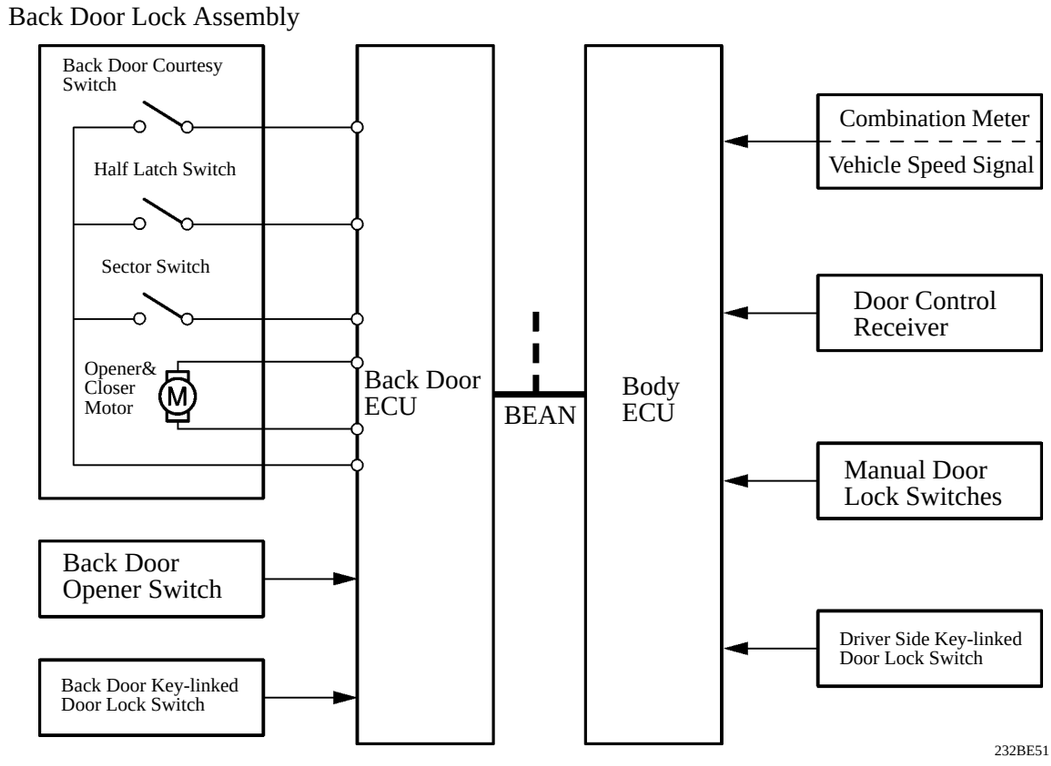
■BACK DOOR OPENER AND CLOSER SYSTEM

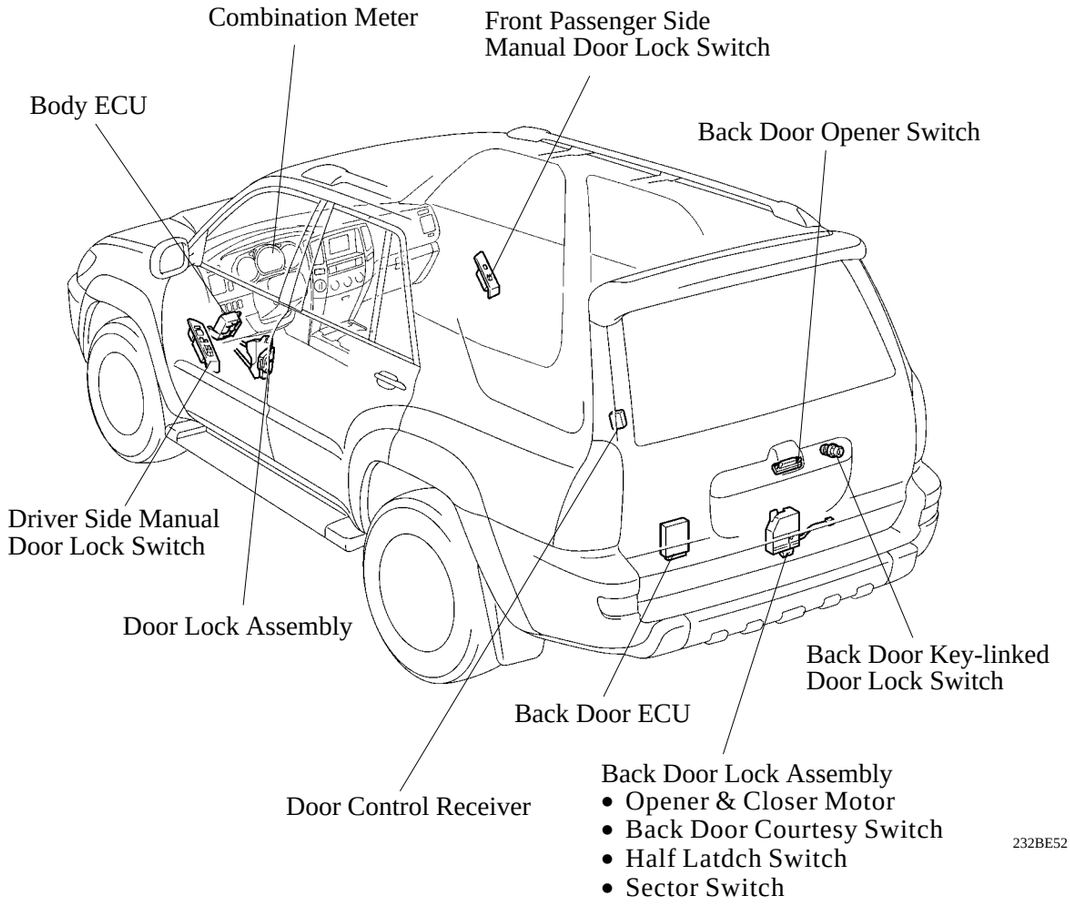
1. General

- The back door opener and closer system has been adopted as standard equipment.
- A single actuator to perform both the opener and closer functions is provided in the back door lock assembly to achieve a lightweight and compact configuration.
- The opener function is provided with a switch on the back door outside handle to open the back door electrically.
- The closer function automatically closes the back door entirely even if only a light pressure is applied to close the back door in order to realize excellent ease of use.
- This system is controlled by the back door ECU.

2. System Diagram



3. Layout of Main Component



