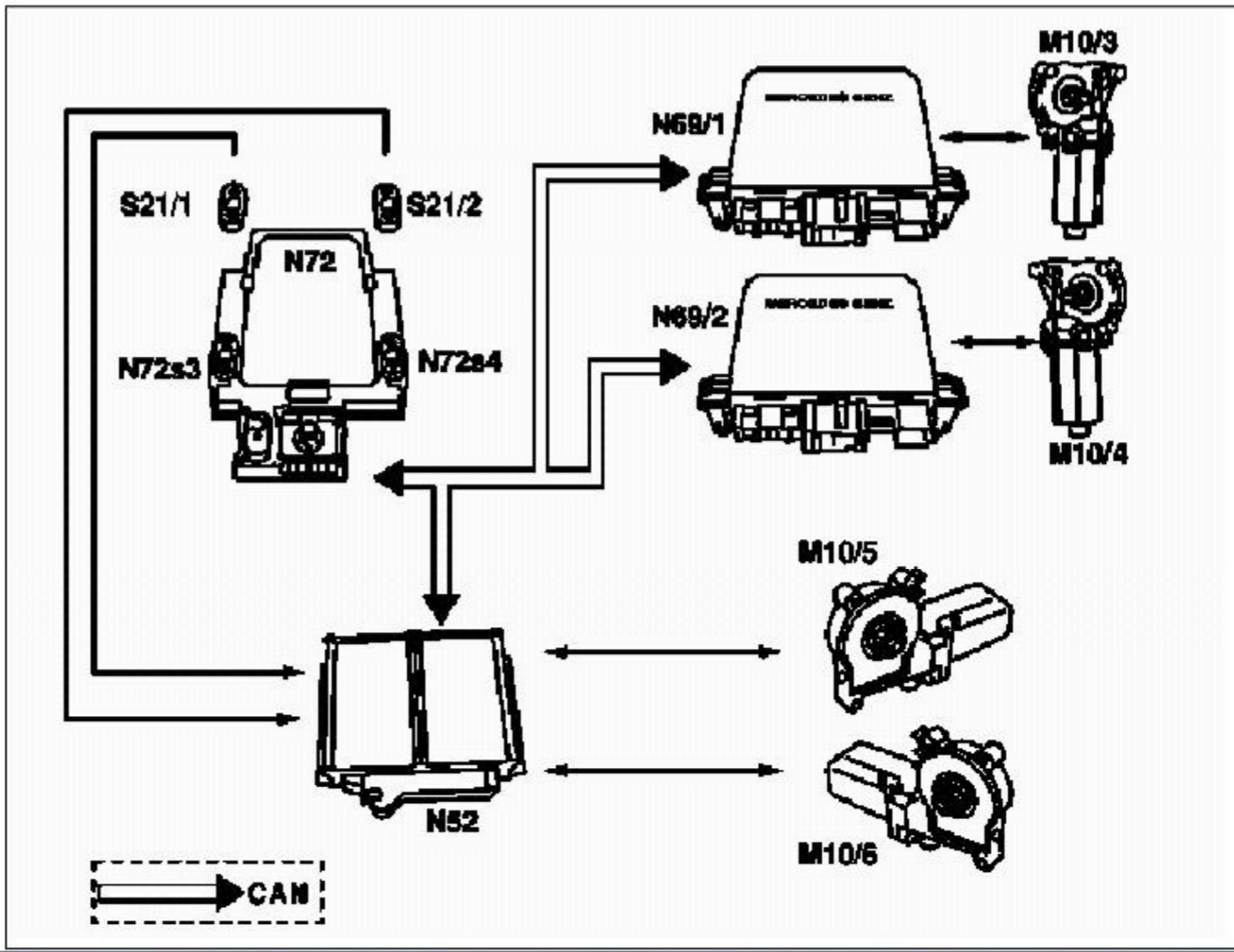


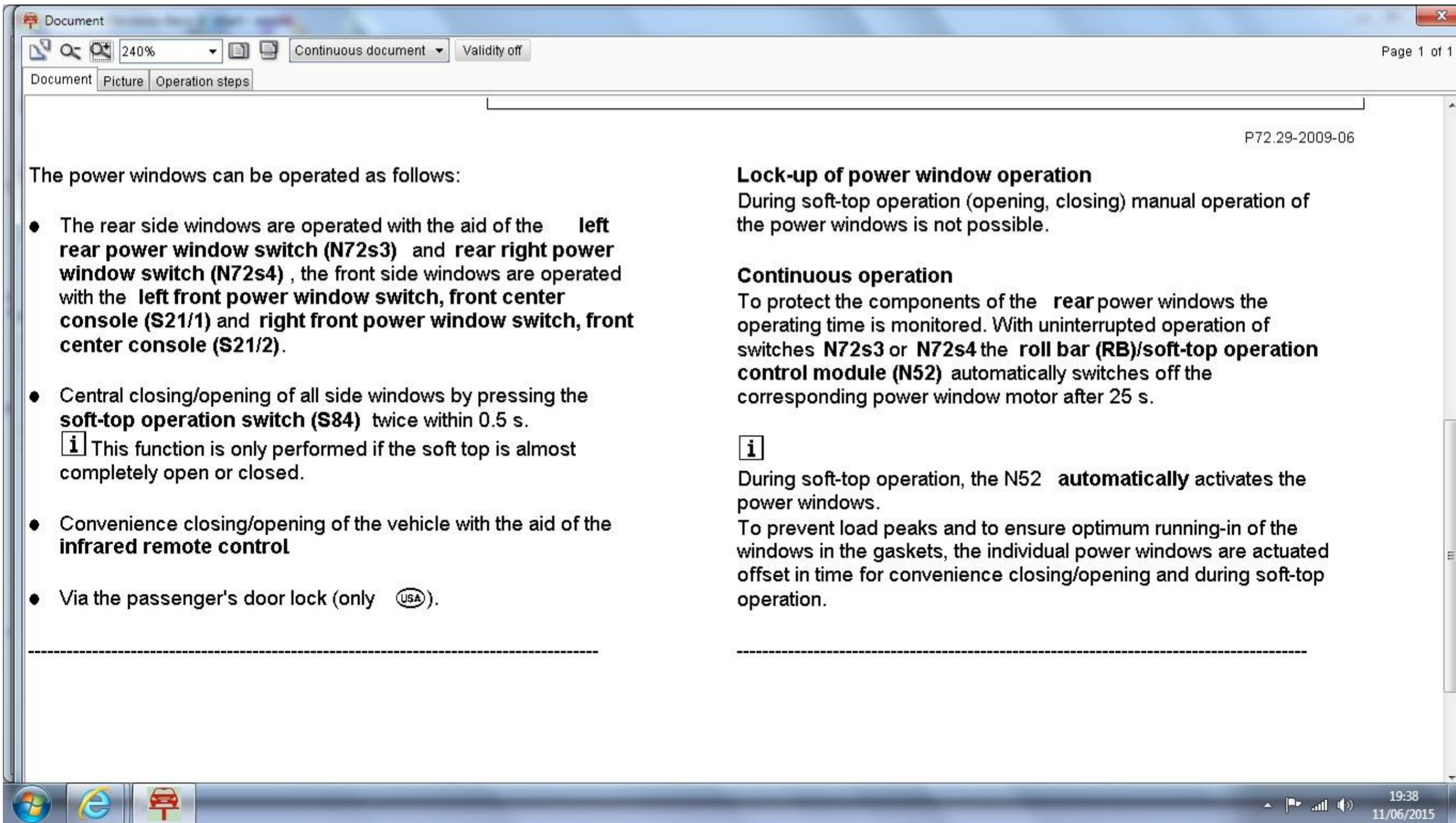
GF72.29-P-0003KA **Power windows (PW [EFH]) function** **10.12.97**

