■START FUNCTION

1. General

- The start function is operated by simply pressing the push-type engine switch while holding the key. The power source control ECU turns the ACC, IG or ST CUT relays off and on to switch (control) the power source.
- This function has different power source control patterns to suit the state of the brake pedal and shift lever position. For detail see page BE-149.
- Along with the adoption of the start function, an engine cranking hold function is used. For details, see page EG-109.

08D0BE31C

Service Tip

- At the first attempt to start the engine after reinstalling the battery, the start function will not operate. The function will operate normally from the second attempt.
- If the engine is started immediately after reinstalling the battery, wait 10 seconds or more before starting the engine. An attempt to start the engine within 10 seconds of reinstalling the battery may fail.
- The start function may not be operational after recharging or while jump-starting. This condition is common if battery voltage drops below 9 volts. If the battery voltage drops, the steering position data will not be recorded, and engine starting will be impossible. This condition occurs when the battery voltage drops gradually, such as when a battery discharges. Therefore, this normally will not occur on the occasion of normal battery replacement (The steering lock position data can be read out from the ECU memory). The following procedure has been developed to address this condition.

  Initialization Procedure:

  1. Confirm that the D/C CUT fuse is installed.

  NOTE:

  If the D/C CUT fuse is not installed, please install it at this time.

  2. Place the shift lever in the “P” position.
  3. Open or close the driver side door.

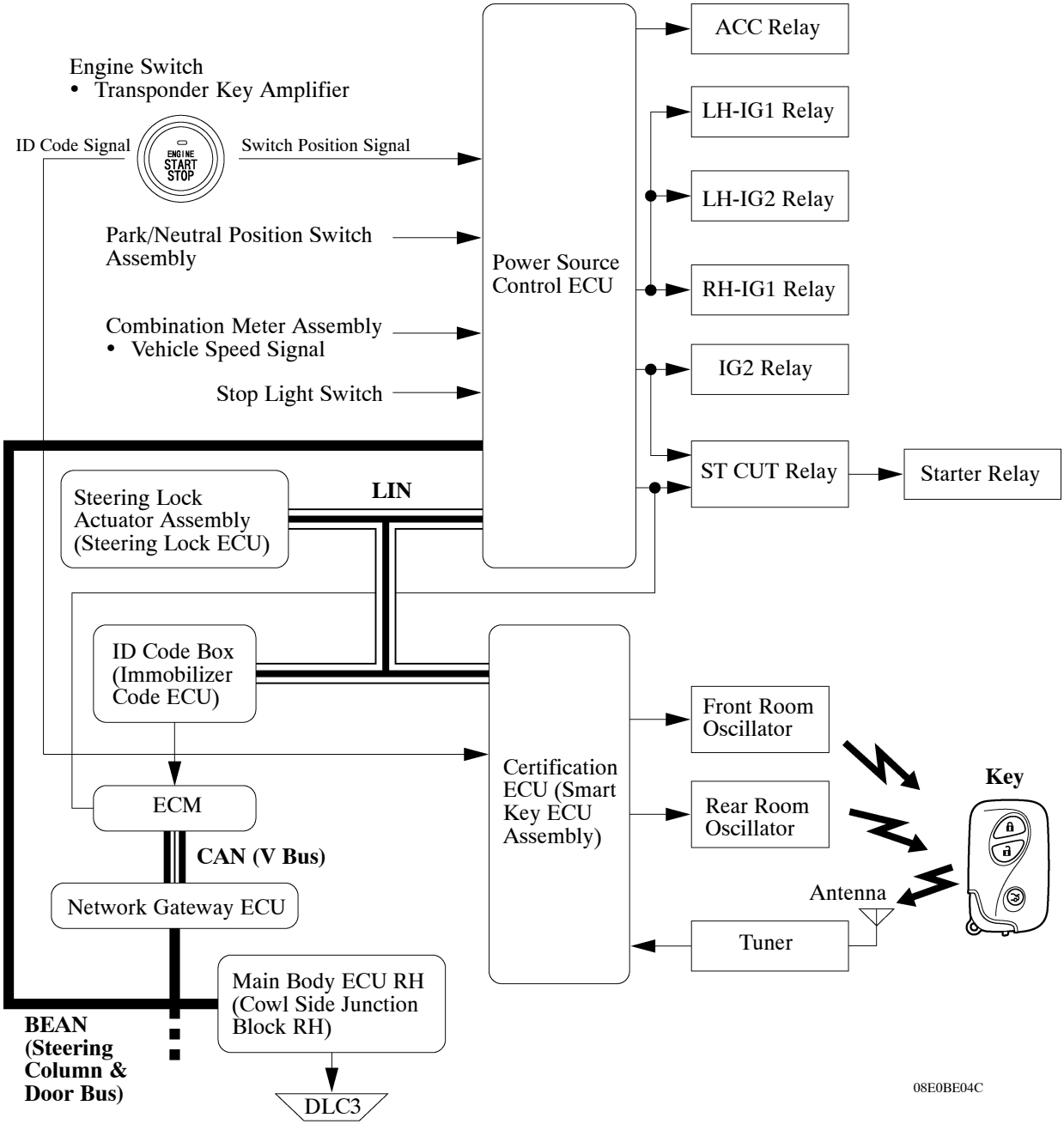
  NOTE:

  This will start an initialization process between the steering lock actuator assembly (steering lock ECU) and the main body ECU RH (cowl side junction block RH).

