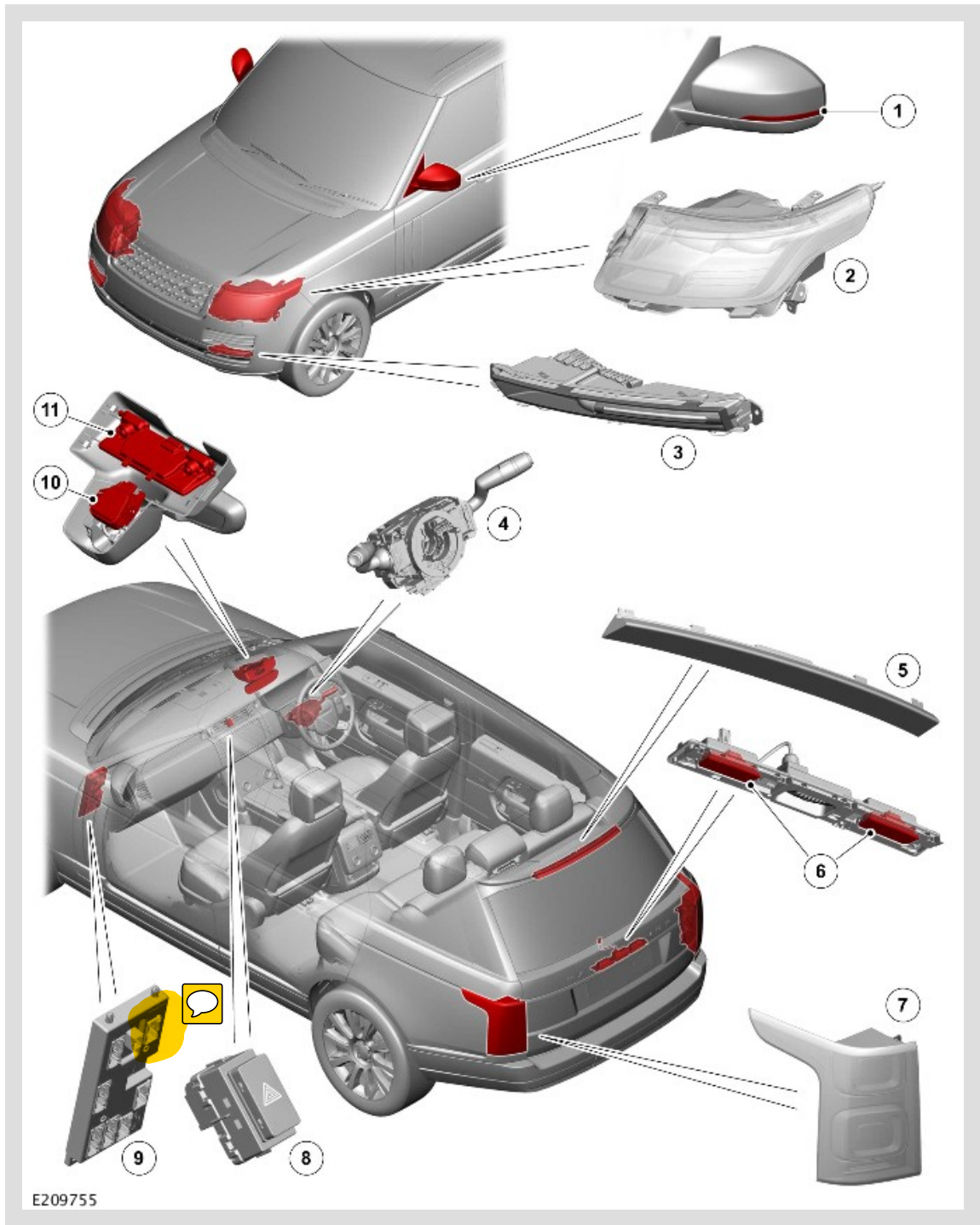


PUBLISHED: 05-JUN-2018
2018.0 RANGE ROVER (LG), 417-01

EXTERIOR LIGHTING

DESCRIPTION AND OPERATION

COMPONENT LOCATION



E209755

ITEM	DESCRIPTION
1	Side repeater lamp (2 off)
2	Light Emitting Diode (LED) headlamp (2 off)
3	Front fog lamp (2 off)
4	Steering Wheel Module (SWM)
5	High Mounted Stop Lamp (HMSL)
6	Licence plate lamp (2 off)
7	Tail lamp assembly (2 off)

8	Hazard lamp switch
9	Body Control Module/Gateway Module (BCM/GWM)
10	Rain/light sensor
11	Image Processing Module (IPM)

OVERVIEW

The exterior lighting consists of:

1. 2 headlamp assemblies, each containing a:

- Headlamp
- Combined Daytime Running Lamp (DRL) and turn signal indicator lamp

1. 2 tail lamp assemblies, each containing a:

- Turn signal indicator lamp
- Tail lamp
- Stop lamp
- Reverse lamp
- Fog lamp

1. A lighting control switch and steering column multifunction switch.

1. Body Control Module/GateWay Module (BCM/GWM).

1. A High Mounted Stop Lamp (HMSL).

1. 2 license plate lamps.

1. Auxiliary lighting switch.

1. Reverse lamp switch.

1. Stop lamp switch.

1. An Image Processing Module (IPM) (model/market dependant).

1. A hazard warning lamp switch.

1. Warning indicators.

1. Rain/Light sensor.

1. Battery Junction Box (BJB)

1. 2 front fog lamps

The exterior lighting is controlled by the BCM/GWM as follows:

- Control and monitoring of the exterior lamps including the turn signal indicators and hazard warning lamp functionality.
- Monitoring and evaluation of control inputs from other system control modules and output of applicable messages in the Instrument Cluster (IC) message center.

The BCM/GWM is connected to the High Speed (HS) Controller Area Network (CAN) buses. The BCM/GWM contains a microprocessor which performs the control, monitoring and evaluation of functions.

Driver lighting selections are made using the lighting control switch and left steering column multifunction switch, the fog lamp switch and the hazard warning lamp switch. The BCM/GWM operates the stop lamps using the inputs from the stop lamp switch.

Depending on model and market specification, the lighting system may have:

- An Auto High Beam (AHB) function, where the headlamps are automatically switched between low and high beam in response to signals from the IPM.
- An Autolamps function, where the exterior lights are automatically turned on or off in response to signals from the rain/light sensor used for automatic wiper operation. For additional information, refer to: Wipers and Washers (501-16 Wipers and Washers, Description and Operation).
- Adaptive High Beam, where part of the light beam is dimmed to prevent annoying the other driver. This allows high beam to be selected at all times.
- Laser supplementary High Beam, where the beam extends the range of the high beam. This is activated at speeds above 80 km/h (50 mph).

Driver lighting selections using the left steering column multifunction switch are passed to the BCM/GWM via the clockspring on a Local Interconnect Network (LIN) bus. The BCM/GWM provides circuit protection for all exterior lighting circuits.

The lighting system has an 'auto' lights function which is controlled by the BCM/GWM on receipt of signals from the rain/light sensor located at the top of the windshield. The exterior lights are turned on or off in response to ambient light signals from the rain/light sensor on a LIN bus connection to the BCM/GWM. The auto lights can also be activated when the windshield wipers are activated by signals from the rain sensor, or when the driver activates the wipers in the continuous wipe position for more than 20 seconds.

In certain markets the headlamps feature a static bending lamp which illuminates the area at the side of the vehicle when turning into driveways for example.

The tail lamp assembly comprises:

- A turn signal indicator.
- A tail lamp.
- A stop lamp.
- A reverse lamp.
- A fog lamp.
- Side marker lamp (North American Specification (NAS) only).

Turn signal indicators and high and low beam functions are controlled from the left steering column multifunction switch. The turn signal indicators have a lane change feature. A single operation of the multifunction switch in either direction will operate the selected turn signal indicators for 3 cycles.

An Image Processing Module (IPM) system may also be installed as an optional feature which automatically controls the high beam headlamps.

DESCRIPTION

HEADLAMP ASSEMBLY

The headlamps are sealed units, with scratch resistant polycarbonate lenses bonded to the headlamp body. There are four types of headlamp available:

- Standard Light Emitting Diode (LED) headlamp
- Matrix LED headlamp with signature DRL
- Pixel LED headlamp with signature DRL
- Pixel Laser LED headlamp with signature DRL

The headlamps are connected to the Body Control Module/Gateway Module (BCM /GWM) for the control of the functions of the lamps. There is also a private bus which connects the two headlamps for transfer of data.

