

POWER BACK DOOR SYSTEM

DESCRIPTION

The power back door system enables the back door to be opened and closed automatically by a motor in accordance with the signals from the power back door opener/closer switch or the power back door button on the transmitter.

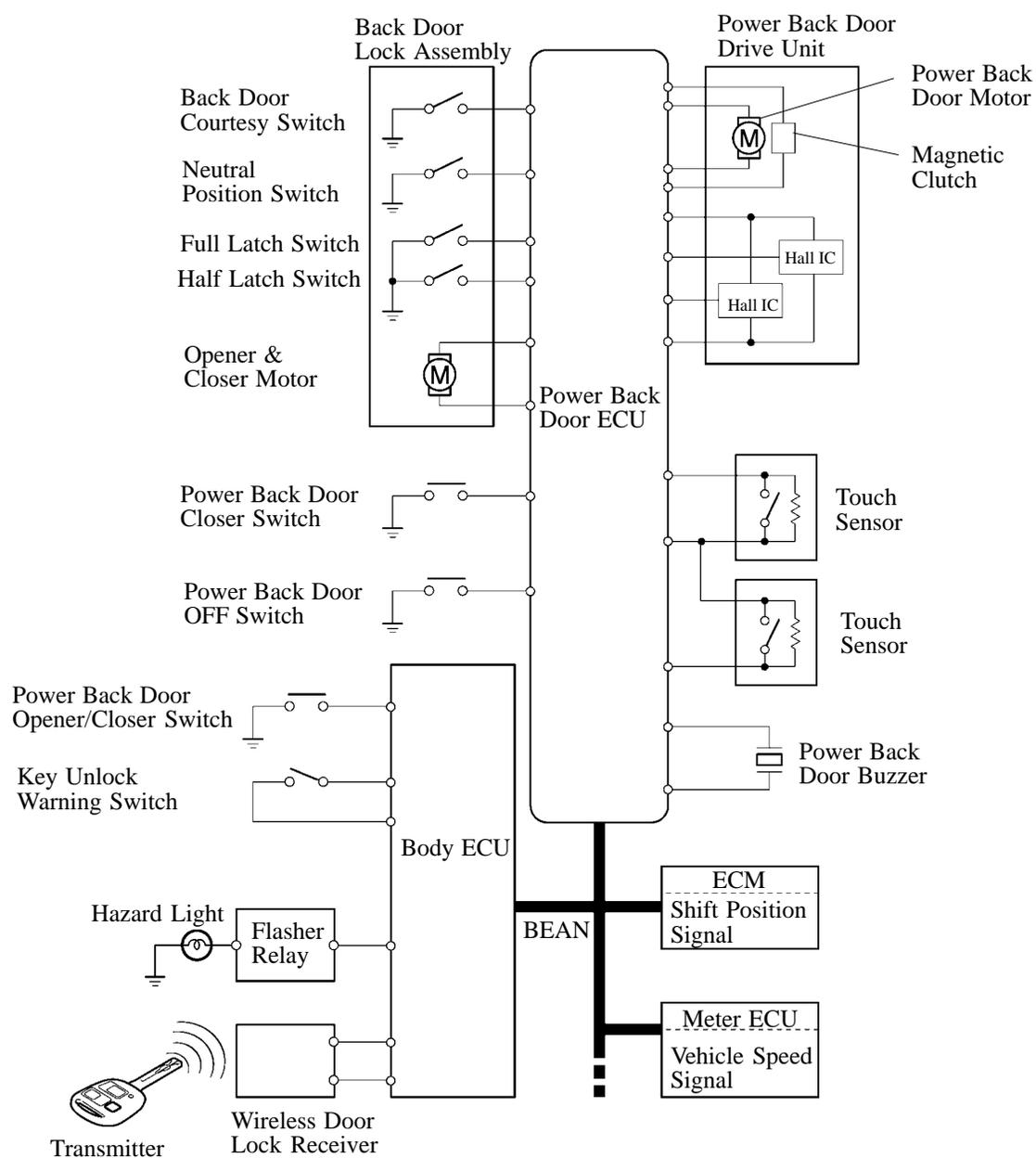
In addition, a power back door closer switch has been provided at the back door for convenience.

- This system is optional equipment on all models.
- This system, which is controlled by the power back door ECU, operates when the conditions indicated below have been met.