MODELS 208.435 /444 /445 /447 /448 /465 /470

Networking of components

- CAN* *Control Area Network*
- M10/3* *Left front power window motor*
- M10/4* *Right front power window motor*
- M10/5* *Left rear power window motor*
- M10/6* *Right rear power window motor*
- N52* *Rollover bar (RB)/ soft top operation control module*
- N69/1* *Driver-side front door control module*
- N69/2* *Passenger-side front door control module*
- N72* *Lower control field control module*
- N72s3* *Left rear power window switch*
- N72s4* *Right rear power window switch*
- S21/1* *Left front power window switch (front center console)*
- S21/2* *Front right power window switch, front of center console*





The power windows can be operated as follows:

- The rear side windows are operated with the aid of the **left rear power window switch (N72s3)** and **rear right power window switch (N72s4)**, the front side windows are operated with the **left front power window switch, front center console (S21/1)** and **right front power window switch, front center console (S21/2)**.
- Central closing/opening of all side windows by pressing the **soft-top operation switch (S84)** twice within 0.5 s.
i This function is only performed if the soft top is almost completely open or closed.
- Convenience closing/opening of the vehicle with the aid of the **infrared remote control**
- Via the passenger's door lock (only **USA**).

Lock-up of power window operation

During soft-top operation (opening, closing) manual operation of the power windows is not possible.

Continuous operation

To protect the components of the rear power windows the operating time is monitored. With uninterrupted operation of switches **N72s3** or **N72s4** the **roll bar (RB)/soft-top operation control module (N52)** automatically switches off the corresponding power window motor after 25 s.



During soft-top operation, the **N52** **automatically** activates the power windows.

To prevent load peaks and to ensure optimum running-in of the windows in the gaskets, the individual power windows are actuated offset in time for convenience closing/opening and during soft-top operation.

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Document Picture Operation steps

GF72.29-P-3007KA	Power windows with one-touch window up and window down control, function	10.12.97
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MODELS 208.435 /444 /445 /447 /448 /465 /470

Function prerequisites

- No overvoltage/undervoltage
- Circuit 15 on or circuit 15R on

Function

The automatic window raising/lowering function is triggered by pressing the power window switch over the **first click-stop position** in the "open" or "close" direction. Each power window can be operated individually.

i

With MODEL 208.4 instead of the **automatic window raising** function of the front or rear power windows, the **manual window raising** function is performed.

- **Front power windows**
On pressing the **left front power window switch, front center console (S21/1)** or the **left front power window switch, front center console (S21/1)** the corresponding door control module receives a CAN message from the **roll bar (RB)/soft-top operation control module (N52)** and actuates the relevant **power window motor** until the window is completely open, even if the switch has already been released.

With **non-normalized** (front) windows, instead of the automatic window raising/lowering function, the **manual window raising/lowering** function is performed.

- **Rear power windows**
On pressing the **left rear power window switch (N72s3)** or the **right rear power window switch (N72s4)** the **roll bar (RB)/soft-top operation control module (N52)** receives a CAN message from the **lower control panel control module (N72)** and actuates the relevant **power window motor** until the window is completely open, even if the switch has already been released.

Function abort

The window raising/lowering function is aborted if

- S21/1, S21/2, N72s3 or N72s4 is actuated again, after it was in the center position,
- lock-up of the power window is detected,
- the function prerequisites are no longer satisfied.,
- with window raising, the **obstruction sensor** reacts,
- with window lowering, **denormalization** takes place (only with the front power windows).

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Document Picture Operation steps

GF72.29-P-4001KA	Lock-up recognition of power windows, function	6.2.98
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MODELS 208.435 /444 /445 /447 /448 /465 /470

Function of front power windows

The **door control module (N69/1) or (N69/2)** receives pulses from the power windows for the **position recognition** .

If these pulses are absent during the actuation of the motor in the **power window** for more than 1 s, then the door control module detects the **lock-up** of the motor and switches it off.

