Water Repellent Clating Glass : Operetion Precautions

- Water alone is sufficient to clean the mirror surface. Do not rub the mirror surface with a cloth that contains an oil film removal agent (such as a rubbing compound) or sand, or apply wax or a water-repellent agent on the mirrors. These substances can negatively affect the hydrophilic effect of the mirrors by scratching or damaging the silica and titania layers that are coated on the mirror surface.
- If ice forms on the mirror surface, do not attempt to scrape it off with a plastic plate or the like. Instead, use running water or lukewarm water to melt the ice.
- The hydrophilic effect of the mirrors could decrease temporarily under the circumstances described below, which are normal. The mirrors will recover their hydrophilic effect after they are exposed to the sunlight for a few days. To accelerate their recovery, clean them by following the instructions given in the repair manual.

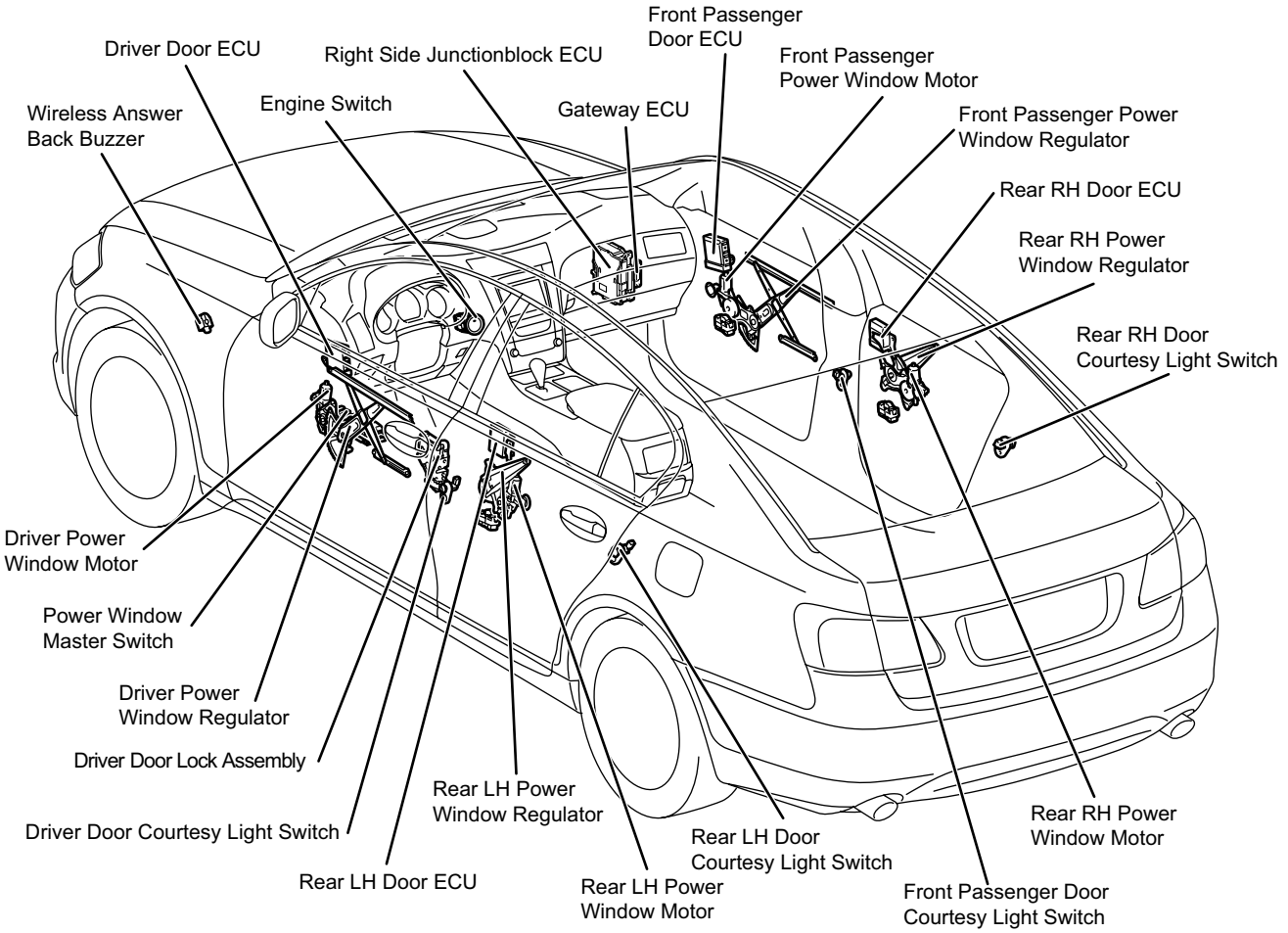
Circumstances in which hydrophilic effectiveness will decrease temporarily