  4. Depress brake pedal.
  5. Press the engine switch “START”.

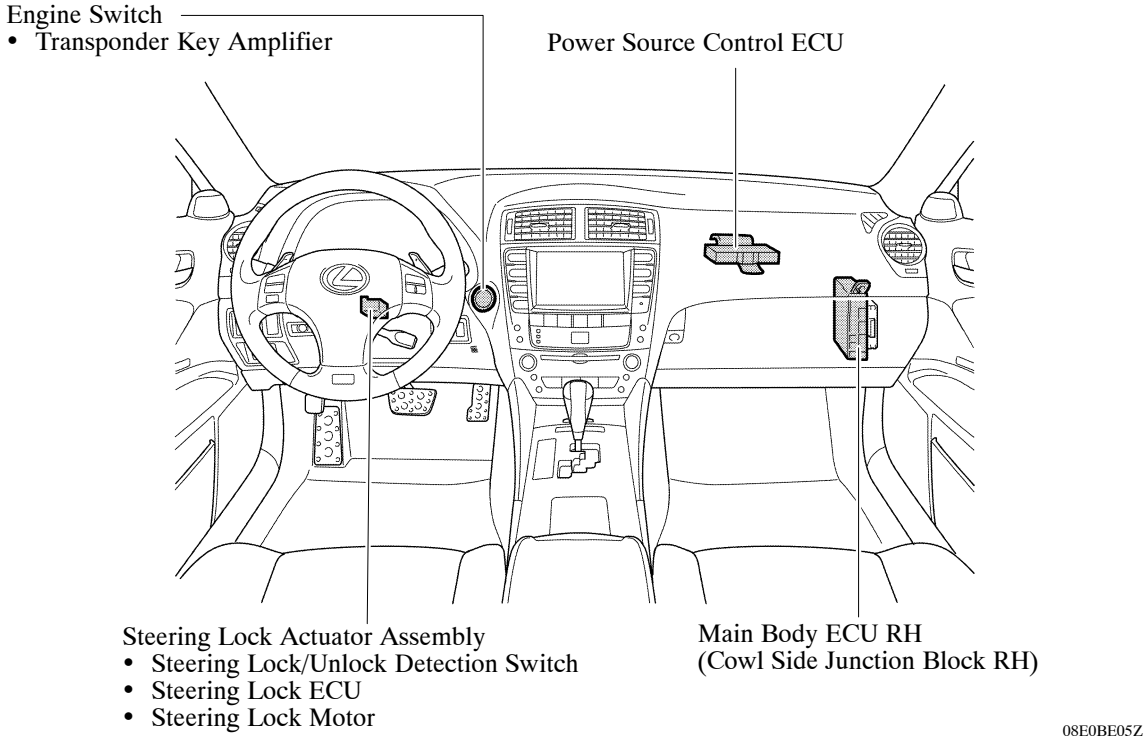
2. System Diagram

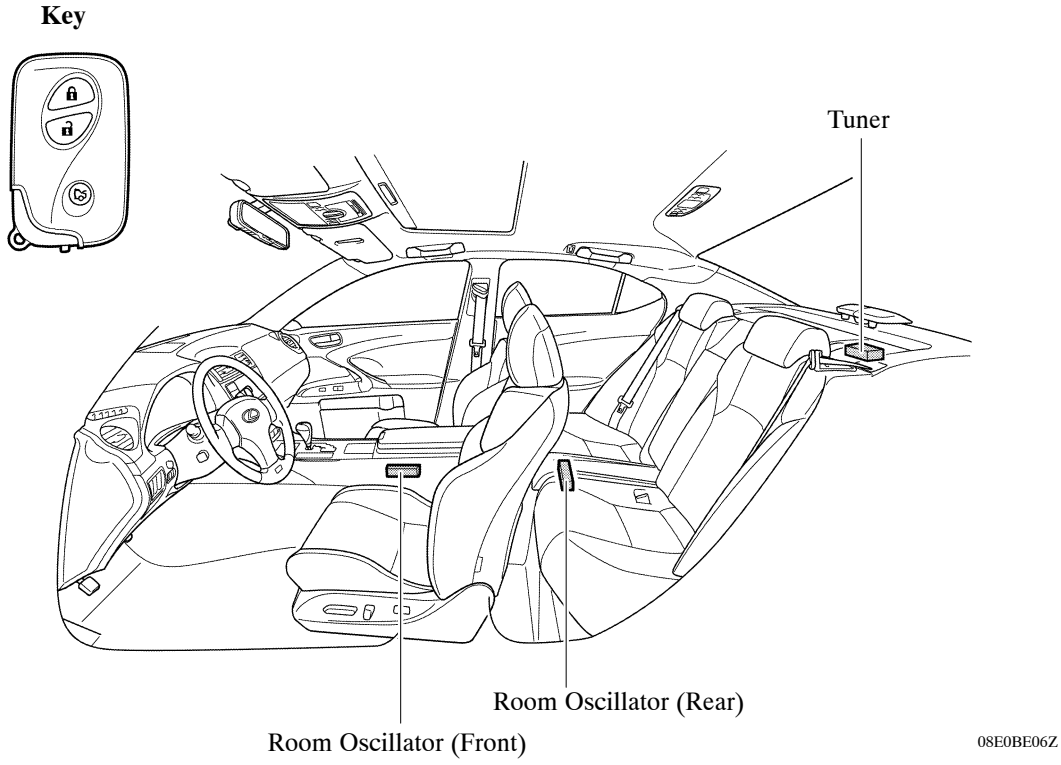
The power source control ECU controls the start function. The system diagram below shows the components that relate to this function.

