■SYSTEM OPERATION

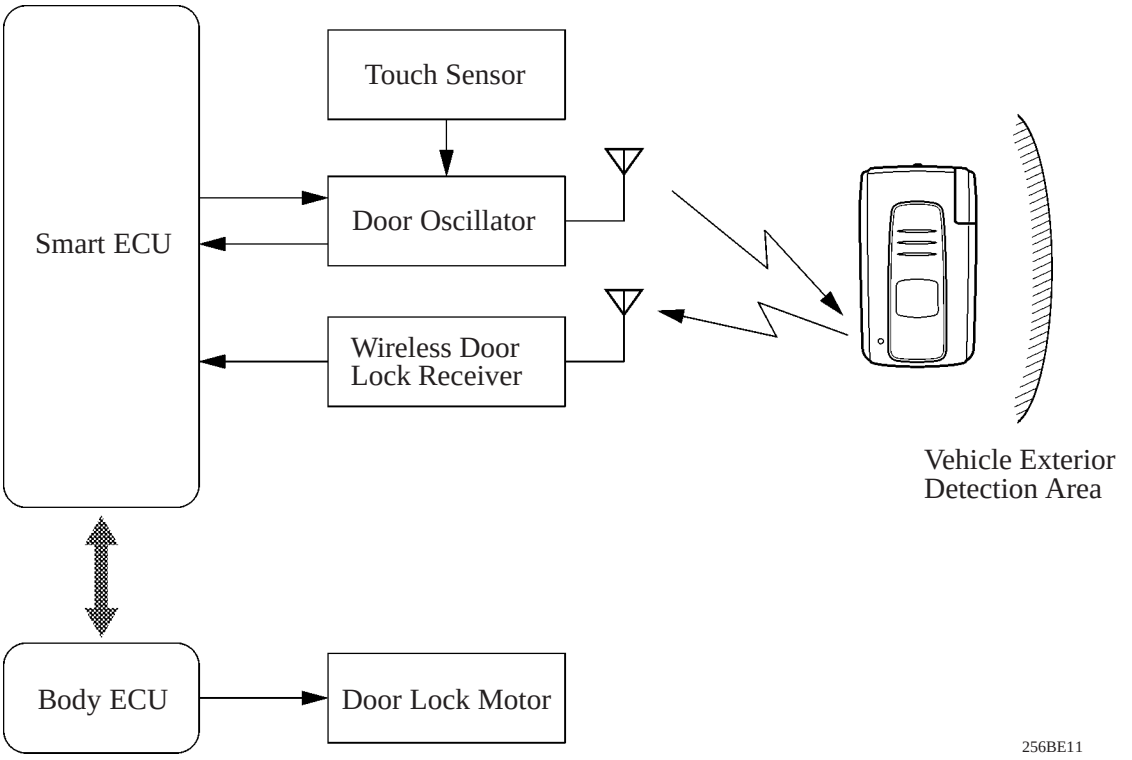
1. General

The electronic control of the smart entry & start system has following control.

Item	Outline
Smart Unlock (see page BE-32)	Provided that the doors are locked and the check results of the smart key by the smart ECU reveal that the ID code is legitimate, if the user touches the outside door handle, the smart ECU unlocks the door via the body ECU.
Smart Back Door Unlock (see page BE-34)	Provided that the doors are locked and the check results of the smart key by the smart ECU reveal that the ID code is legitimate, if the user presses the back door opener switch, the smart ECU unlatches the back door lock via the body ECU.
Smart Lock (see page BE-35)	Provided that all doors are closed and the smart key has been taken outside of the vehicle, if the user presses the lock switch on the outside door handle, the smart ECU checks for a smart key inside and outside of the vehicle. If the check results outside of the vehicle reveal that the ID code is legitimate, the smart ECU locks the door via the body ECU.
Smart Ignition (see page BE-37)	Provided that the smart key is in the user's possession and the user operates the power switch, the smart ECU checks the smart key, and if the check results reveal that the ID code is legitimate, the smart ECU authorizes the operation of the power switch (to change the power mode).
Warning Function (see page BE-40)	When any of the conditions indicated below occur, the smart entry & start system causes the smart ECU to illuminate the smart entry system warning light and sound the buzzer in the combination meter and the wireless door lock buzzer in order to alert the driver. • The smart key has been taken outside of the vehicle when the power switch is in a mode other than OFF (ACC, IG-ON, or READY). • The smart lock is operated when the power switch is in a mode other than OFF. • The doors are locked with the smart key in the vehicle. • The capacity of the battery in the smart key is low. • The power switch is operated when the smart key is located outside the detection area of the room oscillator. • The smart lock is operated, with any of the doors open.
Power-Saving Function (see page BE-43)	To protect the auxiliary battery and the battery in the smart key, the smart ECU stops the smart entry & start system or delays the operation intervals of the driver and front passenger door oscillators under the conditions indicated below. • The smart ECU has not received any ID code signals from a smart key for 14 days or more. • The smart entry & start system maintains communication with a smart key for more than 10 minutes.

