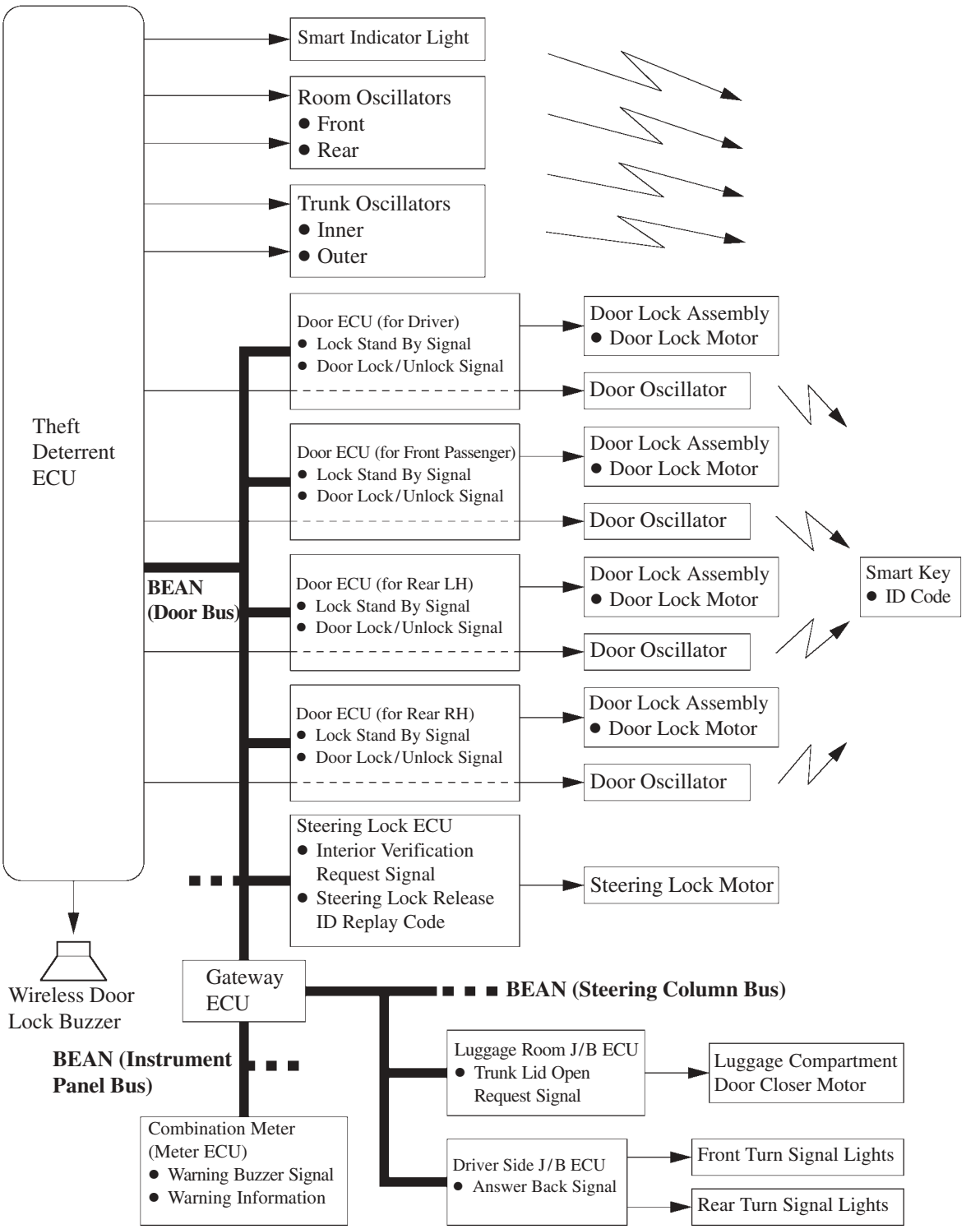
5. System Function

General

The smart key system has the following functions.

Function	Outline
Mechanical Key	The operation is same as mechanical key.
Wireless Door Lock Remote Control	This function is a convenient system for locking and unlocking all the doors or trunk, at a distance. The operation is same as wireless door lock remote control system.
Smart Unlock [See page 164]	When a smart key is located in the detection area of the vehicle exterior, the door will unlock with the touch of an outside door handle.
Smart Unlock Mode Switching [See page 165]	Switches the doors that can be unlocked with the smart unlock function in three modes. ● Individual Door Mode ● One Side Door Mode ● All Door Mode
Smart Lock [See page 166]	When a smart key is located in the detection area of the vehicle exterior and the ignition switch is OFF, the door will be locked by merely pressing the lock switch on the outside door handle.
Smart Ignition [See page 167]	When a smart key is located in the detection area of the vehicle interior, this function cancels the steering lock and the engine immobilizer, and the engine can be started by merely turning the ignition switch.
Smart Trunk Open [See page 167]	When a smart key is in the detection area of the vehicle exterior, the trunk opens by merely pressing the smart trunk open switch.
Smart Key Confine Prevention Inside Luggage Compartment [See page 168]	If the smart key is confined inside the luggage compartment, a warning will be issued, and the trunk can be opened with the smart trunk open switch.
Smart Memory Call [See page 169]	This function operates the memory system in accordance with key ID.
Smart Illumination [See page 175]	When the shift lever is in the P position and a smart key enters the detection area of the vehicle exterior, the front foot lights and the front interior lights illuminate.
Smart Indicator Light	The smart indicator light illuminates or flashes to indicate the condition of the smart key system. ● Turn ON: When the engine switch is pushed and the vehicle interior check results are OK. (in a condition that enables smart ignition) ● Flash: When the engine switch is not pushed in the OFF position and if any door is unlocked. ● Turn OFF: Other than those described above. (As a rule, when all the doors are locked and the ignition switch is in a position other than OFF.)
Battery Saving [See page 176]	If the smart key is constantly located within the vehicle exterior door detection area, the system maintains periodic communication with smart key. Therefore, if the vehicle remains parked in that state for a long time, the smart key battery and the vehicle battery could be drained.
Warning [See page 177]	The smart key system directly operates without key operation. As a result, the following problems may occur. ● The driver is unaware that key has been taken out of the vehicle by an occupant. ● The driver exits the vehicle with its engine running. ● The driver exits the vehicle with its shift lever in a position other than “P”. To prevent these conditions, the system gives a warning to the driver.
Smart Cancel	Pressing the smart cancel switch stops all smart key functions. However, in this case, the smart key can be used to start the engine by inserting, and it also can operate the wireless door lock remote control function.

