ADVANCED KEYLESS ENTRY SYSTEM

id091400107400

Outline

- An advanced keyless entry system has been adopted which performs automatic authorization of the remote transmitter that is carried and locking/unlocking of the doors.
- The start stop unit performs advanced keyless entry system fail-safe. (See START STOP UNIT.)

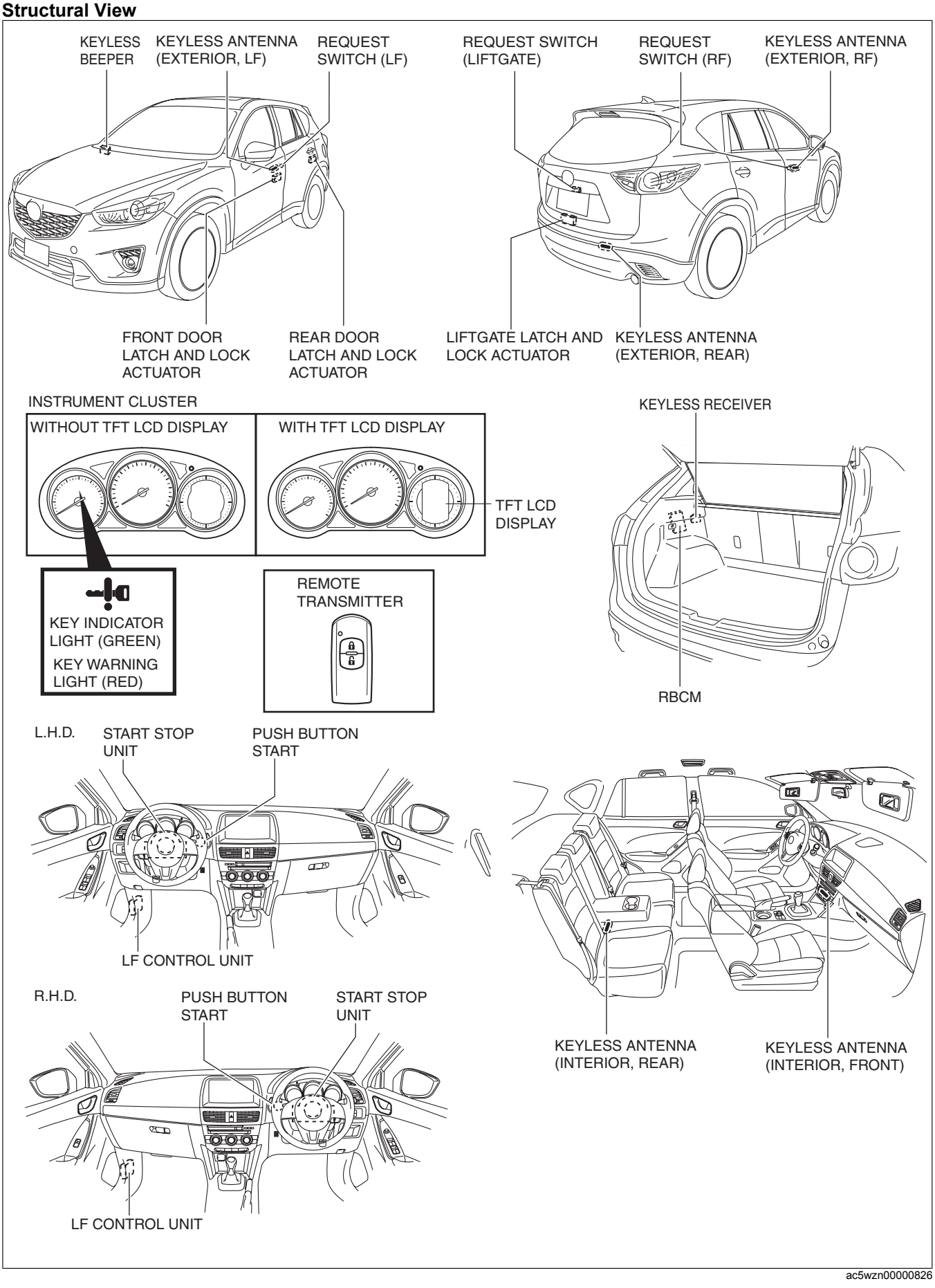
Function

- The advanced keyless entry system performs remote transmitter authorization when any of the following operations is performed.
  - Locking/unlocking using a request switch on an outer door
  - Locking using the request switch on the liftgate
  - Locking/unlocking using a remote transmitter
  - Opening the liftgate
- The advanced keyless entry system has the following functions in the event that the user operates the system incorrectly or to prevent the user from leaving the vehicle without locking.
  - Auto re-lock function: After unlocking, if any door or the liftgate is not opened and a period of time according to the personalization setting has elapsed, all doors are automatically locked.
  - Out-of-area (reception area) type auto lock function: After closing all doors, when the remote transmitter is brought out of the reception area of the keyless antenna, all doors are automatically locked.
  - Remote transmitter pause function: If all doors are locked with a transmitter left in the vehicle, the functions of the remote transmitter inside the vehicle are paused.
  - Remote transmitter left-in-vehicle prevention function: If the liftgate is closed with a remote transmitter left in the vehicle, the liftgate can be opened by pressing the liftgate opener switch.
  - Alert function: If the system is operated incorrectly which results in a possible problem occurring, the system warns the user by using the indicator light, warning light, LCD display, and buzzer in the instrument cluster, or by using the keyless beeper.