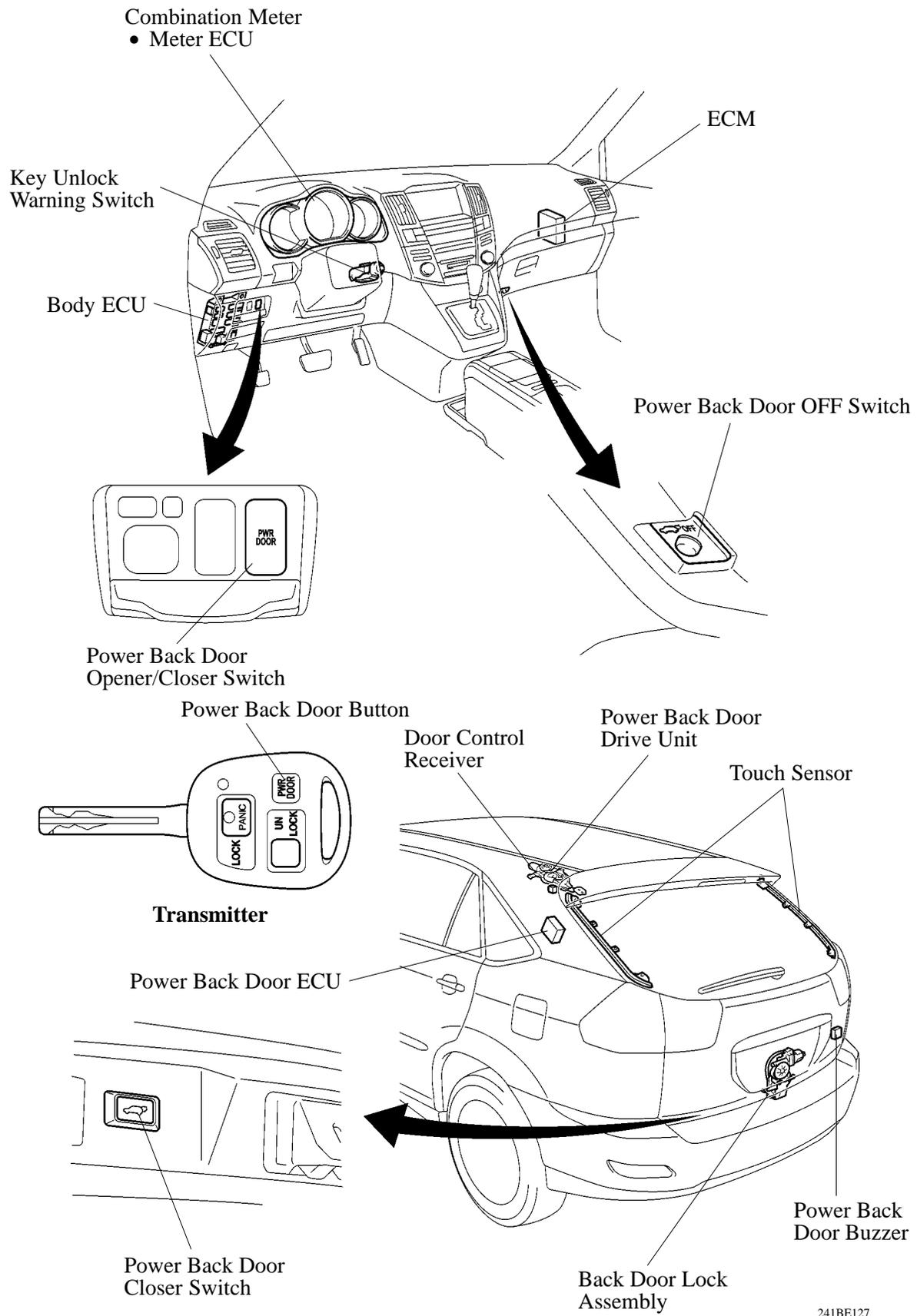
Operating Conditions	<ul style="list-style-type: none"> • The power back door OFF switch is in OFF condition*. • The shift lever is in P position. • The power back door opener/closer switch is pressed a minimum of 1 second, the power back door button on the transmitter is pressed a minimum of 1 second or the power back door closer switch is pressed.
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*: The state in which the switch is not pressed

System Diagram



■ LAYOUT OF MAIN COMPONENTS



■ FUNCTION OF MAIN COMPONENTS

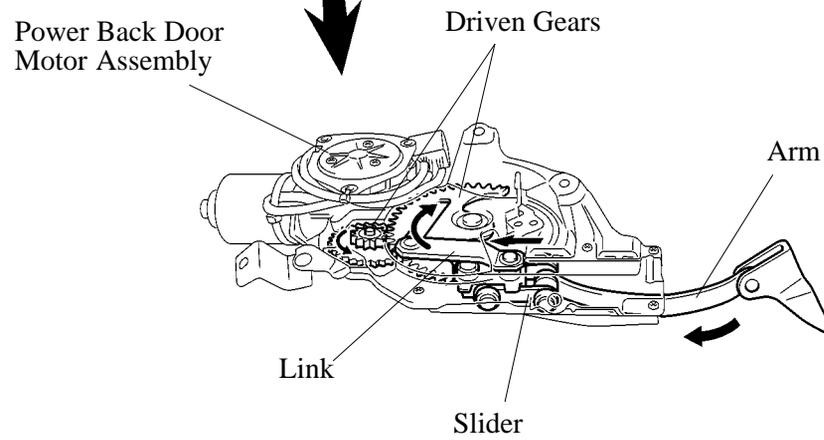
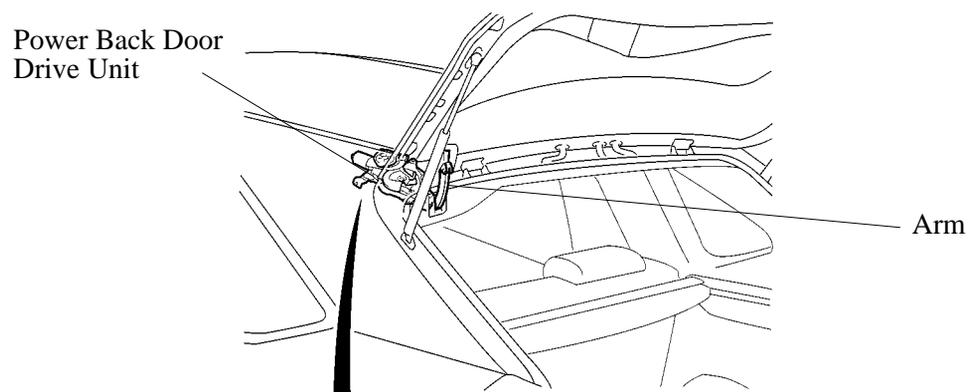
Components		Function	
Power Back Door Drive Unit	Power Back Door Motor Assembly	Power Back Door Motor	Opens and closes the back door when actuated by the power back door ECU.
		Magnetic Clutch	Transmits the rotation of the power back door motor to the driven gear.
		Hall IC	Detects the back door position and the opening and closing speed of the back door.
Back Door Lock Assembly		Opener & Closer Motor	Locks and unlocks the latch of the back door lock when actuated by the power back door ECU.
		Back Door Courtesy Switch	Detects whether the back door is opened or closed. This switch turns ON when the back door is opened or ajar and OFF when the back door is closed.
		Neutral Position Switch	Detects the initial (neutral) position of the driven gear of the opener & closer motor. The switch is on when the back door lock operates to the open side, and off when it operates to the closed side.
		Full Latch Switch	Detects the fully closed position of the latch, turns on in the overlatch condition.
		Half Latch Switch	Detects the ajar position of the latch, turns on in the open latch condition.
Touch Sensor		Detects if an object is jammed in the back door.	
Power Back Door Buzzer		The buzzer sounds to inform the driver that the system is in operation when the power back door system starts to operate. The buzzer also sounds if a malfunction in the system is detected.	
Power Back Door OFF Switch		<ul style="list-style-type: none"> Setting this switch to OFF condition prohibits system operation. In case that this switch is in OFF condition., it is possible to do the open/close operation of the back door manually as the magnetic clutch of the power back door motor is off. 	
Power Back Door Opener/Closer Switch		Setting this switch to ON opens or closes the back door from the cabin.	
Power Back Door Closer Switch		The back door closes when this switch is turned ON from outside of the vehicle.	
Transmitter		The back door opens or closes when the power back door button on the transmitter is pressed outside of the vehicle.	
Back Door Opener Switch		<p>This switch releases the latch of the back door lock for manual opening of the back door. For details, see page BE-100 in the electrical back door outside handle system section.</p> <p>Pressing the back door opener switch during operation of the power back door system enables switching to manual operation of the power back door.</p>	
Power Back Door ECU		Controls the power back door system in accordance with the signals received from the switches and ECUs.	
Body ECU		The body ECU transmits back door lock/unlock control signal to the power back door ECU via the BEAN.	
ECM		The ECM transmits shift position signal (P and N position) to the power back door ECU via the BEAN.	
Combination Meter (Meter ECU)		The meter ECU transmits vehicle speed signal to the power back door ECU via the BEAN.	