Parts Output Signals



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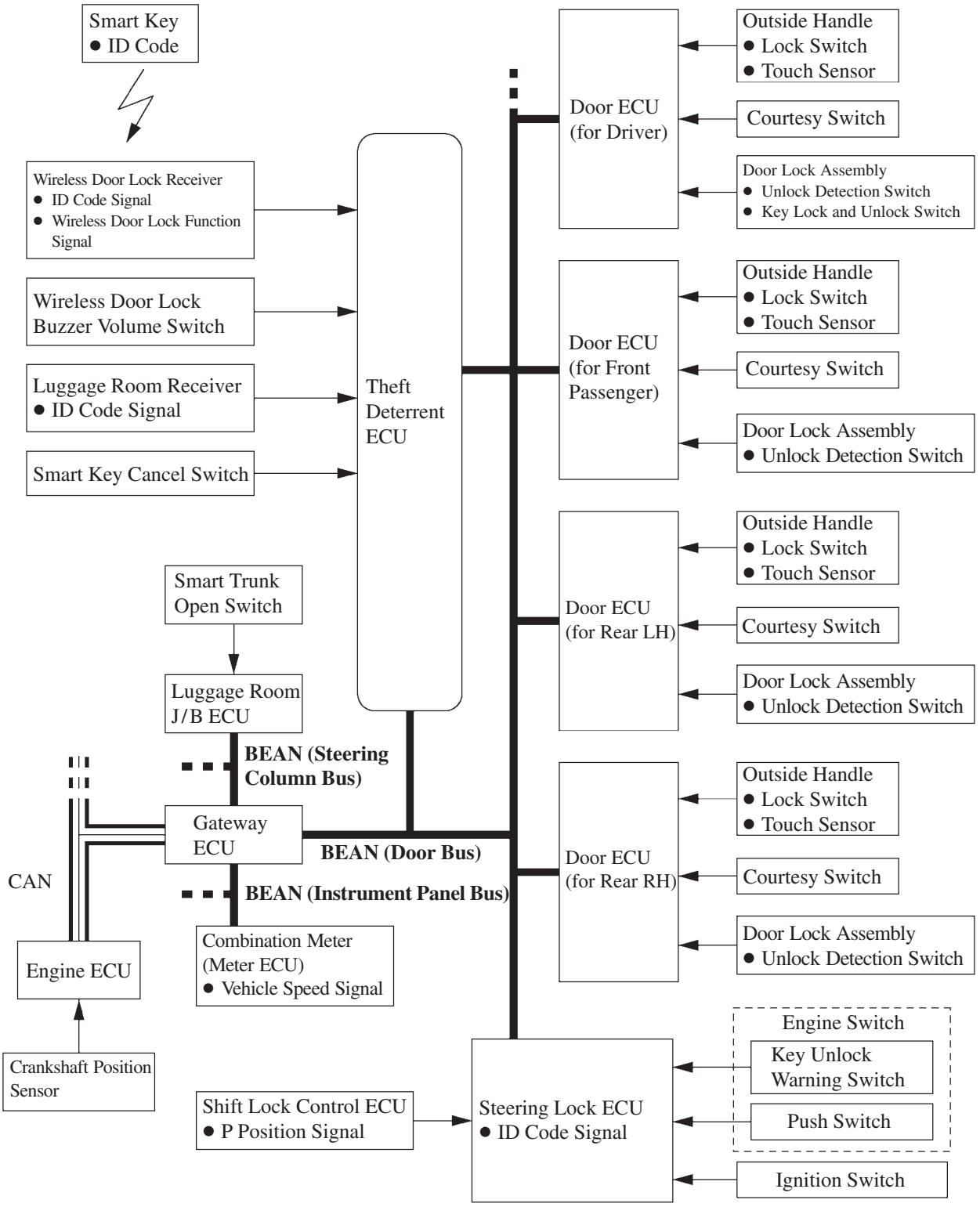
Parts Input Signals



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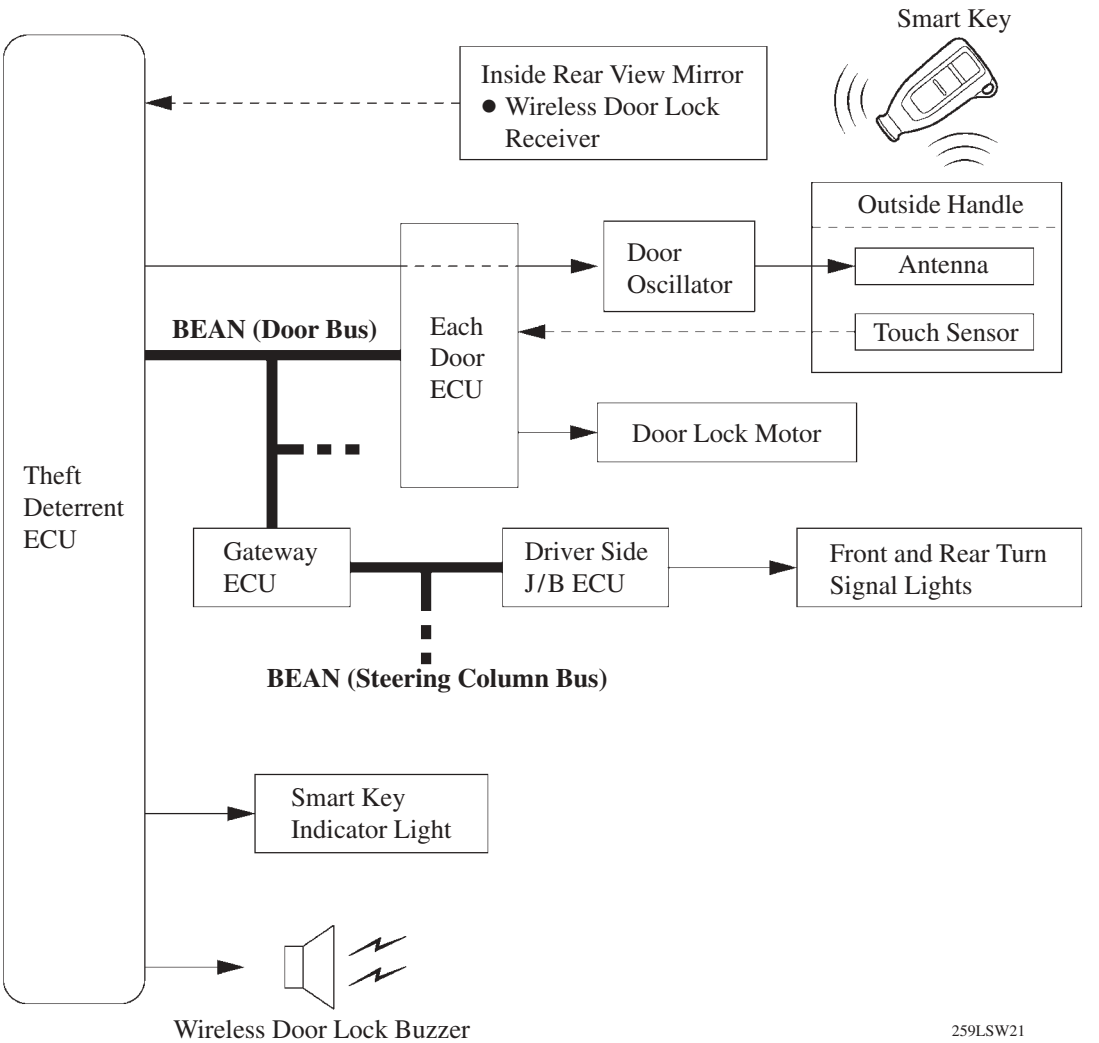
Smart Unlock Function

The smart unlock function operates as follows:

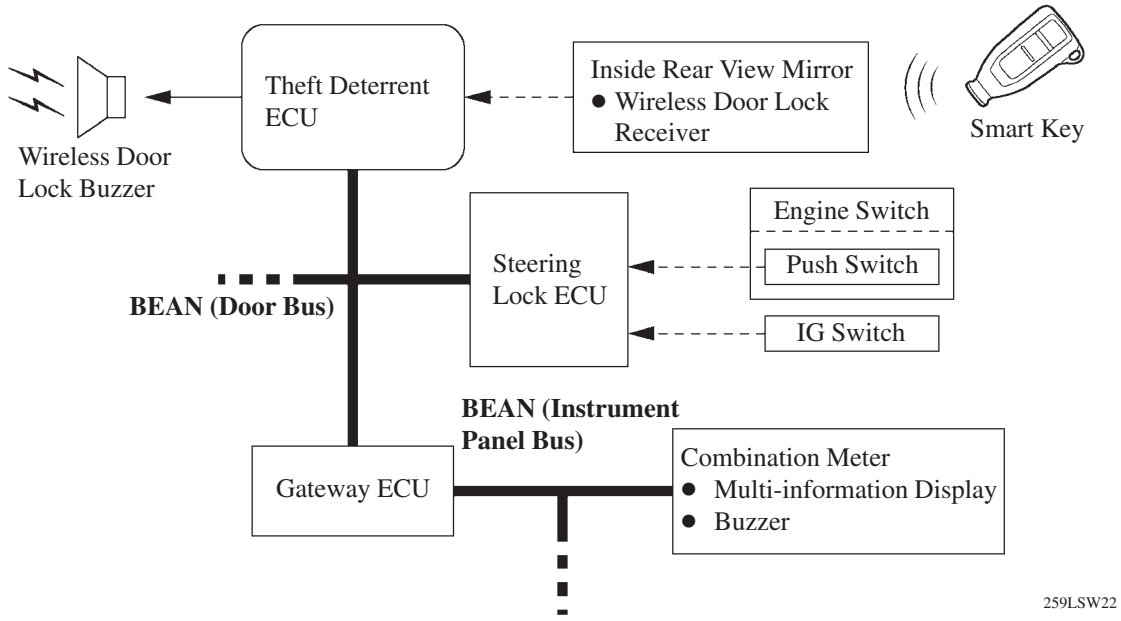
1) When a smart key enters a detection area, the theft deterrent ECU checks the ID code received by the wireless door lock receiver and verifies the position of the smart key.
2) The theft deterrent ECU transmits a door unlock standby signal to the door ECU that has verified the position of the smart key.
3) In this condition, when the user touches the touch sensor on the outside door handle, the door that corresponds to the smart unlock mode is unlocked.
4) The theft deterrent ECU informs the driver that the door has been unlocked by providing an answer back in the form of operating the front and rear turn signal lights and the wireless door lock buzzer twice and flashing the smart indicator light.

