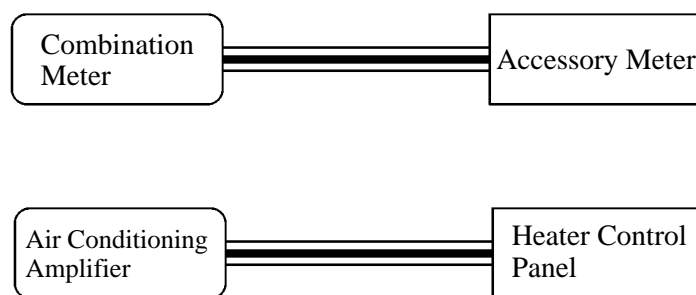
1. General

- The LIN (Local Interconnect Network) consists of bus for each system of the body electrical system, and used for communication between switches.
- The signals transmitted by the LIN can be gatewayed to the CAN through the ECUs or switches connected to the CAN.

2. System Diagram



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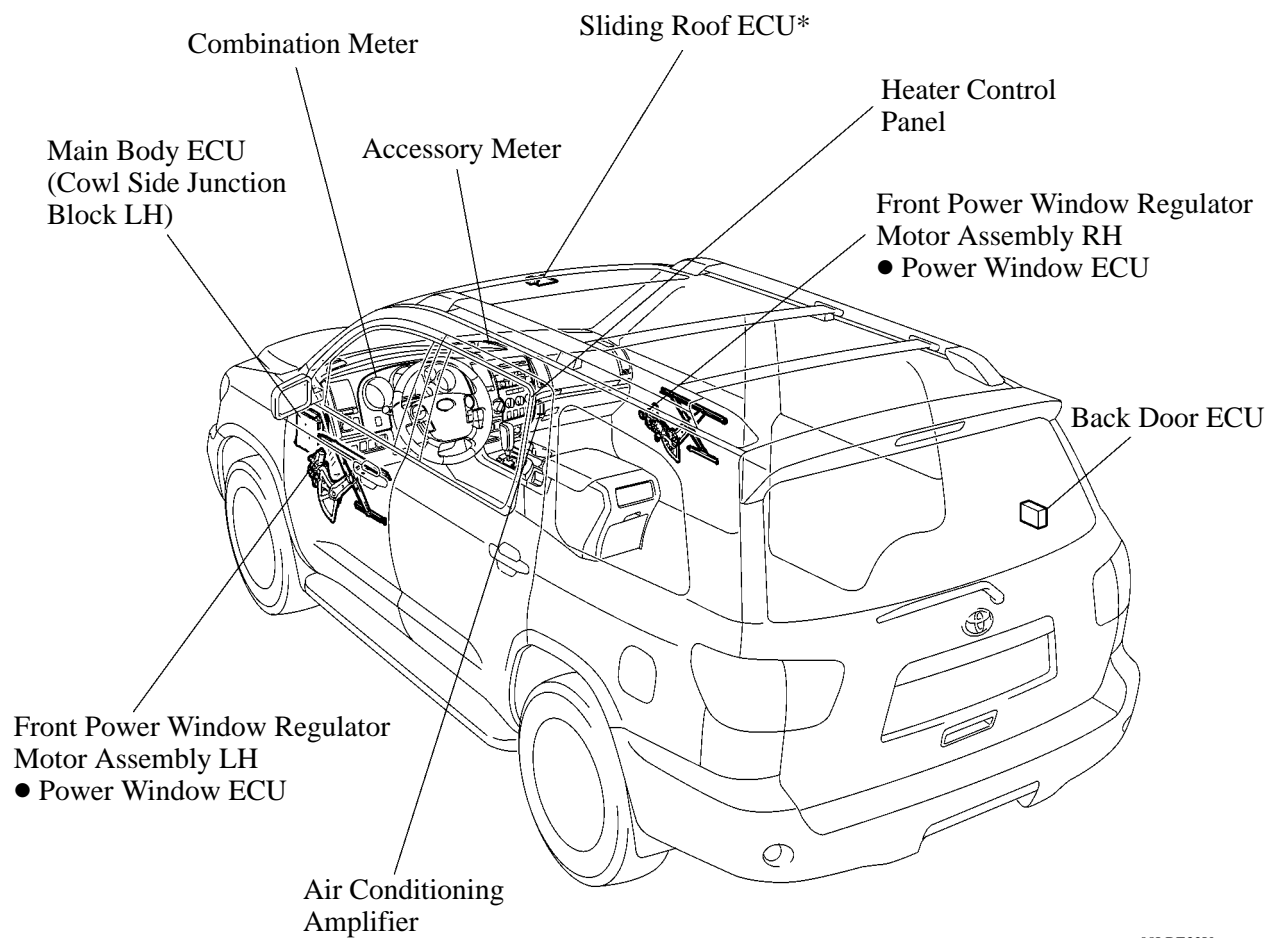


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*: Models with Sliding Roof System

3. Layout of Main Components



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*: Models with Sliding Roof System

■ AVC-LAN

1. General

The AVC-LAN is used to transmit data only between the audio head unit or navigation receiver assembly and the stereo amplifier on models with the JBL branded premium audio system.