■ CONSTRUCTION AND OPERATION

1. Power Back Door Drive Unit

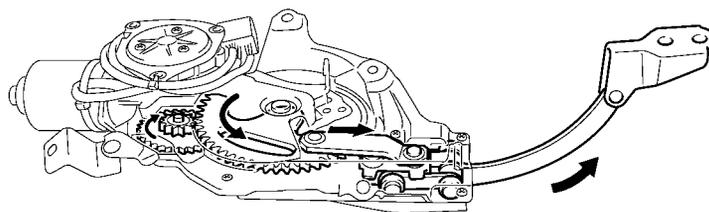
General

- The power back door drive unit comprises the power back door motor assembly, driven gear, link, slider and arm.
- Rotation of the power back door motor moves the arm forward and back via the driven gear, link mechanism and slider mechanism. The back door is opened and closed by movement of this arm.



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Back Door Close

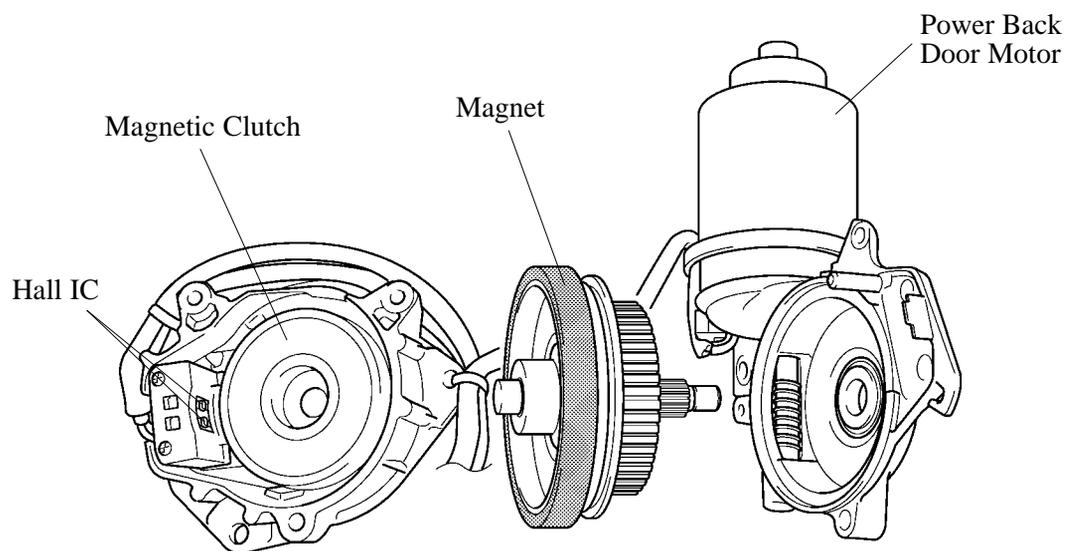


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Back Door Open

Power Back Door Motor Assembly

- The power back door motor assembly is mainly comprised of the power door motor, magnetic clutch and 2 Hall ICs.
- The magnetic clutch transmits the rotation of the power back door motor to the driven gear. Normally, the magnetic clutch is disengaged to enable a manual open or close operation of the power back door.
- The rotation of the magnet located on the perimeter of the magnetic clutch creates changes in the magnetic flux. The 2 Hall ICs convert these changes into pulse signals and output them to the power back door ECU. Based on these signals, the power back door ECU detects the position of the back door, as well as its opening or closing speed, which determines whether the back door is jammed.