- Touching the mirror surface with bare hands or using an oily cloth to wipe off dirt from the mirror surface
- Parking the vehicle in an area that is not exposed to the sunlight, such as in an underground parking lot, for a prolonged time
- Wax remover has adhered to the mirror surface while removing wax from the vehicle
- Wax has adhered to the mirror surface while the vehicle was washed in an automatic car wash

Power Window System

- "Power windows with a one-touch auto function" are provided as standard equipment on all models. They consist of a jam protection function, a key-off operation function, as well as a key-linked up-and-down function, and a transmitter-linked up-and-down function in all door glass windows. The jam protection function operates not only during an auto-up operation, but during a manual-up operation, as well.
- The front doors use X-arm window regulators and the rear doors use single-arm regulators.
- The remote control of the individual door glass window uses the BEAN (Body Electronics Area Network) (bi-directional body and unidirectional multiplex communication) via the door ECU in the individual doors, in order to reduce the number of wiring harnesses.
- A pulse sensor (Hall IC) detects the position of the door glass window and its movement direction, which are needed for system control, thus simplifying the system. After an inspection or maintenance service, these pieces of data must be initialized.

Power Window Components



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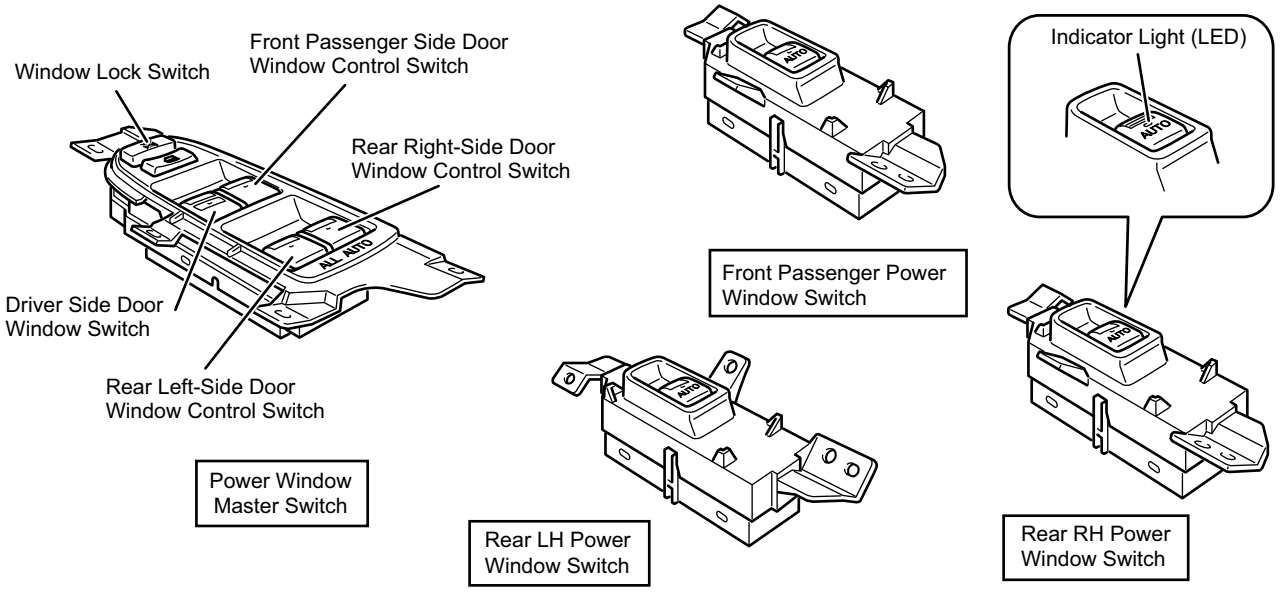
Power Window Switch Composition



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List of Main Components of the Power Window System and Functions