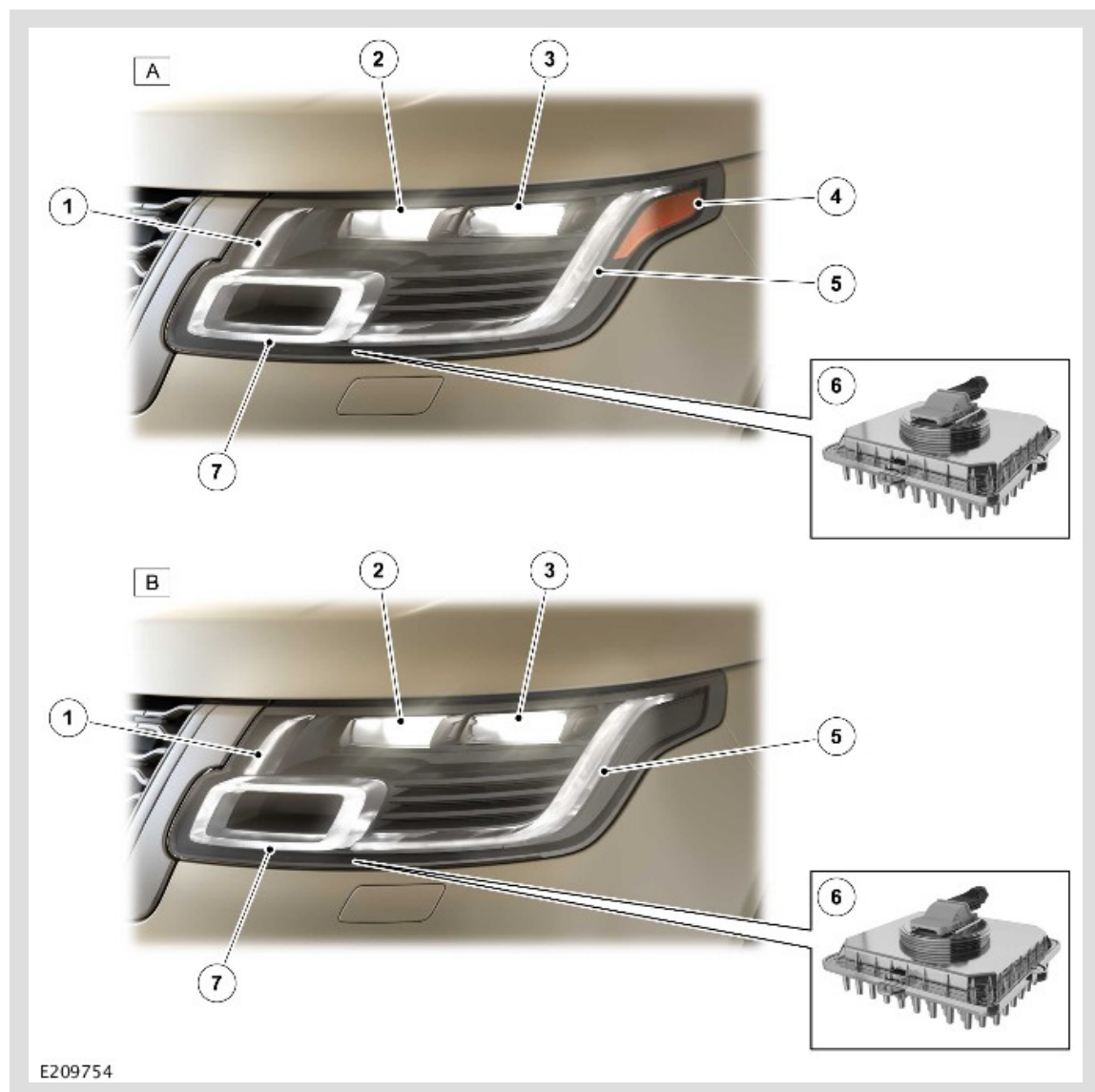
Headlamp Delay

The Body Control Module/GateWay Module (BCM/GWM) controls a headlamp delay function which illuminates after the occupants leave the vehicle. The headlamp delay will operate on low beam headlamps only when the lighting control switch is in the AUTO position and the ignition is off (Power Mode 0) or in accessory (Power Mode 4).

The headlamp delay is activated when the lighting control switch is in the AUTO position and the engine is switched off. The message centre displays a 'HEADLAMP DELAY' message and the low beam headlamps will be activated for a period of approximately 30, 60 or 120 seconds. After the delay period, the BCM/GWM automatically switches off the delay function, extinguishing the headlamps. The delay period can be adjusted using the instrument cluster 'Vehicle Settings' menu. The feature can also be disabled using this menu. For additional information, refer to: Message Center (413-08 Message Center, Description and Operation).

The headlamp delay feature can also be switched on when approaching the vehicle or switched off by operating the headlamp switch on the smart key.

FULL LIGHT EMITTING DIODE HEADLAMP



ITEM	DESCRIPTION
1	Daytime Running Lamp (DRL)
2	High beam module
3	Low beam module
4	Side marker (North American Specification (NAS) only)
5	Turn signal indicator, position lamp and DRL
6	Headlamp Control Module (HCM)
7	DRL

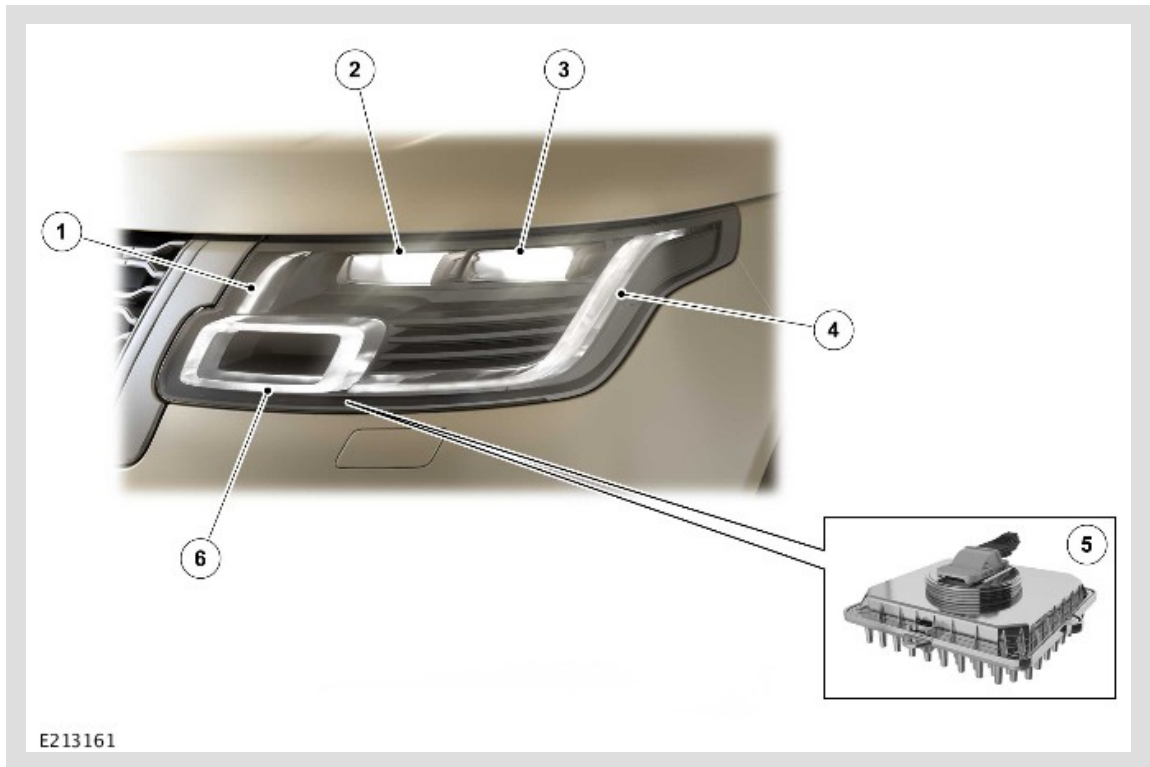
The Light Emitting Diode (LED) headlamp has a low and high beam module. Vertical movement is controlled by an actuator, operated by the Body Control Module/GateWay Module (BCM/GWM) for automatic headlamp Leveling.