2. Smart Unlock

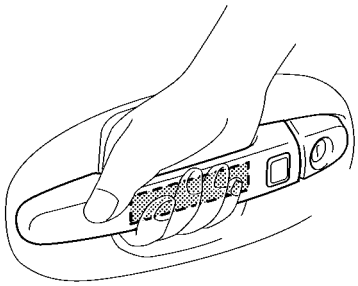
- To detect the location of the smart key, the doors of the vehicle must be locked. The door oscillators transmit key detection signals at prescribed intervals in order to form vehicle exterior detection areas (approximately 0.7 to 1.0 m [2.3 to 3.3 feet] around each outside door handle).
- When the smart key enters a detection area, the system automatically checks the ID codes. When this is completed, the door that has detected the smart key assumes the unlock standby condition. In this condition, if a person touches the touch sensor on the outside door handle, all doors becomes unlocked.



NOTE: Handling Precaution for Smart Unlock

- To perform a smart unlock, make sure to touch the surface area of the door handle as shown in the illustration below. Its response may be delayed or inoperate if the door handle is touched by a hand wearing a leather glove or a ski glove.
- When performing a smart unlock, verify that the door has been unlocked (answer back by the wireless door lock buzzer* and hazard light) before pulling on the door handle.
  The door might not unlock if the user approaches it suddenly or pulls on the door handle suddenly. If a door could not be unlocked, the system retries unlocking it four times, at 750 ms intervals. However, if the user is pulling on the handle during a retry, it might not be possible to unlock the door due to mechanical constraints. In this case, return the door handle one time to its original position.
- If the smart key is placed near the door handle, it might not be possible to smart unlock the door at times.
- As long as the smart key is within the vehicle exterior detection area, the door will unlock even if a person who does not have the smart key touches the door handle. However a door other than the door that resulted in check OK will not be unlocked.
- When the smart key is within the vehicle exterior detection area, the door might smart unlock if a large amount of water is splashed on the door handle, such as during a car wash or in heavy rain. However, if the door is not opened or closed within approximately 30 seconds, it will lock automatically as a theft preventive measure.