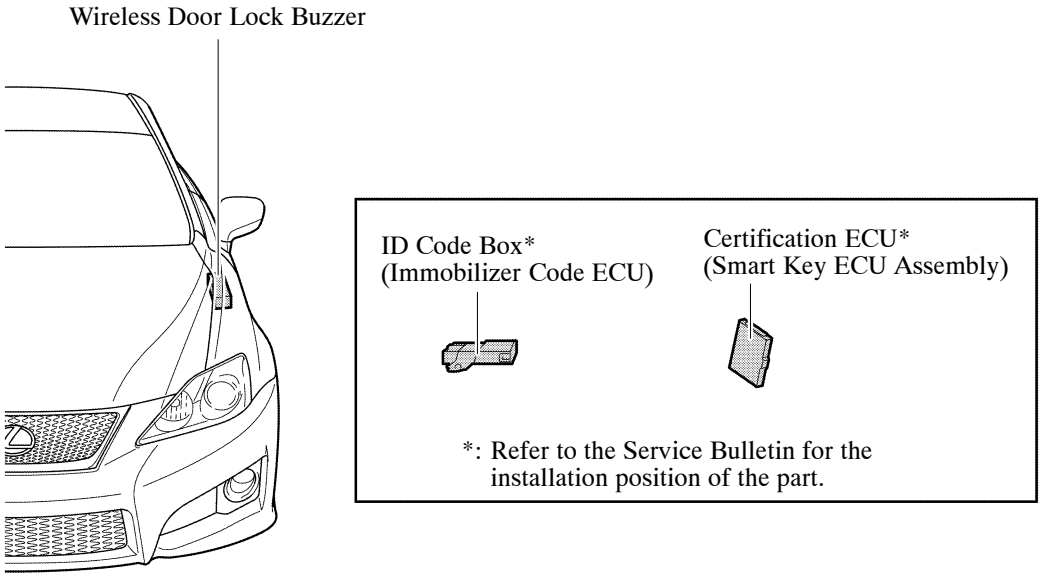


BE

3. Layout of Main Components






Wireless Door Lock Buzzer
ID Code Box*
(Immobilizer Code ECU)
Certification ECU*
(Smart Key ECU Assembly)
*: Refer to the Service Bulletin for the installation position of the part.

08E0BE07Z

4. Function of Main Components

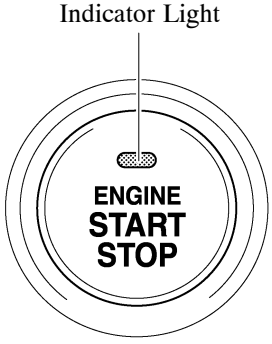
Component	Function
Engine Switch • Transponder Key Amplifier	• Transmits the engine switch signal to the power source control ECU. • Informs the driver of a power source or system abnormality based on the illumination of its indicator light. • Receives the ID code and transmits it to the certification ECU (smart key ECU assembly) when the key battery is too weak to respond to the tuner based on the room oscillators.
Key	Receives the signals from oscillators and returns the ID code to the tuner. For details, see page BE-163.
Room Oscillator • Front and Rear	Receives a request signal from the certification ECU (smart key ECU assembly) and forms the actuation area in the vehicle interior.
Tuner	Receives the ID code from the key and transmits it to certification ECU (smart key ECU assembly).
Power Source Control ECU	• Switches the power source in four modes (OFF, ACC, IG-ON, START) in accordance with the shift position and the state of the stop light switch. • Controls the entry and start system in accordance with the signals received from the switches and each ECU.
Certification ECU (Smart Key ECU Assembly)	Certifies the ID code received from the tuner and transmits the certification results to the ID code box (immobilizer code ECU) and steering lock actuator assembly (steering lock ECU).
Stop Light Switch	Outputs the state of the brake pedal to power source control ECU.
Park/Neutral Position Switch Assembly	Outputs the position of the shift lever to power source control ECU.
ID Code Box (Immobilizer Code ECU)	Receives the steering unlock or engine immobilizer disengage signals from the certification ECU (smart key ECU assembly), certifies them, and transmits each disengage signal to the steering lock actuator assembly (steering lock ECU) or ECM.
ECM	• Receives the engine start request signal from the power source control ECU, turns the ST relay on, and starts the engine. • Receives the signal from the ID code box (immobilizer code ECU) and performs engine ignition and injection.

5. Construction and Operation

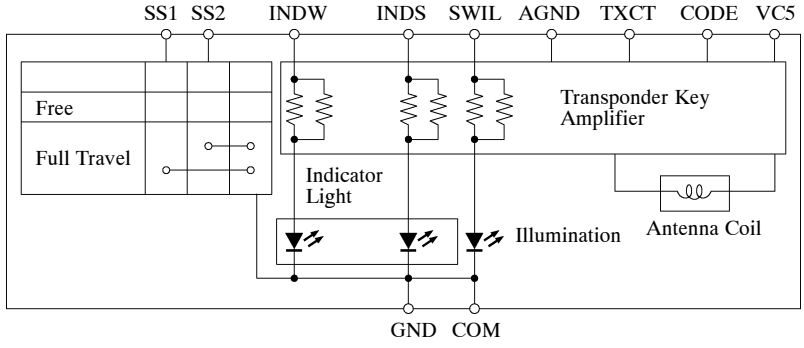
Engine Switch

The engine switch consists of a momentary type switch, two color (Amber, Green) LEDs, and a transponder key amplifier.

- The amber and green LEDs are for the indicator light.
- The driver can determine the present power source and check whether the engine can start or not in accordance with the illumination state of the indicator light.
- When the power source control ECU detects an abnormality with the entry and start system, it makes the amber indicator light flash. If the engine is stopped in this state, it might not be possible to restart it.