Remote transmitter battery voltage low indication function

- This function signals the user that the battery voltage of the remote transmitter is low.

Structural View



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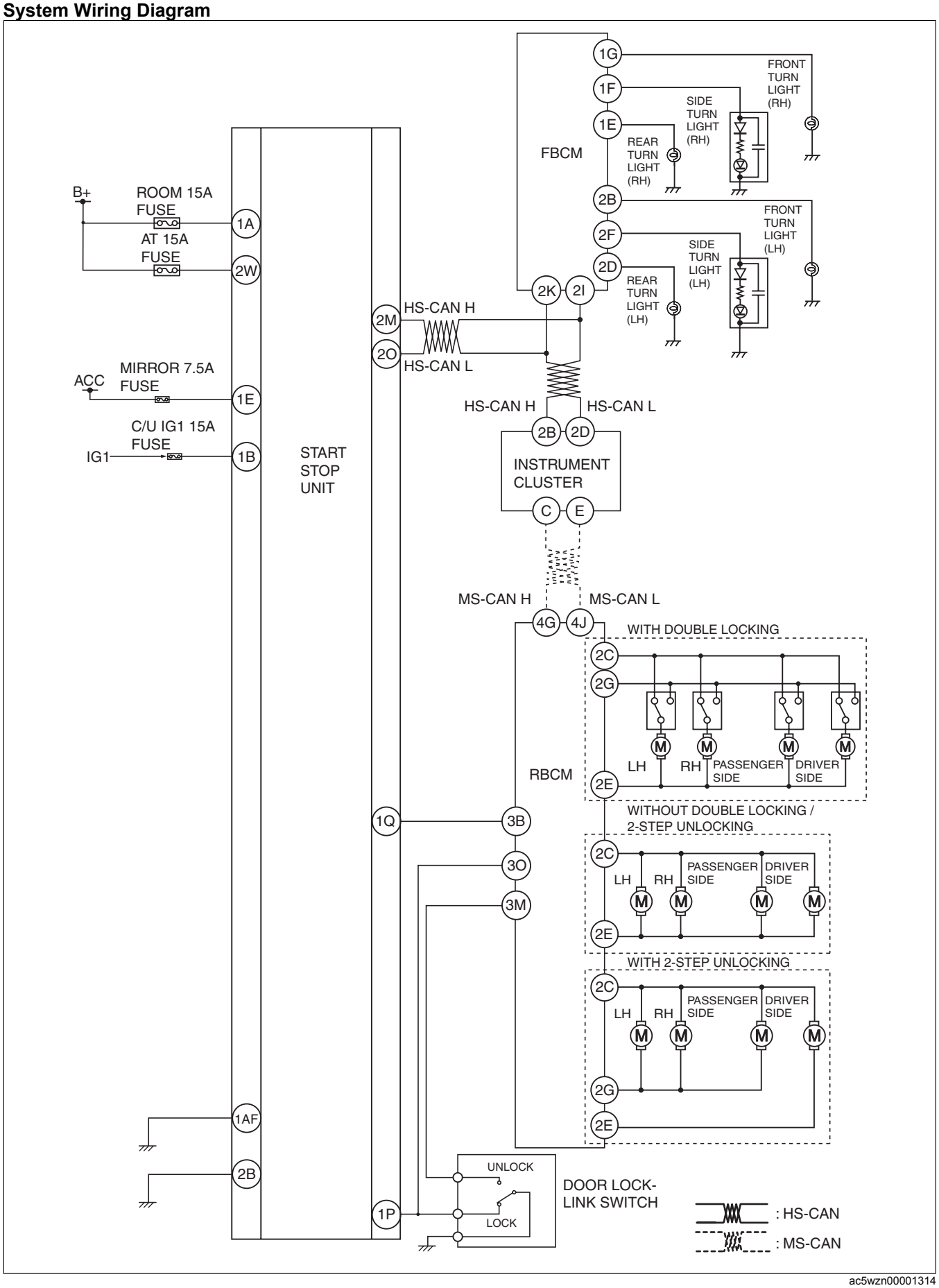
System Wiring Diagram