*: Except European Model

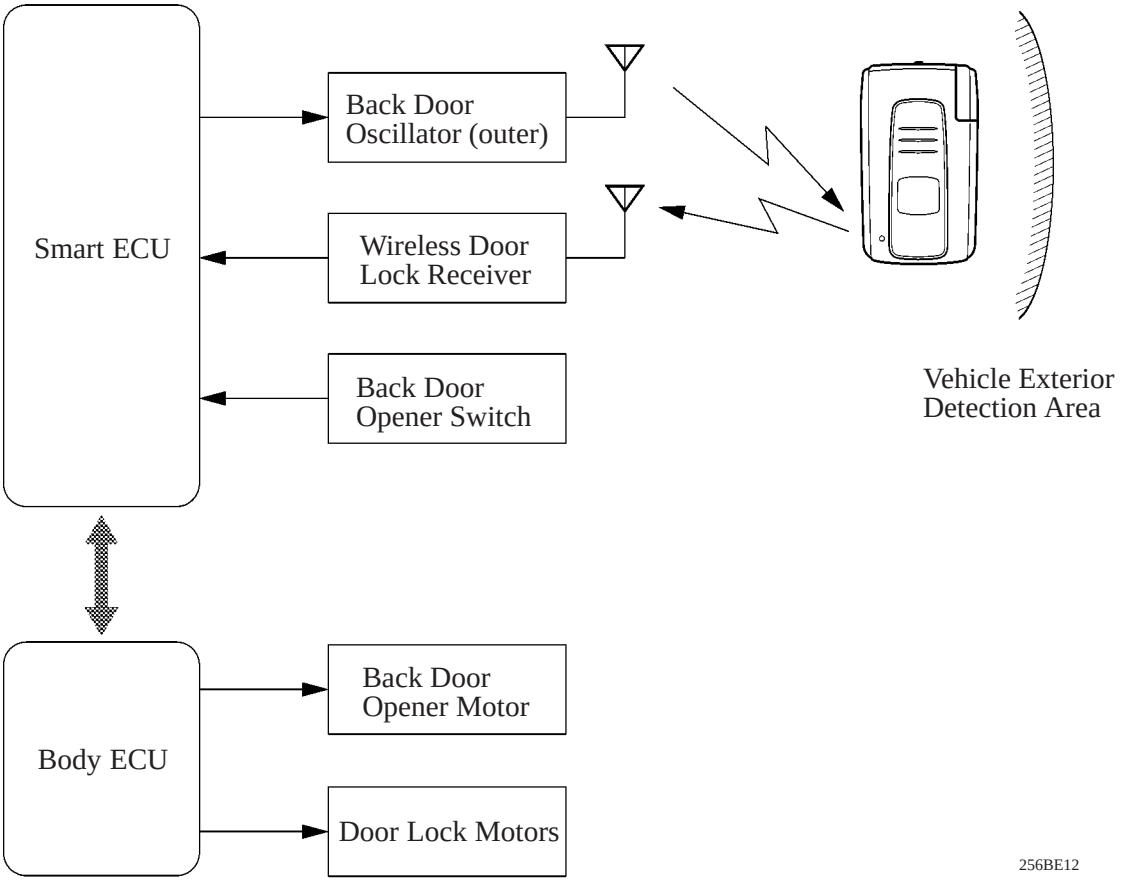


Touch Sensor
(back of outside door handle)

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3. Smart Back Door Unlock

With all doors locked, if the user who has the smart key presses the back door opener switch, the (outer) back door oscillator emits a smart key detection signal. The smart ECU checks the ID code, and after the check is completed, the smart ECU unlocks the all doors via the body ECU. At this time, if the user continues to press the back door opener switch, the back door lock latch will be released.



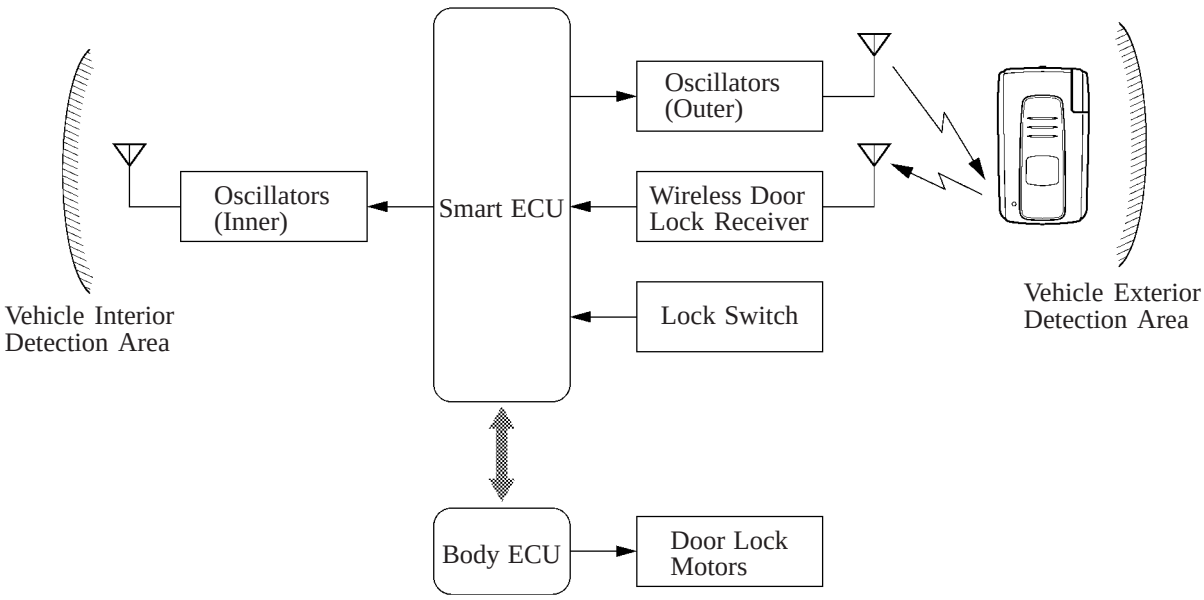
NOTE: Handling Precaution for Smart Back Door Unlock

