08 - Electrical/8R - Wipers/Washers/Description and Operation

DESCRIPTION AND OPERATION

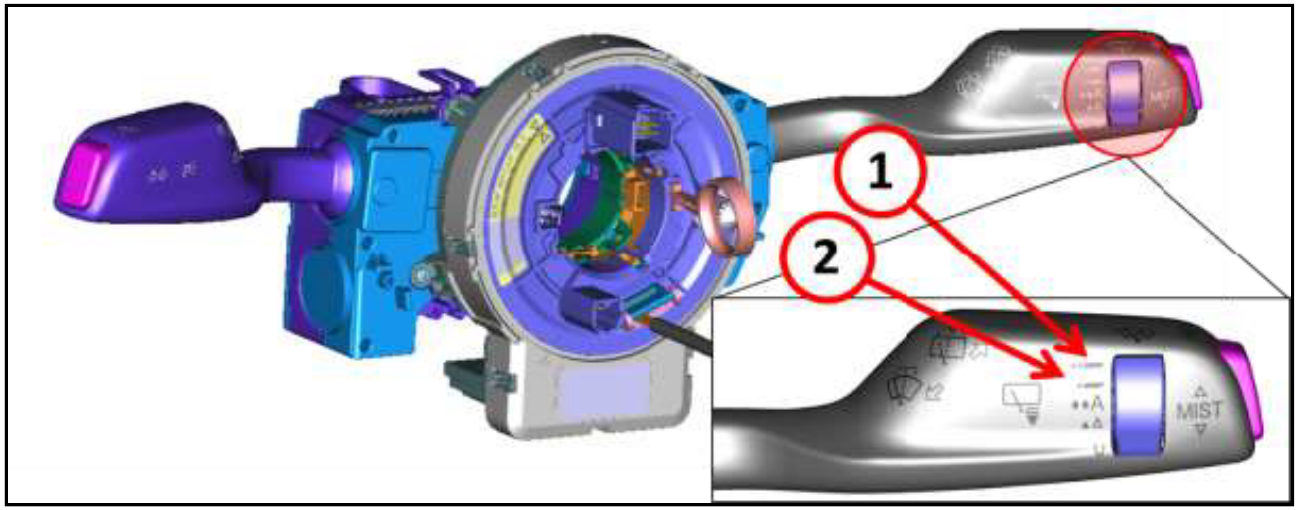
DESCRIPTION

The Body Control Module (BCM) manages the operation of the windshield and rear window wiper system.

Windshield Wipers

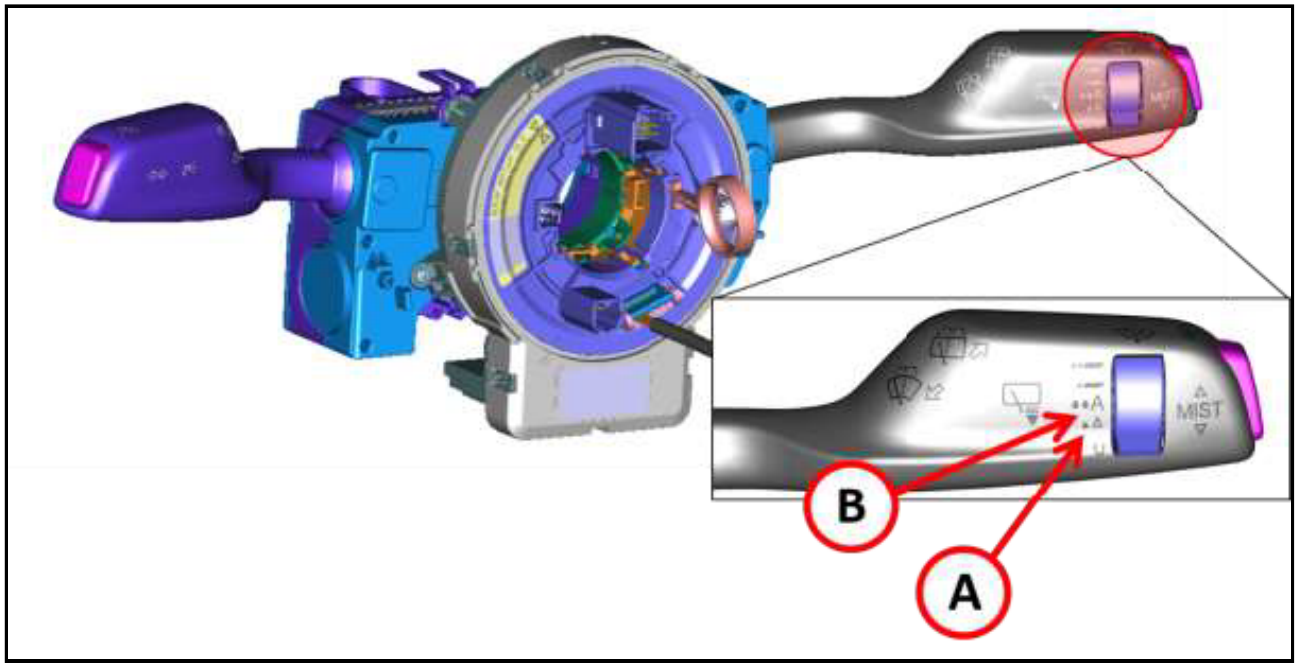
The windshield wiper request may reach the BCM in two ways:

- Manual – the windshield wiper is activated when operated by the user.
- Automatic – the windshield wiper is activated automatically when it starts raining.



