DESCRIPTION - FUNCTION : RAIN AND BRIGHTNESS SENSOR

1. Description

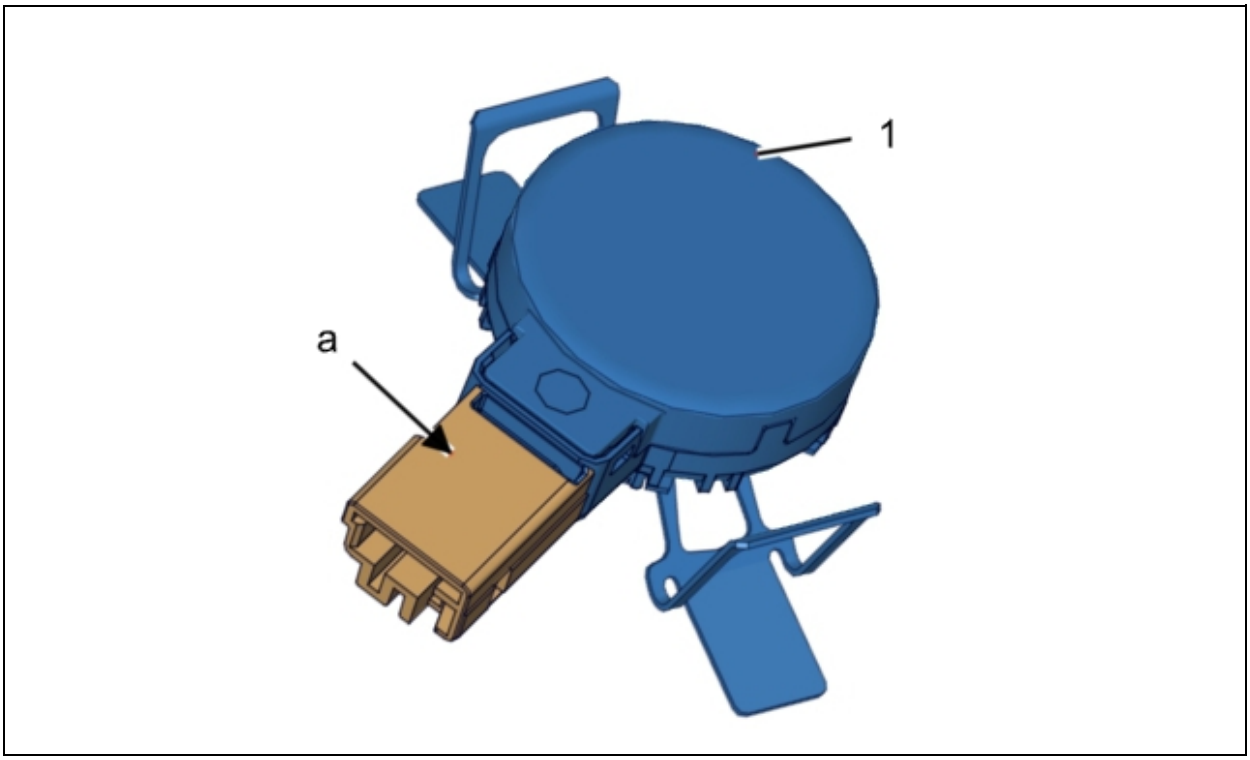

Figure : D4EA7UVD

(1) Rain and brightness sensor .
"a" 3-way blue connector .
The rain and brightness sensor is the one-part integrated system mounted to the interior of face of the windscreen and connected to the vehicle's multiplexed network.
The rain and brightness sensor contains the following elements :

- Base glued to the windscreen
- A unit containing the detection components, the processing electronics and the interface with the multiplexed network

2. Role

The role of the rain and brightness sensor is to detect and analyse the brightness and rain conditions affecting the vehicle in order to manage the following functions.
Functions of the rain and brightness sensor :

- Rain sensor
- Brightness sensor
- Ambient light sensor
- Automatic wiping (Rain sensor function)
- Automatic switching on of the dipped headlamps (Brightness sensor function)
- Automatic adjustment of the brightness of the vehicle displays (Ambient light sensor function)

2.1. Rain sensor

The rain sensor issues wiping requests according to the quantity of water present on the windscreen and how it changes over time.