Component	Main Function
Window Regulator	• Moves the door glass window up or down by operating the power window motor in each door in the normal or reverse direction.
Power Window Motor	• Operates in the normal or reverse direction to actuate the window regulator in each door. • Outputs pulse signals to the power window master switch and the power window switch at each door.
Power Window Master Switch	• Effects main control of the power window system. • Uses a built-in relay to actuate the driver's power window motor. • Transmits a power window remote control signal for the door glass windows in the individual doors to the individual door ECUs via the BEAN (Body Electronics Area Network). • Detects the mode signal of the window lock switch and transmits it to the individual door ECUs via the BEAN (Body Electronics Area Network). • Receives the wireless power window control signal from the right side junctionblock ECU. • Detects the jamming of the driver's door glass window.
Right Side Junctionblock ECU	• Transmits mode signals of the key unlock warning switch and the driver's door courtesy light switch to the via the BEAN (Body Electronics Area Network). • Sends a control signal permitting a key-off power window operation to the power window master switch via the BEAN(Body Electronics Aera Network).
Front Passenger/ Rear RH/ Rear LH Door ECU	• Relays the power window control signal between the power window master switch and the individual Power window switch.
Front Passenger/ Rear RH/ Rear LH Power Window Switch	• Uses a built-in relay to actuate the respective individual power window motor. • Determines the jamming of the respective individual door glass window.
Ignition Switch	• Detects the state of the ignition switch (IG ON or IG OFF) and outputs it to the power window master switch.
Individual door courtesy light switch(driver door /passenger door/ rear RH/rearLH)	• Detects the open or close state of the individual door (ON with door open, and OFF with door closed) and outputs it to the right side junctionblock ECU. [key-off operation judgment condition]
Driver Door Lock Assembly	• Detects the modes of the built-in door lock control switch (for key-linked operation) and the driver's door lock position switch (OFF with door locked, ON with door unlocked), and outputs them to the power window master switch.
Luggage interior Receiver	• Receives and distinguishes the feeble radiowave signals (containing an identification code) from the electronic key. If the receiver recognizes the code as belonging to the vehicle, it transmits various types of operation request signals to the electronic key ECU.
Gateway ECU	• Serves as a connecting point for the buses of the BEAN (Body Electronics Area Network) in order to relay the BEAN signals between buses.
Electronic Key	• Transmits feeble radiowave signals (containing an identification code) to the luggage interior receiver.

Power Window Initialization

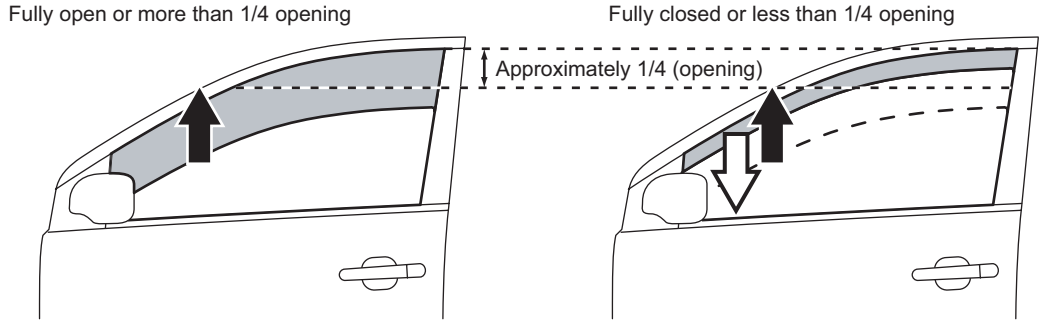
- This system uses a pulse sensor to electrically determine the position of the door glass window by way of the rotational movement of the motor. Based on this information, this system controls various types of functions.
- If the battery is reconnected (initial application of the +B power supply) after an inspection or maintenance service, or the connector of a power window switch is disconnected and reconnected, the door glass window position information that is presently stored in the system memory becomes lost. For this reason, the system must be initialized to "teach" the door glass window position to the system.
- Beware that some functions, such as the jam protection mechanism, do not operate if the system has not been properly "taught" the present door glass window position.

Initialization Operation

- An initialization operation must be performed with the door glass window opened more than approximately 1/4.
- An initialization operation must be performed for each individual door glass window. (Initialization is not possible through the use of the remote control operation)
- Turn the ignition ON, and hold the individual door glass window switch in the auto-up position. Even after the door glass window is fully closed, hold the switch in the auto-up position for approximately 1 second. This will allow the system to memorize the fully closed state of the door glass window as its reference position (origin point 0)*
- After performing an initialization operation, make sure to inspect the functions of the power window system. For details on the initialization operation and the inspection of functions, refer to the repair manual.

❖REFERENCE❖

*The reference position (origin point 0) of the door glass window is updated each time the system detects the fully closed state.



Power Window Initialization Operation

Note: Although the illustration shows the glass window of a front door, the initialization operation must be performed for each door glass window.