263BE05



06J0BE104C

BE

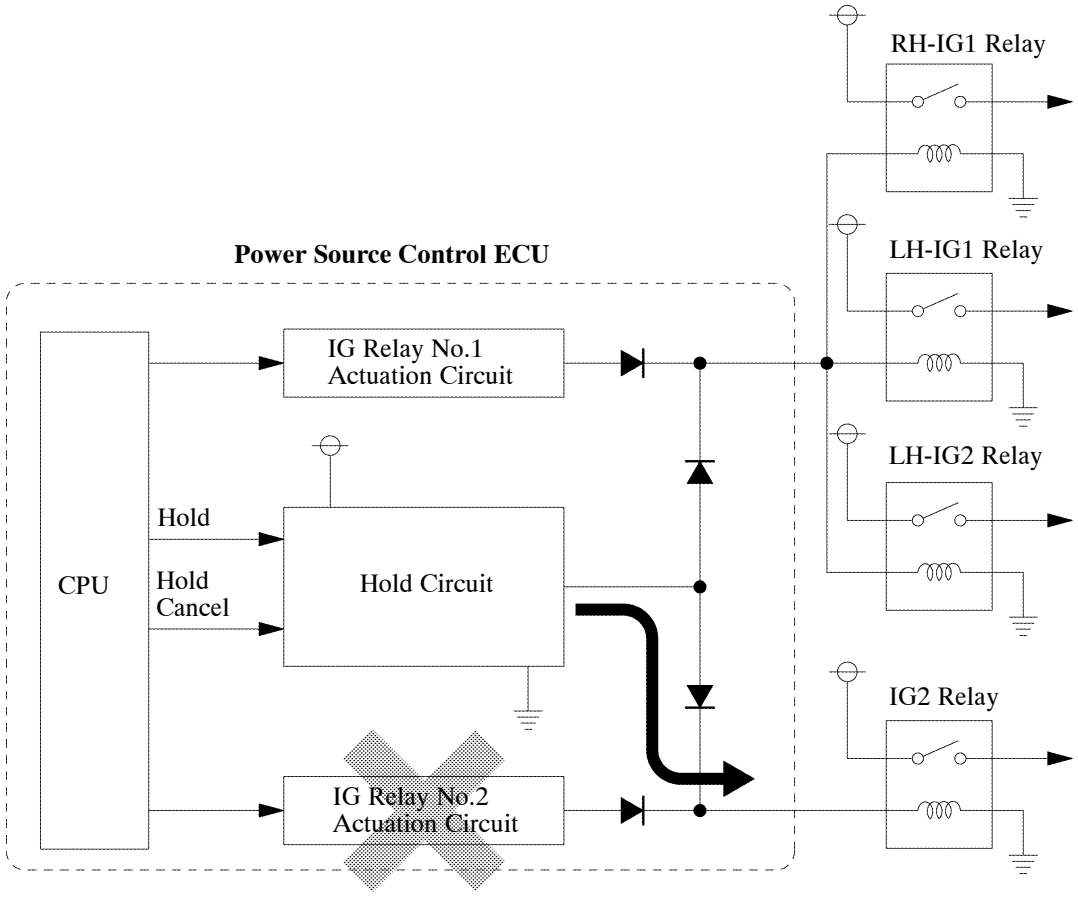
▶ Indicator Light Condition ◀

Power Source Condition	Indicator Light Condition	
	Brake pedal not depressed	Brake pedal depressed with shift lever in "P" or "N"
OFF	OFF	ON (Green)
ACC, IG-ON	ON (Amber)	ON (Green)
Engine Running	OFF	OFF
Steering lock not unlocked	Flashes (Green) for 15 seconds	Flashes (Green) for 15 seconds
Entry and Start System Malfunction	Flashes (Amber) for 15 seconds	Flashes (Amber) for 15 seconds

Power Source Control ECU

The power source control ECU controlled circuits consist of the IG relay No.1 and No.2 actuation circuits, CPU, and hold circuit.

- The hold circuit is installed to prevent the power supply to the relays from being cut off when an abnormality occurs in IG relay No.1 and/or No.2 actuation circuits while driving.



Service Tip

The power source control ECU constantly stores the present power source state in its memory. Therefore, if the power to power source control ECU is interrupted due to the removal of the battery, the power source control ECU restores the power source state after the battery is reconnected.
For this reason, if the battery is removed when the engine switch is in a state other than off, the power will be restored to the vehicle at the same time the power is restored to power source control ECU (by reconnecting the battery).
Therefore, before removing the battery, make sure to turn the engine switch off.

6. Start Function Operation

General

- The start function has different power source patterns to suit the brake pedal state and shift lever position.

Pattern	Brake Pedal	Shift Lever	Power Source Pattern
A	Depressed	P or N Position	When the engine switch is pushed once. • OFF → IG-ON (after the engine is started)
B	Not Depressed	P Position	Each time the engine switch is pushed. • OFF → ACC → IG-ON → OFF
C		Except P Position	Each time the engine switch is pushed. • OFF → ACC → IG-ON → ACC
D	—	P Position	When the engine switch is pushed in the IG-ON condition. • IG-ON (engine is started or not started) → OFF
E	—	Except P Position	When the engine switch is pushed in the IG-ON condition. • IG-ON (engine is started or not started) → ACC

▶ Transition of Power Source ◀

Shift Position		P			N		Except P, N	
Pattern		B or D	A or D	–	C or E	A or E	C or E	–
Engine Switch		Pushed	Pushed	–	Pushed	Pushed	Pushed	Pushed
Brake		–	Depressed	–	–	Depressed	–	Depressed
Hour		–	–	After 1 hour	–	–	–	–
Power Source	OFF							
	ACC							
	IG							
	Engine Start							

: Transition
: Only when the key certification is OK
: Only when the vehicle is stopped