Depending on the automatic wiping mode activated, the speed of the vehicle as well as the quantity of water on the windscreen, the rain sensor communicates a speed setting of the wiper blades to the built-in Systems Interface .

2.2. Brightness sensor

According to the quantity of light received by the brightness sensor, the brightness sensor issues the following requests to turn lights on and off :

- Front and rear sidelamps
- Dipped headlamps
- Lamp illuminating the numberplate

2.3. Ambient light sensor

The ambient light sensor issues a request to adjust the brightness of the screens on the windscreen according to th ambient light.

3. Function

3.1. Rain sensor

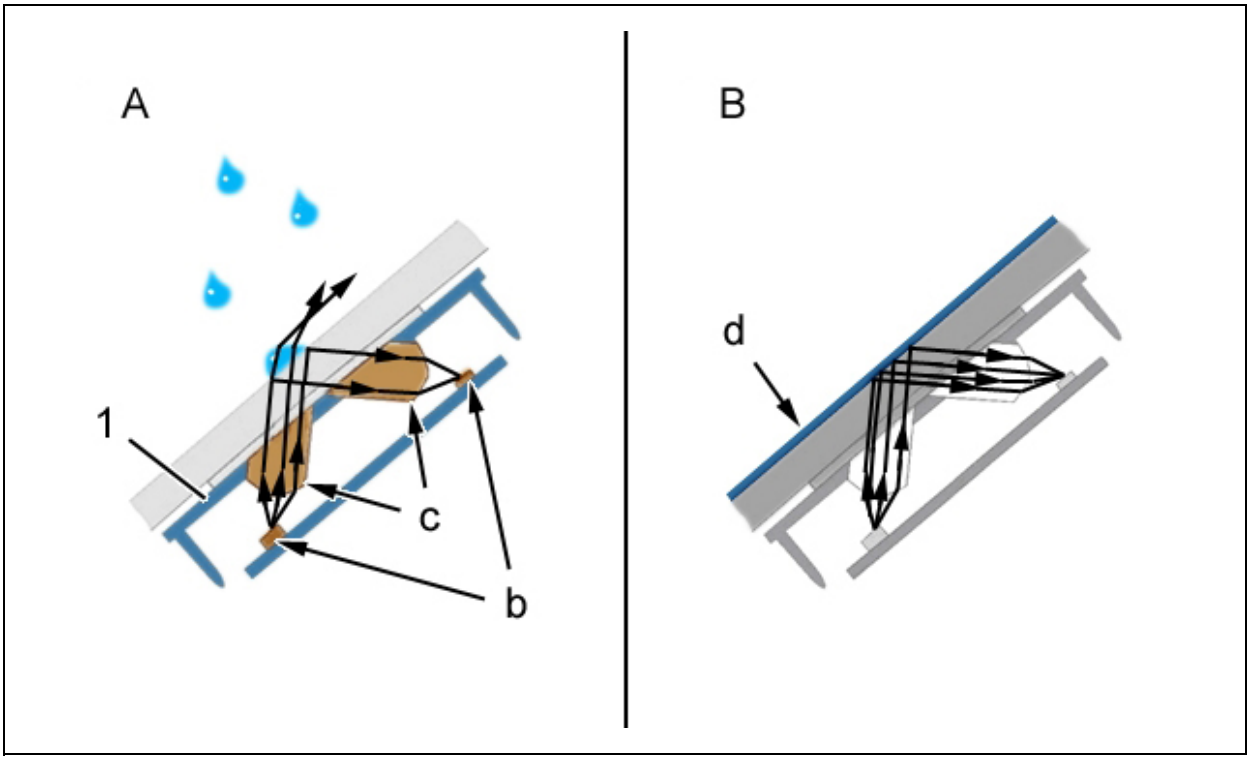

Figure : D4EA1T6D

(1) Rain/brightness sensor.
"A" Principle of refraction.
"B" Total reflection.
"b" Optoelectronic diodes.
"c" Optical lenses.
"d" Surface of the windscreen.
The optoelectronic emission and reception diodes operate within a narrow wavelength band close to the infra-red range, which facilitates a considerable reduction of the influences of the ambient light.
The light emitted by the transmission diodes is collected in the corresponding lenses, made parallel and coupled to the windscreen by the optical lens collector.
On the clean and dry exterior side of the windscreen, the light is subjected to total reflection and is concentrated almost completely on the reception diodes by the secondary lenses allocated to each reception diode.
When the drops of water fall on the windscreen detection zone, some of the light emitted is refracted in the drops of