4. Function of Main Component

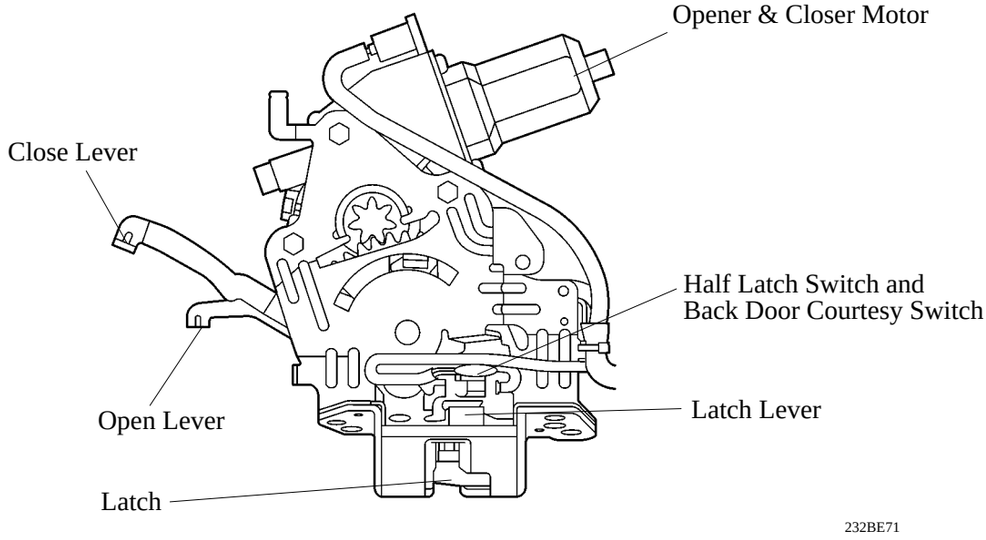
Components	Function
Back Door Lock Assembly	• Detects the conditions of the enclosed half latch, back door courtesy, and sector switch and outputs them to the back door ECU. • Actuated by the signals from the back door ECU, the opener & closer motor performs both the closer and opener functions.
Back Door ECU	Controls the back door opener and closer system in accordance with the signals received from the switches and the body ECU.
Body ECU	The body ECU transmits back door lock/unlock control signal and vehicle speed signal to the back door ECU via the BEAN.
Back Door Open Switch	Detects the condition of the back door open switch and outputs it to the back door ECU.