The LED headlamp is a self contained unit located within the headlamp assembly.

The cooling of the LED driver module allows the warm air to be used for de-icing and demisting the lens of the headlamp unit. The cooling of the driver module makes sure that the life of the LED headlamp unit is as long as possible.

The greatest advantage offered by white LED lies in the color of their light, which is also known as the color temperature. Reaching approximately 6,000° Kelvin the intensity of their light is just about the same as the quality of daylight. When referring to light, Kelvin is a unit of color temperature.

MATRIX LIGHT EMITTING DIODE HEADLAMP



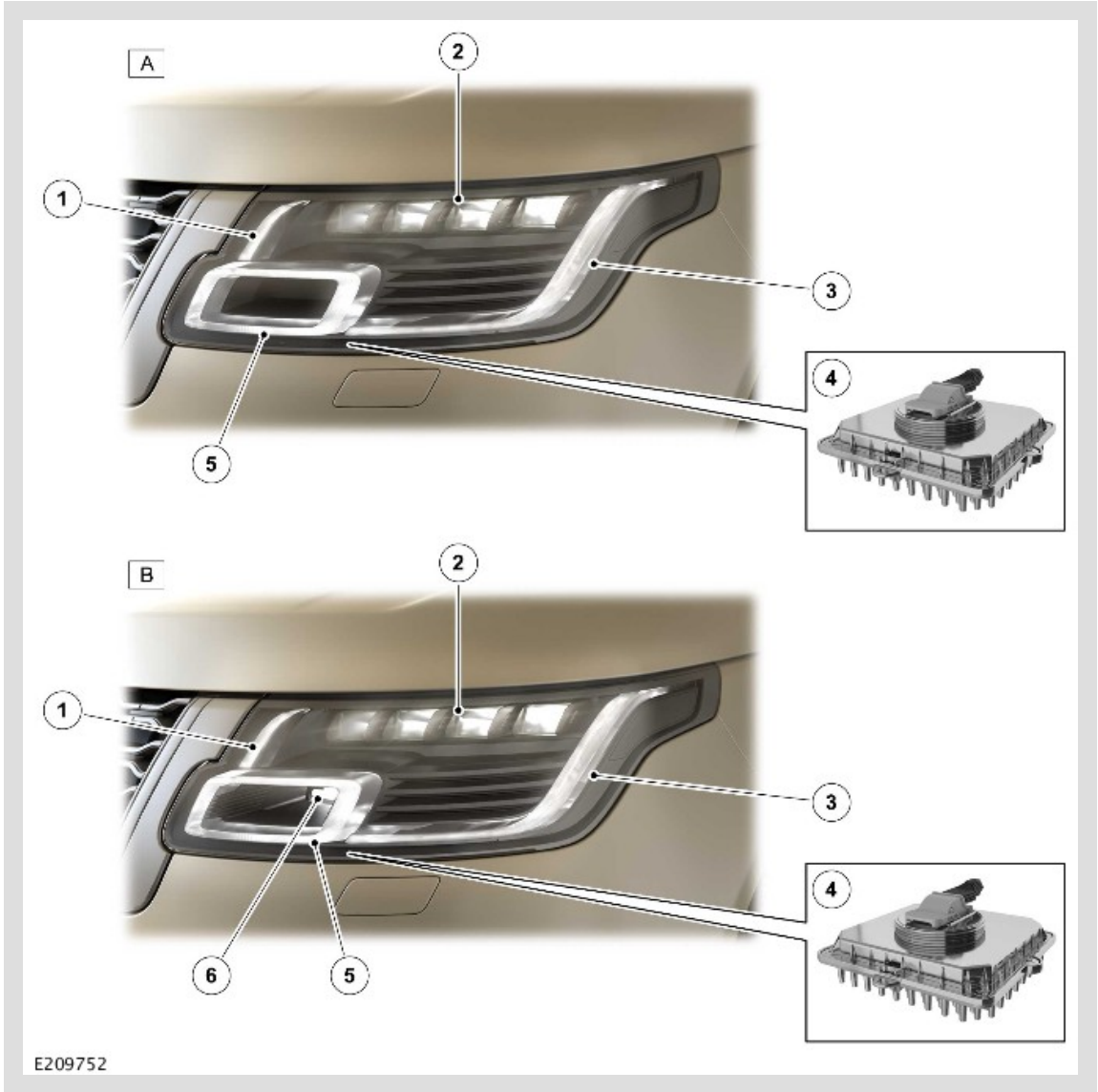
MATRIX LIGHT EMITTING DIODE HEADLAMP

ITEM	DESCRIPTION
1	Daytime Running Lamp (DRL)
2	High beam module
3	Low beam module
4	Turn signal indicator, position lamp and DRL
5	Headlamp Control Module (HCM)

The Matrix headlamp uses Light Emitting Diodes (LED) to illuminate the sections of the headlamp unit.

The Matrix headlamps use the IPM cameras to detect oncoming vehicles and uses the information to turn off some of the LED. This allows the headlamp to light up as much of the road as possible without blinding the oncoming driver.

PIXEL LIGHT EMITTING DIODE HEADLAMP



PIXEL LIGHT EMITTING DIODE HEADLAMP

ITEM	DESCRIPTION
1	Daytime Running Lamp (DRL)
2	Pixel module
3	Turn signal indicator, position lamp and DRL

4	Headlamp Control Module (HCM)
5	DRL
6	Laser supplementary high beam (If equipped)

The Pixel headlamp uses Light Emitting Diodes (LED) to illuminate the sections of the headlamp unit. The unit may have a laser module which projects a longer beam of light to extend the visibility at night. The laser supplementary high beam operates when the vehicle speed exceeds 80 km/h (50 mph). The lighting controls have to be in 'AUTO' and the Image Processing Module (IPM) camera is not detecting any lights.

The Pixel headlamps use the IPM cameras to detect oncoming vehicles and uses the information to turn off some of the LED. This allows the headlamp to light up as much of the road as possible without blinding the oncoming driver.

ADAPTIVE FRONT LIGHTING SYSTEM

The lighting system has no mechanical movement in the horizontal axis. Adjustment to the light beam is by changing the illumination of the LED to create the virtual movement of the beam. The virtual movement is in response to signals from the steering system.

The Adaptive Front Lighting System (AFS) operates when low beam is selected.

When the headlamps are switched on, movement will be seen in the vertical axis to make sure the lights are level.

Adaptive Driving Beam (if equipped)

Adaptive driving beam makes it possible to drive with high beams engaged by identifying other road users and dimming the part of the light cone pointing towards them. When the camera based system recognizes oncoming traffic or vehicles in front while the high beams are engaged, it adjusts the light distribution to suit the situation. The driver can leave the high beams switched on permanently and make use of their range without causing any irritation or risks for other road users. There is no need to switch manually between light settings, significantly increasing the driving time spent with high beams engaged.

Adaptive driving beam is available on the Matrix and Pixel headlamps. The Matrix headlamps have less modules. It is as good as the Pixel headlamps but may appear to be less capable.

Auto High Beam (if equipped)

The Auto High Beam (AHB) automatically selects and deselects high beam, under specific conditions of road lighting and in the absence of other vehicle lights. The system is only active when the ambient light drops below a predetermined level. AHB is

enabled when it is selected via the instrument panel menu, the lighting control is in 'AUTO' and the ambient light drops below a predetermined level.

AHB activates when the vehicle's speed exceeds 40 km/h (25 mph). The system deactivates when the vehicle's speed reduces to less than 24 km/h (15 mph).

Failure Mode

In the event of a failure of the Adaptive Front lighting System (AFS), a warning indicator in the Instrument Cluster (IC) is illuminated to warn the driver. The AFS warning indicator illuminates when the ignition is in Power Mode 6 (ignition on) or greater. The AFS warning indicator will also be illuminated if a failure of the steering angle sensor or the vehicle speed signal is detected.

Illumination of the AFS warning indicator does not necessarily mean that there is a fault with the AFS system. The fault may be caused by a failure of another system such as steering angle sensor or the vehicle speed signal missing, preventing the AFS system operating correctly.

The Body Control Module/Gateway Module (BCM/GWM) performs a diagnostic routine every time AFS is requested. If any fault is found, the BCM/GWM will suspend the operation of the AFS function.