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Service Tip

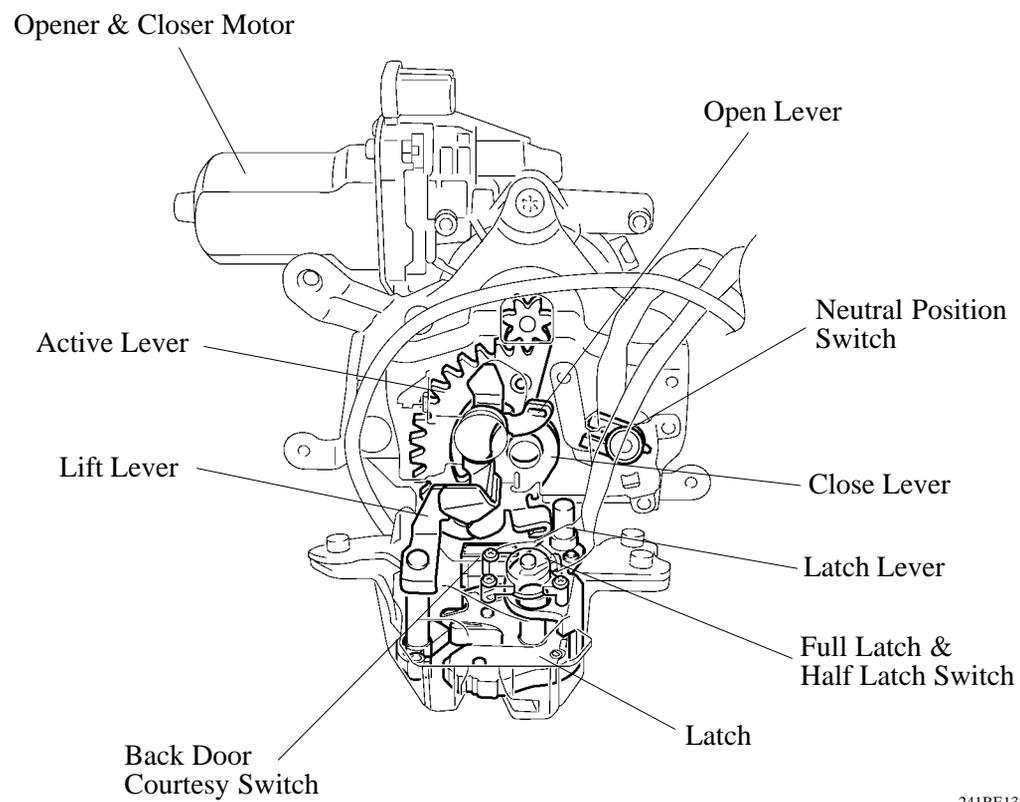
The power back door ECU memorizes the fully close and fully open positions of the back door. This data will be lost if a battery terminal, fuse, power back door ECU, or the power back door drive unit is removed and reinstalled.

For this reason, after the completion of any of the operations indicated above, turn the ignition switch ON and manually operate the back door once to the fully closed position. For details, refer to the 2004 LEXUS RX330 Repair Manual (Pub. No. RM1027U).