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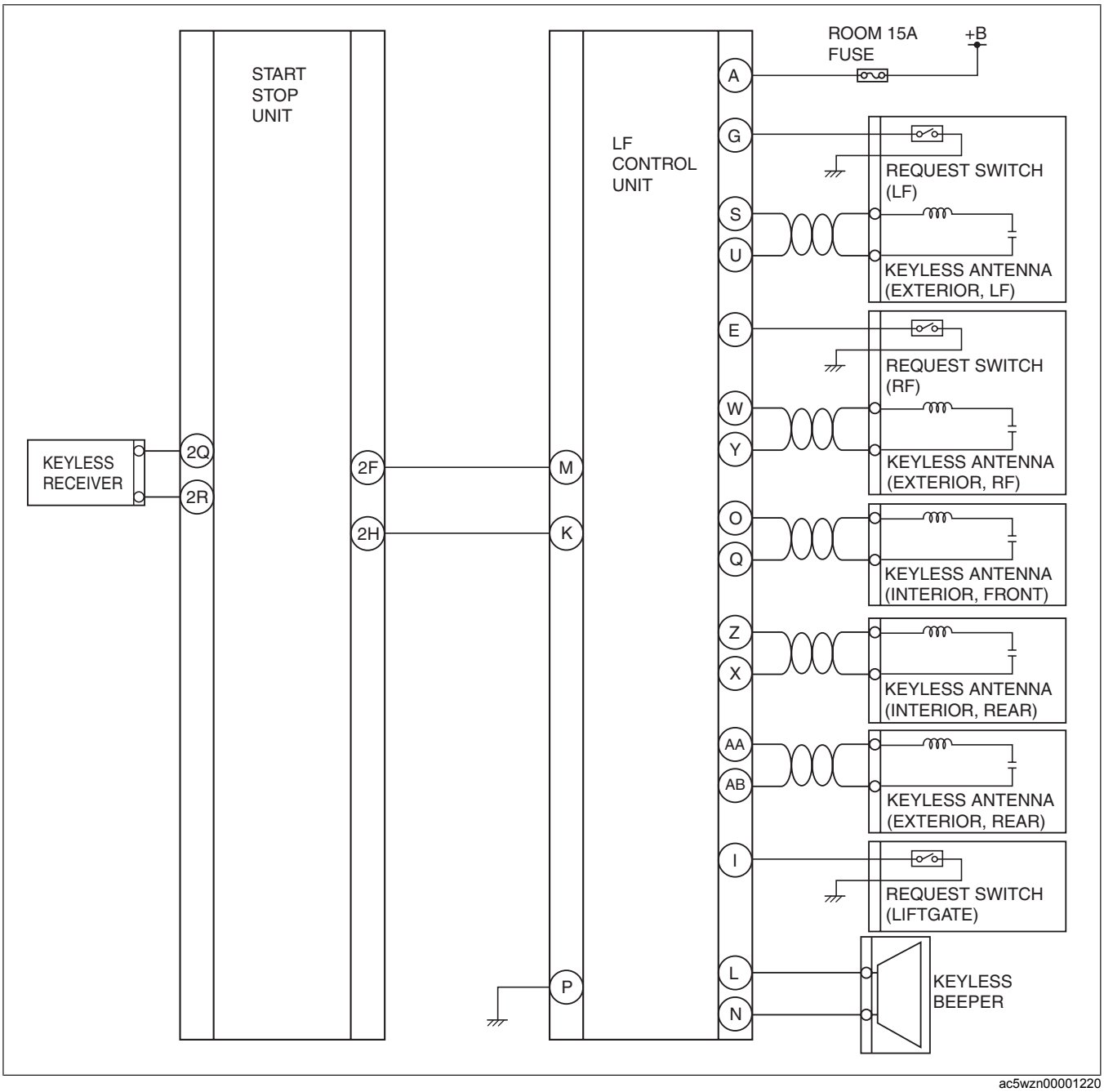

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Operation
Lock/unlock operation using request switch on outer handle