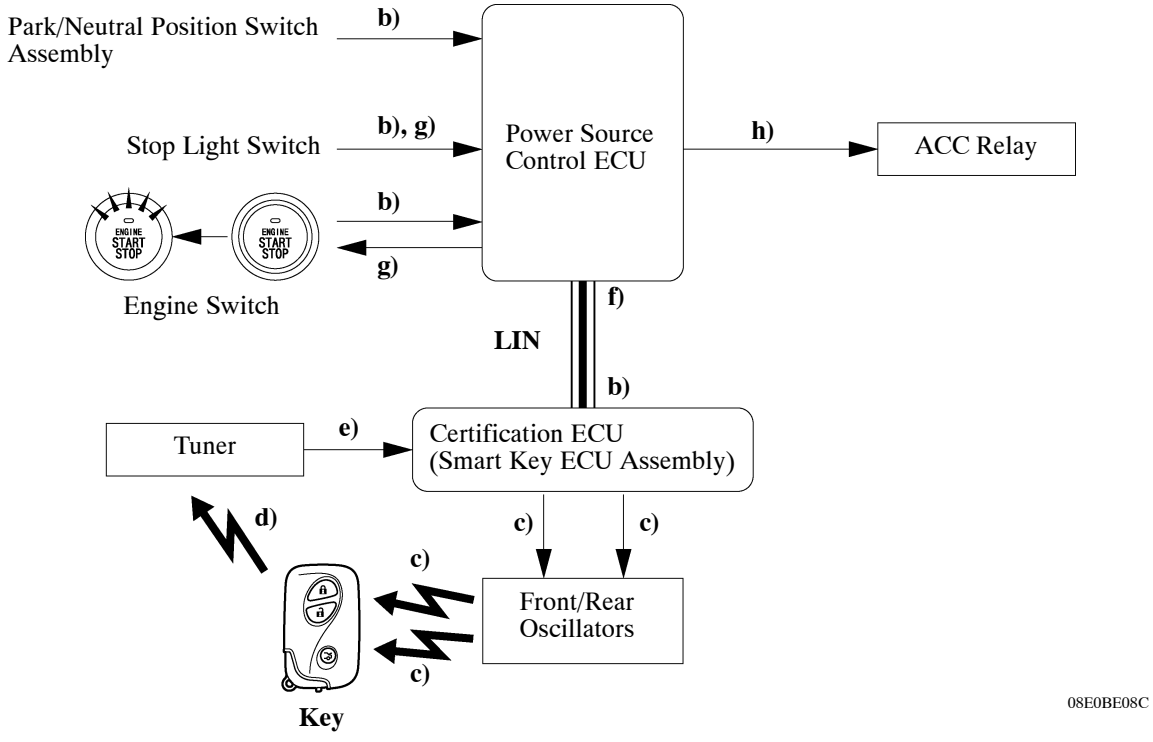
285BE144

- When the key battery is low, the start function can be made to function by holding the key against the engine switch. For details, see page BE-156.

BE

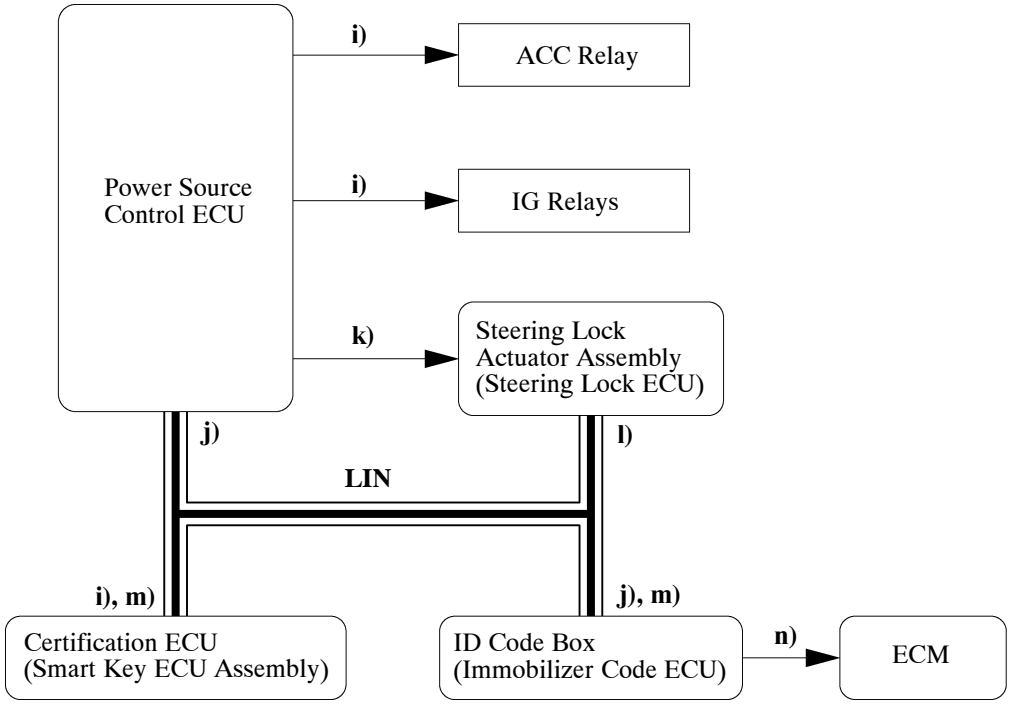
Pattern A: OFF → IG-ON (after the engine is started)

Step	System Operation
a)	The driver has the key in their possession and enters the vehicle.
b)	When the driver presses the engine switch once with the following conditions satisfied, the power source control ECU recognizes the engine switch signal and transmits the key certification request to the certification ECU (smart key ECU assembly). • Shift position is “P” or “N”. • Brake pedal depressed. • Power source is off (engine switch is off).
c)	The certification ECU (smart key ECU assembly) receives the certification request and transmits a request signal to the front/rear oscillators. These oscillators then transmit the request signal for the key.
d)	The moment the key receives the request signal, it returns an ID code to the tuner that includes the response code.
e)	The tuner receives this code and transmits it to the certification ECU (smart key ECU assembly).
f)	The certification ECU (smart key ECU assembly) judges and certifies the ID code, and transmits a key certification OK signal to the power source control ECU.
g)	The brake pedal is depressed, causing the power source control ECU to turn on the green indicator light of the engine switch.
h)	After receiving the key certification OK signal, the power source control ECU turns the ACC relay on.