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Manual Up-and-Down Function

- When the user performs a one-step operation to pull a door glass window switch up (or to push a door glass window switch down) while the ignition is ON, the corresponding door glass window moves up (or down).
- Similarly, the driver can operate the switches for the individual door glass windows on the power window master switch to remotely control the manual operation of the individual door glass windows from the driver's door. With either operation, the door glass window stops at the position when the switch is released.

One-Touch Auto Up-and-Down Function

- When the user performs a two-step operation to pull a door glass window switch up (or to push a door glass window switch down) while the ignition is ON, the corresponding door glass window automatically moves up (or down) until it reaches the fully closed or fully open position. These are called "auto-up" and "auto-down" operations.
- Similarly, the driver can operate the switches for the individual door glass windows on the power window master switch to remotely control the automatic operation of the individual door glass windows from the driver's door. With either operation, the door glass window stops at the position when the switch is released.
- With either automatic operation, perform a one-step operation of the corresponding switch in the opposite direction of the operation to interrupt the automatic operation.

Jam Protection Function

- If a foreign object gets jammed in the door glass window during a manual-up or auto-up operation, the door glass window will operate approximately 50mm down (or approximately 1 second). If the opening of the door glass window has not reached approximately 200mm, the door glass window will operate down until the opening is approximately 200mm (or approximately 5 seconds).

Jam Protection Function Cancel Operation

- In the event of an improper operation of the jam protection function in which a door glass window does not close fully, the operation of the jam protection function can be canceled by holding the switch of the corresponding door glass window in the auto-up position for more than approximately 10 seconds.

Key-Off Operation Function

- This function enables the power window operation of all door glass windows for approximately 45 seconds after the ignition is turned from ON to OFF, or until the driver's door is operated from open to close. If approximately 45 seconds have elapsed during an automatic operation, or if the driver's door is operated from open to close, the automatic operation will continue until it is completed (the jam protection function will also operate).

Key-Linked Up-and-Down Function

- When there is no electronic key in the vehicle interior, and all doors are closed, if the user inserts a key plate into the driver's door key cylinder, turns it in the locking or unlocking direction, and holds it in that position for more than approximately 1.5 seconds, this function will operate all the door glass windows up or down. During this operation, the user can turn the key plate back to its neutral position to stop the operation (the jam protection function will also operate).
- The key-linked up and down function supports the customizable function through the use of the diagnosis tool(hand-held tester).

Transmitter-Linked Up-and-Down Function

- When there is no electronic key in the vehicle interior, and all doors are closed, if the user keeps the lock or unlock button on the Electronic key for more than approximately 3 seconds, all the door glass windows will start moving down (unlock button: down, lock button: up), and the wireless answerback buzzer will sound (answerback). The transmitter-linked operation will continue while the button is pressed, and stop when the button is released (the jam protection function will also operate).
- The transmitter-linked up-and- down function supports the customizable function through the use of the diagnosis tool (hand-held tester).

❖REFERENCE❖

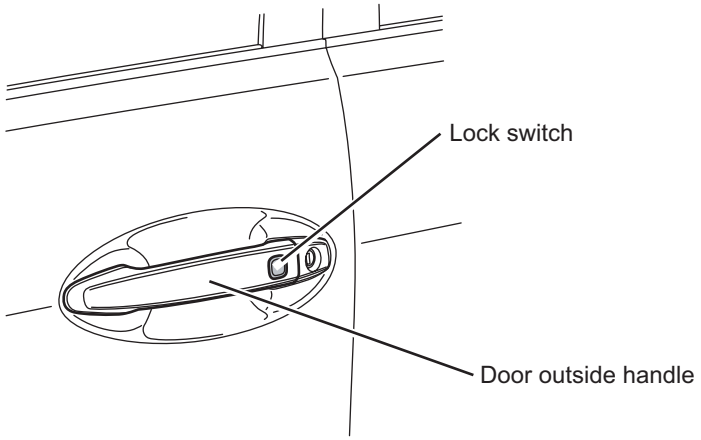
*On the models with a moon roof, the operation of the moon roof glass to slide open/tilt up or slide close/tilt down is linked to the down operation of all the door glass windows.

SMART ENTRY & START SYSTEM Power Window Function

• After door lock operation is effected by the SMART ENTRY & START SYSTEM, if the user continues to operate the lock switch of an individual door for more than 3 seconds, the power windows of all the doors will start moving up and they will continue moving up while the switch is being pressed. For details on the SMART ENTRY & START SYSTEM power window functions, refer to SMART ENTRY & START SYSTEM.

❖REFERENCE❖

On the models with a moon roof, the operation of the moon roof glass to slide close/tilt down is linked to the up operation of the power windows of all the doors.