5. Construction and Operation

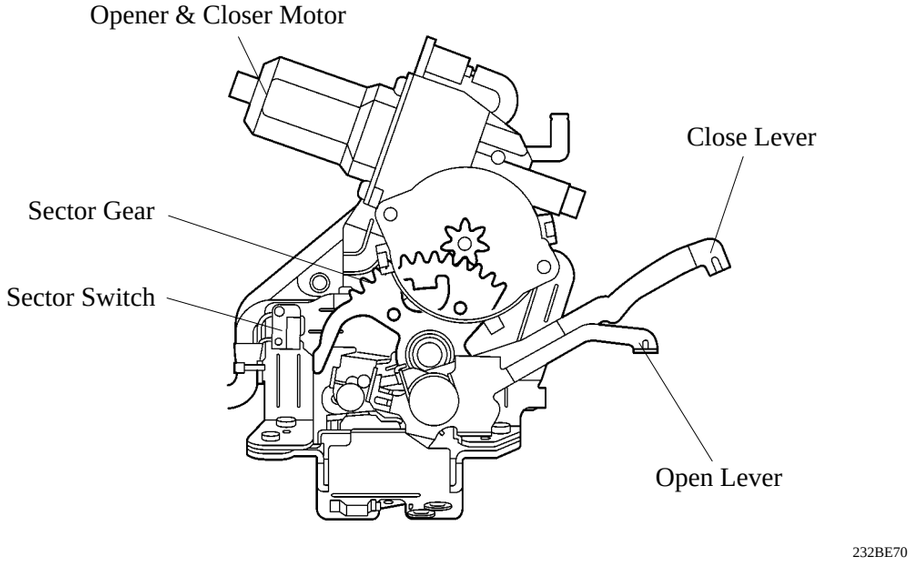
Back Door Lock Assembly

1) General

- The back door lock assembly consists of 3 position detection switches (sector switch, half latch switch, and back door courtesy switch), sector gear, open lever, latch, and opener & closer motor.
- The rotation of the closer motor is transmitted to the close or open lever via the sector gear. The operation of the open or closer lever engages or releases the latch.
- When this system does not operate due to a discharged battery or other malfunctions, the back door can be opened by directly operating the open lever in the back door lock assembly.