Smart back door unlock function may not operate if the smart key is placed near the center of a bumper.

4. Smart Lock

- When the smart key is located outside of the vehicle and all the doors are closed, if the user presses the lock switch on the outside door handle or the lock switch on the back door, the smart ECU will actuate all oscillators and start checking for the ID code of a smart key.
- At this time, if an oscillator outside of the vehicle (driver/front door oscillators or back door outer oscillator) determines that the ID code of the smart key is legitimate, the smart ECU determines that the smart key has been taken outside the vehicle and locks the doors via the body ECU.
- A smart unlock operation will not be authorized for approximately 3 seconds* after the doors have been locked.

*: The setting of this duration can be changed using the customized body electronics system. For details, refer to the Customized Body Electronics System section on page BE-63.



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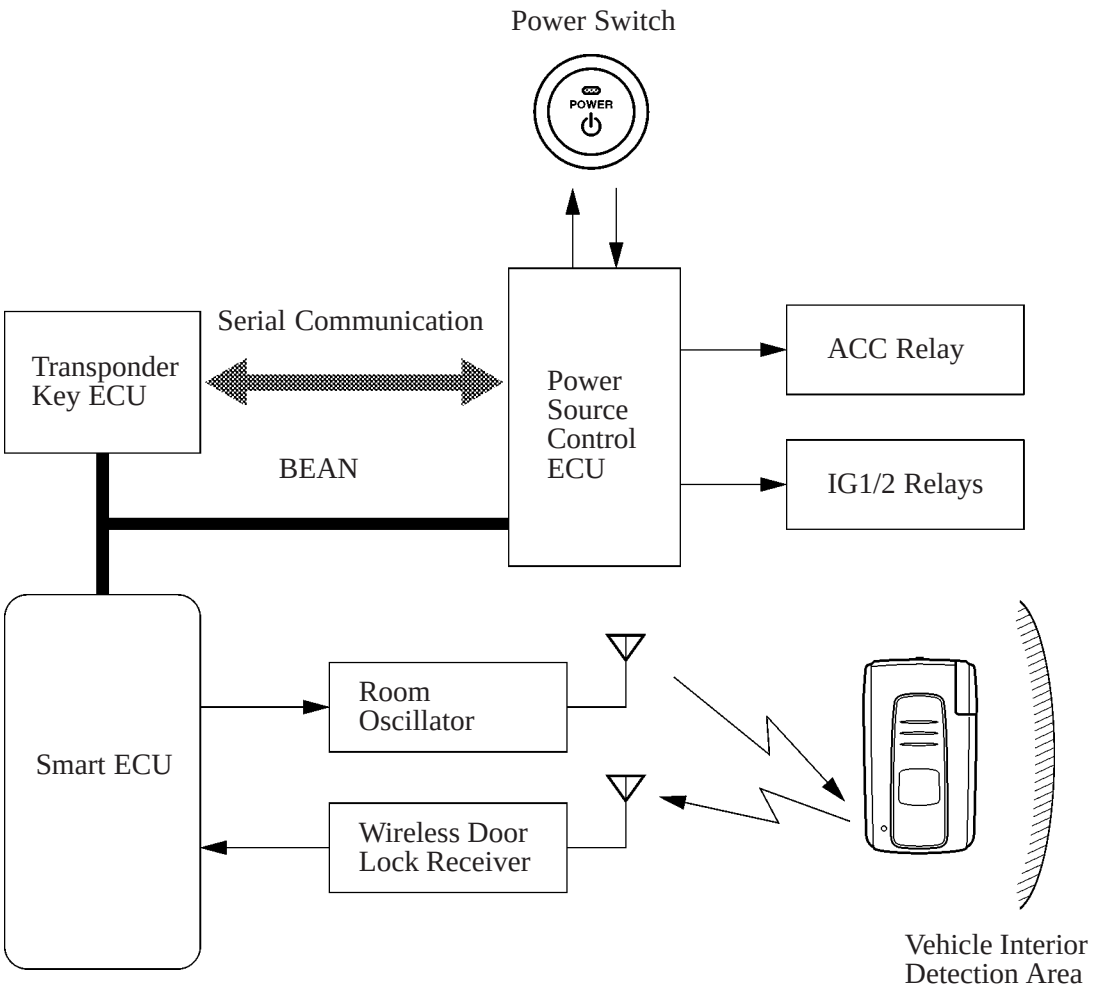
NOTE: Handling Precaution for Smart Lock