The BCM/GWM software can detect an internal failure of the BCM/GWM control circuits. The BCM/GWM will power the projector modules to the zero position and prevent further operation.

Faults can be investigated by interrogating the BCM/GWM using the Jaguar Land Rover approved diagnostic equipment to check for fault codes.

Laser Supplementary High Beam (if equipped)

The laser supplementary high beam is a function of the high beam and is intended as a range extender to the high beam. The feature is in place to improve the long distance range of visibility of the high beam beyond the range of the standard high beam.

The laser supplementary high beam is activated automatically once the vehicle reaches a speed of 80 km/h (50 mph) and the camera is not detecting other external lights. The laser supplementary high beam can only be active when the lights are in 'AUTO'. The driver has the ability to disable and re-enable the laser supplementary high beam at any time through the 'Vehicle Menu Set Up'. The laser supplementary high beam automatically deactivates when the vehicle speed reduces to less than 75 km/h (47 mph).



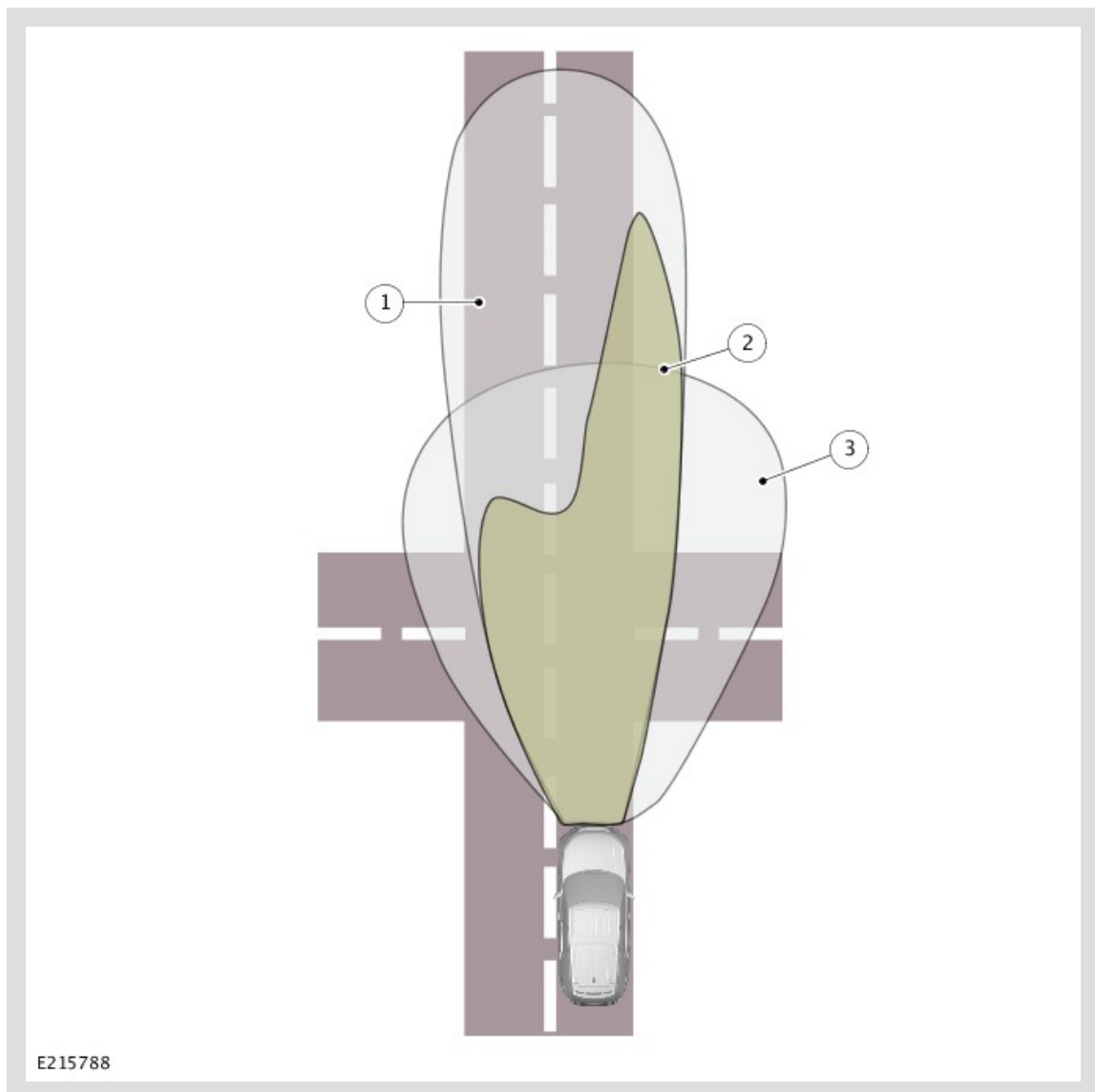
CAUTIONS:

- The laser supplementary high beam emits highly concentrated visible light which can cause irritation or damage to the retina in the back of the eye. The laser supplementary high beam modules used in these headlights are classified by legislation as Class 2M light-emitting diodes.
- Do not look directly into the headlamps or other light sources whilst low or high beam functions are operating.

DRIVING MODES

The AFS consists of the following light modes of operation in which the components of the AFS adapt automatically to according to the conditions described below:

- City mode - Operates below 48 km/h (30 mph).
- Country mode - Operates between 49 km/h (30.5 mph) and 110 km/h (68 mph).
- Adverse Weather mode - Operates below 64 km/h (40 mph).
- Motorway mode- Operates above 110 km/h (68 mph).



ITEM	DESCRIPTION
1	Motorway mode
2	Country mode and adverse weather mode
3	City mode

City Mode

The City mode is activated to allow greater visibility around the vehicle during city traffic conditions and to identify other road users such as:

- Pedestrians
- Cyclists
- Oncoming vehicles

Above 48 km/h (30 mph) City mode will transition to Country mode. In order to prevent repeated switching between modes the transition from Country mode to City mode will occur at 40 km/h (25 mph) as the vehicle speed decreases. If the conditions for Adverse Weather mode are met whilst City mode is active then Adverse Weather mode will take priority.

Country Mode

The Country mode is the standard low beam as normally defined for non-AFS vehicles. The Country mode has a greater forward range of illumination as it includes the kink beam. The Country mode will be used whilst setting the initial aim of the low beam.

Whenever the vehicle is put into Park the mode will be changed to Country mode. When Park is no longer selected then the mode resumes with the same conditions at the point Park was selected.

Above 110 km/h (68 mph) Country mode will transition to Motorway mode. In order to prevent repeated switching between modes the transition from Motorway mode to Country mode will occur at 90 km/h (56 mph) as the vehicle speed decreases. If the conditions for Adverse Weather mode are met whilst Country mode is active then Adverse Weather mode will take priority.

Adverse Weather Mode

The Adverse Weather mode is a specially designed variant of Country mode. The optical design is not able to achieve the requirements of wet road mode but gets as close as possible to this whilst remaining compliant optically to a Country mode beam. The Adverse Weather mode reduces the amount glare caused by light reflecting up off a wet road surface.

The Adverse Weather mode will be active when the following conditions are met:

- The vehicle speed is between 0 km/h and 64 km/h (0 mph and 40 mph)
- The front wipers must have been in continual operation for 120 seconds, either manually or automatically.