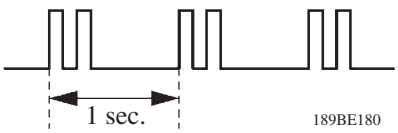
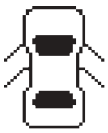


Smart Unlock Mode Switching Function

The smart unlock mode switching function operates as follows:

1) When the ignition switch is OFF position and not pushed, and the smart key's lock button and trunk button remain depressed for approximately 5 seconds.
2) The smart unlock mode can be switched as follows: all door unlock (Default) → one side unlock → individual door unlock.
3) The switching of the conditions is informed at the multi-information display, buzzer, and wireless door lock buzzer.



Mode	Wireless Door Lock Buzzer	Combination Meter	
		Multi-information Display	Buzzer
Individual Door	 189BE178	 189BE181 Displays for 5 seconds	Sounds once
One Side	 189BE179	 189BE182 Displays for 5 seconds	Sounds once
All Door (Default)	 189BE180	 189BE183 Displays for 5 seconds	Sounds once

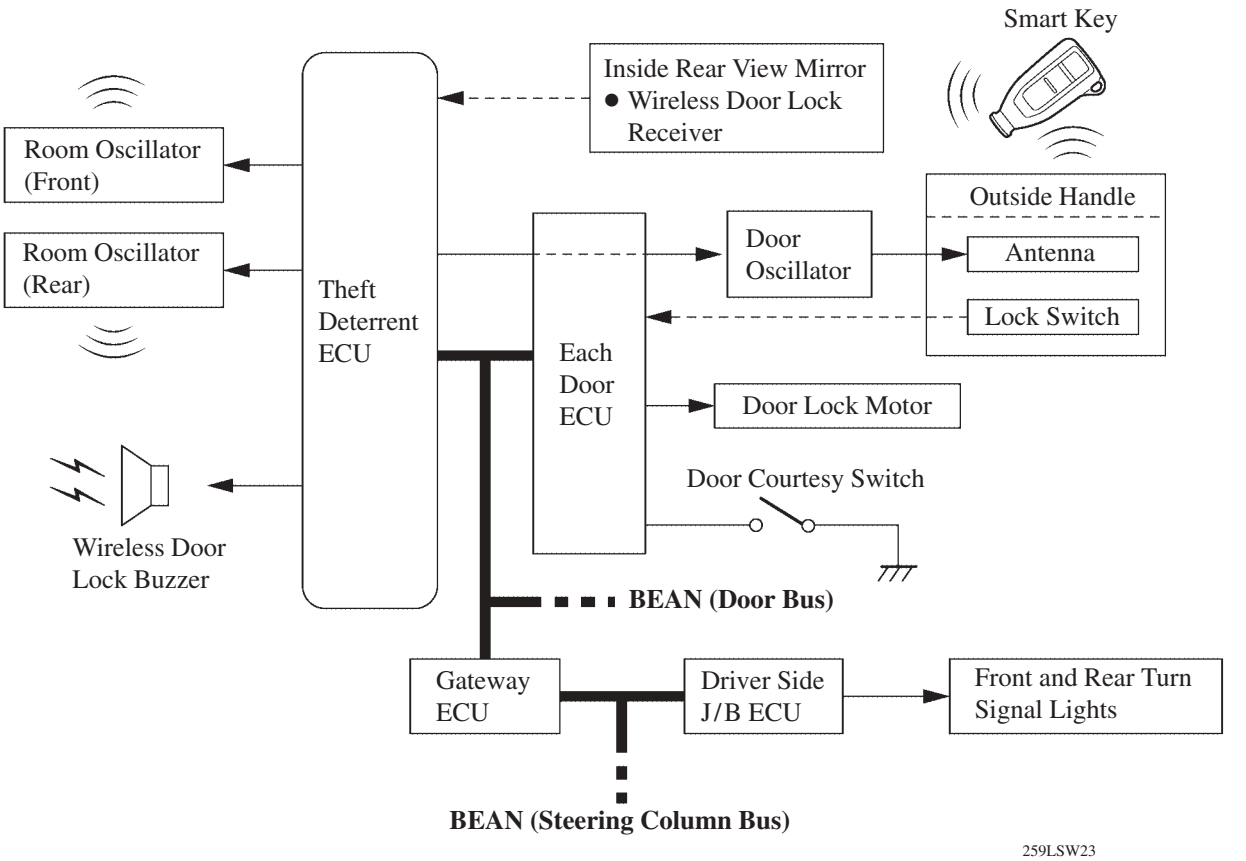
NOTE

- This function only switches the smart unlock modes of the smart function. It does not switch the unlocking of the wireless door lock remote control.
- In the individual door unlock mode, only the door that has detected the smart key becomes unlocked.
- In the one-side unlock mode, only the doors of the side on which the smart key has been detected becomes unlocked.
- In the individual door or one-side unlock mode, if smart unlock is effected, the unlock control for the doors other than those of the respective mode is stopped in order to ensure security.

Smart Lock Function

The smart lock function operates as follows:

1) When all the doors are closed, and the lock switch of the outside handle is pressed, the theft deterrent ECU outputs the door and room oscillators to transmit smart key detection signals.
2) The theft deterrent ECU detects that the smart key is not located in the vehicle interior, but outside of the vehicle.
3) Then, doors become locked.
4) The theft deterrent ECU informs the driver that the doors have been locked by providing an answer back in the form of operating the front and rear turn signal lights and the wireless door lock buzzer once.