(Continued)

Step	System Operation
i)	The power source control ECU turns the ACC relay on, and then turns the IG relays on.
j)	The certification ECU (smart key ECU assembly) checks that the power source has switched from OFF to IG-ON, and transmits a steering unlock signal to the power source control ECU and ID code box (immobilizer code ECU).
k)	The power source control ECU receives this signal and supplies power to the steering lock actuator assembly (steering lock ECU).
l)	The steering lock actuator assembly (steering lock ECU) receives the steering unlock signal via the ID code box (immobilizer code ECU), and releases the steering lock.
m)	After checking the steering unlock condition, the certification ECU (smart key ECU assembly) transmits an engine immobilizer disengage signal to the ID code box (immobilizer code ECU).
n)	The ID code box (immobilizer code ECU) certifies the disengage signal of the certification ECU (smart key ECU assembly), transmits the engine immobilizer disengage signal to the ECM, disengaging the engine immobilizer.

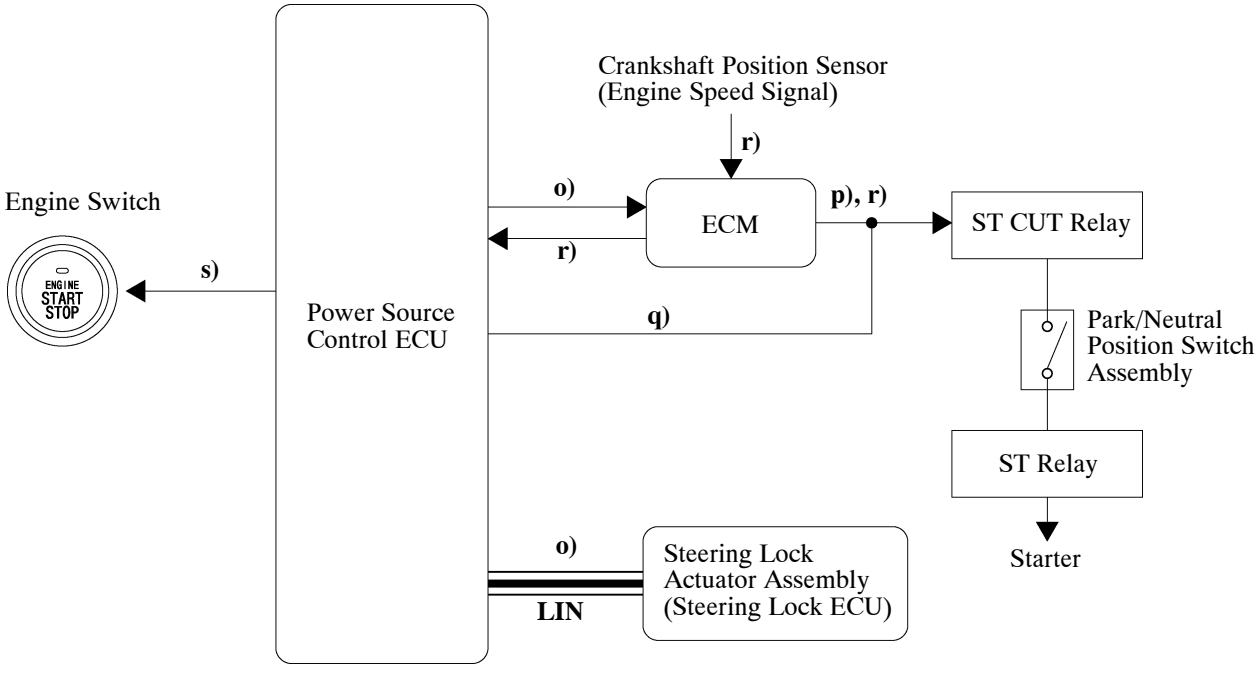


08D0BE37C

(Continued)

BE

Step	System Operation
o)	After checking that the steering is in the unlocked condition, the power source control ECU transmits a starter request (STSW) signal to the ECM.
p)	The ECM receives this signal, outputs an ST relay (STAR) signal, and actuates the starter. (For details see the cranking hold function on page EG-109.)
q)	The ECM and power source control ECU both output the starter relay signal in order to actuate the starter. Both ECUs output the signal in order to prevent situations where the starter may fail to operate, such as when the battery voltage supplied to the ECM is low.
r)	When the ECM judges from the engine speed that engine has started, it stops the starter relay (STAR) signal, stopping the starter.
s)	The power source control ECU receives the engine speed signal, checks that engine start is completed, and turns OFF the indicator light of the engine switch.