2. System Diagram



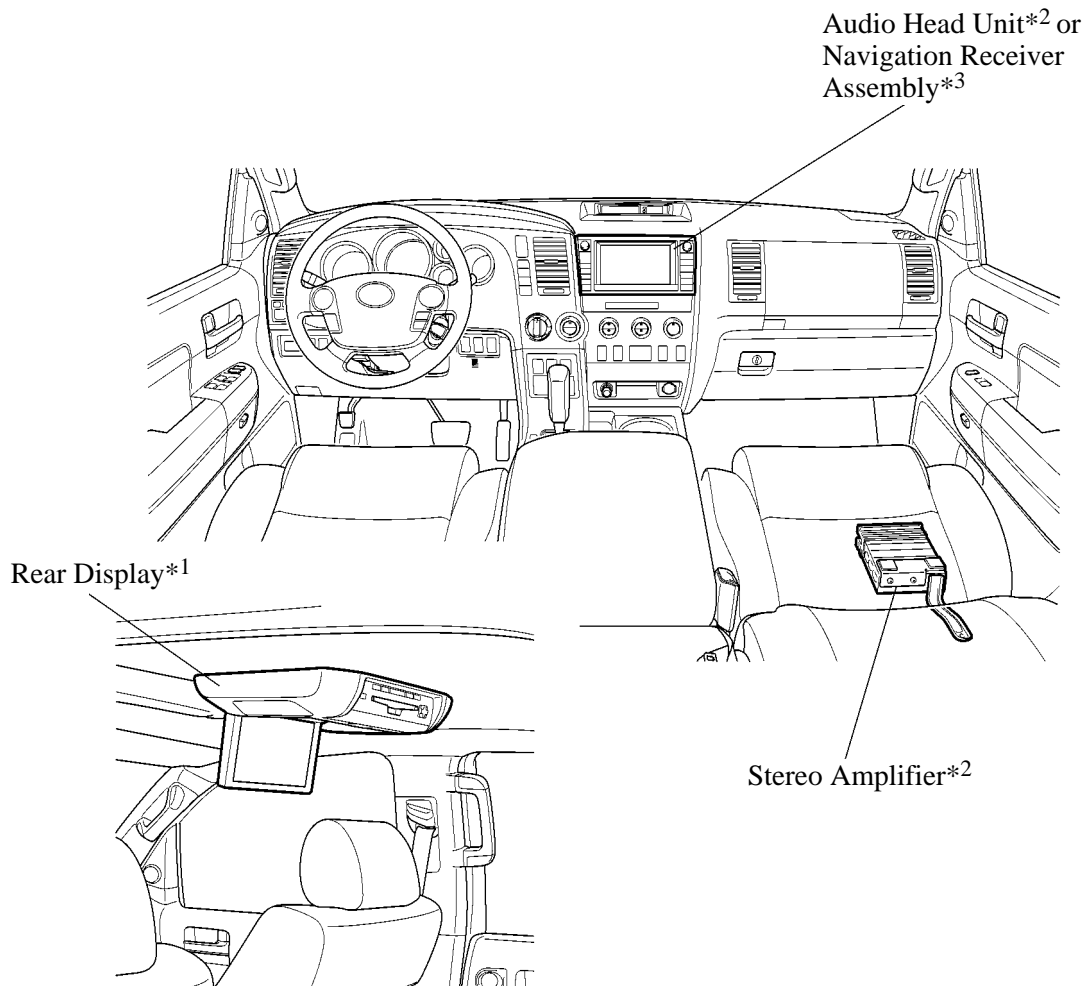
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*1: Models with RSES

*2: Models with JBL branded premium audio system

*3: Models with Navigation with AV System

3. Layout of Main Components



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*1: Models with RSES

*2: Models with JBL branded premium audio system

*3: Models with Navigation with AV System

4. Diagnosis

If a malfunction occurs in the AVC-LAN communication bus, the audio head unit stores a DTC (Diagnostic Trouble Code) in its memory.