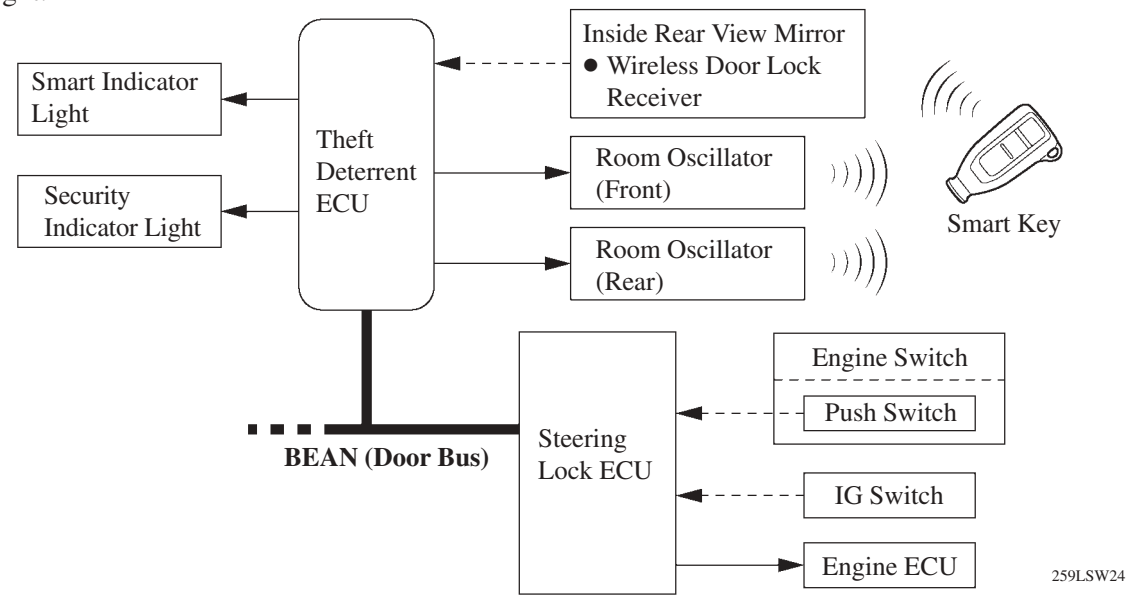


5) To enable the user to pull on the outside door handle to verify that it is locked immediately after the smart lock function has been completed, the theft deterrent ECU delays to the unlock standby condition for approximately 2.5 seconds.

Smart Ignition Function

The smart ignition function operates as follows:

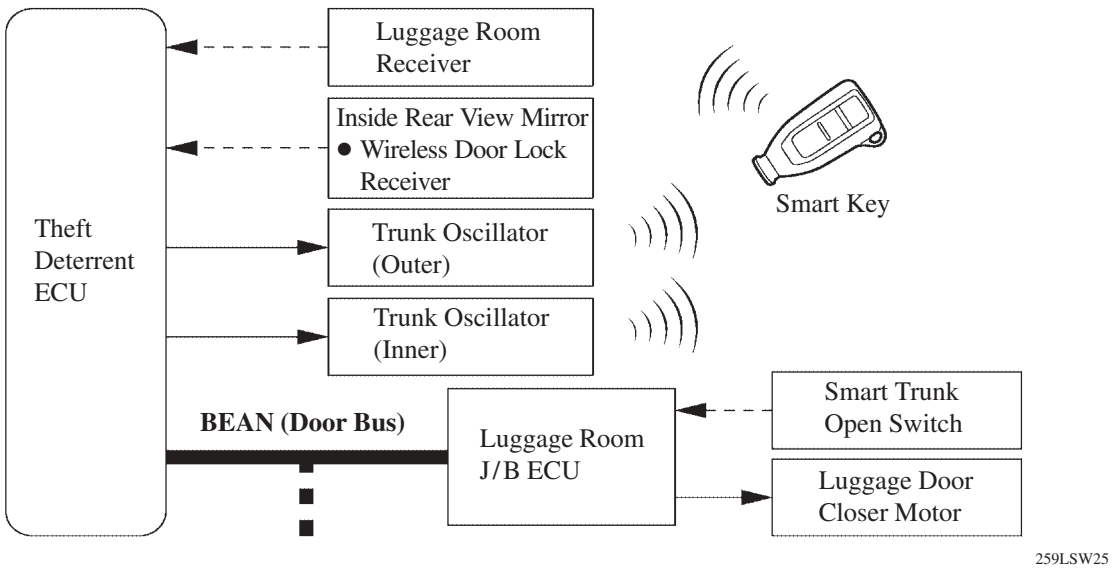
1) When the driver has a smart key and presses the engine switch, the steering lock ECU checks the ID code for the steering lock/engine immobilizer, and outputs a request signal to the theft deterrent ECU.
2) The theft deterrent ECU detects presence of the smart key in the cabin by the front and rear room oscillators in order to check its ID code.
3) The ID code checking is completed and the smart indicator light illuminates, and turns OFF the security indicator light. At this time, the steering lock ECU releases the steering lock and cancels the engine immobilizer.
4) The engine switch is turned to the ACC position, the theft deterrent ECU turns OFF the smart indicator light.



Smart Trunk Open Function

The smart trunk open function operates as follows:

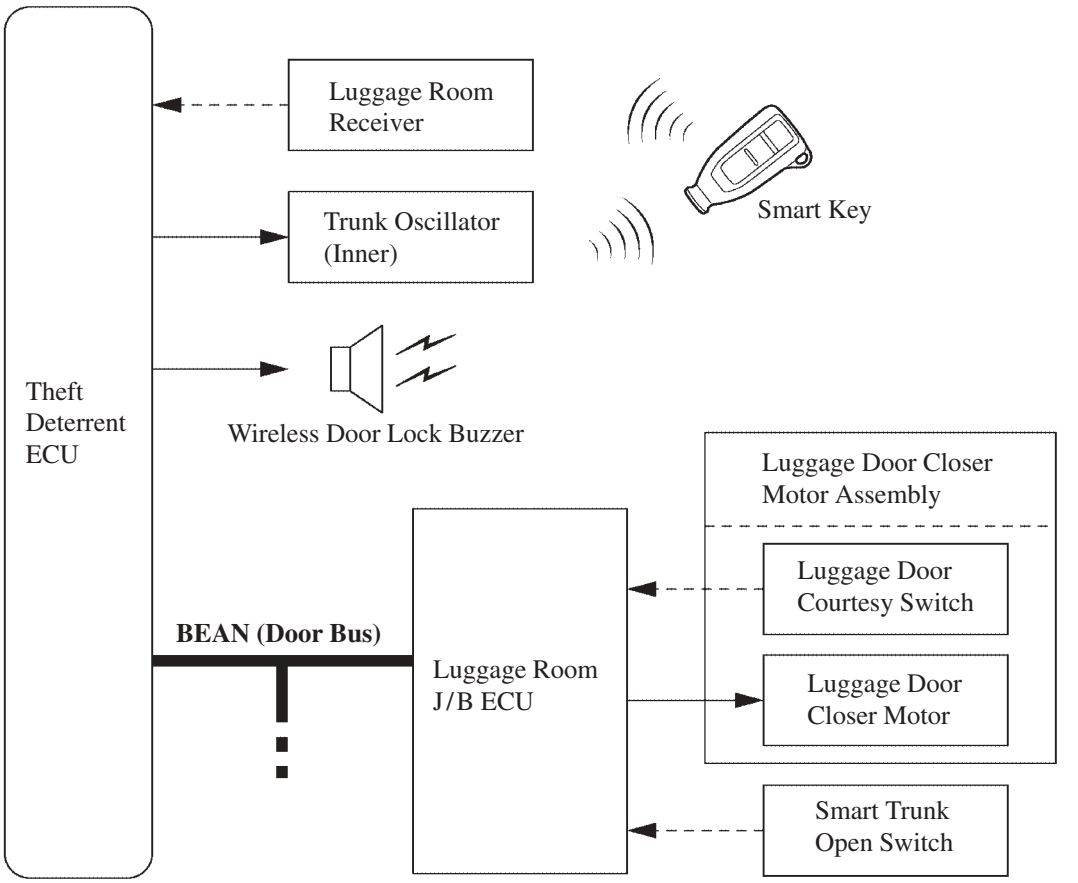
1) When the driver has the smart key and presses the smart trunk open switch, the theft deterrent ECU outputs the inner and outer trunk oscillators.
2) These trunk oscillators form a detection area, and the theft deterrent ECU checks the ID code from the signal of the luggage room receiver or the wireless door lock receiver.
3) The theft deterrent ECU outputs the trunk open request signal to the luggage room J/B ECU.



Smart Key Confine Prevention inside Luggage Compartment Function

The smart key confine prevention function inside the luggage compartment operates as follows:

1) When smart key is located inside the luggage compartment and the trunk lid is closed, the theft deterrent ECU outputs the inner trunk oscillator.
2) The theft deterrent ECU checks the ID code from the signal of the luggage room receiver.
3) This ECU sounds the wireless door lock buzzer for approximately 10 seconds, as a warning.
4) During or after this time, if the smart trunk open switch is pressed, the theft deterrent ECU outputs a trunk open request signal to the luggage room J/B ECU.