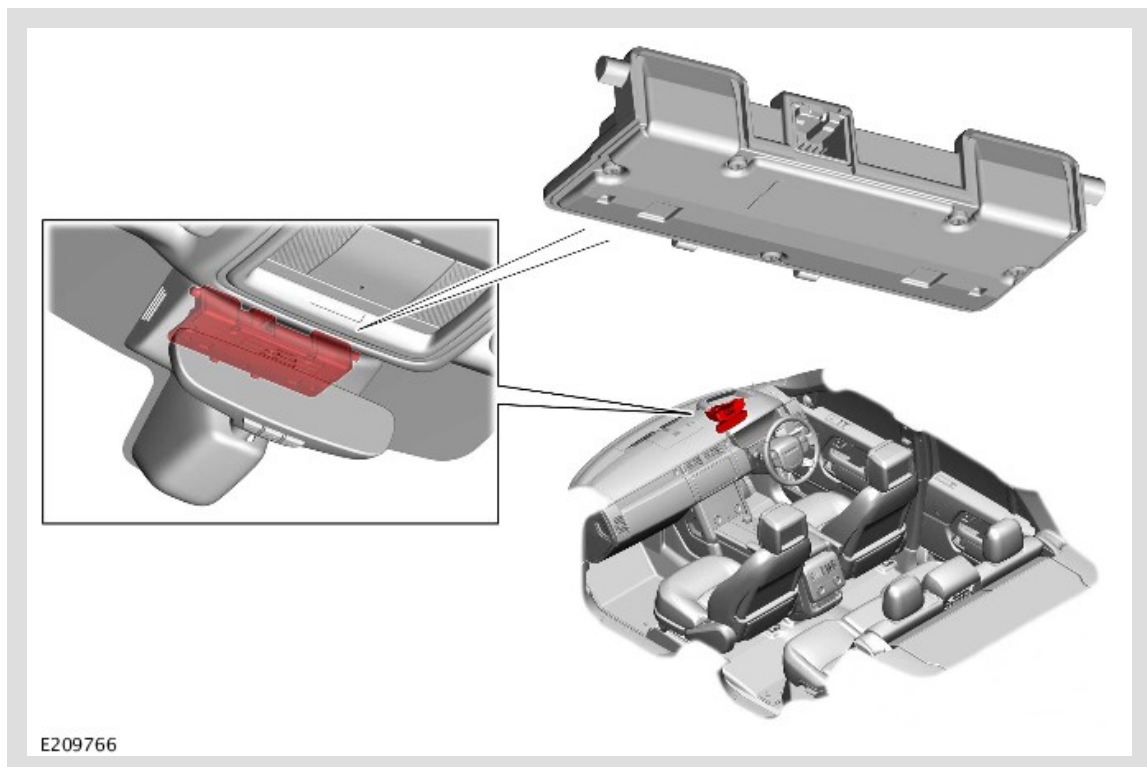
Above 64 km/h (40 mph) Adverse Weather mode will transition to Country mode. In order to prevent repeated switching between modes the transition from Country mode to Adverse Weather mode will occur at 55 km/h (34 mph) as the vehicle speed decreases.

Motorway mode

The Motorway mode is activated to allow greater focus on distance during motorway driving or driving at higher speeds. The Motorway mode enables the driver to be more focused on far vision and reduce distractions caused by excessive light at the sides of the vehicle.

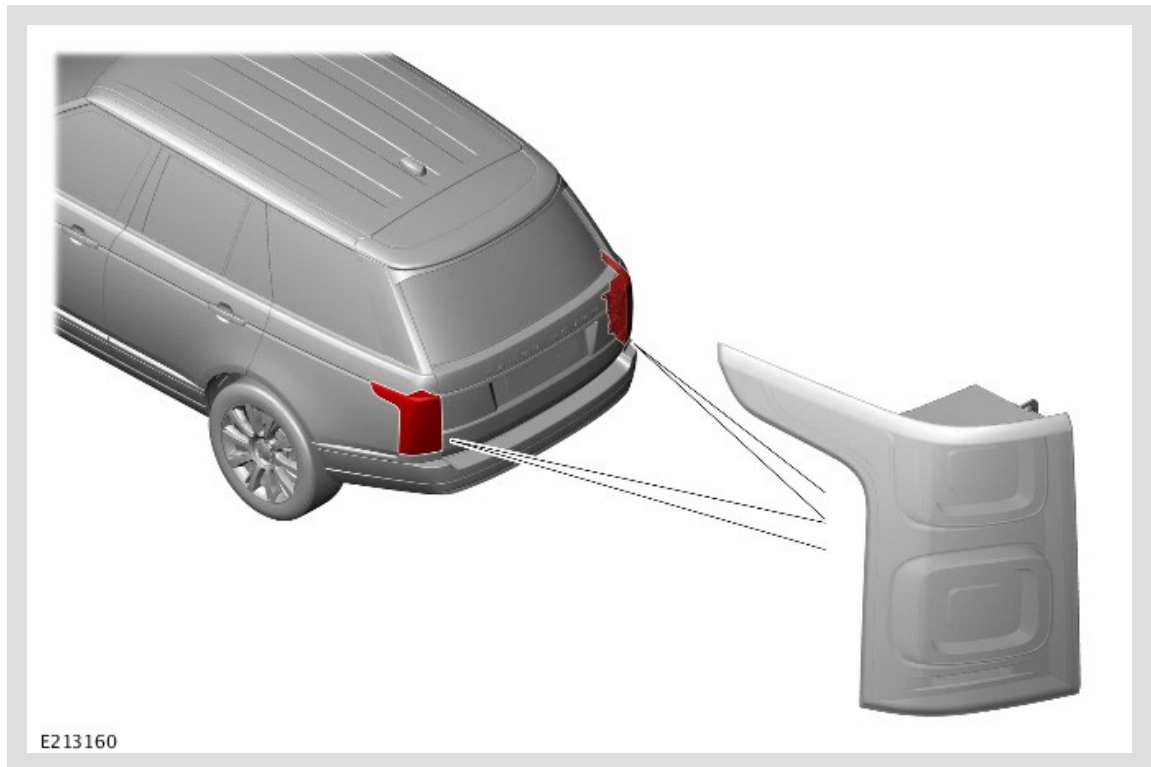
The Motorway mode shall be active when the vehicle speed is above 110 km/h (68 mph). In order to prevent repeated switching between modes the transition from Motorway mode to Country mode shall occur at 90 km/h (56 mph) as the vehicle speed decreases

IMAGE PROCESSING MODULE



The Image Processing Module (IPM) is used to identify oncoming vehicles and other objects to control the Laser supplementary High Beam, the Auto High Beam (AHB) and the Adaptive Driving Beam.

TAIL LAMP ASSEMBLY



The tail lamp assembly is fixed to the body of the vehicle.

The tail lamp assemblies have the following functions:

- Tail lamp
- Turn signal indicator
- Stop lamp
- Reverse lamp
- Fog lamp

The tail lamp assembly is located in a recess in the vehicle body.

Stop Lamp

The stop lamp is a Light Emitting Diode (LED) and is activated when the ignition is in Power Mode 6 or above and the stop lamp switch is active (by depressing the brake pedal). The High Mounted Stop Lamp (HMSL) will also be activated when the brake pedal is pressed. The stop lamps can also be activated by the Anti-lock Brake System (ABS) when Hill Descent Control (HDC) is active (if equipped). The ABS module sends a Flexray message to the Body Control Module/Gateway Module (BCM/GWM) which supplies power to the stop lamps and HMSL.

Side Lamps

The side lamps are operated by selecting side lamps or headlamps on the lighting control switch. The side lamps can be switched on at all times and are not dependent on Power Mode. The side lamps will also illuminate when:

- The lighting control switch is in the 'AUTO' position.
- And a 'lights on' signal is received by the Body Control Module/Gateway Module (BCM /GWM) from the rain/light sensor.

Reverse Lamp

The reverse lamp is located on the tailgate unit and is a Light Emitting Diode (LED)

The reverse lamp is active in Power Mode 7 and the Body Control Module/Gateway Module (BCM/GWM) receives a reverse selected signal on the High Speed (HS) Controller Area Network (CAN) bus. The automatic transmission has a reverse switch which senses when reverse gear is selected and engaged and sends the state out on the HS CAN powertrain systems bus to the BCM/GWM.

Turn Signal Indication

The turn signal indicator and the tail lamp share the same light guide. The tail light is turned off when the turn signal indicator is operated. The lights are Light Emitting Diodes (LED).

The turn signal indicators are operated by the left steering column multifunction switch or by the hazard warning lamp switch. The left steering column multifunction switch is only active with the ignition in Power Mode 6 and above, the hazard warning lamp switch is active in all Power Modes. When active, the turn signal indicators and turn signal indicator in the Instrument Cluster (IC) will flash at a frequency cycle of 400ms on 400ms off.

If a light fails, the remaining turn signal indicator on that side of the vehicle flashes at normal speed. The applicable turn signal indicator in the IC will flash at double speed with the audible alert at twice the normal rate as well to alert the driver to the failure.