08D0BE38C

Pattern B: OFF → ACC → IG-ON → OFF

1) OFF → ACC

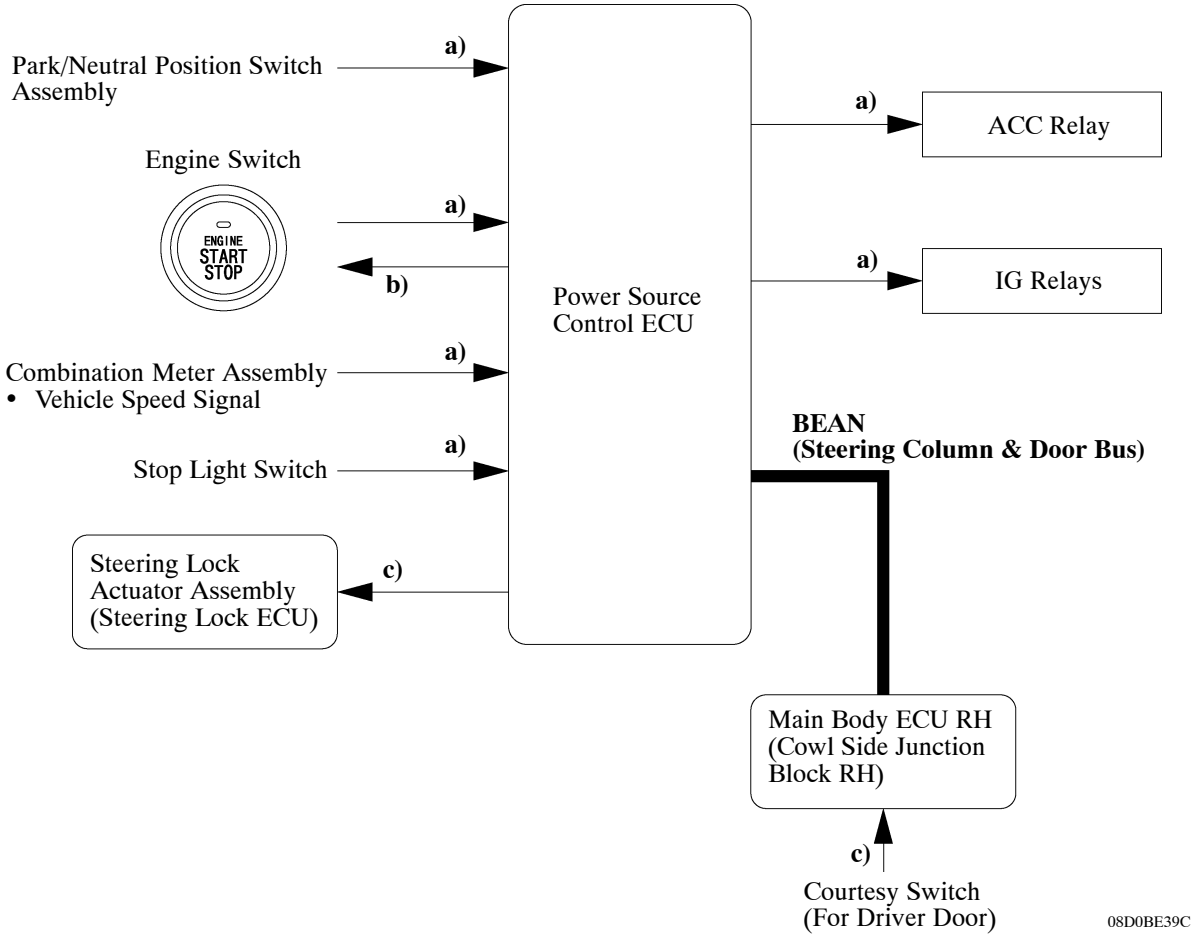
Step	System Operation
a)	The driver has the key in their possession and enters the vehicle.
b)	When the driver presses the engine switch once with the following conditions satisfied, the power source control ECU recognizes the engine switch signal and transmits the key certification request to the certification ECU (smart key ECU assembly). • Shift position is “P”. • Brake pedal is not depressed. • Power source is off (engine switch is off).
c)	Due to the brake pedal not being depressed, the power source control ECU will turn on the amber indicator light of the engine switch.
d)	The rest of the system operation is the same as **c) to n) in “Pattern A”**. For details, see page BE-150.

2) ACC → IG-ON

When the power source is ACC and the driver presses the engine switch again, the power source control ECU recognizes the engine switch signal and turns the IG relays on.

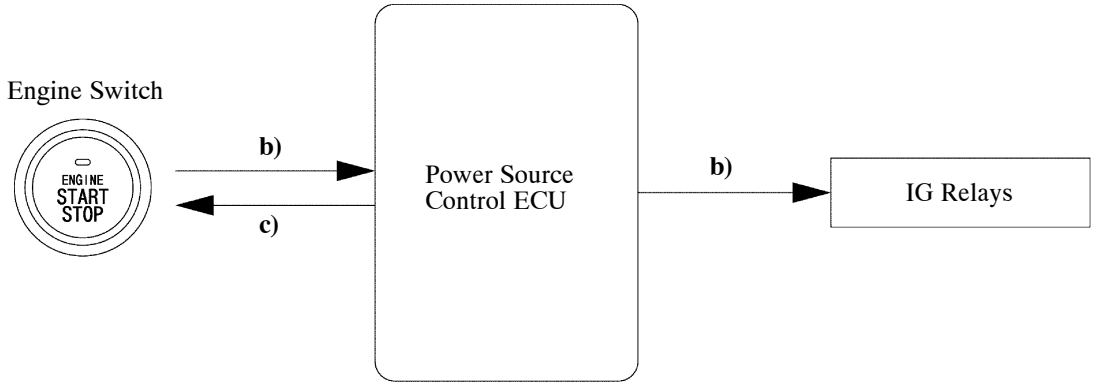
3) IG-ON → OFF

Step	System Operation
a)	When the engine switch is pressed once with the following conditions satisfied, the power source control ECU recognizes the engine switch signal and turns the ACC and IG relays off. • Shift position is “P”. • Brake pedal is not depressed. • Vehicle speed is 0. • Power source is in IG-ON mode (engine switch is on (IG)).
b)	When the power source is switched from IG-ON to OFF, the power source control ECU will turn the indicator light of the engine switch off.
c)	If the driver door is opened, the power source control ECU will receive a signal from the main body ECU RH (cowl side junction block RH). Then, power supply to the steering lock actuator assembly (steering lock ECU) is stopped in order to lock the steering.