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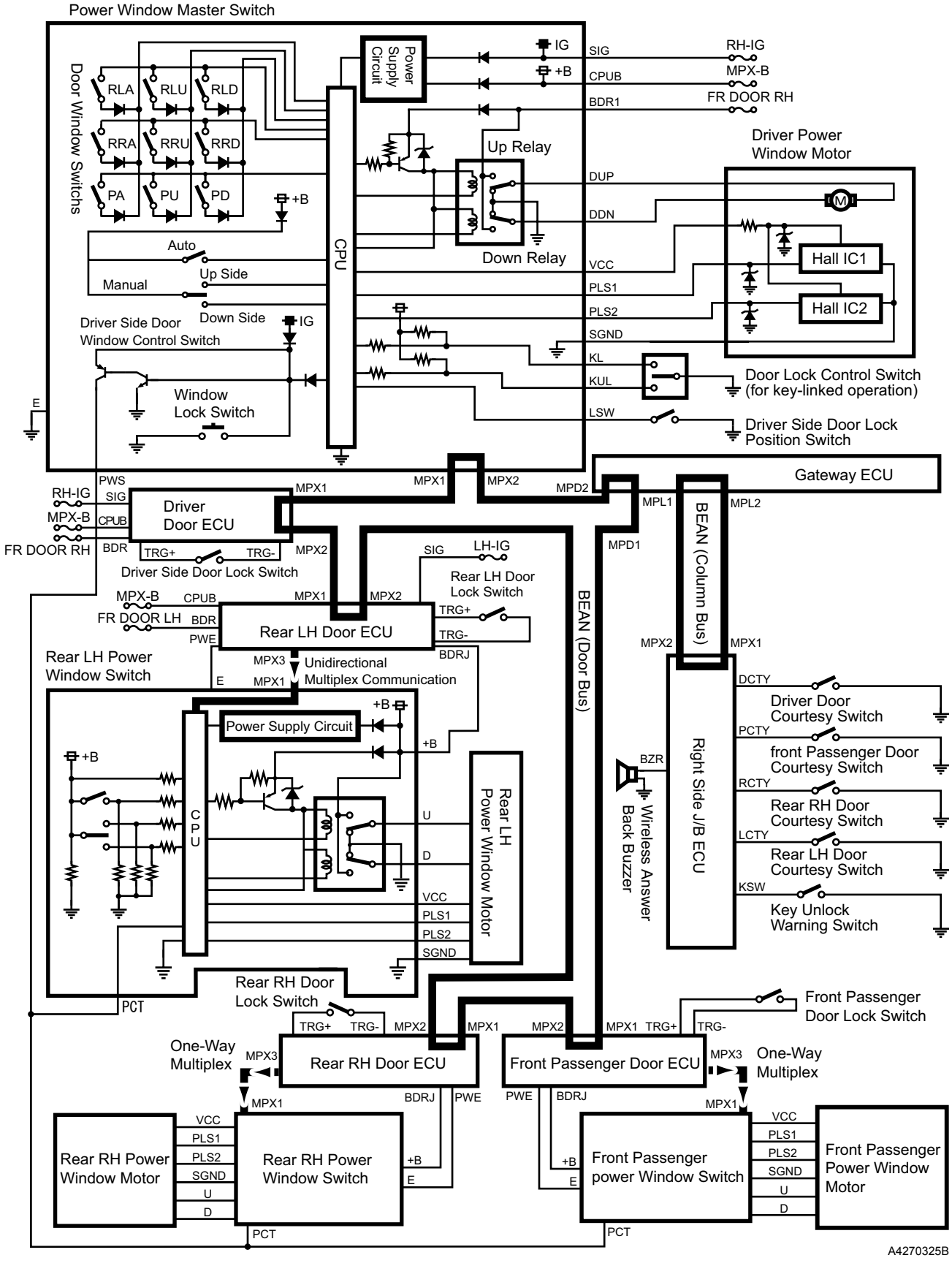
Window Lock

• By pushing the window lock switch ON (and keeping it pushed in) on the power window master switch, the driver can prohibit the door key-linked, transmitter-linked and SMART ENTRY & START SYSTEM power window functions, in addition to the power window operations of the individual doors other than the driver's door. When the window lock is operated, the indicator lights (LEDs) that are built into all the power window switch knobs will go OFF, except in the door glass window switch for the driver's door.

Fail Mode LED Flashing

• If a failure occurs in the Hall IC that is used for detecting the position, speed, and direction of the door glass window, or if an error exceeding a predetermined value occurs between the position information detected by the Hall IC and the position information that is memorized in the power window switch, the system will transfer to the fail mode as a result of a self diagnosis. The indicator light (LED) that is built into the switch knob will blink to indicate the failure.