TAIL LAMP OPERATION

Rest Of The World

1



2



3



4



5

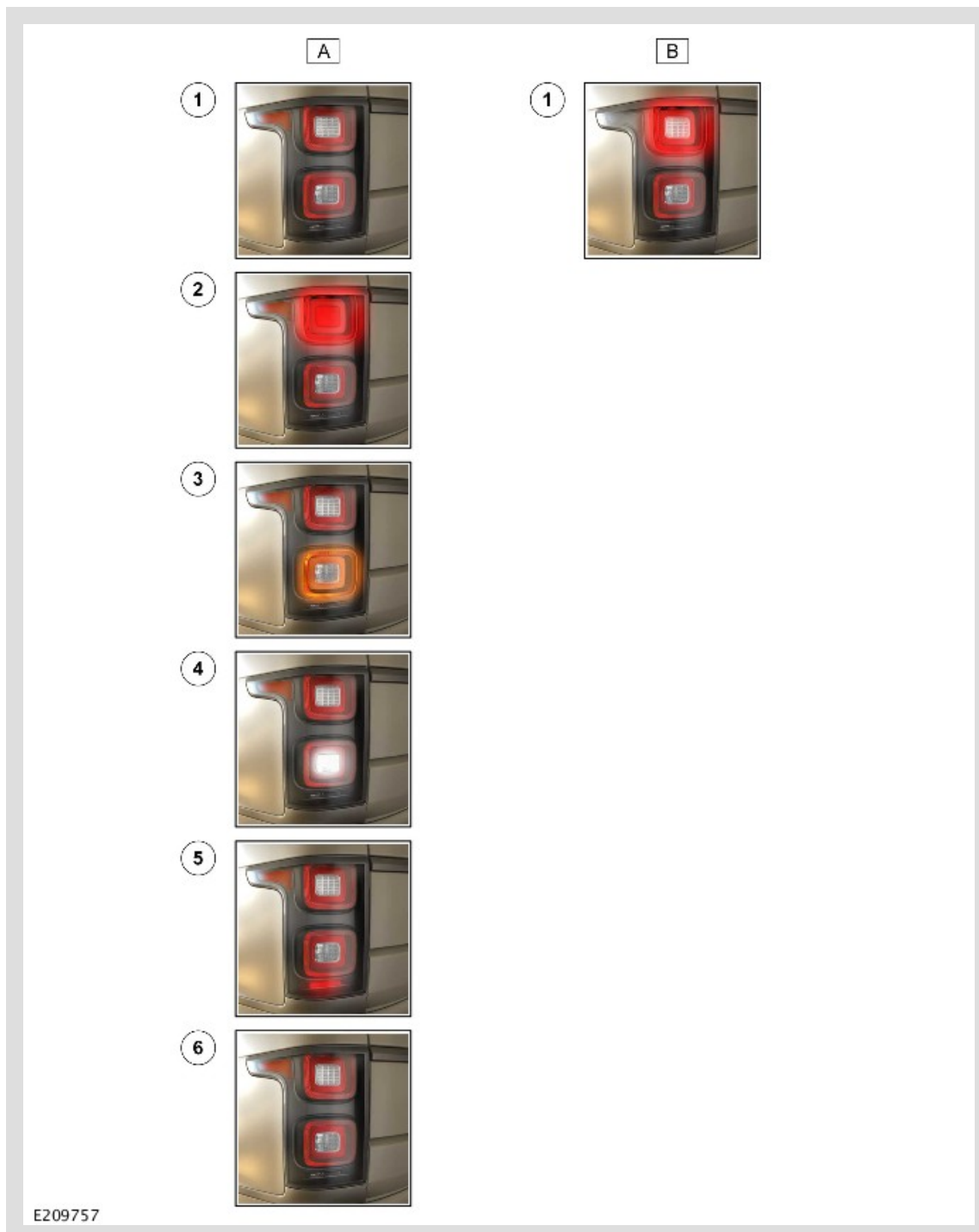


E209758

ITEM	DESCRIPTION
1	Tail lamp
2	Stop lamp

3	Turn signal indicator
4	Reverse lamp
5	Fog lamp

North American Specification



ITEM	DESCRIPTION
1A	Tail lamp off
1B	Tail lamp on

2	Stop lamp
3	Turn signal indicator
4	Reverse lamp
5	Fog lamp
6	Side marker (North American Specification (NAS) only)

FOG LAMPS

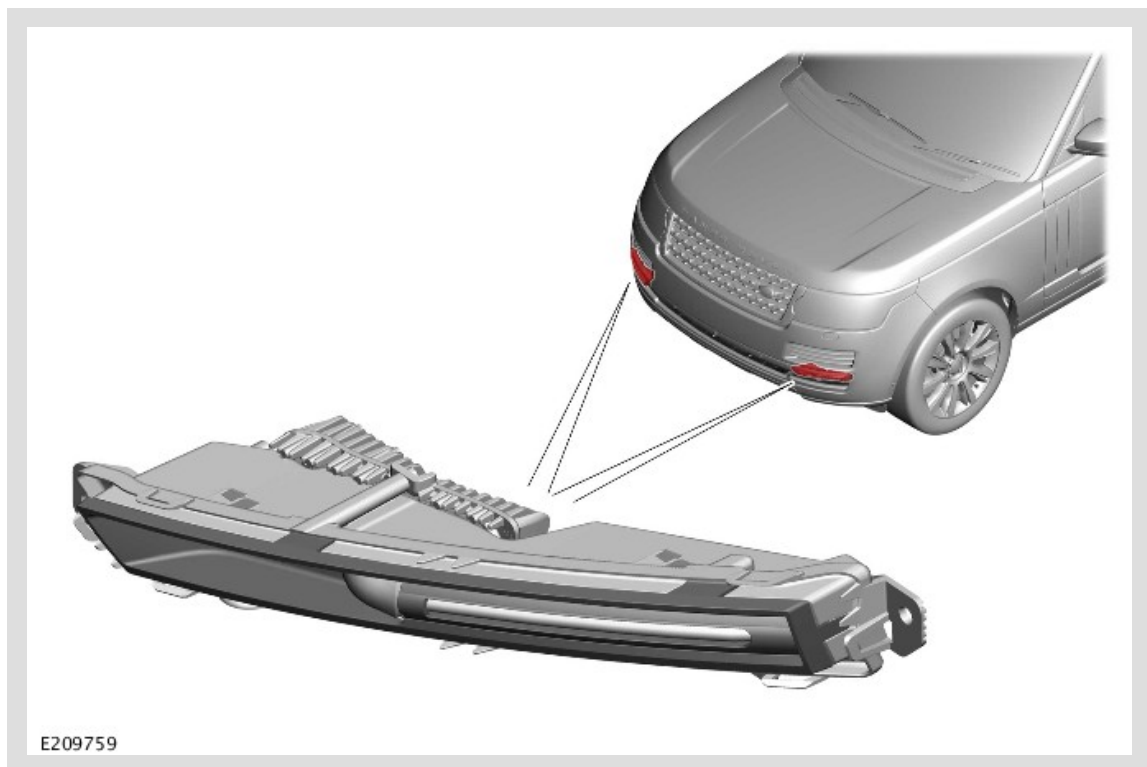
Front and Rear Fog Lamps

The front and rear fog lamps are controlled by the left steering wheel multifunction switch.

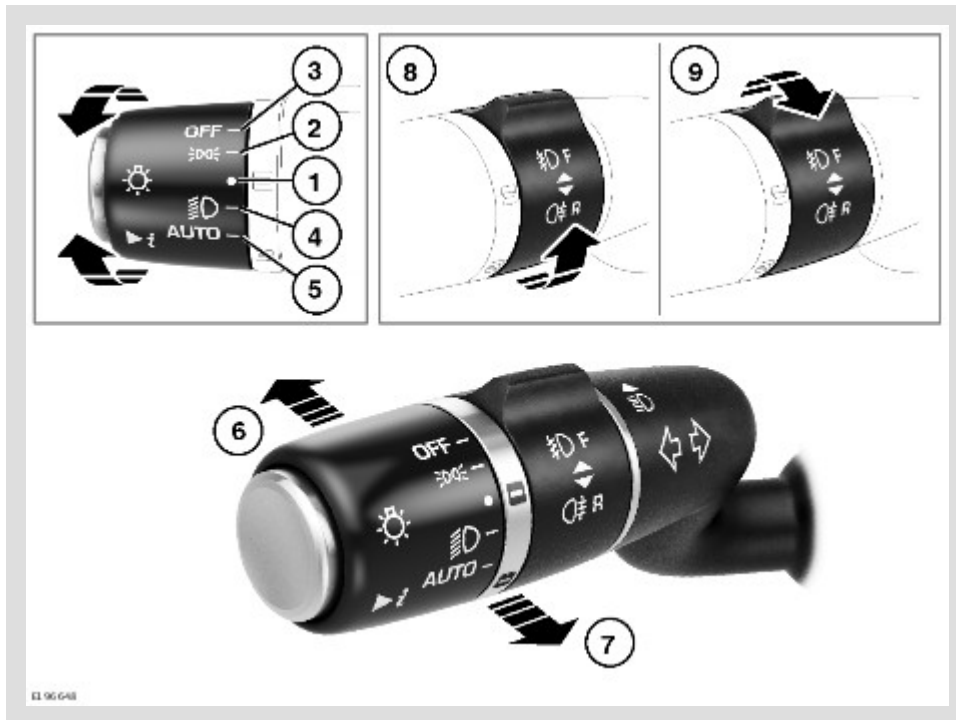
The lamps are Light Emitting Diodes (LED).