- If the key is in the vehicle, do not perform door locking operation, or the key might be locked inside the vehicle.
- To lock a door, make sure to press the lock switch on the outside handle. The door might not lock if it is depressed too quickly.
- It might not be possible to smart lock the door if the smart key is placed near the vehicle interior (window or door handle).
- Even if the smart key is within the vehicle exterior detection area, if the lock switch is depressed without turning OFF the power switch, a warning will be issued to alert the driver that the power switch has not been turned OFF (by emitting a beep sound outside of the vehicle), without being able to smart lock the door.
- When the smart key is within the vehicle interior detection area, pressing the lock switch will cause the system to issue a key confinement warning (by emitting a beep sound outside of the vehicle), without being able to smart lock the door.
  Even if the smart key is located outside of the vehicle, the warning buzzer could beep if the smart key is placed near a window or door handle. In this case, take the smart key slightly away from the door and press the lock switch.
- If the smart key is placed on the instrument panel, in the glove box, or on the floor, the key confinement prevention function might not activate, causing the doors to lock through the smart lock operation. Therefore, make sure to keep the smart key in your possession.
- Even if the smart key is located within the vehicle interior detection area, in the state of the power switch OFF, it is possible to perform a wireless lock, manual lock, or key-linked lock. However, after a door is locked in this manner, it is prohibited from being smart unlocked. (After a wireless lock, manual lock, or key- linked lock, it is possible to smart unlock the door as long as the smart key is not located within the vehicle interior detection area.)
- After a smart lock, the door cannot be smart unlocked for approximately 3 seconds.