- The DTCs of models having the navigation with AV system can be read on the diagnosis menu display on the navigation receiver assembly.
- The DTCs of models without the navigation with AV system can be read on the LCD of the audio head unit.

For details, see the 2008 Sequoia Repair Manual (Pub. No. RM08L0U).

■ CUSTOMIZED BODY ELECTRONICS FUNCTION

A Techstream can be used to customize the system settings.

System	Techstream Display Content	Contents	Default Setting	Available Setting
Lighting	Foot Light	Changes illumination duration after door closure.	30 sec	7.5 sec/ 15 sec/ 30 sec/ OFF
	Lighting Time	Changes illumination duration after door closure. (It will quickly fade out when turning ignition switch ON.)	15 sec	7.5 sec/ 15 sec/ 30 sec
	I/L ON W/Door Key Unlock	Function to light up room light when unlocking with door key cylinder. (Room light illuminated when interior light switch set to DOOR)	ON	ON/OFF
	I/L when ACC OFF	Illuminates light when ignition switch turned to ACC. (Room light illuminated when interior light switch set to DOOR)	ON	ON/OFF
	Light Auto OFF Delay	Function to continue illuminating headlight for certain period of time after closing all doors with ignition switch turned from ON to OFF under condition that light control switch is at HEAD or AUTO with the headlight ON.	30 sec	OFF/ 30 sec/ 60 sec/ 90 sec
	Sensitivity*	Function to adjust sensitivity of lighting illumination.	NORMAL	LIGHT 2/ LIGHT 1/ NORMAL/ DARK 1/ DARK 2
	Disp EX ON Sen	Changes brightness when lowering lights such as combination meter indicator light, A/C indicator light, and clock light	NORMAL	LIGHT 2/ LIGHT 1/ NORMAL/ DARK 1/ DARK 2
	Disp EX OFF Sen	Changes brightness when canceling lowering lights such as combination meter indicator light, A/C indicator light, and clock light.	NORMAL	LIGHT 2/ LIGHT 1/ NORMAL/ DARK 1/ DARK 2
Meter	Key Remind Volume	To change volume of key reminder buzzer.	LARGE	LARGE/ MEDIUM/ SMALL
	Key Remind Sound	To change frequency of key reminder buzzer.	SLOW	NORMAL/ FAST/ SLOW
	Driver Side Seatbelt Warning Buzzer	To change setting of driver side seat belt warning buzzer.	ON	ON/OFF
	Front Passenger Side Seatbelt Warning Buzzer	To change setting of front passenger side seat belt warning buzzer.	ON	ON/OFF

*: The sensitivity adjustment may be difficult to confirm. Check by driving the customer's vehicle.

(Continued)

System	Techstream Display Content	Contents	Default Setting	Available Setting
A/C	Set Temperature Shift	Function to control the shifted temperature in relation to the displayed temperature.	NORMAL	+2°C/ +1°C/ NORMAL/ -1°C/ -2°C
	Air Inlet Mode	In case of turning the A/C ON to cool down the cabin quickly, this is the function to change the mode automatically to RECIRCULATION mode.	AUTO	MANUAL/ AUTO
	Compressor Mode	Function to turn the A/C ON automatically by pressing the AUTO button when the blower is ON and the A/C is OFF.	AUTO	MANUAL/ AUTO
	Compressor/Air Inlet DEF Operation	Function to turn the A/C ON automatically linked with the FRONT DEF button when A/C is OFF.	LINK	NORMAL/ LINK
	Foot/DEF Auto Mode	Function to turn the airflow from FOOT/DEF ON automatically when AUTO MODE is ON.	ON	ON/OFF
	Foot/DEF Automatic Blow Up Function	Function to change the blower level automatically when the defroster is ON.	ON	ON/OFF
	Ambient Temperature Shift	Function to control the shifted ambient temperature in relation to the displayed ambient temperature.	NORMAL	+3°C/ +2°C/ +1°C/ NORMAL/ -1°C/ -2°C/ -3°C
Wiper	Linked Rear Wiper Washer	Function to make the rear wiper run automatically after the washer function is used.	ON	ON/OFF
	Rewipe Function	Function to make the rear wiper run once automatically a certain amount of time after the washer function is completed, to prevent the dripping of washing fluid.	ON	ON/OFF
Door Lock	Unlock Key Twice	Function that unlocks only driver side door when driver side door key cylinder is turned to UNLOCK once, and unlock all doors when it is turned to UNLOCK twice. For OFF setting, turning it once unlocks all doors.	ON	ON/OFF
	Auto Lock	Function that locks all doors when vehicle speed reaches a certain level.	ON	ON/OFF
	Auto Lock/Shift	Function that locks all doors when shift lever is moved to P from any other position with engine running and all doors closed.	OFF	ON/OFF
	Auto Unlock/Shift	Function that unlocks all doors when shift lever is moved to P from any other position while the ignition switch to ON.	ON	ON/OFF
	All Unlock /Open-Close	Function that unlocks all doors when opening driver door within 10 seconds after turning the ignition switch to ON.	OFF	ON/OFF