Pattern C: OFF → ACC → IG-ON → ACC

Step	System Operation
a)	The system operation for the power source "OFF → ACC → IG-ON" are the same as those in pattern B. For details, see page BE-153.
b)	When the engine switch is pressed once with the following conditions satisfied, the power source control ECU recognizes the engine switch signal and turns the IG relays off. • Shift position is in any position except "P". • Brake pedal is not depressed. • Vehicle speed is 0. • Power source is in IG-ON mode (engine switch is on (IG)).
c)	Even after the power source switches from IG-ON to ACC, the amber indicator light of the engine switch will remain illuminated.



0140BE136C

Pattern D: IG-ON → OFF

This system operation is the same as IG-ON → OFF for "Pattern B". For details, see page BE-153.

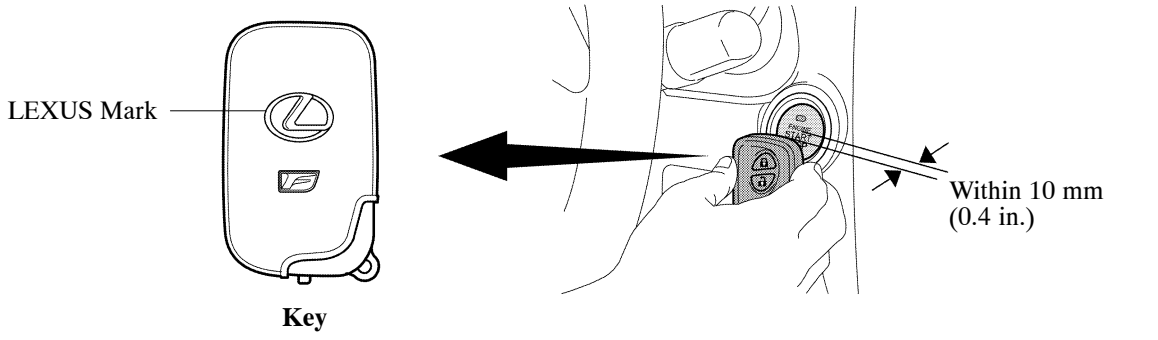
Pattern E: IG-ON → ACC

This system operation is the same as "Pattern C". However, the indicator light of the engine switch will illuminate as follows:

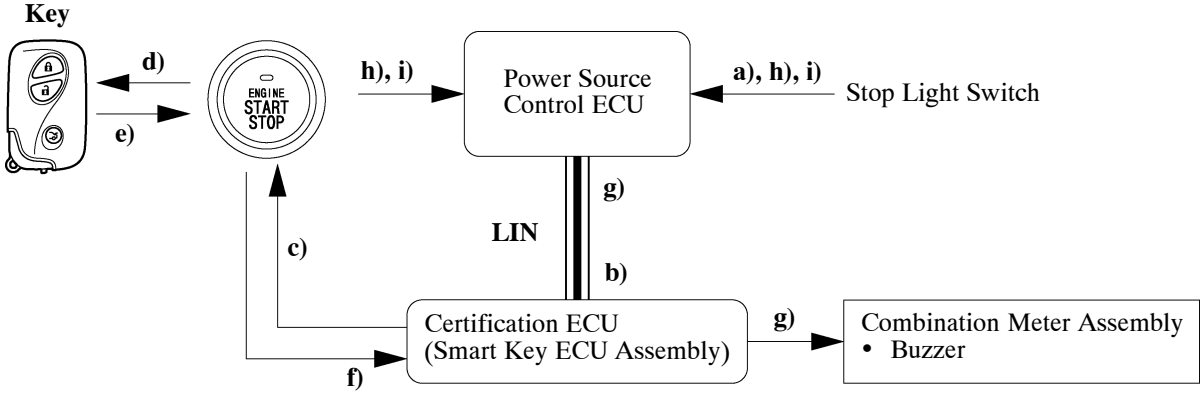
- When the power source is switched from IG-ON to ACC, the power source control ECU continues to illuminate the amber indicator light of the engine switch.
- When the power source is switched from engine running to OFF, the power source control ECU turns OFF the indicator light of the engine switch.

When key battery is low

Step	System Operation
a)	Hold the LEXUS mark of the key against the engine switch while depressing the brake pedal.
b)	The power source control ECU receives the stop light switch signal and transmits a key certification request signal to the certification ECU (smart key ECU assembly).
c)	The certification ECU (smart key ECU assembly) does not receive an ID code response from the tuner, so it actuates the transponder key amplifier built in to the engine switch.
d)	The transponder key amplifier outputs an engine immobilizer radio wave to the key.
e)	The key receives the radio wave, and returns a radio wave response to the transponder key amplifier.
f)	The transponder key amplifier combines the key ID codes with the radio wave response, and transmits it to the certification ECU (smart key ECU assembly).
g)	The certification ECU (smart key ECU assembly) judges and verifies the ID code, and transmits a key certification OK signal to the power source control ECU. The buzzer in the combination meter assembly sounds at the same time.
h)	After the buzzer sounds, if the engine switch is pressed within 10 seconds while the brake pedal is depressed, the power source ECU starts the engine, the same as with normal system operation.
i)	After the buzzer sounds, if the engine switch is pressed within 10 seconds while the brake pedal is not depressed, the power source will be switched to ACC or IG-ON, the same as with normal system operation.



08D0BE40Z



08E0BE09C

7. Diagnosis

The power source control ECU and certification ECU (smart key ECU assembly) can detect malfunctions in the entry and start system when the power source is in IG-ON mode (when the “engine switch is on (IG)”). When the ECUs detect a malfunction, the amber indicator light of the engine switch flashes to warn the driver. At the same time, the ECUs store 5-digit DTCs (Diagnostic Trouble Codes) in their memory.

- The indicator light warning continues for 15 seconds even after the power source is switched off.
- The DTCs can be read by connecting an intelligent tester to the DLC3.
- The entry and start system may not operate successfully if a malfunction occurs.