5. Smart Ignition

OFF → ACC → IG-ON

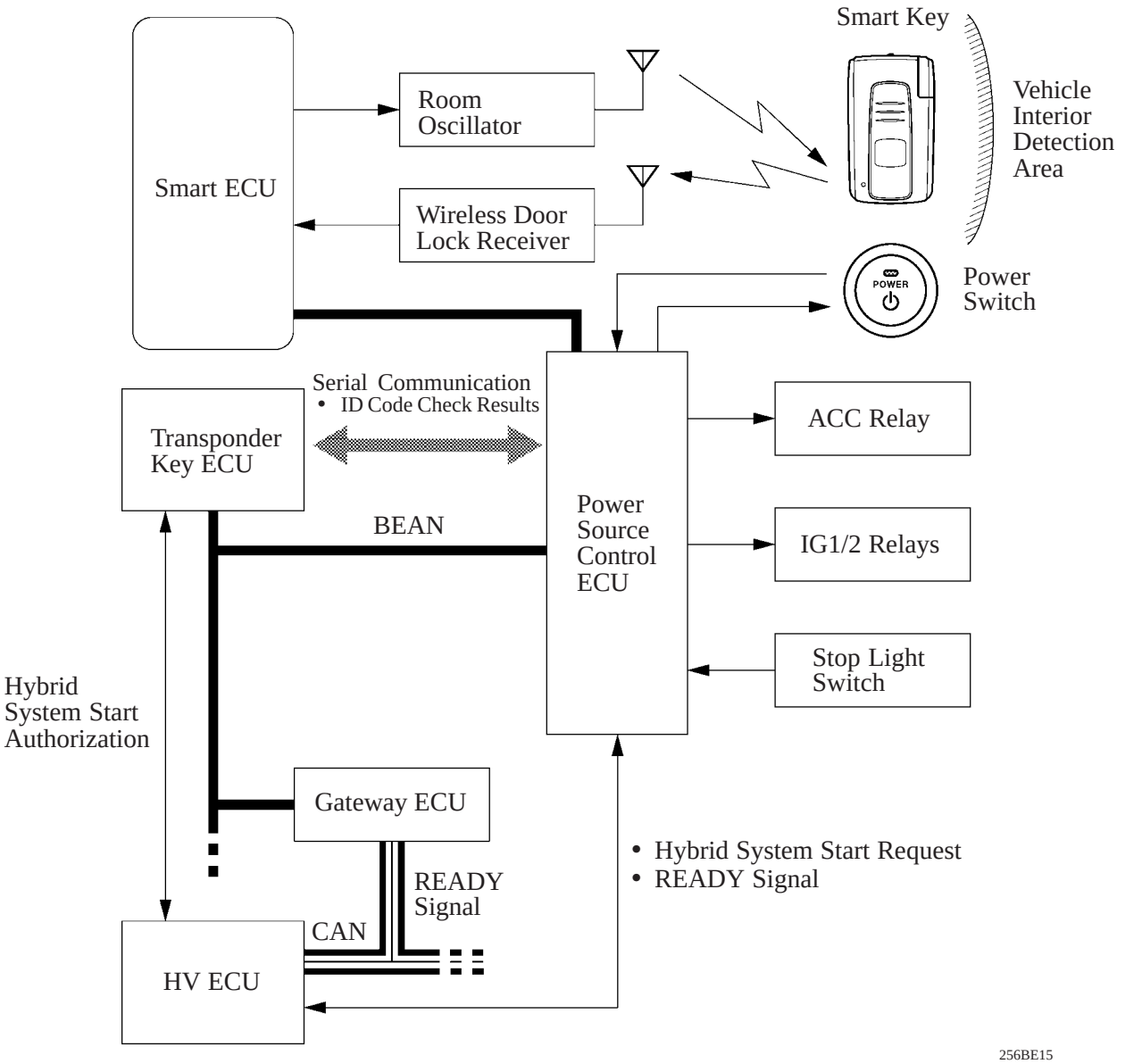
- If the driver presses the power switch once without pressing the brake pedal, the room oscillator forms a smart key detection area inside the vehicle by emitting smart key detection signals in accordance with the request signal received from the smart ECU. Accordingly, the smart key sends an ID code signal to the smart ECU via the wireless door lock receiver. The smart ECU checks the ID code of the smart key and transmits the check results to the transponder key ECU.
- The transponder key ECU transmits the check results to the power source control ECU. If the check results reveal that the ID code is legitimate, the power source control ECU will turn ON the ACC relay and start the ACC power supply. At this time, the power source control ECU illuminates a green indicator light on the power switch in order to inform the driver of the ACC power mode.
- After the transition to the ACC power mode, if the driver presses the power switch again, the power source control ECU will turn ON the IG1 and IG2 relays and start the IG power supply. At this time, the power source control ECU illuminates an amber indicator light on the power switch in order to inform the driver of the IG-ON power mode.



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OFF → READY

- If the driver presses the power switch once while pressing the brake pedal, the room oscillator forms a smart key detection area inside the vehicle by emitting smart key detection signals in accordance with the request signal received from the smart ECU. Accordingly, the smart key sends an ID code signal to the smart ECU via the wireless door lock receiver.
- The smart ECU checks the ID code of the smart key and transmits the check results to the transponder key ECU.
- The transponder key ECU transmits the check results to the power source control ECU. If the check results reveal that the ID code is legitimate, the power source control ECU will turn ON the ACC, IG1 and IG2 relays and start the ACC and IG power supply.
- At this time, the power source control ECU illuminates an amber indicator light on the power switch in order to inform the driver of the IG-ON power mode.
- After the indicator light has illuminated, the power source control ECU transmits a hybrid system start request signal to the HV ECU.
- Upon receiving this signal, the HV ECU verifies the check results of the smart key ID code provided by the transponder key ECU.
- If the check results reveal that the ID code is legitimate, the HV ECU starts the hybrid system.
- At this time, the power source control ECU will turn OFF the indicator light on the power switch in order to inform the driver of the READY mode.