(Continued)

System	Techstream Display Content	Contents	Default Setting	Available Setting
Wireless Door Lock	Wireless Control	ON/OFF of wireless door lock function.	ON	ON/OFF
	Hazard Answer Back	When lock switch on transmitter pressed, all hazard warning lights illuminate once. When unlock switch pressed, all hazard warning lights illuminate twice.	ON	ON/OFF
	Wireless Buzzer Resp	Function that makes wireless buzzer sound for answer back when transmitter lock/unlock switch pressed.	ON	ON/OFF
	Open Door Warning	If door is not completely closed and transmitter lock switch is pressed, this function sounds a buzzer for 10 seconds.	ON	ON/OFF
	Unlock 2 Operation	Function that unlocks driver side door when unlock switch on transmitter is pressed once, and unlocks all doors when pressed twice. If setting is OFF, pressing unlock switch once makes all doors unlock.	ON	ON/OFF
	Auto Lock Time	This function controls amount of time from unlocking doors to automatic re-locking function.	60 sec	OFF/ 30 sec/ 60 sec/ 120 sec/
Power Back Door	Panic Function	This function operates the theft deterrent system when panic is pressed and held for 0.8 second or more.	ON	ON/OFF
	PBD SW Operation	Function that turns power back door closer switch ON when switch is pushed once or held down for 0.8 sec.	0.8 sec	0.8 sec/ON
	PBD Buzzer	This function makes the power back door buzzer sound when power back door is operating.	ON	ON/OFF
	Wireless PBD SW Operation	Function that operates power back door when transmitter switch is pressed in specified way.	0.8 sec	1 Oper/ 2 Oper/ 0.8 sec/ OFF/ 1 Motion

(Continued)

System	Techstream Display Content	Contents	Default Setting	Available Setting
Power Window	Door Key P/W Up	Function that raises the driver and passenger power windows when, with the ignition switch off, a key is used to hold the driver door key cylinder to the lock position for more than 2.3 seconds.	ON	ON/OFF
	Door Key P/W Down	Function that lowers the driver and passenger power windows when, with the ignition switch off, a key is used to hold the driver door key cylinder to the unlock position for more than 2.3 seconds.	ON	ON/OFF
	Door Key Linked Back P/W Up	Function that raises the back door power window when, with the ignition switch off, a key is used to hold the driver door key cylinder to the lock position for more than 0.7 seconds.	ON	ON/OFF
	Door Key Linked Back P/W Down	Function that lowers the back door power window when, with the ignition switch off, a key is used to hold the driver door key cylinder to the unlock position for more than 0.7 seconds.	ON	ON/OFF
Theft Deterrent	Warning by Glass Breakage Sensor*	Function that turns the glass breakage sensor ON/OFF. This function is only effective for vehicles with glass breakage sensor.	ON	ON/OFF
	Warning by Horn	Function that allows the vehicle horn and theft deterrent horn to be used as warning devices.	ON	ON/OFF
	Passive Mode (Security system)	PASSIVE MODE is the function used to set the theft deterrent system automatically 30 seconds after closing the driver's door when the door was opened after removing the key from the key cylinder.	OFF	ON/OFF
	Entry Delay	Function that changes entry delay time (time before warning starts) for passive mode.	14 sec	0 sec/ 14 sec/ 30 sec/
Tilt & Telescopic	Autoaway/Return Function	ON/OFF of the auto away/return function.	ON	ON/OFF
Sliding Roof	Door Key Related Operation	Function to select either tilt up or slide open for the manual sliding roof operation linked with power window, which is activated by holding the driver door key in the unlock position for 3 seconds or more when the ignition switch is off.	SLIDE	TILT/ SLIDE
	Door Key Related Open	Function to manually open the sliding roof linked with power window by holding the driver door key in the unlock position for 3 seconds or more when the ignition switch is off.	ON	ON/OFF
	Door Key Related Close	Function to manually close the sliding roof linked with power window by holding the driver door key in the lock position for 3 seconds or more when ignition switch is off.	ON	ON/OFF

*: Models with Glass Breakage Sensor