Smart Memory Call Function

1) General

The memory call function using a smart key utilizes the transmitter key ID to restore the seat position, outside rear view mirror position, tilt and telescopic position, and seat belt anchor position automatically, which creates driver convenience.

- The driver seat ECU records all the settings and conditions. When each ECU becomes the operating condition and timing, the driver seat ECU outputs the restoration signal.

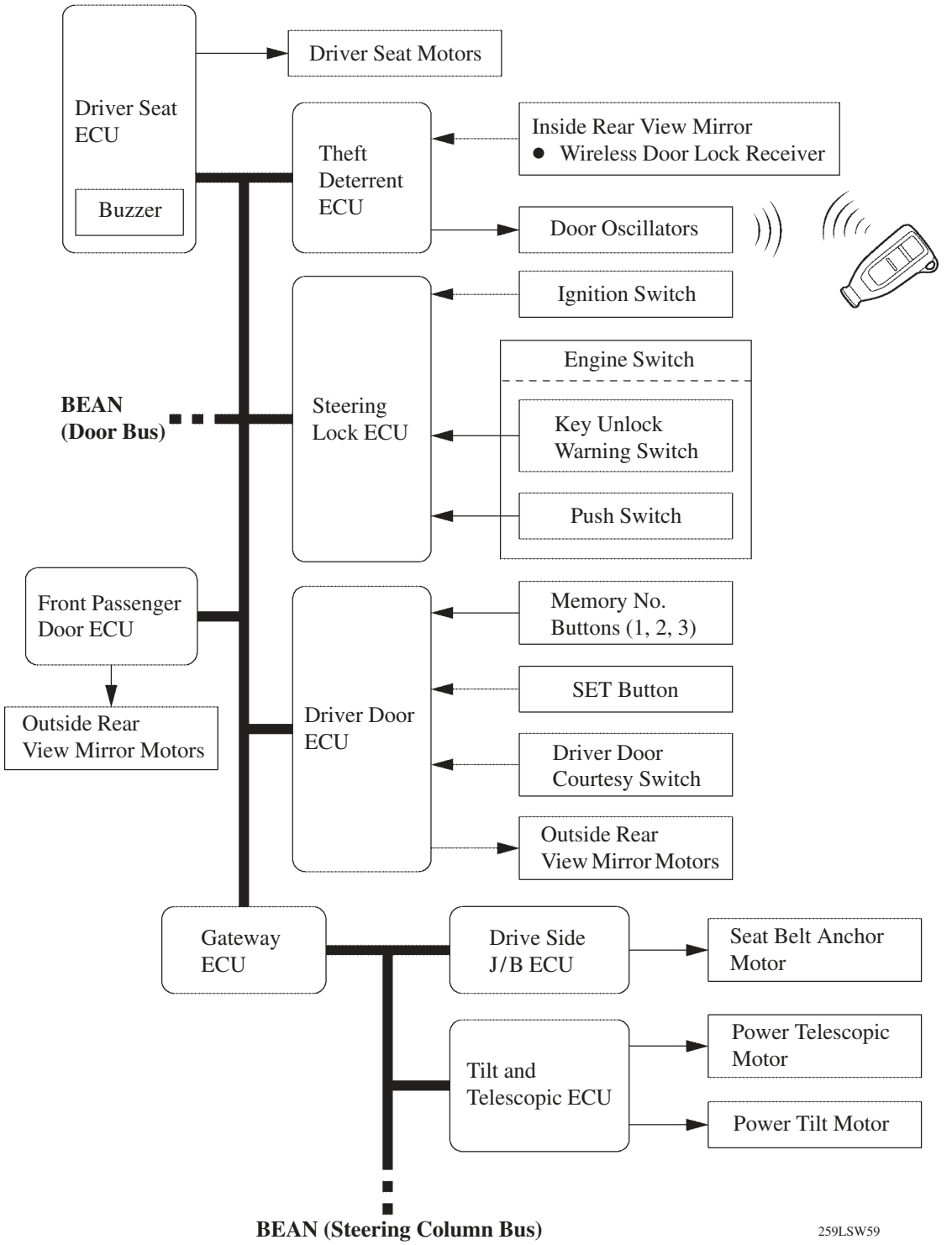
▶ Various Condition ◀

Condition	Outline
Memory Registration	When all the following conditions are met, the driver seat ECU records the settings and conditions. ● Ignition switch is OFF. ● Driver door is closed. ● Memory No. (1, 2, or 3) button pressed and held. ● LOCK or UNLOCK button in the smart key kept pressing.
Operation	After the door is unlocked by the smart function or the wireless door lock remote control function, if the driver door is opened, the driver seat ECU operates the memory call function.
Memory Call Cancel	When all the following conditions are met, the driver seat ECU cancels the memory call function. ● Ignition switch is OFF. ● Driver door is closed. ● SET button pressed and held. ● LOCK or UNLOCK button in the smart key kept pressing.

▶ Operation and Timing ◀

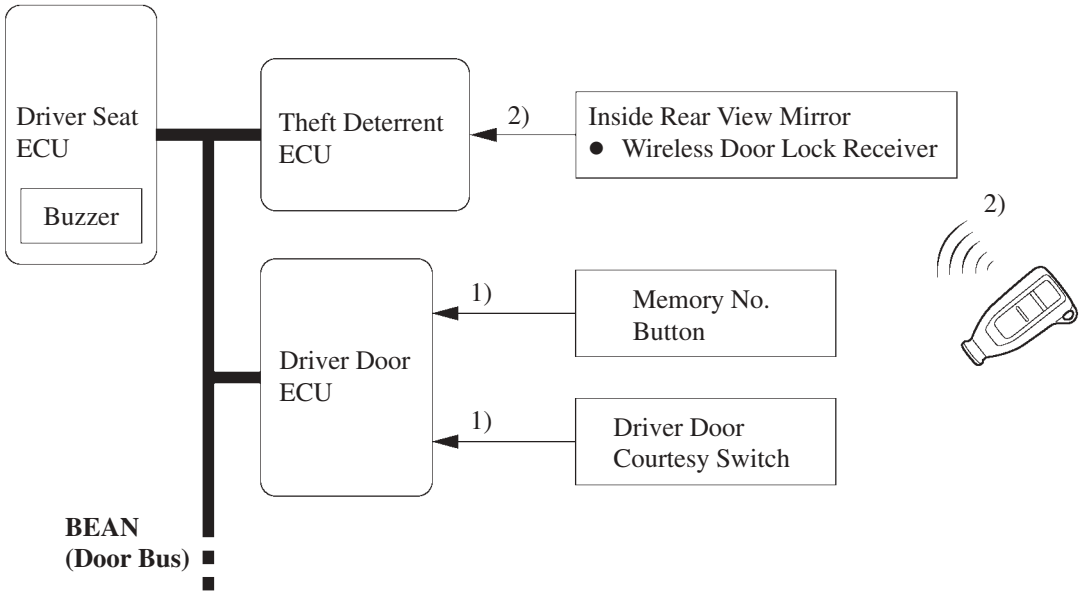
Control ECU	Operation	Timing
Driver Seat ECU	Driver Seat Position	Driver Door is opened.
Driver Door ECU	Outside Rear View Mirror Position	
Front Passenger Door ECU	Outside Rear View Mirror Position	
Driver Side J/B ECU	Seat Belt Anchor Position	
Tilt and Telescopic ECU	Tilt and Telescopic Position	Engine switch is pushed.