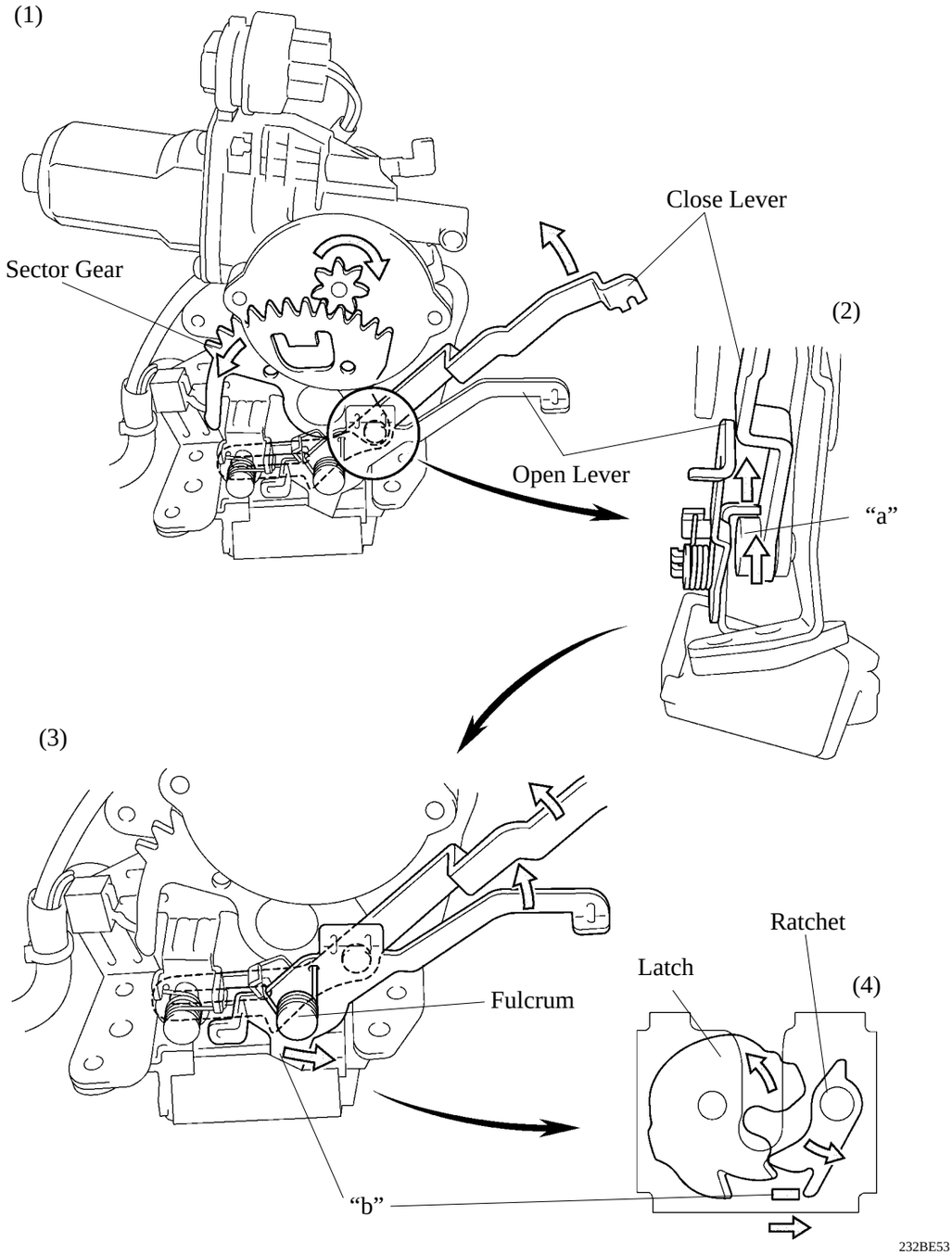
Front Side View



Back Side View

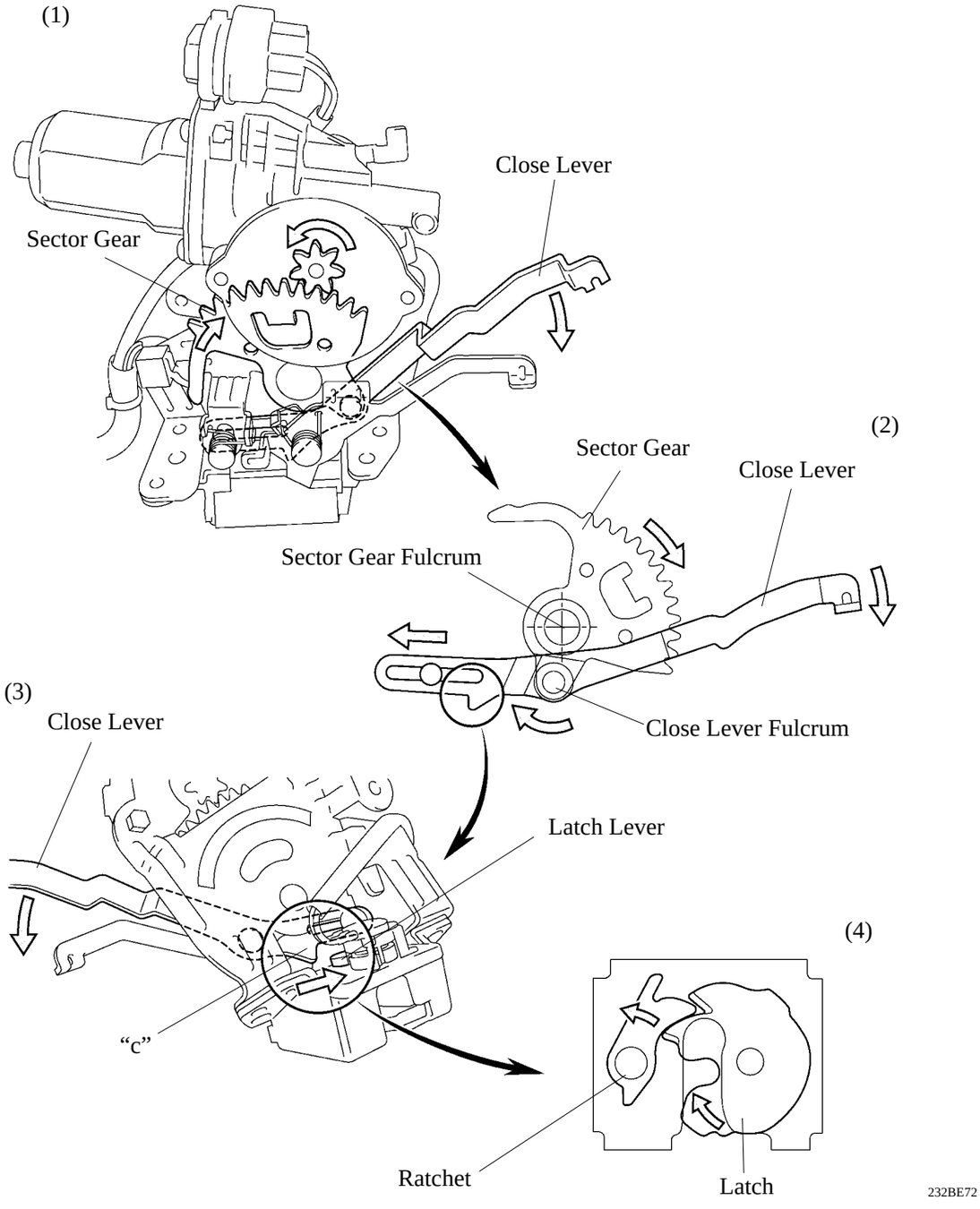
2) Opener Function

(1) When the opener & closer motor rotates in reverse, the sector gear, which is coupled to the closer motor through a gear, is driven. Along with this movement, the closer lever, which is attached to the sector gear, moves upward.
(2) As the closer lever ascends, the protrusion “a” of the closer lever pushes the open lever upward.
(3) Along with the ascent of the open lever, the lever portion “b” on the other side of the fulcrum, moves to the right.
(4) As a result of the movement of the lever portion “b” to the right, the ratchet that had the latch locked becomes disengaged, allowing the spring force to move the latch in the release direction. As a result, the latch releases and the back door opens.