The rear fog lamp is integrated into the tail light assembly.

Front fog lamp



LEFT STEERING COLUMN MULTIFUNCTION SWITCH



ITEM	DESCRIPTION
1	Neutral position
2	Side lamps
3	Headlamps off
4	Headlamps on
5	Autolamps on
6	Headlamp high beam on
7	Headlamp high beam flash
8	Front fog lamps
9	Rear fog lamps

The left steering column multifunction switch allows the following selections:

- All exterior lamps off
- Side lamps on
- Low beam headlamps on

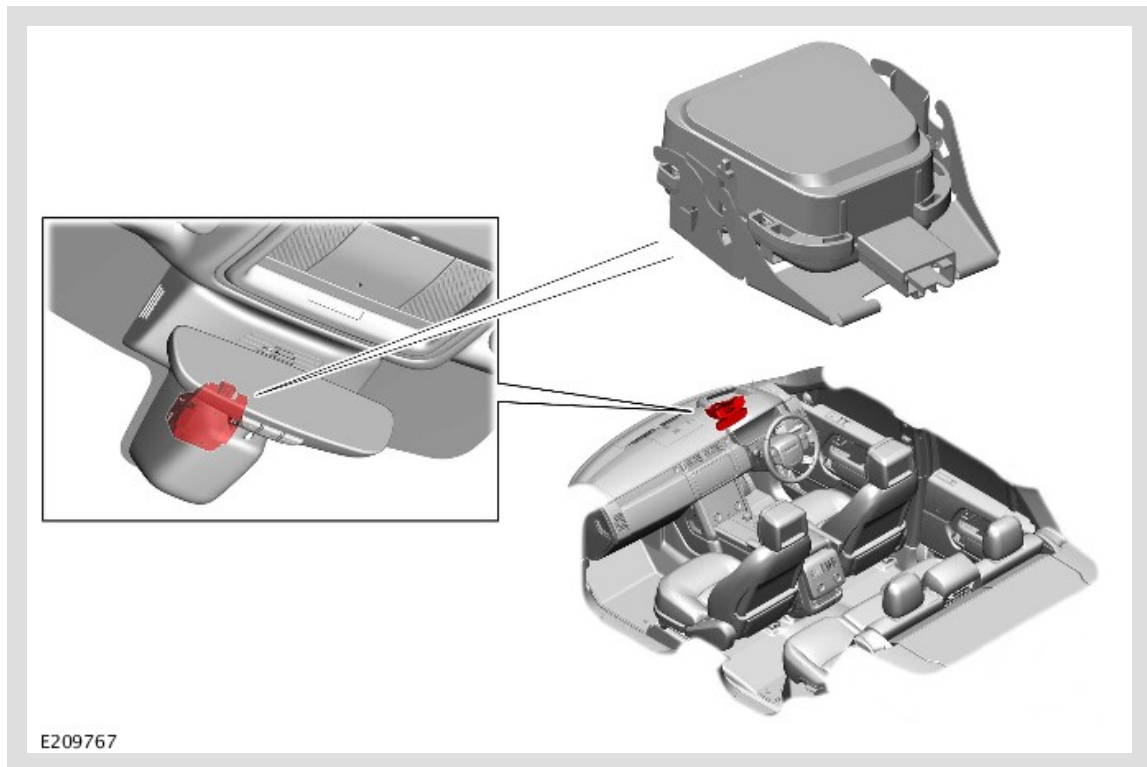
- Autolamps activation
- Headlamp low/high beam
- Headlamp high beam flash
- Left/right turn signal indicators
- Rear fog lamps
- Front fog lamps
- Trip computer functions.

The multifunction switch positions are all connected via a resistive ladder. The output from the resistive ladder is connected to the clockspring which converts the switch operation to Local Interconnect Network (LIN) bus signals. The signals are received by the Body Control Module/Gateway Module (BCM/GWM) which operates the required exterior lighting selection.

Autolamps

The 'AUTO' Autolamps function is a driver assistance system. The driver can override the system operation by selection of side lamp or low beam headlamp on.

Rain/Light Sensor



The automatic headlamp system uses a rain/light sensor which is connected to the Body Control Module/Gateway Module (BCM/GWM) via a Local Interconnect Network (LIN) bus. The BCM/GWM reacts to the signals from the rain/light sensor and activates the exterior lamps as required.

The light sensor is incorporated in the rain/light sensor located on the inside of the windshield, below the rear view mirror. The wiper system also uses the rain/light sensor for automatic wiper operation. For additional information, refer to: Wipers and Washers (501-16 Wipers and Washers, Description and Operation).

The light sensor measures the ambient light around the vehicle in a vertical direction and also the angular light level from the front of the vehicle. The rain/light sensor uses vehicle speed signals, wiper switch position and the park position of the front wipers to control the system.

The lights may operate in the following circumstances:

- Twilight
- Darkness
- Rain
- Tunnels
- Underground or multistory car parks.

Operation of the autolamps requires the ignition to be on (Power Mode 6 or above), the left steering column multifunction switch to be in the 'AUTO' position and a lights on request signal from the light sensor. When the 'AUTO' system is active, the side lamp warning indicator in the Instrument Cluster (IC) will be illuminated.

High Beam On and Flash Functions

The high beam is operated by pushing the left steering column multifunction switch towards the instrument panel. The switch will latch in the high beam position. When the high beam headlamps are active, the high beam warning indicator will illuminate in the Instrument Cluster (IC).

The high beam flash function is operated by pulling the left steering column multifunction switch away from the instrument panel. The non-latching switch will operate the high beam headlamps for as long as the switch is held. The switch will return to the high beam off position when released. The high beam warning indicator will illuminate when the high beam headlamps are active.

High beam can also be automatically operated by the Image Processing Module (IPM) system (if equipped).

Turn Signal Indicators

The left and right turn signal indicators are operated by moving the left steering column multifunction switch up or down to select right or left turn signal indicators respectively. The switch will latch in each position.

The switch has a turn signal indicator lane change function which is configurable by the dealer. If the switch is gently pushed, but not latched, to either turn signal indicator position and then released, the applicable turn signal indicators will flash 3 times. The turn signal will then be automatically cancelled.

If a turn signal indicator fails, the green turn signal warning indicator in the Instrument Cluster (IC) will flash at twice the normal rate and the audible ticking from the IC sounder will also be at twice the normal rate.

The red section in the tail lamp turns off when the turn signals are operating.

Side Lamps and Headlamps

The side lamps and headlamps are selected by a rotary switch on the left steering column multifunction switch.

Rotating the switch from the off position to the side lamps position illuminates the front side lamps, the tail lamps, the license plate lamps and the instrument panel illumination.