2) System Diagram related to Smart Memory Call Function



3) Memory Registration

1) The driver seat ECU moves to the key ID registration mode, if the memory No. (1, 2, or 3) button is pressed with the ignition switch OFF and driver door closed.
2) In this condition, when LOCK or UNLOCK button in the smart key is pressed, the key ID is transmitted from the theft deterrent ECU to the driver seat ECU.
3) The driver seat ECU records the key ID, each position and each setting into the memory No. (1, 2, or 3) button.
4) When the driver seat ECU completes recording, it beeps buzzer in the driver seat ECU once as an answer back.



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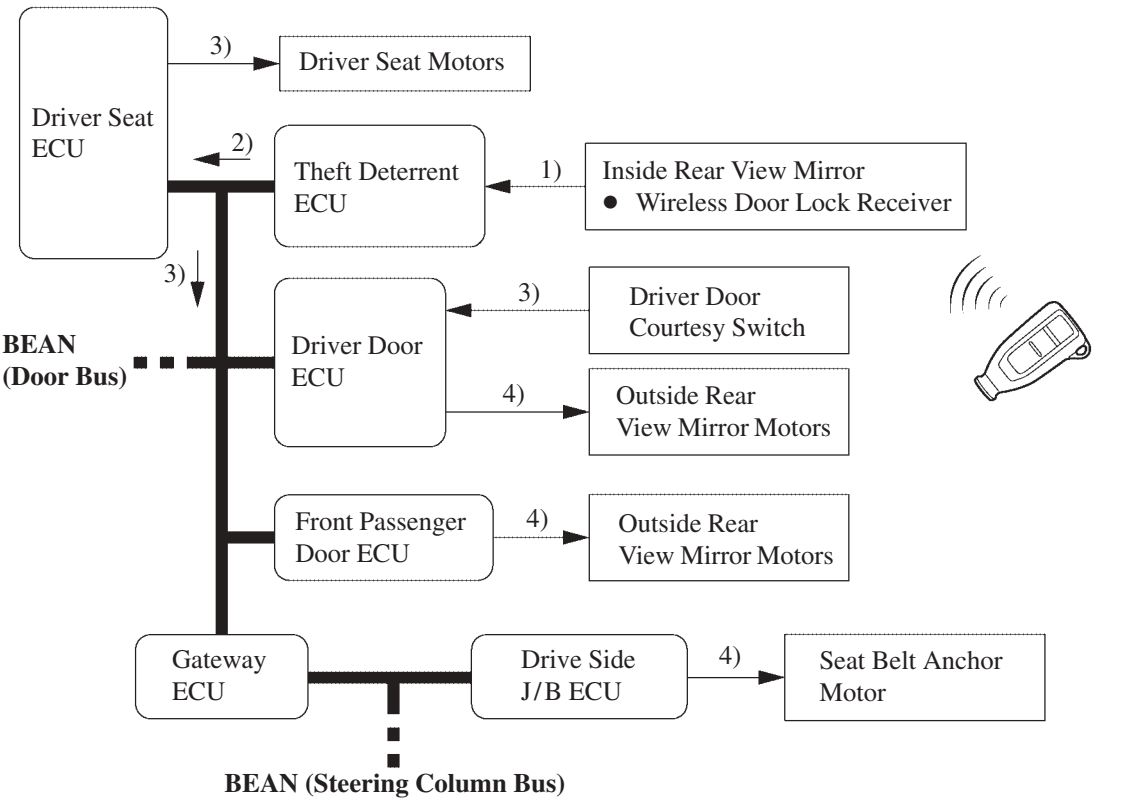
4) When Driver Door is Opened

a. General

In the smart key operation timings in the wireless door lock remote control function and smart unlock function are different.

b. Operation in the wireless door lock remote control function

1) When the smart key button is pressed, the ID code with key ID is input to the theft deterrent ECU through the wireless door lock receiver.
2) When the theft deterrent ECU receives the key ID, it transmits the key ID to the driver seat ECU.
3) If the driver door is opened, the driver seat ECU outputs key ID memory restoration signal from the theft deterrent ECU to each ECU and activates the drive seat motors.
4) When each ECU receives this signal, it activates each actuator.



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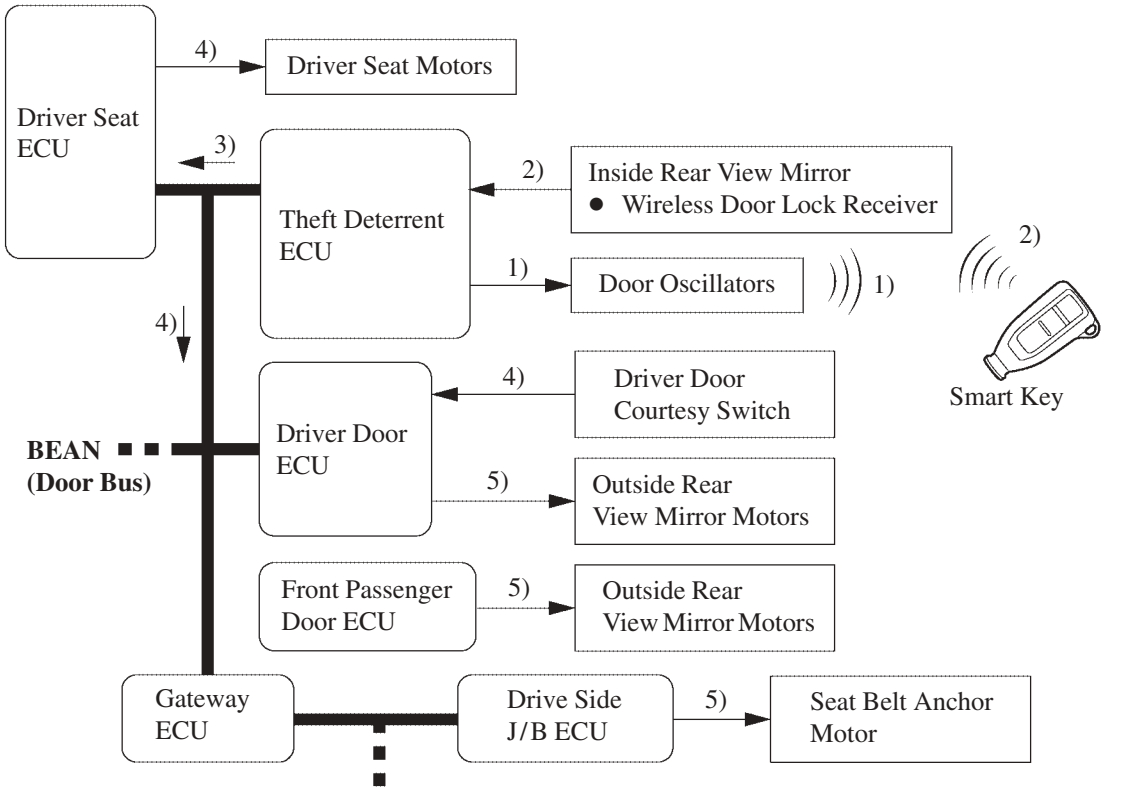
c. Operation in the smart unlock function

1) When the smart key enters in the detection area, the door oscillator transmits the decoded code.
2) When the smart key receives the decoded code, it outputs the ID code with key ID to the wireless door lock receiver and transmits the code to the theft deterrent ECU.
3) When the theft deterrent ECU receives the key ID, it transmits the key ID to the driver seat ECU.
4) If the driver door is opened, the driver seat ECU outputs key ID memory restoration signal from the theft deterrent ECU to each ECU and activates the drive seat motors.
5) When each ECU receives this signal, it activates each actuator.