NOTE: Handling Precaution for Smart Ignition

- If the power switch is pressed while the smart key is not located within the vehicle interior detection area, the smart entry system warning light will illuminate and a buzzer will beep inside the vehicle.
- The hybrid system can be started (READY) if the smart key is located in the vehicle interior. Before exiting the vehicle, return to the power switch to the OFF position, and carry the smart key in your possession.
- If the smart key is taken out of the vehicle without returning the power switch to the OFF position, and if any door that is open is subsequently closed, the following warning will be issued to alert the driver that the power switch has not been turned OFF: the buzzer in the combination meter and the wireless door lock buzzer sound. At the same time, the smart entry system warning light will illuminate.
- The genuine formal key (smart key) can be inserted in the IG-ON mode or with the hybrid system starting (READY). Do not insert any key other than the genuine formal key.

6. Warning Function

General

Because the smart entry & start 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 smart key has been taken out of the vehicle by an occupant.
2. The driver exits the vehicle while the hybrid system is operating.
3. The driver exits the vehicle with its shift position 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 hybrid system 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.

- Warning against the driver taking the smart key outside the vehicle with its shift position in “P”.
- Warning against the driver taking the smart key outside the vehicle with its shift position in a position other than “P”.
- Warning against an occupant taking the smart key outside the vehicle.
- Warning against operating the smart lock while the hybrid system is in operation.
- Warning against operating the door lock while the smart key remains inside the vehicle.
- Warning on the low capacity of the battery in the smart key.
- Warning against operating the smart ignition outside the detection area of the room oscillator.
- Warning against operating the door lock while any of the doors is open.

Warning Against the Driver Taking the Smart Key Outside the Vehicle With Its Shift position in “P”

Possible Effects without Warning		Vehicle theft or inability to restart the hybrid system
Detection Conditions		If all the conditions listed below are met and the result of the smart key ID code check by the room oscillator is NG, a warning will be issued. • Shift position is in the P position. • Power switch is in a position other than OFF. • Driver door that is opened and is closed.
Warning	Smart Entry System Warning Light	Illuminates upon detection, and turns OFF if the power switch is turned OFF or the result of the smart key ID code check by the room oscillator is OK.
	Buzzer (Combination Meter)	Sounds once upon detection. Sounds once again if the vehicle is started to be driven in this state.
	Wireless Door Lock Buzzer	Sounds 3 times upon detection and stops if the power switch is turned OFF or the result of the smart key ID code check by the room oscillator is OK.

Warning Against the Driver Taking the Smart Key Outside the Vehicle With Its shift position In A Position Other Than "P"

Possible Effects without Warning		Vehicle theft or inability to restart the hybrid system.
Detection Conditions		If all the conditions listed below are met and the result of the smart key ID code check by the room oscillator is NG, a warning will be issued. • Shift position is not in the P position. • Power switch is in the ACC, IG-ON or READY position. • Driver door that is opened and closed. • The warning message is displayed in the multi display.
Warning	Smart Entry System Warning Light	Illuminates upon detection, and turns OFF if the power switch is turned OFF or the result of the smart key ID code check by the room oscillator is OK. The warning message is displayed in the multi display.
	Buzzer (Combination Meter)	Sounds continuously upon detection, and stops if the power switch is turned OFF, the shift position is changed to "P", or the result of the smart key ID code check by the room oscillator is OK.
	Wireless Door Lock Buzzer	Sounds continuously upon detection, and stops if the power switch is turned OFF, the shift position is changed to "P", or the result of the smart key ID code check by the room oscillator is OK.

Warning Against an Occupant Taking the Smart Key Outside the Vehicle

Possible Effects without Warning		Inability to restart the hybrid system.
Detection Conditions		If all the conditions listed below are met and the result of the smart key ID code check by the room oscillator is NG, a warning will be issued. • Power switch is in a position other than OFF. • A door other than the driver door that is opened and is closed.
Warning	Smart Entry System Warning Light	Illuminates upon detection, and turns OFF if the power switch is turned OFF or the result of the smart key ID code check by the room oscillator is OK.
	Buzzer (Combination Meter)	Sounds once upon detection. Sounds once again if the vehicle is started to be driven in this state.
	Wireless Door Lock Buzzer	Sounds 3 times upon detection, and stops if the power switch is turned OFF or the result of the smart key ID code check by the room oscillator is OK.