2. Back Door Lock Assembly

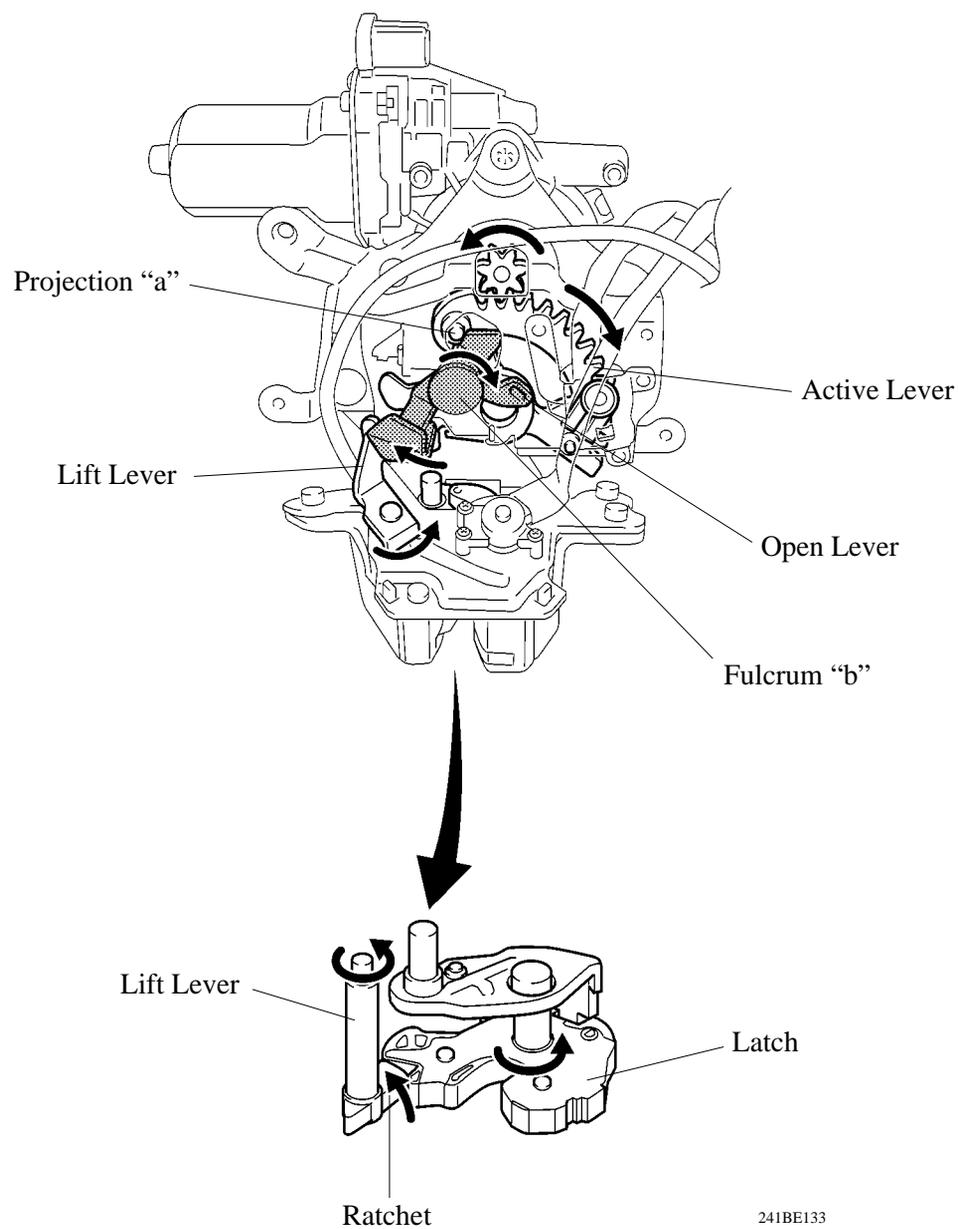
Construction

- The back door lock assembly consists of 4 position detection switches (full latch switch, half latch switch, neutral position switch and back door courtesy switch), 5 levers (active lever, open lever, close lever, lift lever and latch lever), latch, ratchet and opener & closer motor.
- The rotation of the opener & closer motor is transmitted to the close or open lever via the active lever. The operation of the open or close lever engages or releases the latch.
- When this system dose 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 assembly.



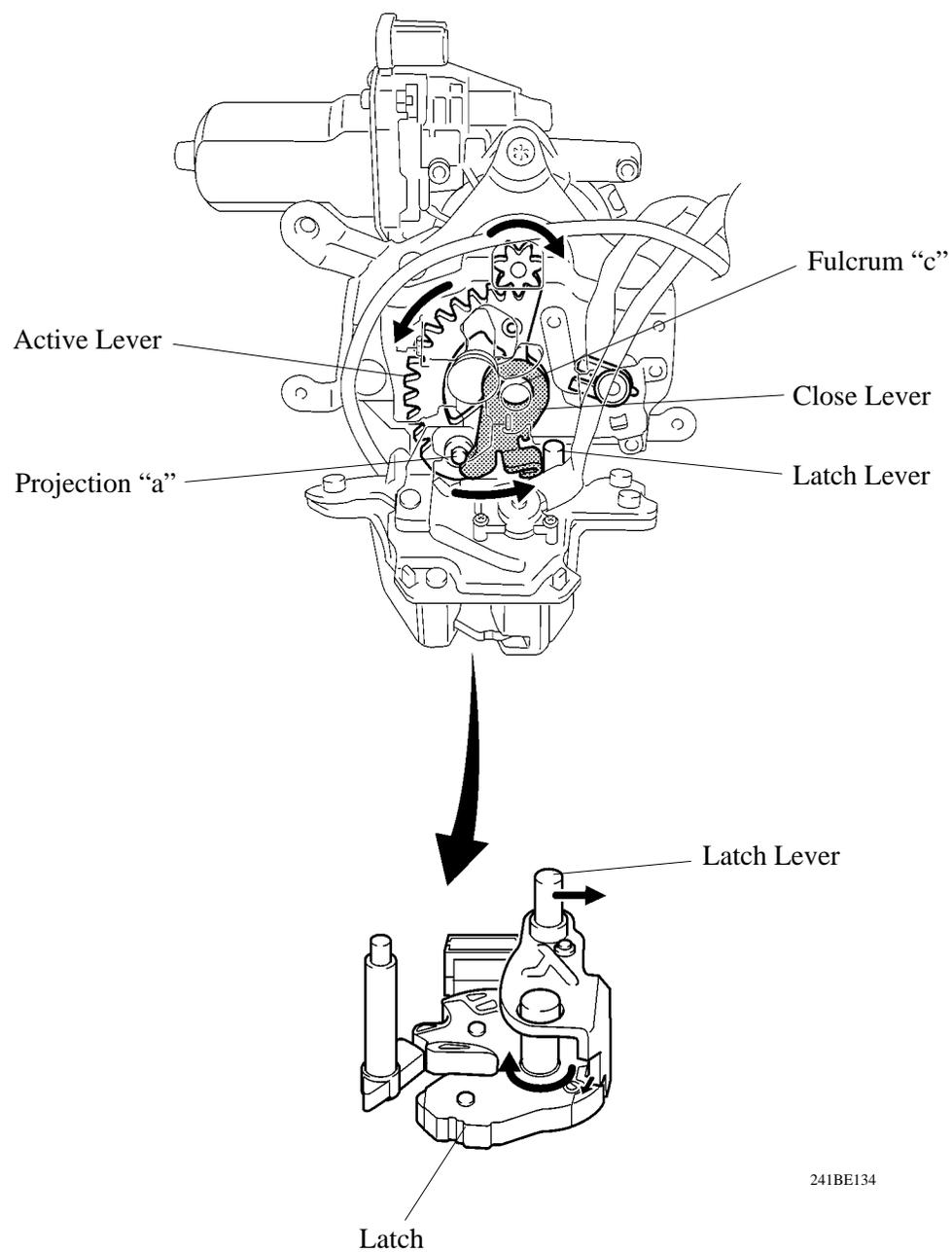
Opener Operation

- When the opener and closer motor rotates in reverse, the active lever coupled to the opener and closer motor through a gear is driven to the right. This pushes projection “a” on the active lever against the open lever, and the open lever rotates clockwise through fulcrum “b”.
- The open lever turns the lift lever counterclockwise, releasing the ratchet located on the same axis, thus releasing the latch.