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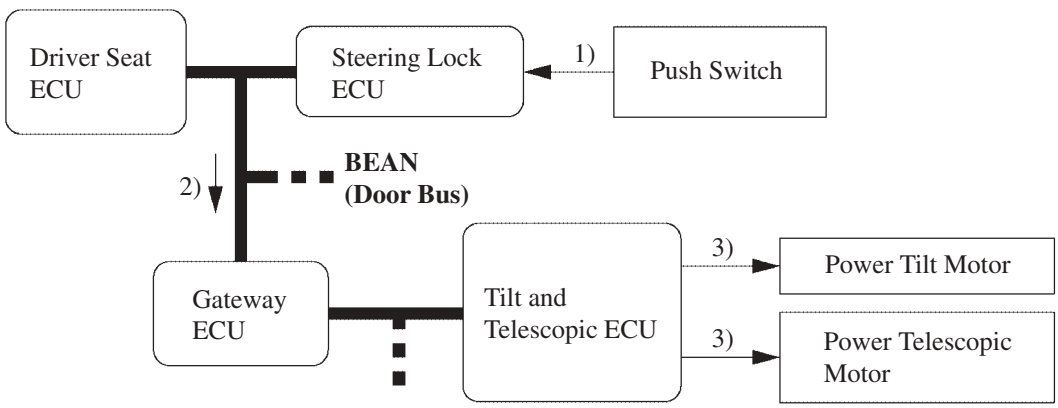
5) When Engine Switch is Pushed

1) If the engine switch is pushed, the steering lock ECU transmits the push switch signal to the driver seat ECU.
2) When the driver seat ECU receives the push switch signal, it outputs the restoration signal to the tilt and telescopic ECU.
3) When the tilt and telescopic ECU receives the signal, it activates the power tilt and telescopic motors.



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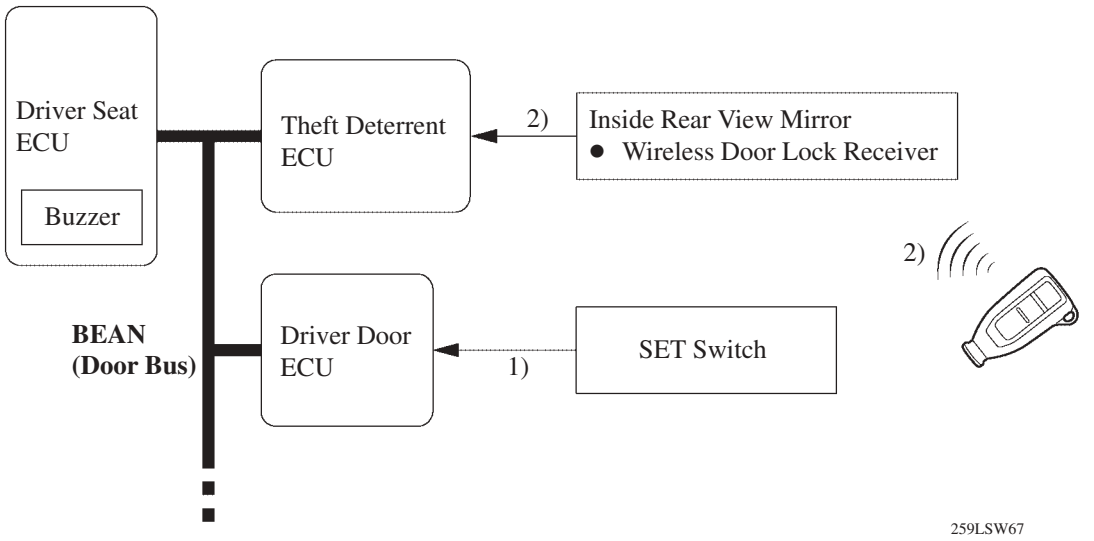
6) Smart Memory Call Cancel

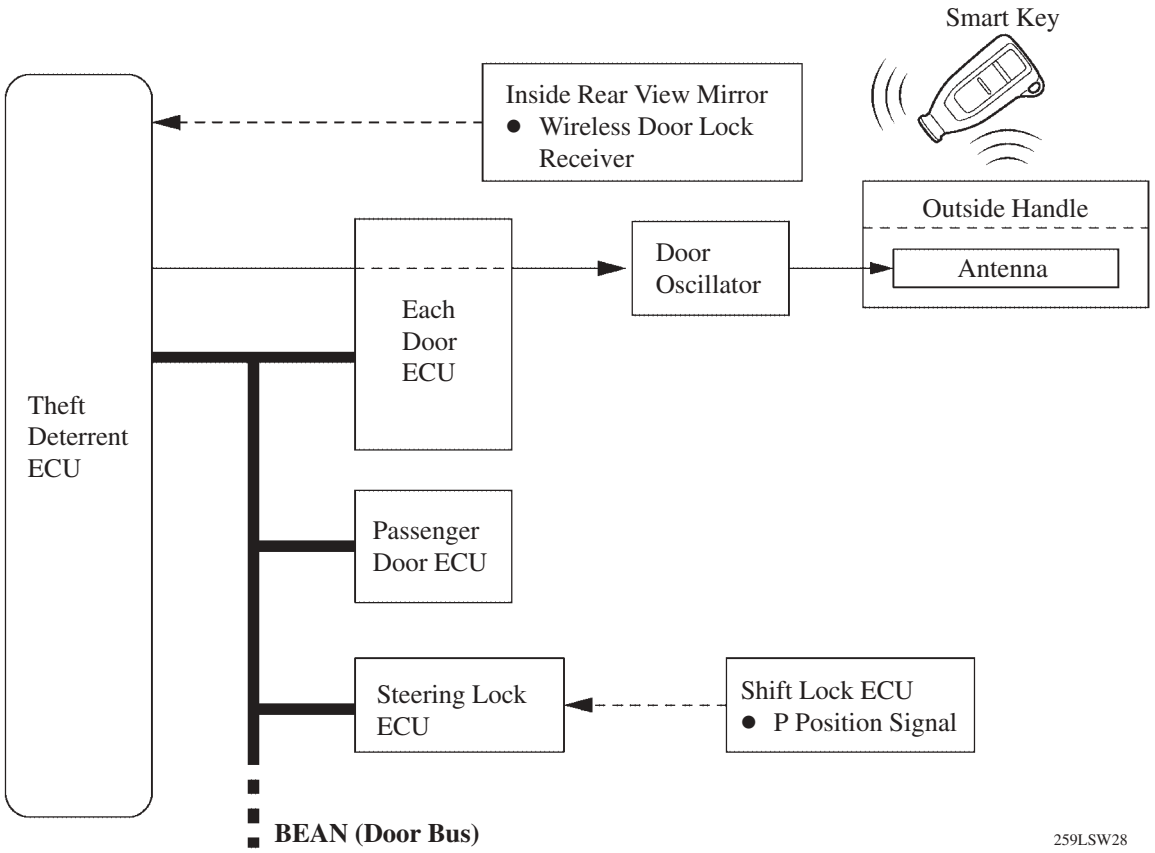
1) If the SET button is pressed when the ignition switch is OFF and driver door is closed, the driver seat ECU moves to the memory call cancel mode.
2) In this condition, when LOCK or UNLOCK button in a smart key is pressed, the key ID is transmitted from the theft deterrent ECU to the driver seat ECU.
3) If the key ID has already been registered, the driver seat ECU will cancel the key ID memory call function. To perform key ID memory call function again, it is necessary to register the key ID.
4) When the driver seat ECU completes switching, it beeps buzzer in the drive seat ECU twice as an answer back.



Smart Illumination Function

The smart illumination function operates as follows:

1) When a smart key enters a detection area of the vehicle exterior and the shift lever is in the P position, the theft deterrent ECU checks the ID code received at the wireless door lock receiver and verifies the position of the smart key.
2) When this is completed, the theft deterrent ECU transmits a door unlock standby signal to the door ECU once the position of the smart key has been verified.
3) At this time, the theft deterrent ECU outputs an illumination request signal to the passenger door ECU.
4) Upon receiving this signal, the passenger door ECU operates the illuminated entry system.



Battery Saving Function

1) Vehicle Battery Saving Function

In the smart key system, signals are emitted outside of the vehicle at a prescribed interval (300 ms) when the doors are locked. Therefore, the vehicle battery could be drained if the vehicle remains parked for a long time. For this reason, the controls listed below are effected.