The control position on the right steering column stalk used for manual activation are:

1	Windshield wiper low speed manual activation
2	Windshield wiper high speed manual activation



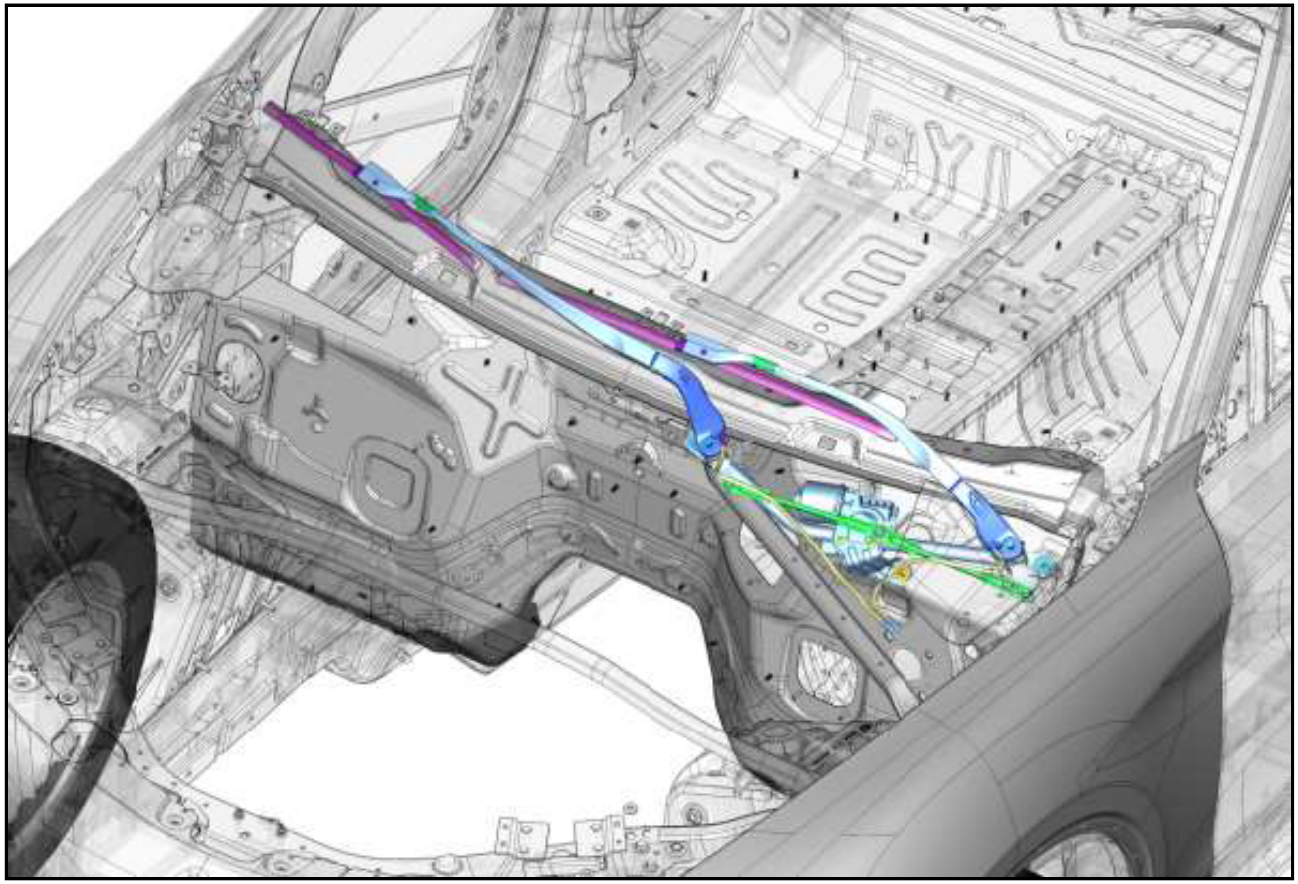
Automatic activation can be selected by the user by setting the windshield wiper control position to one of the two initial positions. The user can set the rain sensitivity level of the automatic function by selecting position A or B.

A	Rain sensor low sensitivity level
B	Rain sensor high sensitivity level

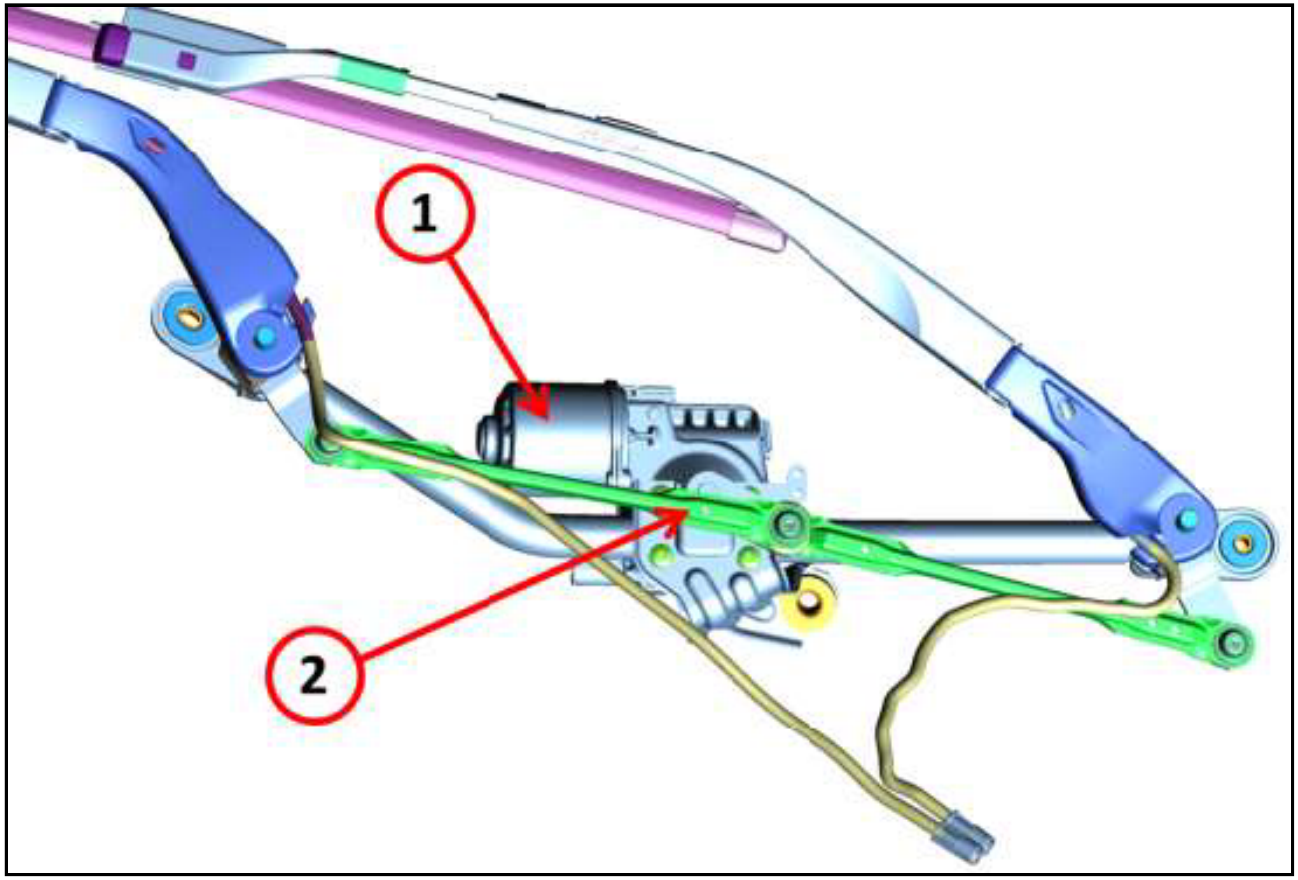
The windshield wash/wipe system is activated by the lever located on the right of the steering wheel, there are various possible positions for the stalk to which the following functions correspond:

- windshield wipers OFF
- rain sensor first sensitivity level
- rain sensor second sensitivity level
- first continuous speed
- second continuous speed
- MIST function (toggle position up): operation limited to the time for which the stalk is held in this position

A rain sensor, located behind the interior rearview mirror, in contact with the windshield, can detect the presence of rain and, consequently, manage the cleaning of the windshield in accordance with the amount of water on the glass. In positions 1 or 2, the frequency of the windshield wiper strokes is automatically adjusted according to the amount of water on the windshield detected by the sensor: the frequency varies continuously from no stroke (windshield dry) to wiping at the second continuous speed (heavy rain).

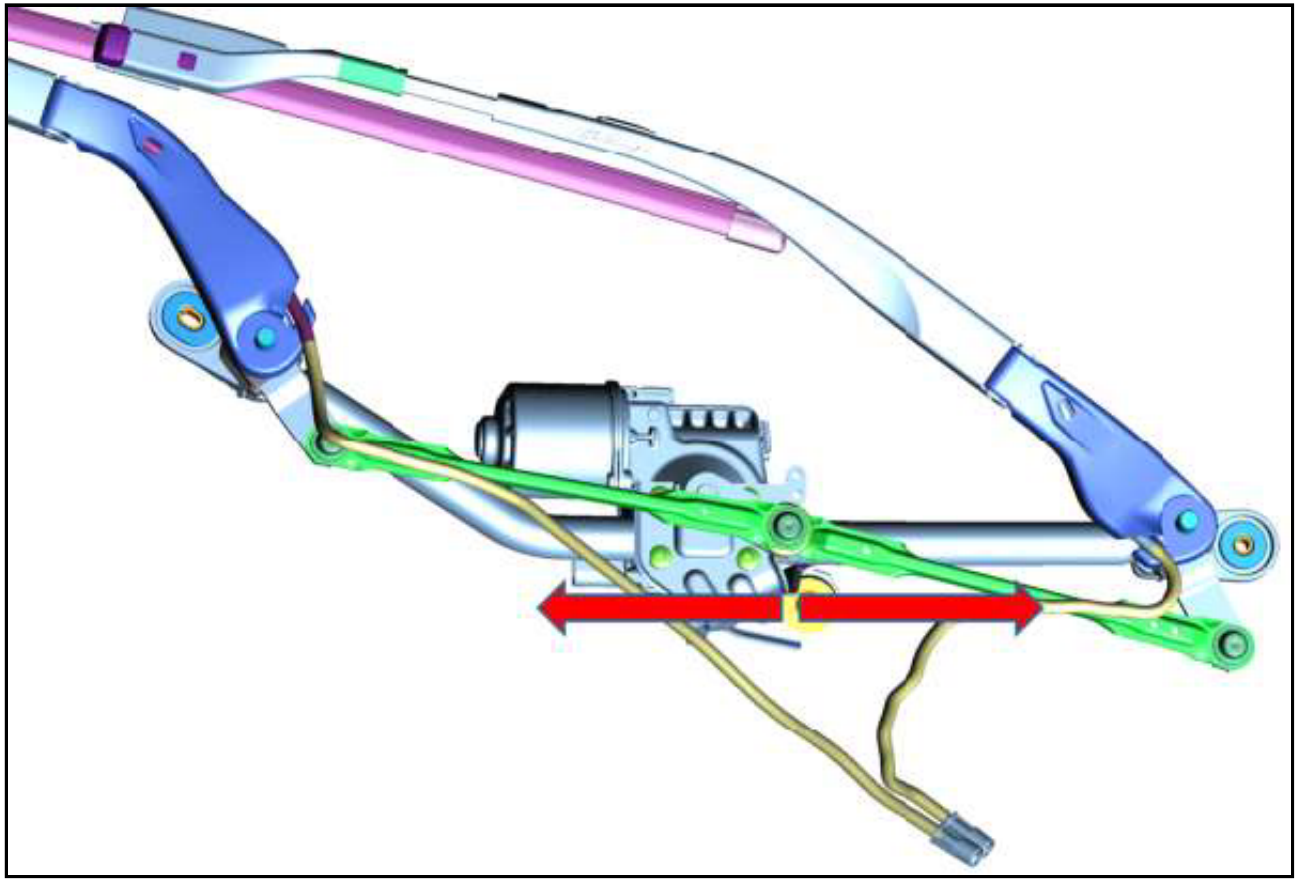


The windshield wiper mechanism is located behind the cowl trim, just below the windshield.