Warning Against Operating the Smart Lock While the Hybrid System is in Operation

Possible Effects without Warning		Vehicle theft or inability to restart the hybrid system.
Detection Conditions		If all the conditions listed below are met, the result of the smart key ID code check by the room oscillator is NG, and the result of the smart key ID code check by the door oscillator is OK, a warning will be issued. • Shift position is in the P position. • Power switch is in a position other than OFF. • All door are closed. • Lock switch on the outside door handle is ON.
Warning	Smart Entry System Warning Light	Illuminates upon detection, and turns OFF if the power switch is turned OFF or the result of the smart key ID code check by the room oscillator is OK.
	Buzzer (Combination Meter)	—
	Wireless Door Lock Buzzer	Sounds for 2 seconds.

Warning Against Operating the Door Lock While the Smart Key Remains in the Vehicle

Possible Effects without Warning		Vehicle theft.
Detection Conditions		If all the conditions listed below are met and the result of the smart key ID code check by the room oscillator is OK, a warning will be issued. • Power switch is in the OFF position. • All door are closed. • Lock switch on the outside door handle is ON.
Warning	Smart Entry System Warning Light	—
	Buzzer (Combination Meter)	—
	Wireless Door Lock Buzzer	Sounds for 2 seconds.

Warning on the Low Capacity of the Battery in the Smart Key

Possible Effects without Warning		Smart control is suddenly disabled.
Detection Conditions		If the condition given below is met, and the smart ECU receives a code indicating the voltage drop of the smart key battery while the room oscillator checks the smart key ID code. • The power switch has been turned OFF after 20 or more minutes have elapsed after the hybrid system has been started.
Warning	Smart Entry System Warning Light	—
	Buzzer (Combination Meter)	Sounds once upon detecting.
	Wireless Door Lock Buzzer	—

Warning Against Operating the Smart Ignition Outside the Detection Area of the Room Oscillator

Possible Effects without Warning		User is perplexed
Detection Conditions		If the condition given below is met and the result of the smart key ID code check by the room oscillator is NG, a warning will be issued. • Power switch is pushed.
Warning	Smart Entry System Warning Light	Illuminates for 5 seconds upon detection.
	Buzzer (Combination Meter)	Sounds once upon detecting.
	Wireless Door Lock Buzzer	—

Warning Against Operating the Door Lock While Any of the Doors is Open

Possible Effects without Warning		Vehicle theft.
Detection Conditions		If all the conditions listed below are met, a warning will be issued. • Power switch is in the OFF position. • Any of the doors is open. • Lock switch on the outside door handle is ON.
Warning	Smart Entry System Warning Light	—
	Buzzer (Combination Meter)	—
	Wireless Door Lock Buzzer	Sounds for 10 seconds, and stops when 10 seconds have passed or if the door is closed.

7. Power Saving Function

- When the doors are locked, the door oscillators emit signals outside of the vehicle at prescribed intervals (300 msec). Therefore, the auxiliary battery could be drained if the vehicle remains parked for a long time.
- If the smart key is constantly located within the vehicle exterior detection area, the system maintains periodic communication with the smart key. Therefore, if the vehicle remains parked in the state for a long time, the smart key and the auxiliary battery could be drained.

To prevent the smart key battery and the auxiliary battery from being depleted in the conditions indicated above, the smart entry & start system effects the controls listed in the table below.

Condition	Control	Reinstatement Condition
Vehicle remains parked for a long time. • No response from smart key for more than 5 days	Signal transmission interval is extended from 300 msec. to 600 msec.	• A wireless door lock remote control signal (lock or unlock) is input and the ID code matches. • A lock switch signal is input. • A door is locked or unlocked in unison with the movement of the mechanical key.
Vehicle remains parked for a long time. • No response from smart key for more than 14 days	Automatically deactivates the smart entry & start system	
Vehicle remains parked for a long time. • Smart key is located in the vehicle exterior detection area for longer than 10 minutes.	Automatically deactivates the smart entry & start system	