Condition	Control
No smart unlock operation for more than 5 days	Signal transmission interval is extended from 300 ms to 600 ms.
No smart unlock operation for more than 14 days	Automatically deactivates the smart key system.

▶ Reinstatement Conditions ◀

- A wireless door lock remote control signal (lock, unlock, or trunk lid open) is input and the ID matches.
- A user carries the smart key and pushes a lock switch signal for the outside handle.
- A door is locked or unlocked by the mechanical key.

2) Smart Key Battery and Vehicle Battery Saving Function

In the smart key system, if the smart key is constantly located within the vehicle exterior detection area of the doors the system maintains periodic communication with the smart key. Therefore, if the vehicle remains parked in that state for a long time, the smart key battery and the vehicle battery could be drained. For this reason, if this state continues longer than 10 minutes, the smart key system automatically becomes deactivated.

▶ Reinstatement Conditions ◀

- A wireless door lock remote control signal (lock, unlock, or trunk lid open) is input and the ID matches.
- A user carries the smart key and pushes a lock switch signal for the outside handle.
- A door is locked or unlocked by the mechanical key.

Warning Function

1) General

Because the smart key system is so convenient, the driver could become unaware of the presence of this key, which could lead to human errors.

Examples: 1. The driver is unaware that the key has been taken out of the vehicle by an occupant.
2. The driver exits the vehicle with its engine running.
3. The driver exits the vehicle with its shift lever in a position other than "P".

If the situations described above occur, they could lead to a serious problem, such as an inability to restart the engine once it has been turned OFF or the possible theft of the vehicle.
For this reason, the system is equipped with warning functions against possible human errors (as well as some non-human errors) assuming the situations described below.

2) Assumption: With the shift lever in P, and without turning the ignition switch to LOCK, the driver or an occupant takes the smart key out of the vehicle.

Possible effects without the warning: Vehicle theft or inability to restart the engine.		
Detection Conditions		If all the conditions listed below are met and a vehicle interior check results in NG, a warning will be issued. ● Shift lever is in the P position. ● Ignition switch is in a position other than LOCK. ● Any door that is opened and closed.
Warning	Buzzer (in combination meter)	Sounds once upon detection. Sounds once again if the vehicle is started to be driven in this state.
	Multi-information Display	"**Key is not Detected**" appears on the display and disappears when the ignition switch is turned LOCK or the vehicle interior check results are OK.
	Wireless Door Lock Buzzer	Sounds 3 times upon detection and stops when the starter switch is turned LOCK or the vehicle interior check results are OK.

3) Assumption: Doors locked without turning the ignition switch to LOCK.

Possible effects without the warning: Vehicle theft or inability to restart the engine.		
Detection Conditions		If all the conditions listed below are met and vehicle interior and exterior checks result in NG for the interior and OK for the exterior, a warning will be issued. ● Shift lever is in the P position. ● Ignition switch is in a position other than LOCK. ● All doors are closed. ● Lock switch on the outside handle is ON.
Warning	Buzzer (in combination meter)	—
	Multi-information Display	—
	Wireless Door Lock Buzzer	Sounds for 2 seconds.

4) Assumption: With the shift lever in a position other than P and the ignition switch is not turned to LOCK, the driver is about to exit the vehicle.

Possible effects without the warning: Vehicle theft or inability to restart the engine.		
Detection Conditions		If all the conditions listed below are met and a vehicle interior check results in NG, a warning will be issued. ● Ignition switch is in the ACC or IG ON position. ● Shift lever is not in the P position. ● Driver's door that is openid and closed.
Warning	Buzzer (in combination meter)	Sounds continuously and stops when the shift lever is in the P position or the vehicle interior check results are OK.
	Multi-information Display	"**Shift to P Range**" and "**Key is not Detected**" appear alternately. ● "**Shift to P Range**" disappears when the shift lever is moved to the P position. ● "**Key is not Detected**" disappears when the starter switch is turned LOCK or the vehicle interior check results are OK.
	Wireless Door Lock Buzzer	Sounds continuously and stops when the shift lever is in the P position or the vehicle interior check results are OK.

5) Assumption: With the shift lever in a position other than P, an occupant takes the smart key out of the vehicle.

Possible effects without the warning: Inability to restart the engine.		
Detection Conditions		If all the conditions listed below are met and a vehicle interior check results in NG, a warning will be issued. ● Shift lever is not in the P position. ● Ignition switch is in a position other than OFF. ● A door other than the driver 's door that is opened and closed.
Warning	Buzzer (in combination meter)	Sounds once upon detection. Sounds again if the vehicle is started to be driven in this state.
	Multi-information Display	"**Key is not Detected**" appears on the display and disappears when the ignition switch is turned LOCK or the vehicle interior check results are OK.
	Wireless Door Lock Buzzer	Sounds 3 times upon detection and stops when the ignition switch is turned LOCK or the vehicle interior check results are OK.

6) Assumption*: An occupant takes the smart key out of the vehicle together with luggage.

Possible effects without the warning: Inability to restart the engine.		
Detection Conditions		If all the conditions listed below are met and a vehicle interior check results in NG, a warning will be issued. ● Ignition switch is in a position other than OFF. ● Any window is opened. ● Vehicle speed is 10 km/h (6.2 mph) or less. ● All doors are closed.
Warning	Buzzer (in combination meter)	Sounds once upon detection. Sounds again if the vehicle is started to be driven in this state.
	Multi-information Display	"**Key is not Detected**" and "**E/G can not Restart**" appear alternately and disappears when the ignition switch is turned LOCK or the vehicle interior check results are OK.
	Wireless Door Lock Buzzer	Sounds 3 times upon detection and stops when the ignition switch is turned LOCK or the vehicle interior check results are OK.

*: This assumption is not default setting.

7) Assumption: An attempt is made to lock the doors with the smart key left inside the vehicle.

Possible effects without the warning: Vehicle theft.		
Detection Conditions		If all the conditions listed below are met and a vehicle interior check results in NG, a warning is issued. ● Ignition switch is in the LOCK position. ● All the doors are closed. ● The lock switch on the outside handle is turned ON.
Warning	Buzzer (in combination meter)	—
	Multi-information Display	—
	Wireless Door Lock Buzzer	Sounds for 2 seconds.

8) Assumption: An attempt is made to lock a door that is ajar.

Possible effects without the warning: Vehicle theft or drained battery.		
Detection conditions		If all the conditions listed below are met and vehicle interior and exterior checks result in NG for the interior and OK for the exterior, a warning will be issued. ● Ignition switch is in the LOCK position. ● One of the doors is open. ● Lock switch on the outside handle is ON.
Warning	Buzzer (in combination meter)	—
	Multi-information Display	—
	Wireless Door Lock Buzzer	Sounds for 10 seconds and stops when one of the conditions listed below occurs. ● Wireless door lock remote control unlock signal is input. ● Engine switch is pushed. ● All the doors are closed.

9) Assumption: The voltage of the smart key has dropped.

Possible effects without the warning: Smart control is suddenly disabled.		
Detection Conditions		When the condition given below is met, a vehicle interior check is performed and a code indicating the voltage drop of the smart key battery is received, a warning is issued. ● When the ignition switch has been ON for approximately 20 minutes or more, and is then turned OFF.
Warning	Buzzer (in combination meter)	Sounds once upon detection.
	Multi-information Display	"**Low Key Battery**" appears for approximately 5 seconds.
	Wireless Door Lock Buzzer	—

10) Assumption: The smart key is placed outside of the engine startable area (in the glove box or on the floor mat).

Possible effects without the warning: Driver is perplexed.		
Detection conditions		If the condition given below is met and a vehicle interior check results in NG, a warning is issued. ● Engine switch is pushed.
Warning	Buzzer (in combination meter)	Sounds once upon detection.
	Multi-information Display	"**Key is not Detected**" appears for approximately 5 seconds.
	Wireless Door Lock Buzzer	—