water so that this light is dispersed outwards.
Therefore, the quantity of light detected by the reception diodes is reduced.
The modulation of the quantity of light energy is analysed by the control electronics and results in variation of the frequency and speed of wiping.
The rain sensor is not sensitive to light variations.
The light sensor is more sensitive to a first triggering situation at night than during the day as the driver is more sensitive to loss of visibility due to rain at night.
The reaction time during the transitions between the operating modes, as well as the intermittent rates, are higher when the cadence is being reduced then when it is being increased.
When the driver makes a washing request, which can last up to 30 seconds, the sensor maintains the wipe request in the current wipe mode.
The rain and brightness sensor does not measure rain on the LIN network throughout the presence of the information "request for washing" of the windscreen made by the driver.

Rain conditions	Behaviour of the rain sensor
No rain	No wiping
Frost on the windscreen (Depends on the frost's humidity)	No wiping
Snow	Behaviour identical to the rain behaviour
Light direct rain	Fast intermittent wiping
Fine direct rain	Slow intermittent wiping
Heavy direct rain or very heavy rain	Fast speed wipe
Medium direct rain	Slow speed wipe
Light spray	Fast intermittent wiping
Fine spray	Slow intermittent wiping
Heavy spray	Fast speed wipe
Medium spray	Slow speed wipe
Dew when starting	Slow intermittent wiping
Transitions from fine rain to no rain	Slow intermittent wiping (Wiping off)
Transitions from fine rain to light rain	Slow intermittent to fast intermittent wiping
Transitions from fine rain to medium rain	Slow intermittent wiping (Slow speed)
Transitions from fine rain to heavy or very heavy rain	Slow intermittent wiping (High speed)
Transitions from light rain to no rain	Fast intermittent wiping (Wiping off)
Transitions from light rain to medium rain	Fast intermittent wiping (Slow speed)
Transitions from light rain to heavy or very heavy rain	Fast intermittent wiping (High speed)
Transitions from medium rain to no rain	Slow speed wipe (When stationary)
Transitions from medium rain to heavy or very heavy rain	Slow speed wipe (High speed)

N.B. : Manual wiping requests always take priority over requests from the rain and brightness sensor.

3.2. Brightness sensor

When the automatic illumination of the dipped headlamps is active, the system manages the turning on and off of th headlamps according to the ambient brightness and the exterior context.
The brightness sensor differentiates between a drop-in brightness due to dusk from a drop of brightness due to the entry of the vehicle into a shady zone (tunnel or car park entrance).
In the same way the brightness sensor differentiates between an increase in brightness due to dawn from an increase in brightness due to the vehicle leaving a shady zone.
The brightness sensor makes requests to turn the lights on and off which are relevant under clear skies (direct light) and in overcast conditions (diffused light).

Brightness conditions	Behaviour of the brightness sensor
Dawn	Dipped beam headlamps turned off : From 2000 lux to 4000 lux

Dusk	Dipped beam headlamps turned on : From 500 lux to 2000 lux
Illuminated tunnels or underground car parks	On/off : The information is made available over the network in less than 0,05 seconds
Bridges	Dipped beam headlamps not turned on
Driving by night, passing vehicles with full headlamps, reflective panels, street lights, etc.	Dipped beam headlamps not turned off
Unlit tunnels	On/off : The information is made available over the network in less than 0,05 seconds
Succession of close-by bridges (light wells)	Dipped beam headlamps not turned off
Exiting the garage in full daylight after starting in the garage	Dipped beam headlamps turned off : The information is made available over the network in less than 0,1 seconds
Fog	The dipped beam headlamps are not turned off if turning on of the dipped beam headlamps is already activated, otherwise the dipped beam headlamps are turned on : The information is made available over the network in less than 0,15 seconds

N.B. : In a tunnel, even brightly lit by artificial light, the lamps stay on.