Power Window system Operation



Operation of Manual Up-and-Down Function

Operation by an individual door glass window switch

- When the user performs a one-step operation to operate the driver's door glass window switch of the power window master switch up (or down) while the ignition is ON, a built-in CPU receives the input of a manual up (or down) ON signal, causing the up relay (or down relay) to turn ON.
- At this time, the down relay (or up relay) forms a ground circuit. Thus, the current will flow from the BDR1 terminal to the up relay (or down relay), DUP terminal (or DDN relay), power window motor, DDN terminal (or DUP terminal), down relay (or up relay) and ground. Thus, the power window motors of the respective doors will rotate in the up (or down) direction.
- When the CPU detects that the switch is OFF, it stops the up relay (or down relay) at that time, and stops the power window motor.

Remote control operation by power window master switch

- When the user performs a one-step operation to operate an individual door glass window switch of the power window master switch up (or down) while the ignition is ON, a built-in CPU receives the input of an up switch (or down switch) ON signal. Then, the CPU sends this signal in the form of a "remote control up (or down)" signal of the corresponding switch to the ECU of the individual door, via the BEAN (Body Electronics Area Network).
- Upon receiving the BEAN (Body Electronics Area Network) data, the individual door ECU converts it into unidirectional multiplex communication data and forwards it to the individual power window switch.
- While the corresponding individual power window switch receives the "remote control up (or down)" signal, it operates the power window motor of its own door in the up (or down) direction, in the same way as the manual operation of an individual door glass window switch.
- When the switch for the individual door glass window in the power window master switch turns OFF, the CPU stops the transmission of the "remote control up (or down)" signal and stops the operation of the door glass window switch of the corresponding door.

Operation of One-Touch Auto Up-and-Down Function

Auto operation by an individual door glass window switch

- When the user performs a two-step operation to operate the driver's door glass window switch of the power window master switch or an individual power window switch up (or down) while the ignition is ON, a built-in CPU receives the input of a manual up (or down) ON signal, as well as the input of an auto switch ON signal. As a result, the CPU turns the up relay (or down relay) ON, and causes the power window motor of the individual door to operate in the same way as the manual up (or down) operation.
- At this time, the built-in CPU counts the pulse signals provided by the Hall IC that is built into the power window motor. Even if the CPU detects that the switch is OFF, until it detects from the speed of the motor that the door glass window has reached the fully closed (or fully open) position, it will keep the up relay (or down relay) ON.

Remote control auto operation by power window master switch

- When the user performs a two-step operation to operate an individual door glass window switch of the power window master switch up (or down) while the ignition is ON, a built-in CPU receives the input of an up switch (or down switch) ON signal and an auto switch ON signal. Then, the CPU transmits these signals to the individual door ECU in the form of a "remote control auto-up (or down)" signal of the corresponding switch via the BEAN (Body Electronics Area Network).
- Upon receiving the BEAN (Body Electronics Area Network) data, the individual door ECU converts it into unidirectional multiplex communication data and forwards it to the individual power window switch.
- While the corresponding individual power window switch receives the "remote control auto-up (or auto-down)" signal, it operates the power window motor of its own door up (or down) to the fully closed (or fully open) position, in the same way as the auto operation performed by an individual power window switch.

Stopping the automatic operation

- The system stops the automatic operation if any one of the following conditions is met.

Auto Operation Stop Conditions

- A switch that is operating with automatic operation control detects that the door glass window is fully closed (or fully open).
- A switch that is operating with automatic operation control inputs an operation switch ON signal in the opposite direction.
- Approximately 10 seconds have elapsed after an automatic operation has started.
- A switch that is operating with automatic operation control receives a "remote control" or "window lock" signal in the opposite direction via unidirectional multiplex communication.

Operation of Jam Protection Function

Operation Outline

- The power window switch of an individual door controls the jam protection function of the corresponding door glass window.
- If either the power window motor locks, its speed changes, the pulses are disturbed, or the voltage drops while all the prerequisites listed below have been met, the power window switch determines that jamming has occurred, and operates the power window motor in reverse. To prevent an improper operation, the power window switch will not make a jamming judgment when the door glass window position is within a specified section.

Prerequisites

- The door glass window is operating up through the manual, auto, key-off operation (manual/auto), door key-linked, transmitter-linked, or SMART ENTRY & START SYSTEM power window function.
- The power window switch is being "taught" with the fully closed position of the door glass window as a reference point (origin point 0).
- The door glass window is in a position other than immediately before the fully closed position or immediately after starting an up operation from the fully open position (specified section).