Closer Operation

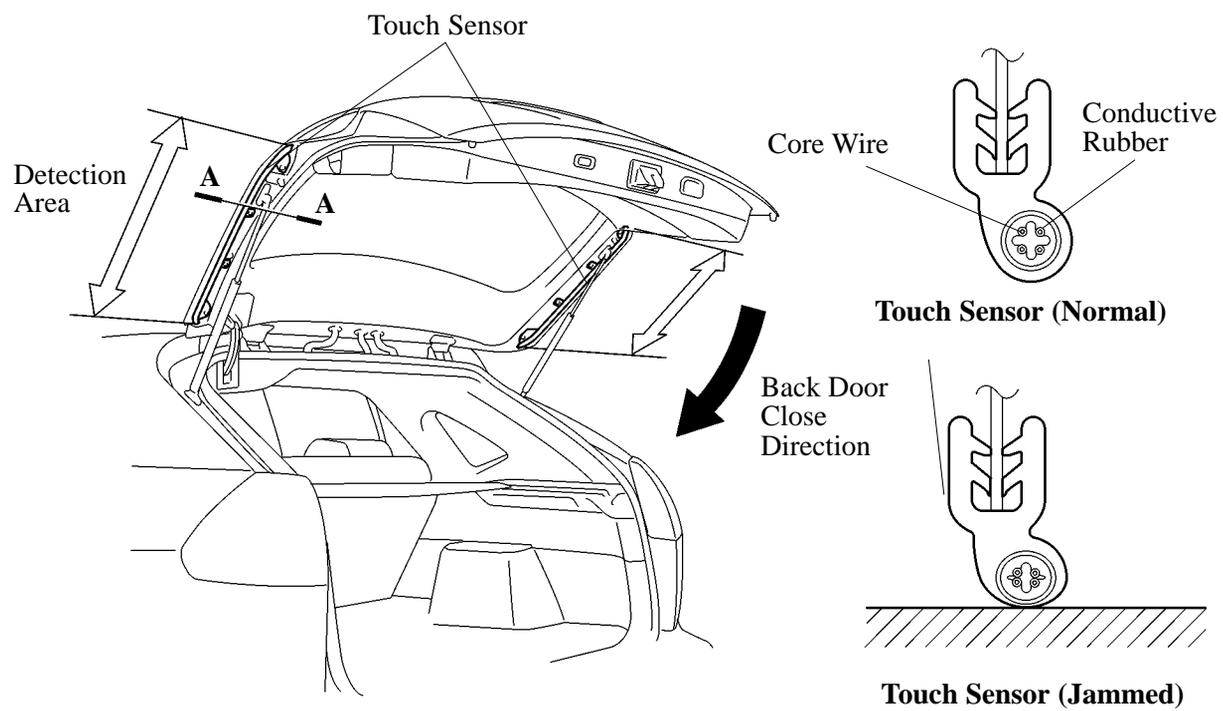
- When the opener and closer motor rotates forward, the active lever coupled to the opener and closer motor through a gear is driven to the left. This pushes projection “a” on the active lever against the close lever, and the close lever rotates counterclockwise through fulcrum “c”.
- The close lever moves latch lever rightward. This causes the latch lever to move the latch in the close direction.



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3. Touch Sensor

While the back door is moving in the closing direction, if one of the touch sensors (right or left) located on each side of the back door becomes compressed due to the jamming of a foreign object, the built-in pieces of conductive rubber contact each other, causing the resistance of the sensor to change and a current to flow. Accordingly, the power back door ECU determines that the back door has jammed.



■ SYSTEM CONTROL

1. General

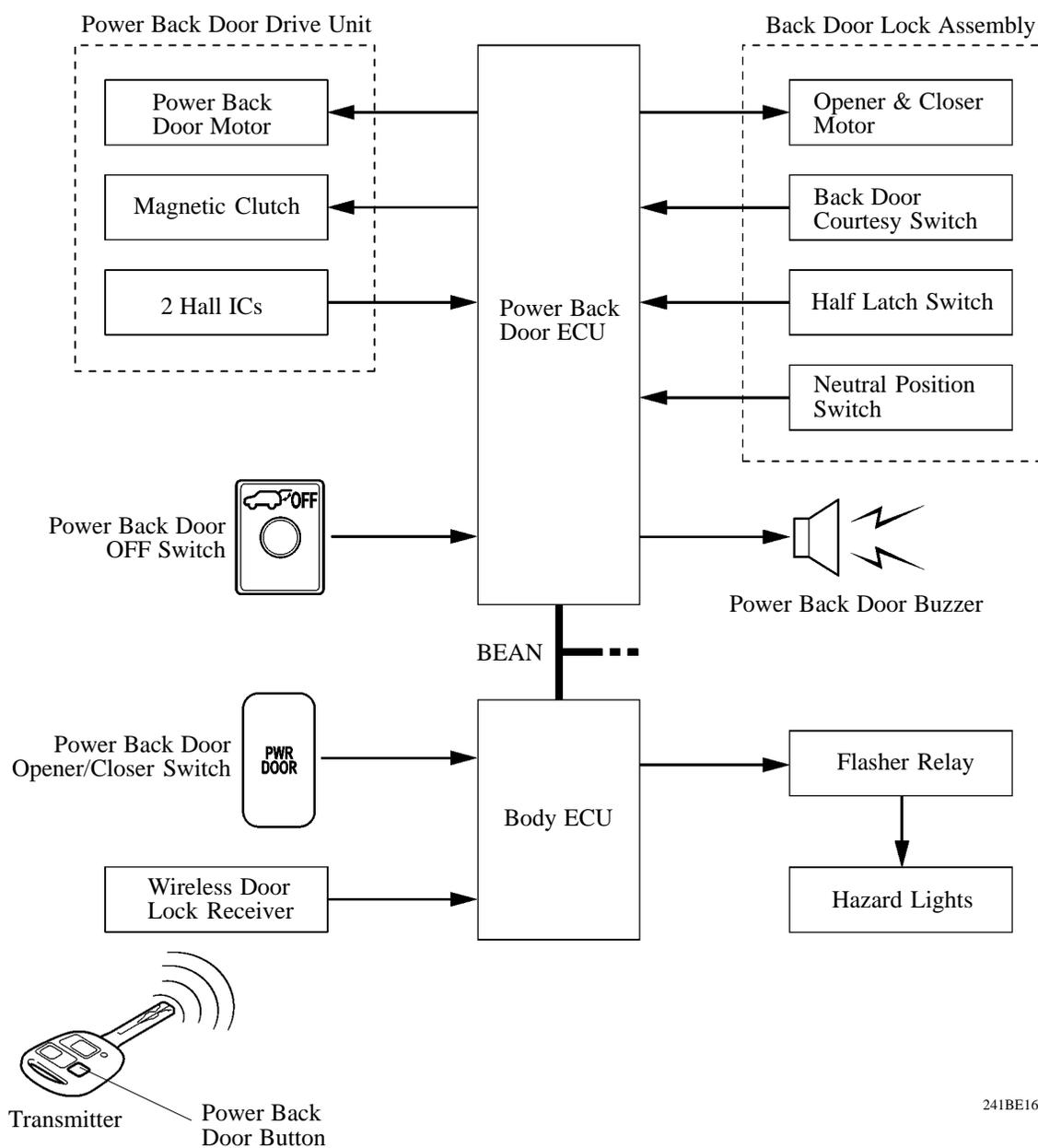
This system performs the functions listed below.