The windshield wiper mechanism consists of a Local Interface Network (LIN) bus controlled electric motor (1) which operates the control linkage (2) of the two arms, to which the rest of the wiper linkage and wiper blades are connected.

1	LIN bus controlled electric motor
2	Control linkage



The feature of the electric motor is that it is controlled by electronics which can reverse the control linkage movement. In traditional windshield wiper mechanisms, the electric motor always turns the same way. The motion of the two blades is obtained by means of a cam present in the control mechanism.

In this case, the next-generation electric motor has a mechanism which does not always turn in the same direction but which cyclically reverses the sense of rotation without needing the motion inversion cam used in traditional mechanisms.

The main advantages of the system are:

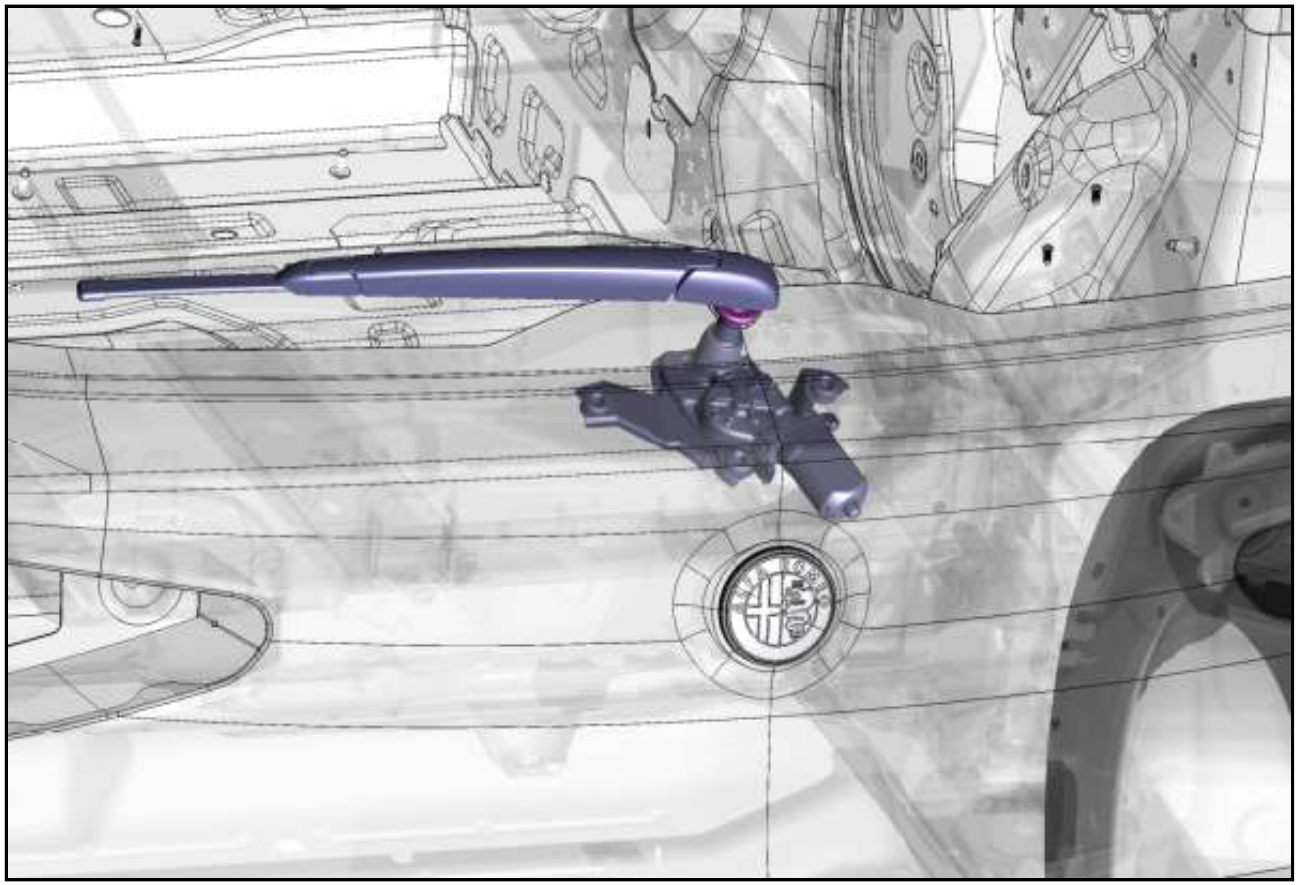
- The blades are nearly invisible to the vehicle occupants when the blades are in home position.
- Larger wiping area. The system allows to set the motion inversion point very close to the A pillar of the windshield.
- Lighter weight of the system as a whole.
- Continuously controlled operating speed maintained in load conditions (wind force, variable friction).

Substantially, the electronics integrated in the motor can recognize the position of the arms instant by instant which allows for adjusting the rotation speed of the motor according to their position. When the blade approaches the motor inversion point, the rotation speed of the motor is reduced: this causes reduction of noise and less wear on the blade.