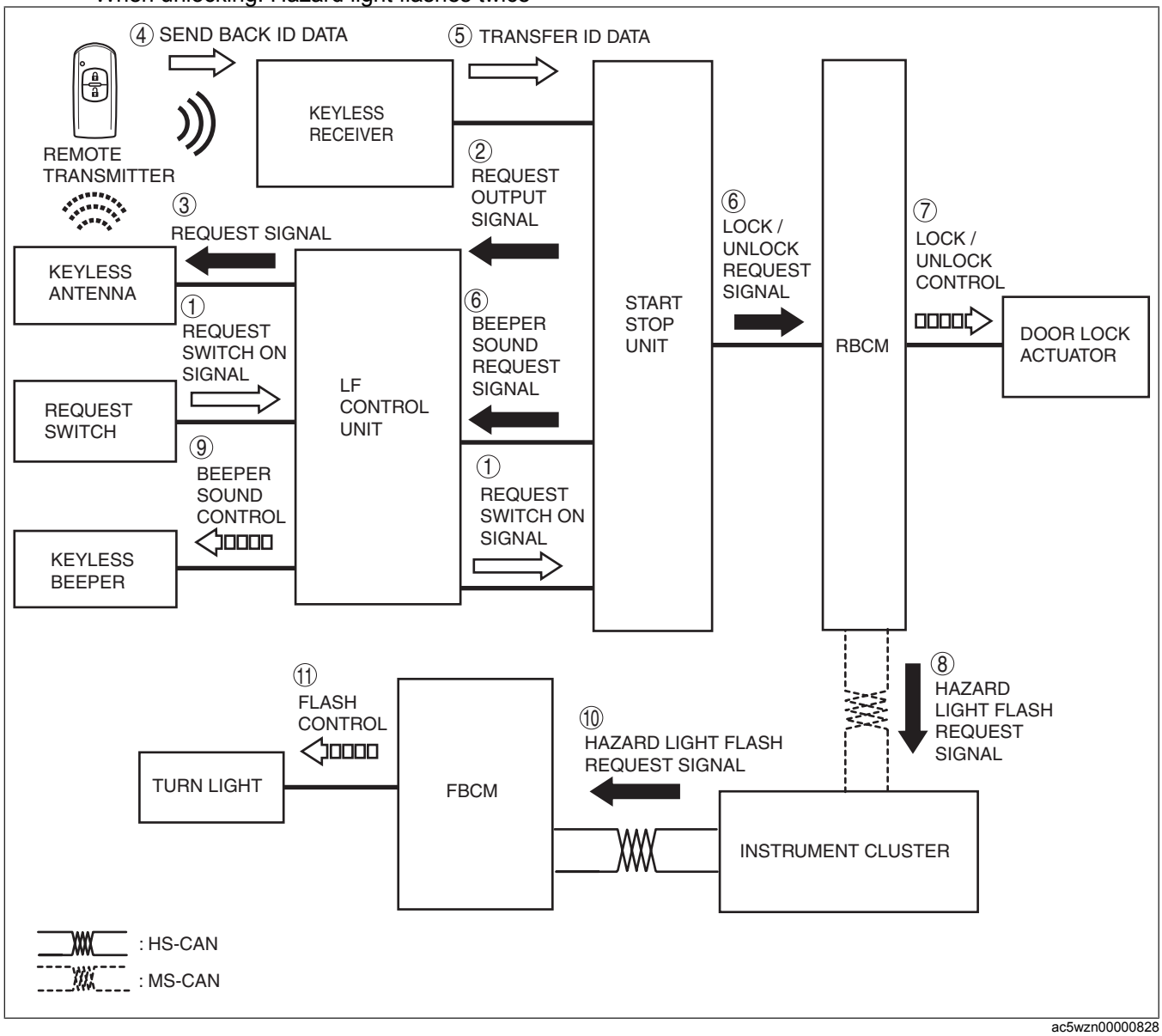
Note
- Lock/unlock operation is performed when a request switch on an outer handle is pressed with all the following conditions met.
  — Ignition is switched OFF (LOCK)
  — All doors are closed
  — The remote transmitter is within the reception area outside the vehicle.

1. When the driver's or the passenger's side request switch is pressed, a request switch on signal is input to the start stop unit via the LF control unit.
2. Based on the request switch on signal, the start stop unit sends a request output signal to the LF control unit to verify that the remote transmitter is inside the reception area.
3. The LF control unit sends a request signal from the keyless antenna of the door in which the request switch was pressed and all keyless antennas for the vehicle interior.
4. The remote transmitter receives the request signal from the outside antenna, and sends ID data to the keyless receiver.
5. The keyless receiver transmits the received ID data to the start stop unit.

6. The start stop unit verifies the ID data, and if it determines a programmed remote transmitter is outside the vehicle, it sends a lock/unlock signal to the rear body control module (RBCM) and at the same time, it sends a beeper sound request signal to the LF control unit.
7. When the rear body control module (RBCM) receives the lock/unlock signal, it operates the front/rear door lock actuator motor to lock/unlock the front/rear doors.

Note
- It takes **approx. 1—2 s** from when a request switch is pressed until the lock/unlock operation is completed.

8. At the same time as the door lock/unlock operation, it sends a hazard light flash request signal to the instrument cluster as a CAN signal.
9. When the LF control unit receives the beeper sound request signal, it operates the keyless beeper for the following number of times:
   — When locking: Keyless beeper sounds once
   — When unlocking: Keyless beeper sounds twice
10. The instrument cluster sends the hazard light flash request signal to the front body control module (FBCM) as a CAN signal.
11. When the front body control module (FBCM) receives the hazard light flash request signal, it controls the hazard light to flash for the following number of times to signal that the lock/unlock operation is completed.
   — When locking: Hazard light flashes once
   — When unlocking: Hazard light flashes twice



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Lock operation using request switch on liftgate