Function	Outline
Opener Function	Upon receiving an ON signal from the power back door opener/closer switch or the power back door button on the transmitter, the power back door ECU actuates the opener & closer motor and the power back door motor in order to release the latch of the back door lock and open the back door. For details, see page BE-112.
Closer Function	Upon receiving an ON signal from the power back door opener/closer switch, power back door closer switch, or the power back door button on the transmitter, the power back door ECU actuates the power back door motor and the opener & closer motor in order to close the back door and engage the latch of the back door lock. For details, see page BE-113.
Jam Protection Function	Upon receiving the signals from a touch sensor and the Hall ICs of the power back door motor, the power back door ECU detects that an object is jammed in the back door, and reverses the movement of the power back door motor. For details, see page BE-114.
Reverse Control Function	During a power back door operation, if the power back door ECU detects an ON signal from the power back door opener/closer switch or the power back door button on the transmitter, the power back door ECU sounds the power back door buzzer for approximately 0.1 seconds and reverses the power back door motor in order to reverse the back door to a predetermined position.
Back Door Open/Close Speed Control Function	In accordance with the signals received from the Hall ICs, the power back door ECU effects the following controls: <ul style="list-style-type: none"> • Reduces the closing speed from approximately 200 mm (7.9 inch) before the back door is fully closed, in order to reduce the jamming load. • Reduces the opening speed from approximately 80 mm (3.1 inch) before the back door is fully open, in order to reduce the shock that occurs when it is fully open.
Diagnosis	If the power back door ECU detects a malfunction in the power back door system, the power back door ECU diagnoses the failed section and stores the diagnostic trouble code in the body ECU via the BEAN (Body Electronics Area Network). For details, refer to 2004 LEXUS RX330 Repair Manual (Pub. No. RM1027U).
Fail Safe	<ul style="list-style-type: none"> • If the power back door ECU detects any of the malfunctions listed below during power back door operation, the power back door ECU stops the power back door motor and sounds the warning buzzer simultaneously, then turns off the magnetic clutch and stops the system. <ul style="list-style-type: none"> – Open in the touch sensor – The power back door motor is operated continuously for 30 sec or more. – Abnormal back door position signal (Hall IC signal) – Abnormality with position switches on back door lock assembly. • During a power back door operation, if the shift lever is shifted to a position other than P, the power back door ECU performs the aforementioned failsafe operation.

2. Opener Function

The operation of the power back door opener function is described below.