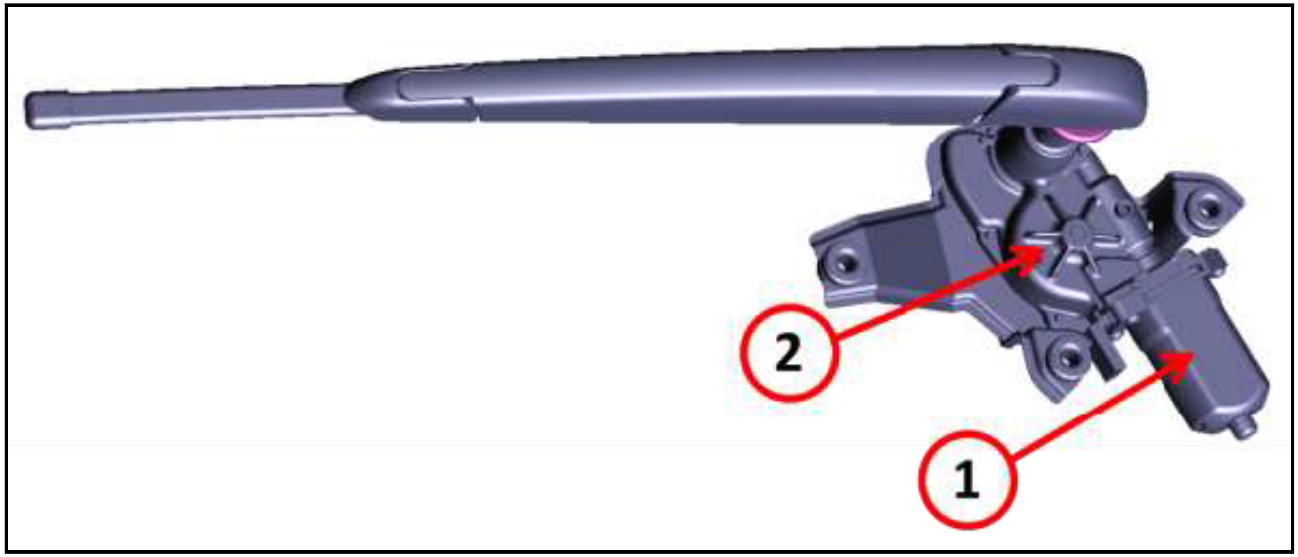
The electronics integrated in the motor can detect the presence of obstacles to arm movement (for example snow). An obstacle causes a higher current consumption. The system reduces the operating field of the arms to prevent damage when the current peak is detected.

The Body Control Module (BCM) manages motor activation by means of a dedicated LIN bus.

Rear Window Wiper



The rear window wiper mechanism consists of an electric motor which operates a cam for controlling the arm to the ends of which the wiper blades are coupled.