Reverse Conditions and the Amount of Descent After Jamming Detection

- After the jam protection function operates and the door glass window moves down approximately 50mm or until 1 second has elapsed, if the opening (clearance) of the glass window has not reached approximately 200mm, the power window motor will continue its reverse operation until the opening is approximately 200mm or 5 seconds have elapsed. However, if the door glass window reaches its fully open position before the down operation reaches approximately 50mm, the power window motor will end the operation at that time.
- During a reverse operation, the power window switch will prohibit the input of a manual-up or auto-up switch signal, or an up actuation instruction signal from the key-linked, transmitter-linked, or SMART ENTRY & START SYSTEM power window function. (It will accept a switch input after the reverse operation has been completed.) During a reverse operation, the power window switch will accept a manual-down or auto-down switch signal or a down actuation instruction signal from the key-linked or transmitter-linked function. However, it will perform a down operation after the reverse operation has been completed.

Jamming Reverse Operation

- When the power window switch determines that jamming has occurred, it turns OFF the built-in up relay, and simultaneously turns ON the down relay. As a result, the current flows in the down direction to operate the power window motor in reverse.

Key-OFF Operation

- When the driver turns the ignition from ON to OFF, the CPU in the right side junctionblock ECU detects this action and starts counting approximately 45 seconds for the key-off operation. At the same time, the CPU will continue transmitting a "key-off operation authorization" signal to the individual power window switches via the individual door ECUs through the BEAN (Body Electronics Area Network) and the unidirectional multiplex communication. Thus, the CPU authorizes the power window operation at all doors.
- After approximately 45 seconds have elapsed, or the right side junctionblock ECU has received a signal indicating that the driver's door courtesy light switch has been turned from ON to OFF via the BEAN (Body Electronics Area Network), it will stop the transmission of the "key-off operation authorization" signal. However, if the transmission of the "key-off operation authorization" signal stops during an automatic operation or jamming protection control, the operations will be performed until they are completed. Thus, the jamming protection control is effected even with the automatic operation.

Operation of Key-Linked Up-and-Down Operation

- While the key semi-push switch is OFF, if the user holds the door lock control switch (for key-linked operation) in the lock <or unlock> direction for more than 1.5 seconds, the power window master switch will detect a driver's door lock position switch OFF <or ON> signal at the time 1.5 seconds have elapsed. Then, it will start the door key-linked control.
- After the door key-linked control starts, the power window master switch turns the up relay <or down relay> ON, in order to rotate the driver's door power window motor in the up <or down> direction. At the same time, the power window master switch transmits an individual door key-linked up <or down> operation instruction signal to the individual door ECUs via the BEAN (Body Electronics Area Network).
- Upon receiving the key-linked up <or down> operation instruction signals for the front passenger, rear right, and rear left doors, the individual door ECUs will transmit this signal to the corresponding individual power window switches in the form of unidirectional multiplex communication data. Thus, the power window motors of the individual doors will rotate in the up <or down> direction in the same way as in the remote control manual operation.
- If any one of the conditions listed below is met, the system will stop the operation.

Door Key-Linked Operation Stopping Conditions

- The power window master switch detects that the door lock control switch (for key-linked operation) is operated from ON to OFF in the lock direction <or unlock direction>.
- The power window master switch detects that the driver's door glass window is fully closed <or fully open>.
- During operation, the power window master switch receives a key unlock warning switch ON signal via the BEAN (Body Electronics Area Network).
- During operation, the power window master switch receives a wireless (lock or unlock) signal via the BEAN (Body Electronics Area Network).
- During operation, the power window master switch receives a door outside handle switch (lock) signal via the BEAN (Body Electronics Area Network).
- During operation, the power window master switch detects that the ignition is ON.
- During operation, the driver operates the power window master switch.
- After the operation has started, the timer stopping time (approximately 10 seconds) has elapsed.

Operation of Transmitter-Linked Up-and-Down Function

- Upon receiving a wireless power window up (or down) operation instruction signal from the driver's J/B ECU via the BEAN (Body Electronics Area Network), the power window master switch turns ON the built-in up relay (or down relay) in order to rotate the driver's door power window motor in the up (or down) direction. At the same time, the power window master switch transmits an individual door wireless power window up (or down) operation instruction signal to the individual door ECUs via the BEAN (Body Electronics Area Network)..
- Upon receiving the wireless power window up (or down) operation instruction signals for the front passenger, rear right, and rear left doors, the individual door ECUs will transmit this signal to the corresponding individual power window switches in the form of unidirectional multiplex communication data. Thus, the power window motors of the individual doors will rotate in the up (or down) direction in the same way as in the remote control manual operation.
- If any one of the conditions listed below is met, the system will stop the operation.