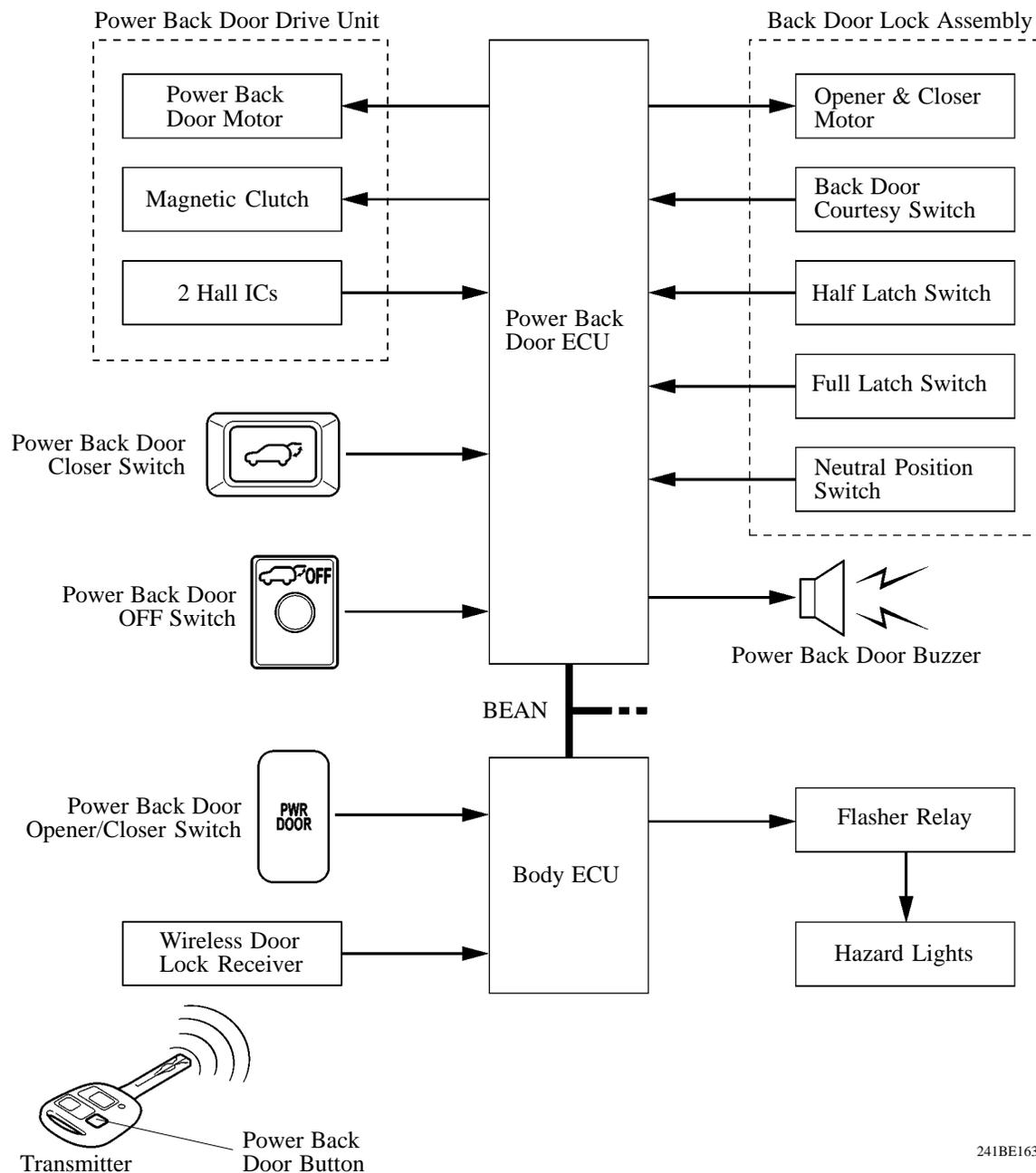
1. The power back door opener/closer switch or the power back door button on the transmitter is turned ON for a minimum of 1 second.
2. The power back door buzzer sounds and the hazard lights flash.
3. The opener & closer motor operates to unlock the latch.
4. Through the state of the back door courtesy switch, the power back door ECU detects that the latch has been released, and actuates the power back door motor to start opening the back door.
5. Through the state of the half latch switch, the power back door ECU detects that the back door is open, and reverses the opener & closer motor to its initial position.
6. Through the state of the neutral position switch, the power back door ECU detects that the motor has reverted to its initial position. Then, it stops the opener & closer motor.
7. Through the Hall ICs of the power back door motor, the power back door ECU detects the back door position, and stops the power back door motor just before the back door is in its full open position, and turns off the magnetic clutch.



3. Closer Function

The operation of the power back door closer function is described below.

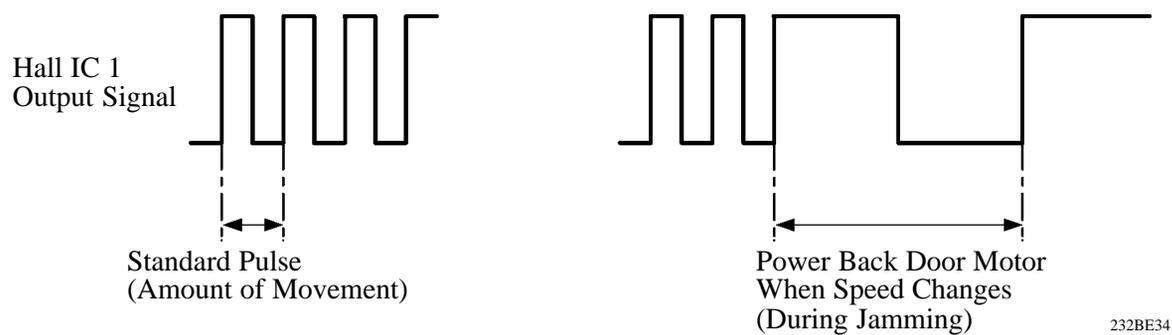
1. The power back door opener/closer switch, the power back door closer switch, or the power back door button on the transmitter is turned ON for a minimum of 1 second. Or, the back door is manually closed to a predetermined position.
2. The power back door buzzer sounds and the hazard lights flash.
3. The power back door ECU actuates the power back door motor to start closing the back door.
4. Upon detecting that the latch is disengaged through the state of the half latch switch, the power back door ECU actuates the opener & closer motor to engage the latch.
5. Upon detecting that the back door has closed through the state of the back door courtesy switch, the power back door ECU stops the magnetic clutch and the power back door motor.
6. Upon detecting that the latch has been engaged through the state of the full latch switch, the power back door ECU reverses the opener & closer motor to its initial position.
7. Upon detecting that the motor has reverted to its initial position from the state of the neutral position switch, the power back door ECU stops the opener & closer motor.



4. Jam Protection Function

- The power back door ECU determines the jamming of the back door upon receiving the signals from a touch sensor and the Hall ICs of the power back door motor.
- The power back door ECU determines the back door movement distance and the back door opening/closing speed (back door foreign object jamming) from the pulse signals from the Hall IC of the power back door motor, and the back door position (back door movement direction) from the phase difference between the pulses from Hall IC 1 and Hall IC 2 of the power back door motor.
- If a foreign object gets jammed during opening or closing of the power back door, the pulse width of the output signal from Hall IC of the power back door motor changes. The power back door ECU judges this change in pulse width as jamming, reversing the power back door motor.
- If jamming is again detected during this reversal operation, the power back door ECU again reverses the power back door motor. However, if jamming is detected during the second closing operation or more, the power back door ECU turns off the magnetic clutch of the power back door motor, then sounds the back door buzzer and stops power back door system operation. After the system is stopped, power back door system operation is restored by fully closing the back door manually.
- If either of the touch sensors located on each side of the back door is compressed by a jammed foreign object while the power back door is closing, the resistor value of the sensor changes. The power back door ECU judges this resistor value change as jamming, and reverses the power back door motor.

► Judgment of Amount of Movement and Opening/Closing Speed ◀



► Judgment of Back Door Moving Direction ◀