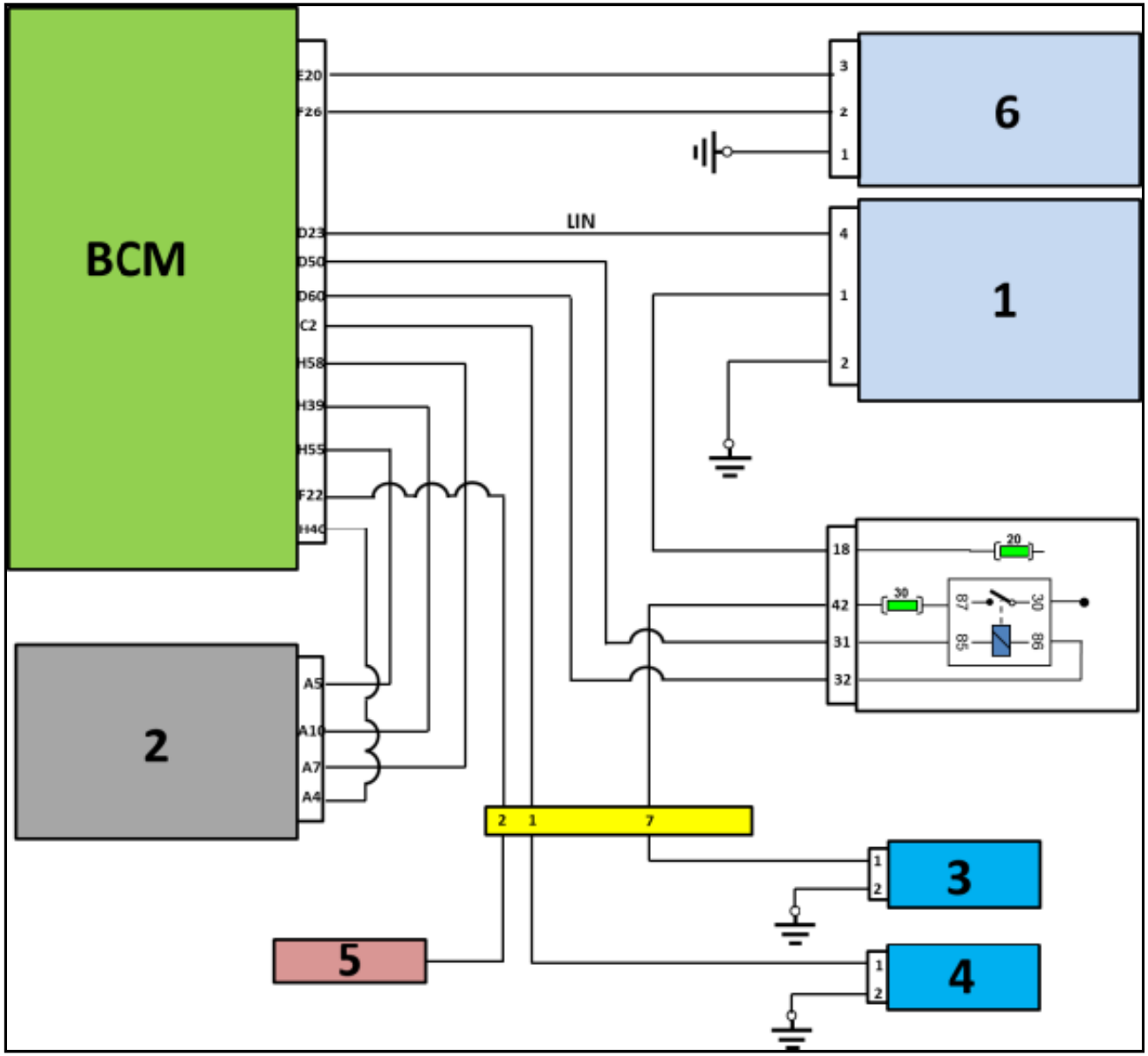
1	Rear wiper motor
2	End of cam travel

When the rear window wiper ring nut located on the right steering column stalk is moved to the ON position, the rear window wiper is activated in one of the following modes:

- intermittent: with a pause between wipes of 2.7 seconds
- subject to the windshield wiper (if there is a simultaneous windshield/rear window wiper request): synchronous operation at half the frequency of the windshield wiper
- if reverse gear is engaged it is continuous

With the windshield wipers operating, if reverse gear is engaged, the rear window wiper is automatically activated: this function is managed by the BCM, which receives information from the Powertrain Control Module (PCM) via the Controller Area Network (CAN). Pushing the lever to the right of the steering column, the rear washer is activated, and holding the lever pushed for longer than 0.5 seconds automatically activates the continuous speed wiper. When the control is released, there are three additional strokes to clean the rear window plus another stroke six seconds later (to remove any drips). If the rear window wiper had already been activated before the washer was activated, the wash logic only has the effect of activating intermittently.