N.B. : Manual lighting commands always take priority over requests from the rain and brightness sensor.

4. Electrical features

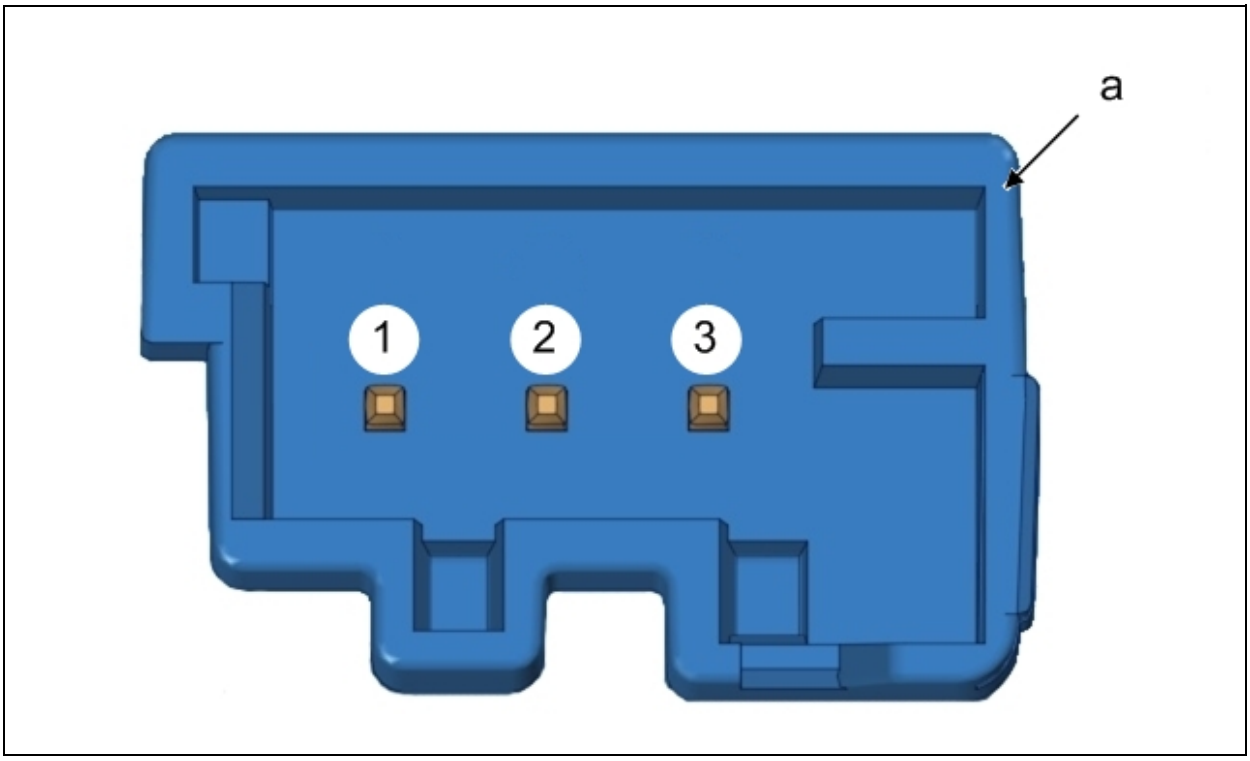

Figure : D2AA077D

"a" 3-way blue connector	
Number of channels	Allocation of channels of connector
1	Earth
2	LIN

"a" 3-way blue connector	
3	CAN+

The default temperature range in the vehicle of the rain and brightness sensor is between -30°C and 100°C.
The rain and brightness sensor is sensitive to luminous radiation in the visible spectrum between 400 and 1100 nm.

5. Programming - initialisation

Programming is necessary if the rain and brightness sensor is removed/refitted.