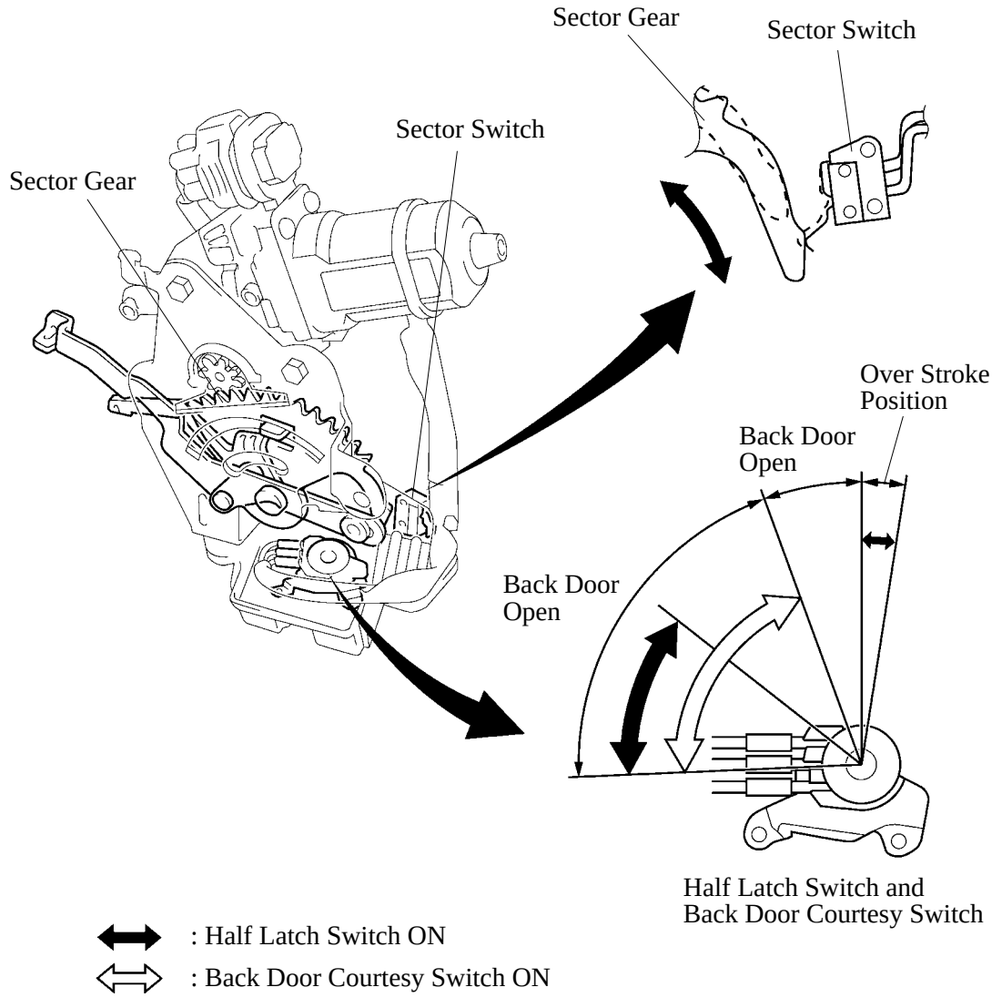


3) Closer Function

(1) When the opener & closer motor rotates forward, the sector gear, which is coupled to the closer motor through a gear, is driven. Along with this movement, the closer lever, which is attached to the sector gear, moves downward.
(2) However, because of the differences in the positions of the fulcrums of the sector gear and the close lever, the close lever descends while moving to the left, causing the protrusion “c” of the close lever to move to the left.
(3) The protrusion “c” of the close lever pushes on the latch lever, which is located coaxially to the latch.
(4) As a result, the latch rotates in the engagement direction, becomes fully latched, and the back door closes.



Position Detection Switch



The position detection switch performs the following functions:

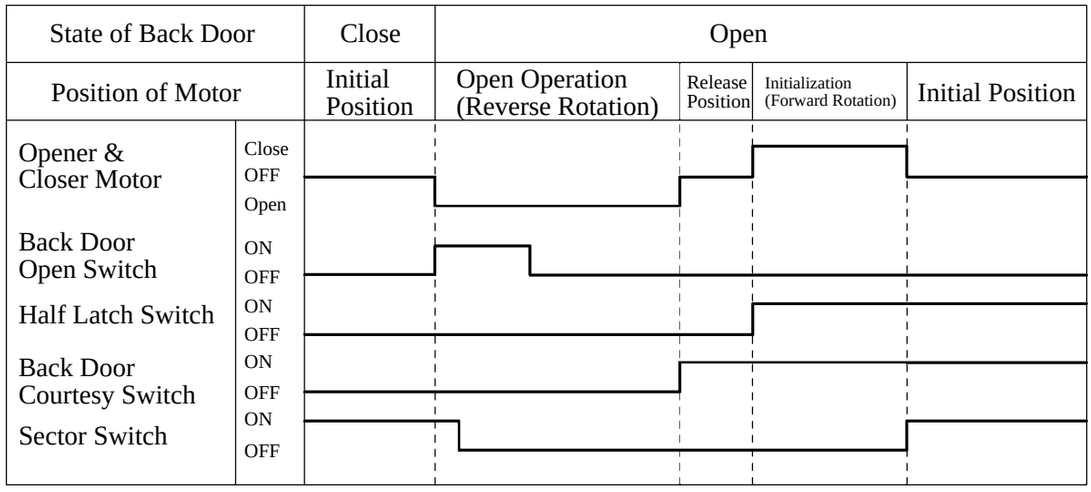
Position Detection Switch	Function
Half Latch Switch	Detects the ajar position of the latch. It turns ON from the fully open position to just before the door ajar position, and beyond the fully closed (over stroke) position. It remains OFF in all other positions.
Back Door Courtesy Switch	Detects the fully closed position of the latch. It turns ON from the fully open position to just before the fully closed position, and OFF in the fully closed position.
Sector Switch	Detects the neutral (initial) position of the driven gear of the opener & closer motor. It turns OFF after the opener & closer motor operates, and ON when the driven gear returns to the neutral (initial) position.