Windshield wiper wiring diagram

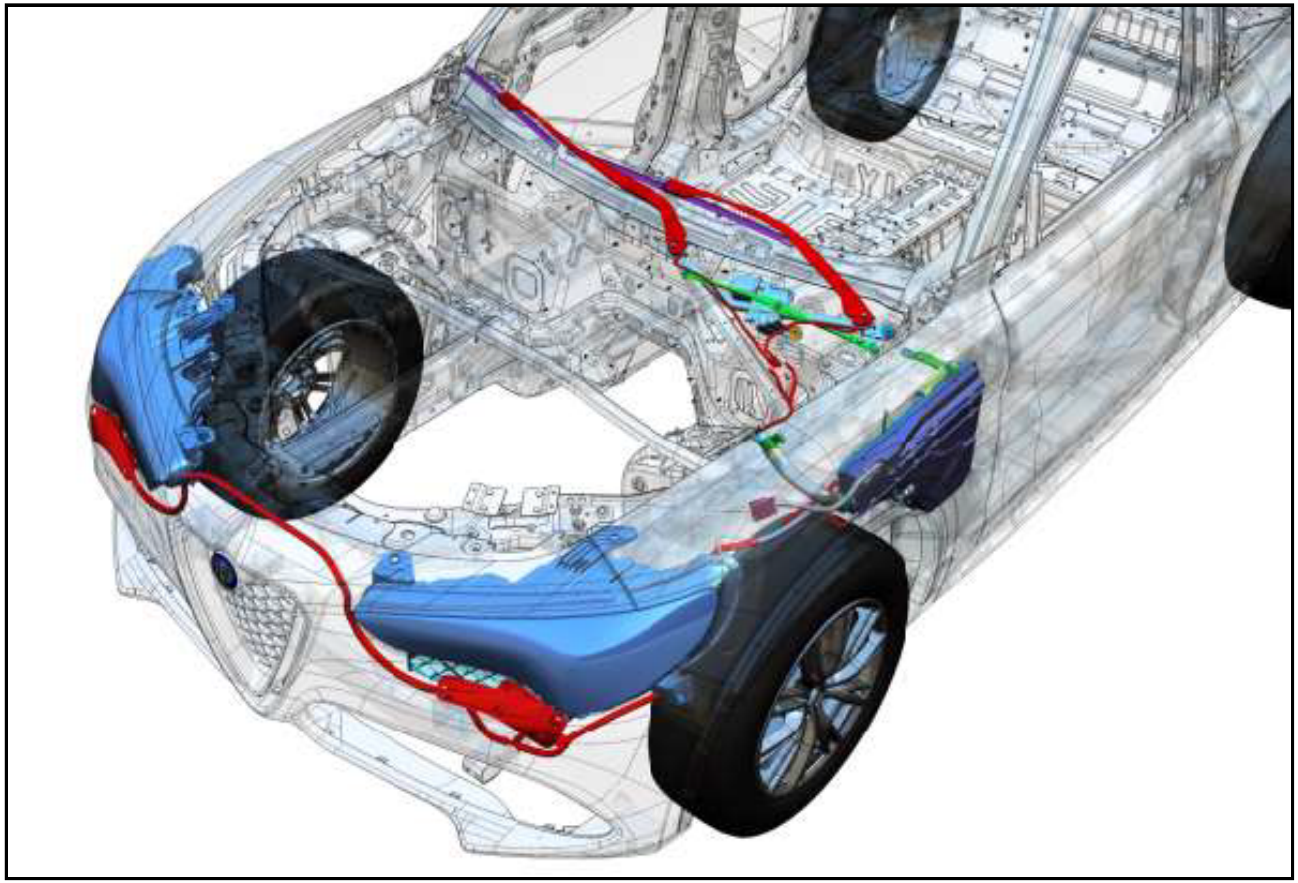


1	LIN controlled electric motor

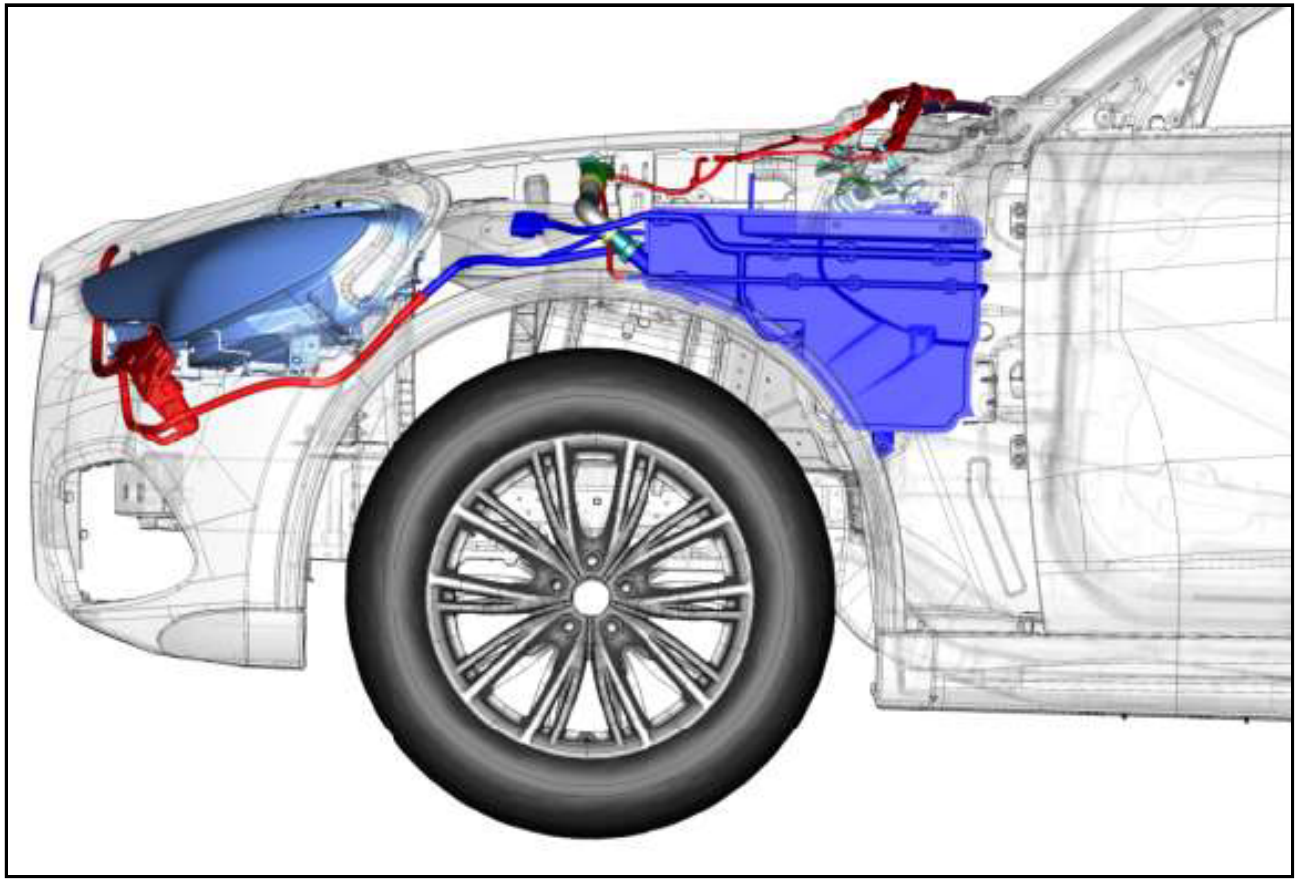
2	Steering column stalk controls
3	Windshield washer pump
4	Headlight washer system pump (top level headlights only)
5	Windshield washer fluid level sensor
6	Rear window wiper motor

Windshield and headlamp washer system

The windshield washer function can be activated by pulling the lever toward the steering wheel, this activates the windshield washer pump. Keeping the lever pulled also switches on the windshield wiper in accordance with a specific control logic and the windshield wiper is activated at the first speed. When the windshield washer control is no longer present, an additional stroke is carried out.