Note

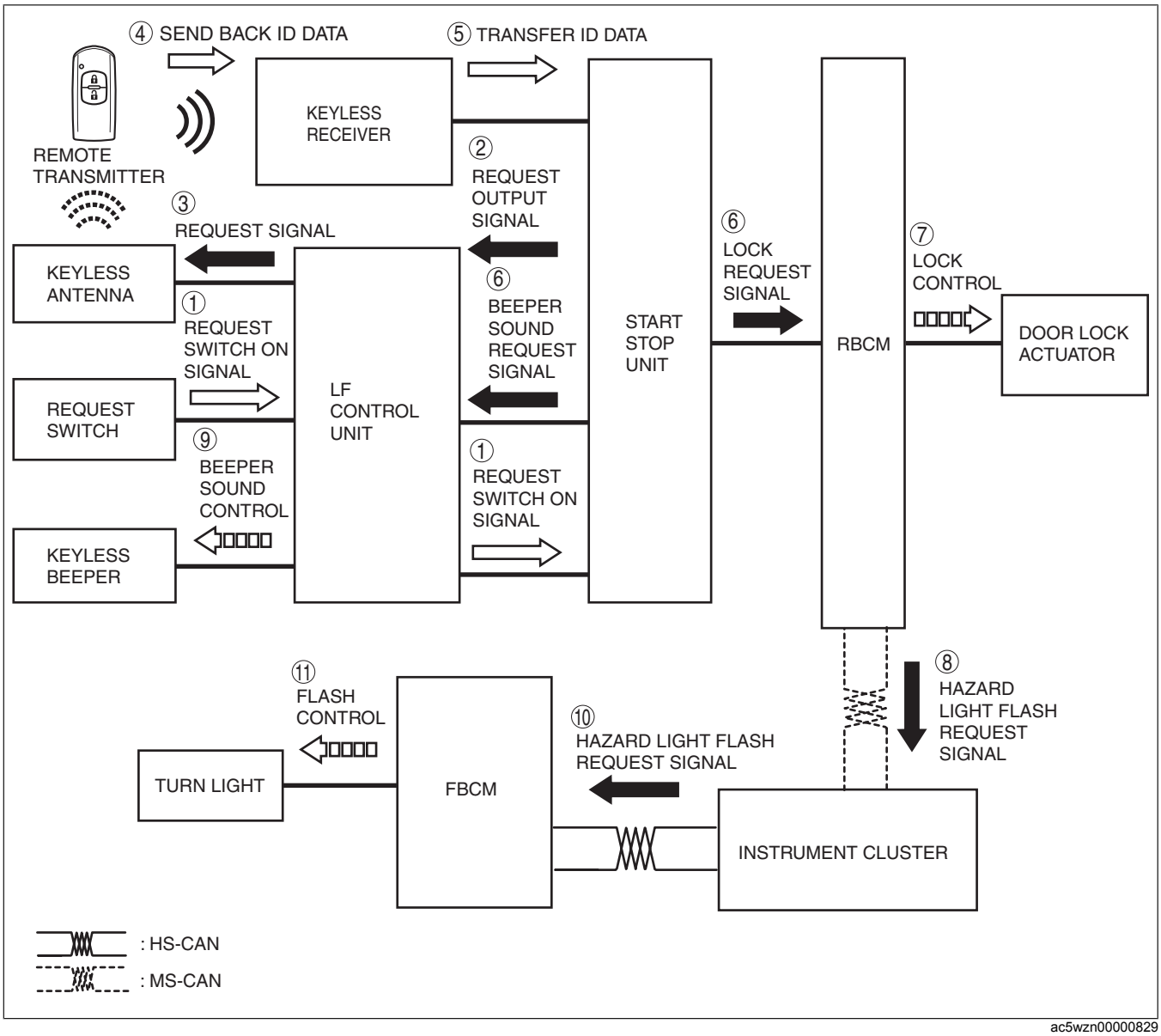
- Lock operation is performed when the request switch on the liftgate is pressed with all the following conditions met.
  - Ignition is switched OFF (LOCK)
  - All doors and liftgate are closed
  - The remote transmitter is within the reception area outside the vehicle.

1. When the request switch is pressed, a request switch on signal is input to the start stop unit via the LF control unit.
2. Based on the request switch on signal, the start stop unit sends a request output signal to the LF control unit to verify that the remote transmitter is inside the reception area.
3. The LF control unit sends a request signal from the outside keyless antenna (rear) and all keyless antennas for the vehicle interior.
4. The remote transmitter receives the request signal from the outside antenna, and sends ID data to the keyless receiver.
5. The keyless receiver transmits the received ID data to the start stop unit.
6. The start stop unit verifies the ID data, and if it determines a programmed remote transmitter is outside the vehicle, it sends a lock signal to the rear body control module (RBCM) and at the same time, it sends a beeper sound request signal to the LF control unit.
7. When the rear body control module (RBCM) receives the lock signal, it operates the front/rear door lock actuator motor to lock the front/rear doors.

Note

- It takes **approx. 1—2 s** from when the request switch is pressed until the lock operation is completed.

8. At the same time as the door lock/unlock operation, it sends a hazard light flash request signal to the instrument cluster as a CAN signal.
9. When the LF control unit receives the beeper sound request signal, it operates the keyless beeper once.
10. The instrument cluster sends the hazard light flash request signal to the front body control module (FBCM) as a CAN signal.
11. When the front body control module (FBCM) receives the hazard light flash request signal, it controls the hazard light to flash once to signal that the lock operation is completed.