Back Door ECU

1) Opener Function

- This function actuates when the following conditions are met:
  - Vehicle speed is 5 km/h (3.1 mile/h) less than.
  - An unlock signal is input into the body ECU from the respective doors in accordance with the wireless door lock remote control, key or door lock control.
- When the back door opener switch of the back door outside handle is turned ON, the back door ECU rotates the opener & closer motor in reverse to operate the open lever. This causes the latch to become released and the back door to open.
- Then, the back door ECU detects that the back door is open based on the conditions of the half latch switch and the back door courtesy switch. As a result, the back door ECU rotates the opener & closer motor forward in order to return the open lever to the initial position.

▶ Timing Chart ◀



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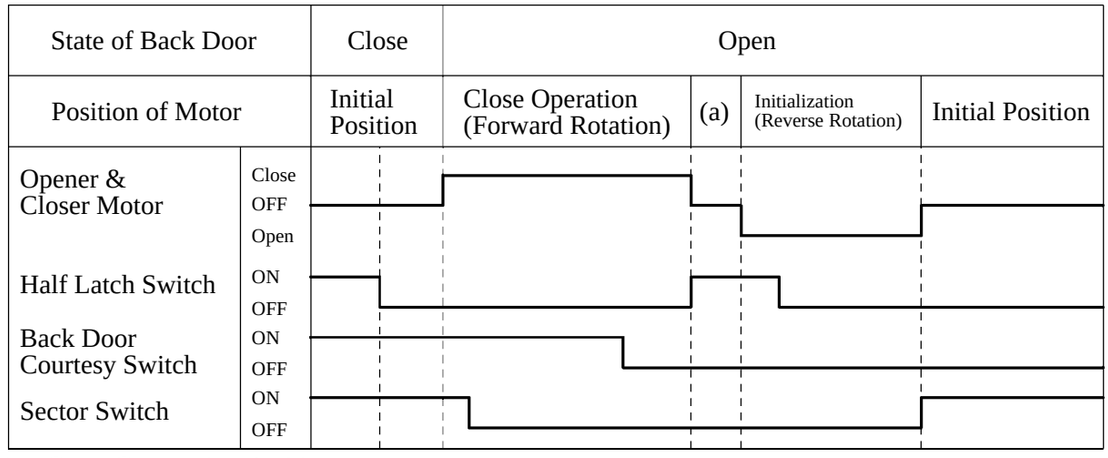
2) Closer Function

- When the state of the back door changes from open to ajar, the signal from the half latch switch changes from ON to OFF. When the back door ECU receives this signal for 0.5 seconds or longer, it determines that the back door is ajar and rotates the opener & closer motor forward to operate the closer lever. As a result, the latch engages and the back door is fully closed.
- Then, based on the state of the half latch switch (OFF → ON), the back door ECU determines that the back door is fully closed. As a result, the opener & closer motor rotates in reverse in order to return the close lever to the initial position.
- If the back door opener switch signal is input into the back door ECU during the operation of the closer function, the back door ECU stops the operation of the closer function and starts the operation of the opener function.

▶ Timing Chart ◀



(a): Close Completion Position

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3) Fail-Safe Function

If the back door ECU detects a malfunction in the sector switch, the ECU stops this system. This function continues until the power of the back door ECU is reset.