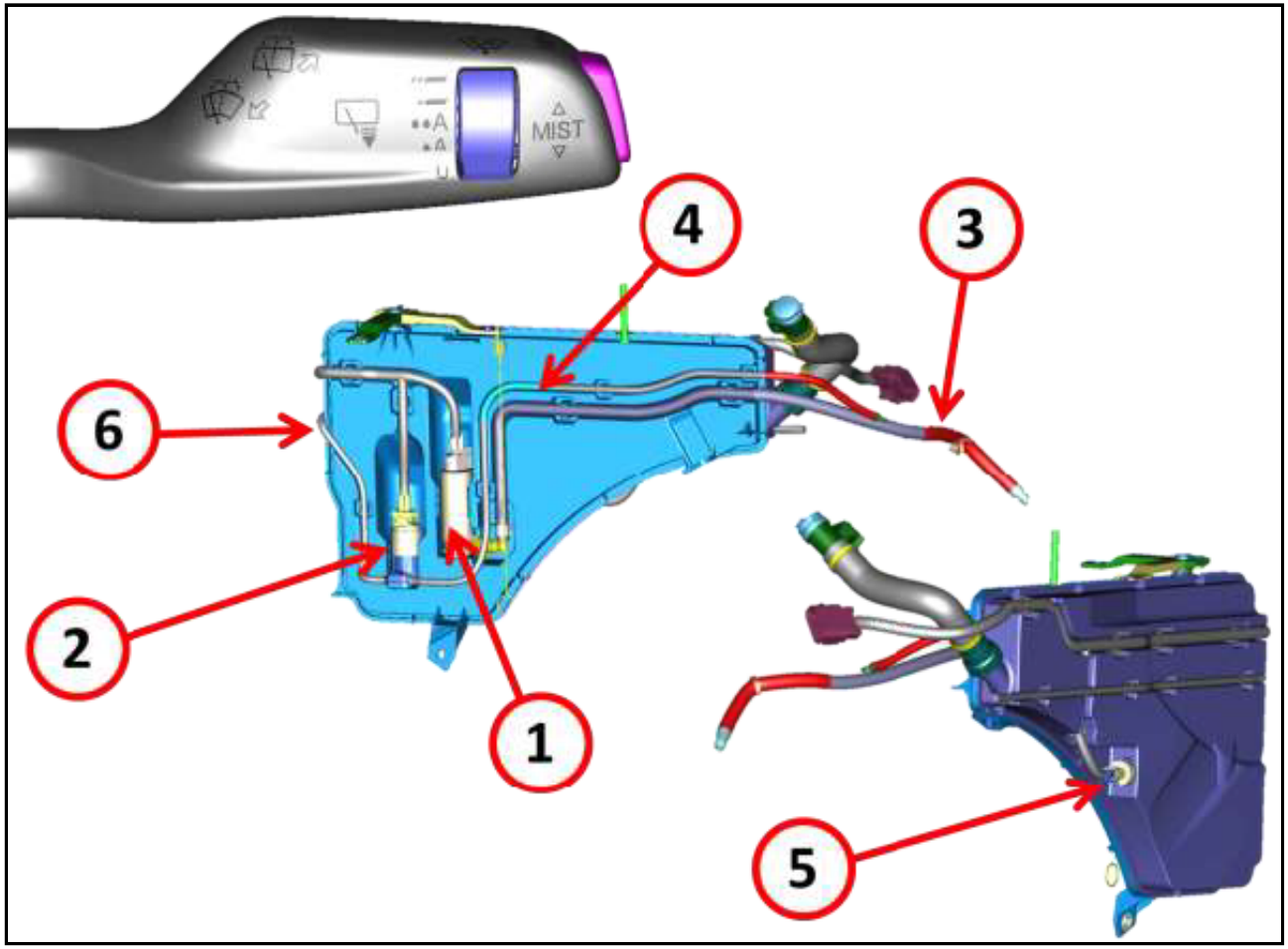


The windshield washer system implements headlight washers only if the vehicle is equipped with top level headlights (Xenon 35W).



The system consists of a reservoir for the washer fluid, front nozzles inserted directly on the windshield wiper blades, connecting hoses and a sprayer nozzle in the tailgate spoiler.

The reservoir is located behind the front left wheelhouse splash shield.



The BCM sends current to the windshield washer system pump when the right stalk is pulled towards the driver for the windshield wiper or pushed for the rear window wiper.

1	Headlight washer pump
2	Windshield washer pump
3	Headlight washer hose

4	Windshield washer hose
5	Fluid level sensor
6	Rear window washer hose

Light Rain Sensor Module (LRSM)

A rain sensor, located behind the interior rearview mirror, in contact with the windshield, can detect the presence of rain and, consequently, manage the cleaning of the windshield in accordance with the amount of water on the glass. In positions 1 or 2, the frequency of the windshield wiper strokes is automatically adjusted according to the amount of water on the windshield detected by the sensor: the frequency varies continuously from no stroke (windshield dry) to wiping at the second continuous speed (heavy rain).

OPERATION

Windshield Wipers and Washers

There is a single (ground) signal sent by the steering column stalk to the BCM that manages all the windshield wiper commands. The signal sent is coded via resistive dividers so that multiple information can be sent from the steering column stalk to the BCM via a single connection. The steering column stalk receives the reference ground from the BCM. Similarly, the windshield washer controls are sent from the steering column stalk to the BCM.

The BCM receives direct battery power via the circuit protected by a maxi fuse on the Battery Distribution Unit (BDU). The BCM receives an ignition-controlled power supply (INT) signal from the Radio Frequency Hub (RFH) Module. The BCM has a dedicated reference ground.

Based on the chosen function, the BCM sends the control signals to the windshield wiper motor via a dedicated LIN bus. The windshield wiper motor is powered directly from the battery through the circuit protected by a fuse in the engine compartment Power Distribution Center (PDC). The BCM sends a command which operates the windshield washer pump which sends the washer fluid in front of the windshield wiper. The power supply circuits for the pump are controlled by two relays and protected by a fuse in the BCM.

The windshield washer fluid level sensor, on the cap of the reservoir, receives a reference ground from the BCM and sends a status signal to the BCM.

The LRSM receives a power supply from the INT circuit protected by a fuse in the BCM and also sends the BCM the automatic activating signal via a LIN serial bus. The BCM is connected via the CAN data bus to the Instrument Panel Cluster (IPC) to manage the windshield washer fluid level indication and relevant indicators in case of fault to the wiper motor or to the LRSM.

Rear Wipers and Washer

There is a single (ground) signal sent by the steering column stalk to the BCM that manages all the rear window wiper commands. The signal sent is coded via resistive dividers so that multiple information can be sent from the steering column stalk to the BCM via a single connection. The steering column stalk receives the reference ground from the BCM. Similarly, the rear window washer commands are sent from the steering column stalk to the BCM.

The BCM receives direct battery power via the circuit protected by a maxi fuse on the BDU. The BCM receives an ignition-controlled power supply (INT) signal from the RFH module. The BCM has a dedicated reference ground.

The BCM sends the command signal to the rear window wiper motor. The ground signal comes from the end-of-run cam motor, which stops the rear window wiper motor. The rear window wiper motor is then continuously connected to the ground.

The BCM sends a command which operates the rear window washer pump. This sends the washer fluid to the rear window wiper nozzle. The power supply circuits for the pump are controlled by two relays and protected by a fuse in the BCM. The BCM is connected via the CAN data bus to the IPC to manage the windshield washer fluid level indication and relevant indicators in case of fault to the wiper motor or to the LRSM.