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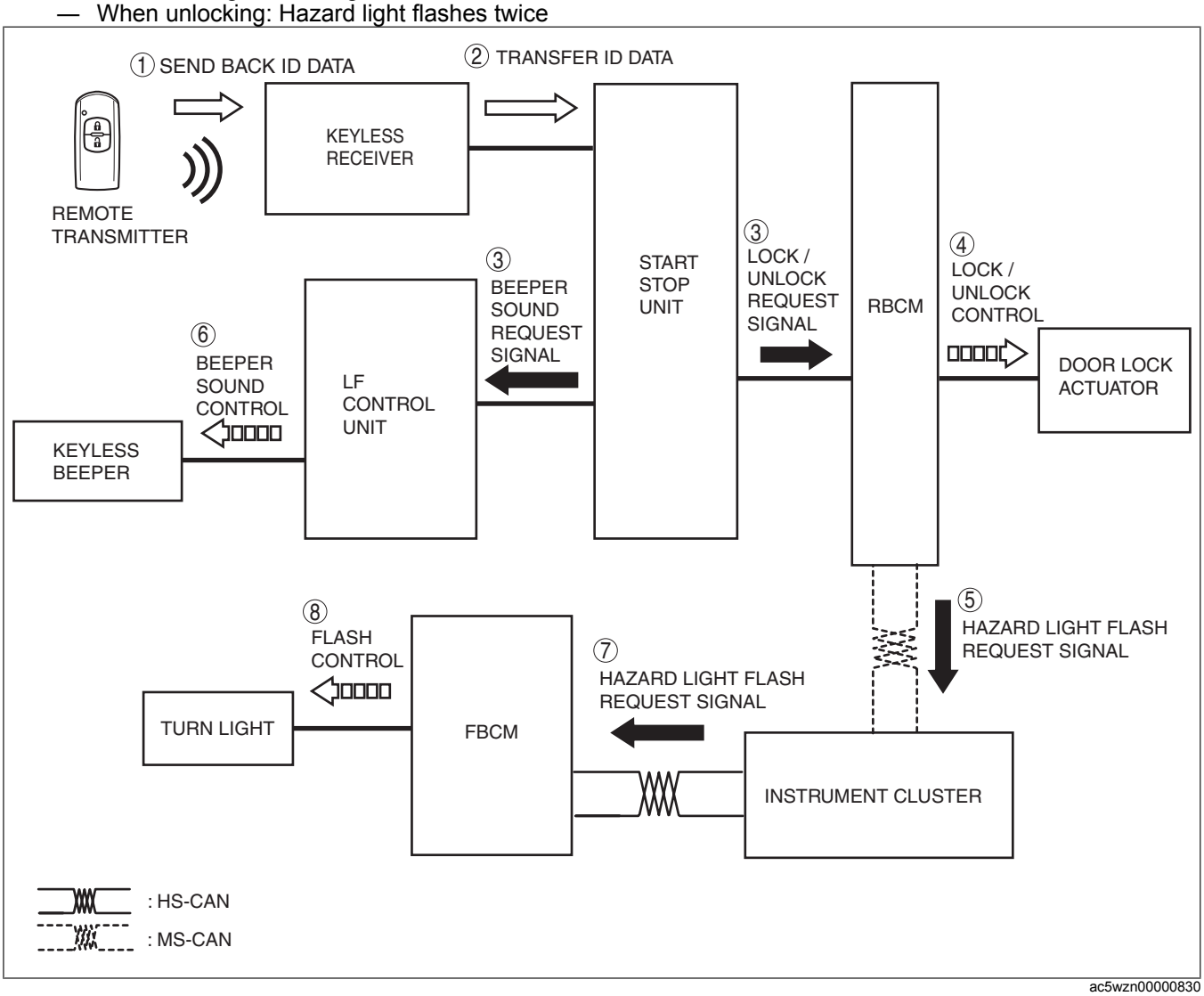
Lock/unlock operation using remote transmitter

Note

- The lock/unlock operation is performed when the lock button of the remote transmitter is pressed with all the following conditions met.
  - — Ignition is switched OFF (LOCK)
  - — All doors are closed
  - — The remote transmitter is within the operable range

1. When the lock or unlock button of the remote transmitter is pressed, the remote transmitter sends ID data.
2. When the keyless receiver receives ID data, it transmits the data to the start stop unit.
3. The start stop unit verifies the ID data, and if the ID data match, it sends a lock/unlock signal to the rear body control module (RBCM) and at the same time, it sends a beeper sound request signal to the LF control unit.
4. The rear body control module (RBCM) operates the front/rear door lock actuator motor to lock/unlock the front/rear doors.
5. At the same time as the door lock/unlock operation, it sends a hazard light flash request signal to the instrument cluster as a CAN signal.
6. The LF control unit operates the keyless beeper for the following number of times:
   - — When locking: Keyless beeper sounds once
   - — When unlocking: Keyless beeper sounds twice
7. The instrument cluster sends the hazard light flash request signal to the front body control module (FBCM) as a CAN signal.