Function of rear power windows

The **roll bar (RB)/soft-top operation control module (N52)** during operation measures the power consumption of the **left rear power window motor (M10/5) and right rear power window motor (M10/6)** . If the rear side windows reach their limit positions (upper or lower), then the power consumption increases considerably as a result of the lock-up.



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Document Picture Operation steps

GF72.29-P-4000A	Position recognition of power windows, function	12.12.96
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MODELS 202 as of 1.6.97,
208, 210.081 /281 (except 208.4),
210 (except 210.081 /281) as of 1.3.97

Direction recognition

- 1 Square-wave pulses from Hall sensor b1
- 2 Square-wave pulses from Hall sensor b2

360° One rotation of motor shaft
b1,b2 Hall sensor

The diagram illustrates the relationship between the motor shaft's rotation and the Hall sensor outputs. The vertical axis is labeled 'U' and has two levels, '1' and '2'. The horizontal axis is labeled 'x' and has two points, '0°' and '360°'. Two square-wave pulses are shown: pulse '1' (top) and pulse '2' (bottom). Pulse '1' is high from 0° to approximately 90° and from 270° to 360°, and low in between. Pulse '2' is high from approximately 90° to 270° and low in between. To the right, a horizontal bar represents the motor shaft with a Hall sensor 'b1' (marked with an 'X') positioned at the 0° mark. Below it, a circular diagram shows the motor shaft with North (N) and South (S) poles and a curved arrow indicating clockwise rotation. A second Hall sensor 'b2' (marked with an 'X') is positioned at the 90° mark.

P72.29-0260-06



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Document Picture Operation steps

P72.29-0260-06

Direction recognition

The two Hall sensors **b1** and **b2** are located at the shaft of the **motor** in the power window. They react to movements of the magnet. The Hall sensors supply one square-wave pulse for each rotation of the motor.

The corresponding **door control module (N69/1) or (N69/2), (MODELS 202/210 also N69/3 or N69/4)**, inputs the pulses from the Hall sensors. From the time difference between the pulses from Hall sensor **b1** and the pulses from Hall sensor **b2** the **door control module** determines the motor's direction of rotation.

Position recognition

The corresponding **door control module** counts the pulses from the Hall sensors as a function of the determined **rotational direction** of the **motor** in the power window. The value in the position counter is increased when the window closes. In the other direction, the value in the position counter is reduced when the window opens. The zero position is defined as the **upper lock-up point**, i.e. when the window is completely open the counter should be at zero. The zero position is set by the **normalization** function. If the zero position is exceeded in the open direction, the count becomes negative.

GF	Normalizing of power windows	GF72.29-P-4003A
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Document Picture Operation steps

GF72.29-P-4003A	Power window synchronization, function	12.12.96
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MODEL 202 as of 1.6.97,
208, 210.081 /281,
210 (except 210.081 /281) as of 1.3.97

Definition
Synchronization means the counter status for **position recognition** in the **door control module (N69/1) or (N69/2), (models 202/210 also N69/3 or N69/4)**, is set to the actual position of the side window. Synchronization is necessary when the door control module has been separated from the power supply (e.g. by disconnecting the battery, removing or installing the door control module), or following a **desynchronization**. When a window is not synchronized the **door control module** does not know in which position the window is and in which direction it is necessary to move the **power window** motor in order to close the window. For this reason synchronization is a prerequisite for proper operation of the **one-touch window up/down control** for the power window.

Synchronising
Close window in question with **power window switch** or **convenience feature** until **power window** motor locks up, then continue to actuate switch. The **door control module** continues to

actuate the motor and sets the counter for **position recognition** to zero when motor **lock-up** has been recognized for at least 0.3 sec. The window is then synchronized. This means that the **door control module** can now switch off the power window motor before reaching the lock-up position when opening and closing the window.
The window remains synchronized as long as it is not **desynchronized**

i Model 208: For synchronization it is necessary for the door in question to be closed.

Resynchronizing
Resynchronization is accomplished when the power window switch is held down in the closed direction for longer than 0.3 seconds even though the zero position has already been reached.

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