Stop Conditions Linked to Transmitter Operations

- If any one of the conditions listed below is met, the system will stop the operation.
- After the power window master switch outputs a wireless power window up (or down) signal to the driver's door power window motor and transmits it to the front passenger, rear right, and rear left door ECUs, the timer stopping time (approximately 10 seconds) has elapsed.
- During operation, the power window master switch receives a key unlock warning switch or semi-push switch ON signal via the BEAN (Body Electronics Area Network).
- During operation, the power window master switch receives a courtesy light switch ON signal from any one of the doors via the BEAN (Body Electronics Area Network) (down operation only).
- During operation, the power window master switch detects that the ignition is ON.
- During operation, any one of the doors is unlocked (during up operation) or all doors are locked (during down operation).
- During operation, the power window master switch receives a door key-linked operation instruction signal via the BEAN (Body Electronics Area Network).
- The power window master switch and an individual power window switch detects that the driver's door glass window and its own door glass window are fully closed (or fully open).
- During operation, the driver operates the power window master switch.

Window Lock Operation

- When the driver turns the window lock switch ON with the ignition ON or during a post-key OFF operation, it cuts off the power supply from the PWS terminal of the power window master switch to the PCT terminals of the individual power window switches. Furthermore, when the CPU in the power window master switch detects the ON signal of the window lock switch, it transmits a "window lock signal" to the individual power window switches via the individual door ECUs, by way of the BEAN (Body Electronics Area Network) and the unidirectional multiplex communication.
- If an individual power window switch detects that the PCT current has been shut down or while it receives a "window lock" signal, it will stop the power window control of its own door glass window.

Fail-Safes Pertaining to the Detection of Door Window Position Information

- If a failure is detected in the Hall IC that is used for detecting the position, speed, and direction of the door glass window, or if an error exceeding a predetermined value occurs between the fully closed position of the door glass window that has been "taught" to the power window switch and the actual door glass window position, the system will transfer to the fail mode as a result of a self diagnosis.
- After the system transfers to the fail mode as a result of a self diagnosis, the system effects the same control as when the power window switch is not "taught" the position information of the door glass window. Thus, the illumination on the switch knob for the driver's door glass window will blink to indicate the failure for approximately 45 seconds after the switch is operated or until the ignition is turned OFF.

List of Failsafe Functions Pertaining to the Detection of Door Glass Window Position Information

Item	Status
Malfunction of pulse sensor (Hall IC)	• Pulses exceeding a specified amount are detected continuously only from one of the two Hall ICs, which are used for detecting the position, speed, and direction of the door glass window, during a close or open operation.
Abnormal pulse direction	• Pulses exceeding a specified amount are detected continuously in the opposite direction of the actuation of the power window motor during a close or open operation.
Abnormal stoppage of both pulses	• No pulses are detected from the two Hall ICs exceeding a specified length of time during a close or open operation, or for 1 second while the door glass window operates to open from the fully closed state (or nearby).
Abnormal door glass position information	• An error exceeding a predetermined value occurs between the actual door glass window position and the fully closed position (origin point 0) that is memorized by the power window master switch and the individual power window switches during a close operation.
Microprocessor failure	• A reset signal is output by the watchdog IC to the microprocessor.
Communication failure (front passenger, rear right, or rear left only)	• Unable to properly receive a BEAN (Body Electronics Area Network) signal from the power window master switch for approximately 10 seconds.

Failsafe Pertaining to Power Window Motor Actuation Control

- This function prevents the motor from actuating in excess of a specified length of time during an automatic operation, in order to protect the motor and the circuit. If there is an error in the door glass window position information, causing the jam protection function to operate in the fully closed position, and thus preventing the door glass window from closing fully, this function renders the system to a state in which it is not "taught" the position information. Thus, the door glass window is able to close fully.

Continuous Operation Restriction Mechanism

- If the motor actuation time (relay ON time) by the power window switch is too long, this mechanism automatically turns OFF the relay after approximately 10 seconds have elapsed.

Forced Teaching Operation (jam protection function Cancel Operation)

- A failure in the jam protection function may create a problem of preventing the door glass window from closing fully (by preventing it from stopping at the fully closed position). If this occurs, the driver can perform an auto-up operation continuously for more than approximately 10 seconds in order to force the system to transfer into a state in which it is not "taught" any position information. Then, the driver can correct the position information by fully closing the door glass window.