8. The front body control module (FBCM) controls the hazard light to flash for the following number of times to signal that the lock/unlock operation is completed.
   — When locking: Hazard light flashes once
   — When unlocking: Hazard light flashes twice



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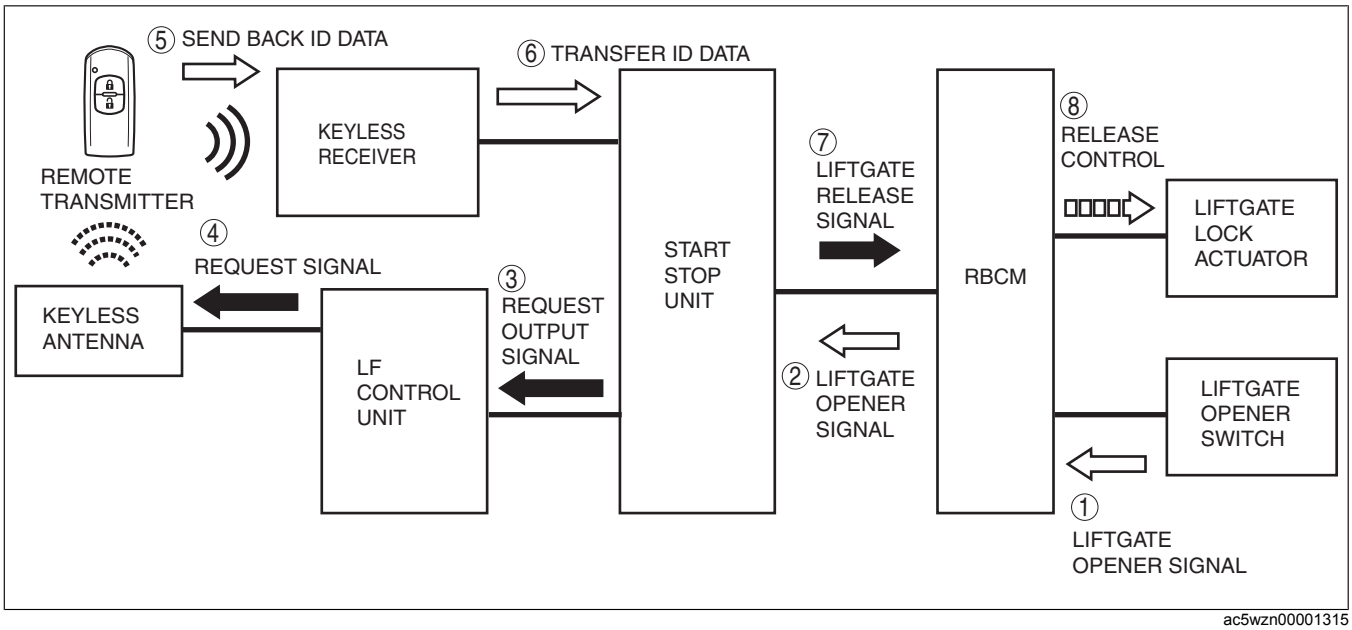
Liftgate open operation

1. When the liftgate opener switch is pressed, a liftgate open signal is input to the rear body control module (RBCM).
2. The rear body control module (RBCM) sends the liftgate open signal to the start stop unit.
3. Based on the liftgate open signal, the start stop unit sends a request output signal to the LF control unit to verify that the remote transmitter is inside the reception area.
4. Based on the request output signal from the start stop unit, the LF control unit outputs a request signal using the keyless antenna inside the rear bumper.
5. The remote transmitter receives the request signal from the antenna (outside, rear), and sends ID data to the keyless receiver.
6. The keyless receiver transmits the received ID data to the start stop unit.
7. The start stop unit verifies the ID data, and if the ID data matches, it sends a liftgate release signal to the rear body control module (RBCM).
8. When the rear body control module (RBCM) receives the liftgate release signal, it operates the liftgate lock actuator motor to release the liftgate.



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Auto re-lock function operation

- After the start stop unit sends an unlock request signal to the rear body control module (RBCM), if any of the following operations is not performed in **30 s** *1, it sends a lock request signal to the rear body control module (RBCM) to lock the front/rear doors.
  - — A door or the liftgate is opened
  - — A lock/unlock operation is performed using the driver's side front door key cylinder.
  - — A lock/unlock operation is performed using the driver's side front door lock knob.
  - — A lock/unlock operation is performed using the remote transmitter.
  - — The ignition is switched to ACC or ON (engine off).

*1 : Personalization setting time

Out-of-area (reception area) type auto lock function operation

1. When all doors and the liftgate are closed after any door or the liftgate is open, the start stop unit goes on auto lock standby if all the following conditions are met.
   - There is no remote transmitter inside the vehicle.
   - The remote transmitter is within the reception area outside the vehicle.
   - The ignition is switched off (LOCK).
2. After entering the standby status, if the remote transmitter is moved out of the keyless antenna reception area and the ID data cannot be received from the keyless receiver, the start stop unit operates all the lock actuator for a lock operation.

Note

- The keyless beeper sounds once when switching to stand-by and the door is locked.

Remote transmitter pause function operation

When door locking is performed

1. If a lock signal is input with a remote transmitter detected inside the vehicle, the start stop unit outputs a request signal using the outside/inside keyless antennas.
2. When the remote transmitter inside the vehicle sends the ID data to the keyless receiver, the keyless receiver transmits the received ID data to the start stop unit.
3. The start stop unit receives the ID data, and after **approx. 32 s**, it suspends the functions of the transmitter inside the vehicle. It also operates the keyless beeper for 10 s.

When the liftgate is closed

1. When the liftgate is closed with all the following conditions met, the start stop unit outputs a request signal using the inside keyless antennas.
   - — All doors are locked.
   - — The liftgate is open.
   - — The start stop unit identifies a remote transmitter inside the vehicle.
2. When the remote transmitter inside the vehicle sends the ID data to the keyless receiver, the keyless receiver transmits the received ID data to the start stop unit.
3. The start stop unit receives the ID data, and after **approx. 32 s**, it suspends the functions of the transmitter inside the vehicle.

Remote transmitter pause cancel operation

- The functions of the paused remote transmitter are restored when any one of the following conditions is met:
  - — A remote transmitter with which the engine can be started is brought inside the vehicle.
  - — The lock/unlock button on the paused remote transmitter is pressed.

Remote transmitter left-in-vehicle prevention function operation

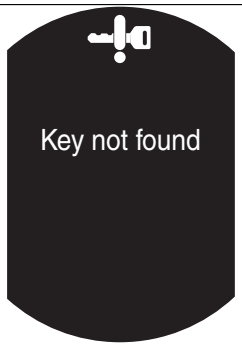
1. When the liftgate is closed with all the following conditions met, the start stop unit operates the keyless beeper (See Alert function operation) and puts the remote transmitter left-in-vehicle prevention function on standby.
   - — The liftgate is open.
   - — All doors are closed and locked.
2. When the liftgate opener switch is pressed while the remote transmitter left-in-vehicle prevention function is on standby, the start stop unit verifies the remote transmitter ID data and if it determines that the transmitter is inside the vehicle, it operates the left-in-vehicle function and sends a latch lever release signal to the rear body control module (RBCM) to release the liftgate latch lever.

- When any of the following conditions is met while the remote transmitter left-in-vehicle prevention function is on standby, the remote transmitter left-in-vehicle prevention function is canceled.
  - — The lock/unlock button of the remote transmitter is pressed.
  - — A request switch is pressed.
  - — Any door is opened.
  - — The vehicle speed exceeds **10 km/h {6.2 mph}**.
  - — The liftgate is opened and closed.

Alert function operation

- Under the conditions indicated in the table, the start stop unit sends an alert request signal to the instrument cluster via CAN communication, and the instrument cluster displays the warning. In addition, it illuminates the push button start indicator (amber) and operates the keyless beeper.

Condition	Keyless beeper	Instrument cluster			Push button start
		Keyless warning alarm	KEY warning light (red)	TFT LCD display	Indicator light (amber)
The advanced keyless entry system has a malfunction.	—	—	On		Flash
The driver's door is opened with the ignition in ACC.	—	**European (L.H.D. U.K.) specs.** • Pattern A*1×6 times **Without European (L.H.D. U.K.) specs.** • Pattern A*1×Continuous	—		—

Condition	Keyless beeper	Instrument cluster			Push button start
		Keyless warning alarm	KEY warning light (red)	TFT LCD display	Indicator light (amber)
The remote transmitter cannot be detected inside the vehicle when all doors are closed with the ignition not switched off (LOCK).	Sounds 6 times	Pattern B*1	Flash		—
A door lock operation is performed using a request switch with any door or the liftgate is open.	Sounds 2 times	—	—	—	—
A door lock operation is performed using a request switch with ignition not switched off (LOCK).	Sounds 2 times	—	—	—	—

*1 : For the keyless warning alarm sound pattern, refer to the keyless warning alarm. (See KEYLESS WARNING ALARM.)

Remote transmitter battery voltage low indication function operation

- When the ignition is switched from ON (engine off or on) to off (LOCK) under the condition indicated in the table, the start stop unit sends a battery voltage low indication request signal to the instrument cluster as a CAN signal, and the instrument cluster performs the remote transmitter battery voltage low indication.

Condition	Instrument cluster	
	KEY indicator light (green)	Indication on LCD
The start stop unit receives a code for remote transmitter battery voltage low.	Flash (for approx. 30 s after ignition switched off)