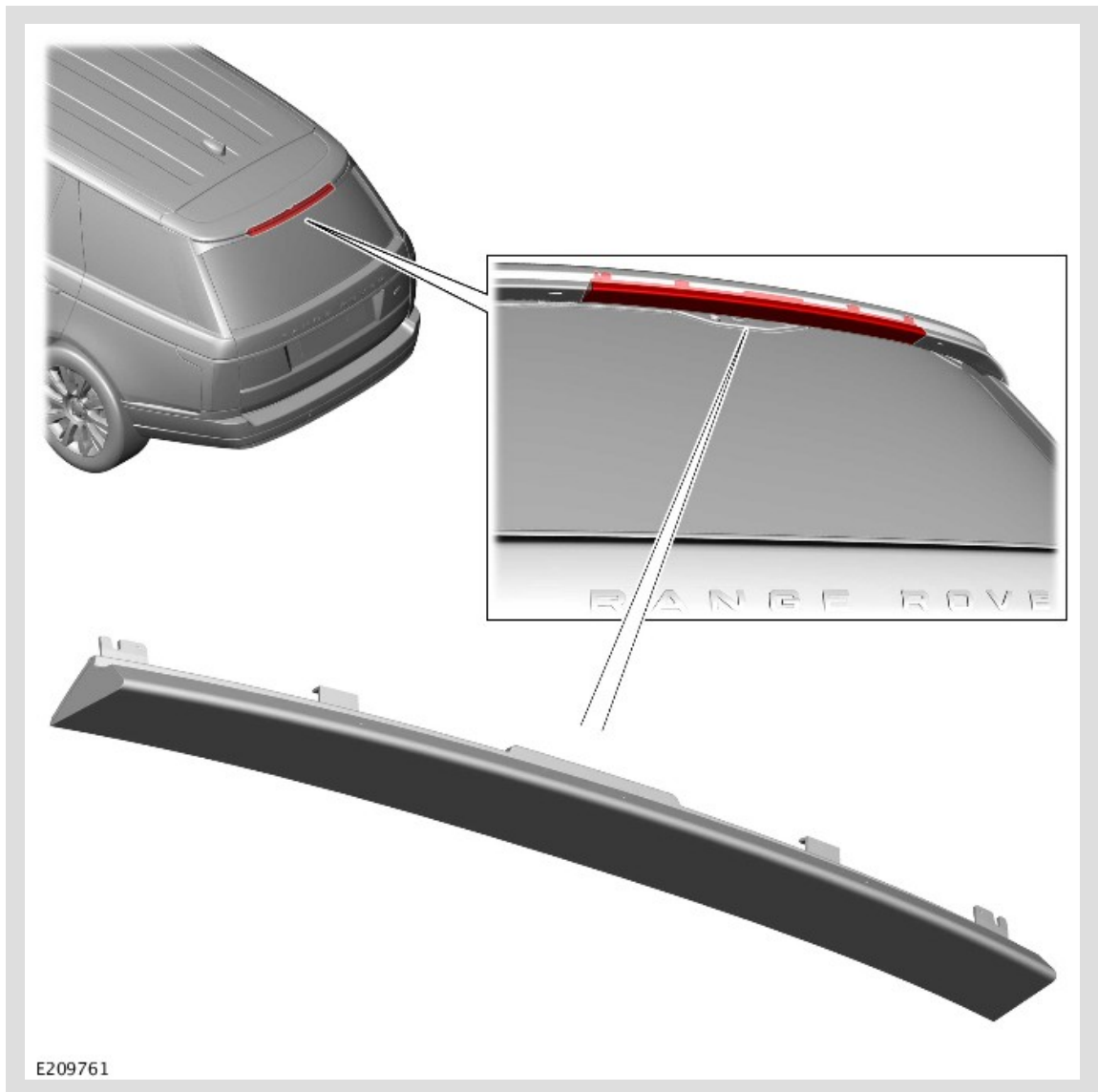
Rotating the switch to the headlamps position, switches on the headlamps in addition to the lamps illuminated by the side lamp position.

Autolamps

Autolamps is selected by rotating a rotary switch on the left steering column multifunction switch to the 'AUTO' position. When the lighting control switch is in the 'AUTO' position, a reference voltage from the Body Control Module/Gateway Module (BCM/GWM) flows through 4 resistors in the lighting control switch. The returned signal voltage is detected by the BCM/GWM which activates the auto headlamp function to activate the headlamps and front and rear side/tail lamps.

The rain/light sensor receives a battery voltage output from the ignition relay in the BCM/GWM. The rain/light sensor continually outputs a Local Interconnect Network (LIN) bus message to the BCM/GWM with information regarding the ambient light levels. When the ambient light level reaches a predetermined value, the BCM/GWM activates the Autolamps feature. The BCM/GWM can also activate the Autolamps when it receives information regarding rain fall from the rain/light sensor which subsequently activates the auto wipers function.

HIGH MOUNTED STOP LAMP

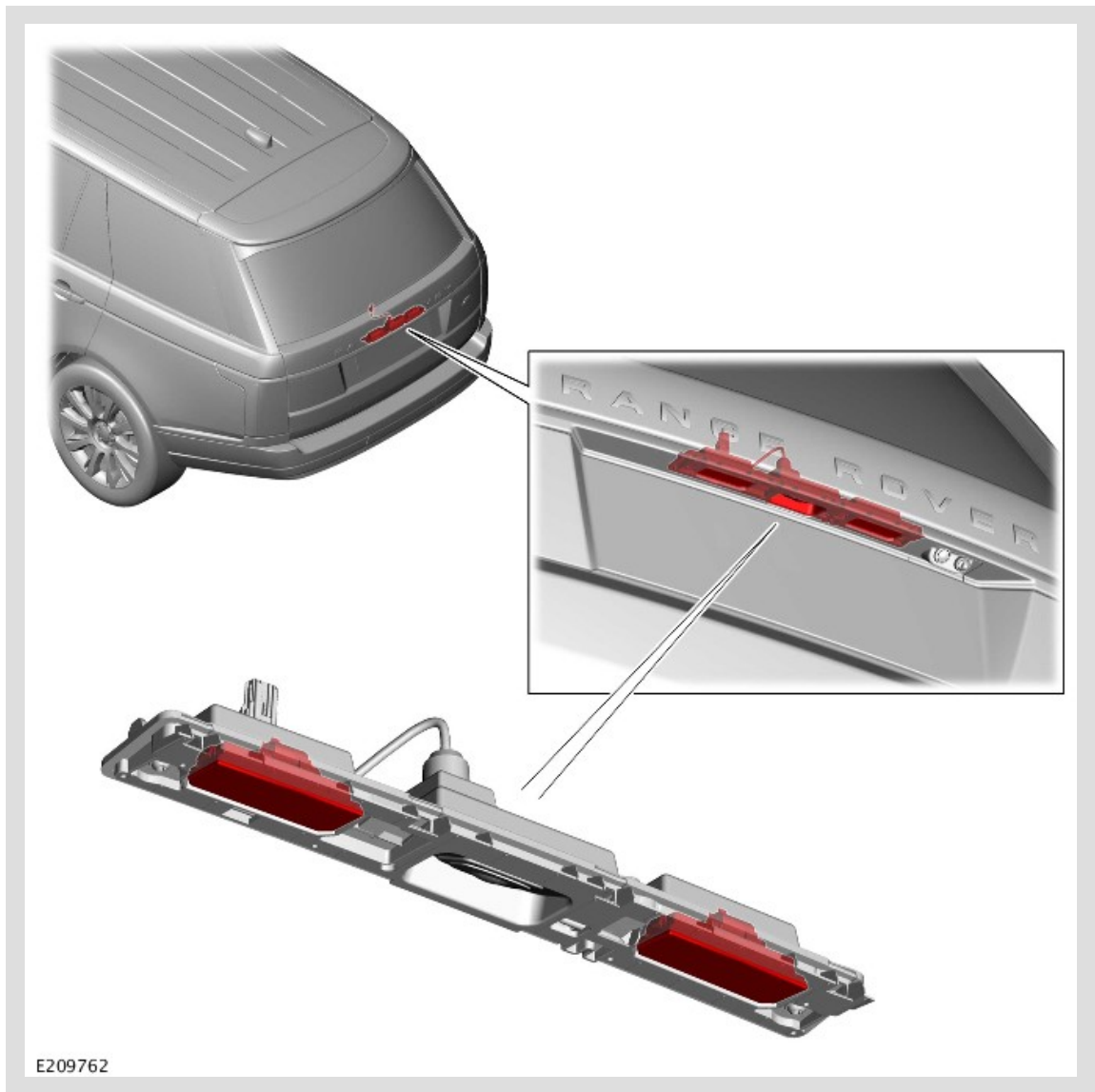


The High Mounted Stop Lamp (HMSL) is located above the rear window. The lamp comprises a plastic housing with a red coloured lens. The lamp is illuminated by Light Emitting Diodes (LED).

The HMSL is activated, along with the tail lamp stop lamps, when the ignition is in Power Mode 6 or above and the stop lamp switch is active (by pressing the brake pedal).

The HMSL and the stop lamps can also be activated by the Anti-lock Brake System (ABS) when Hill Descent Control (HDC) is active (if equipped).

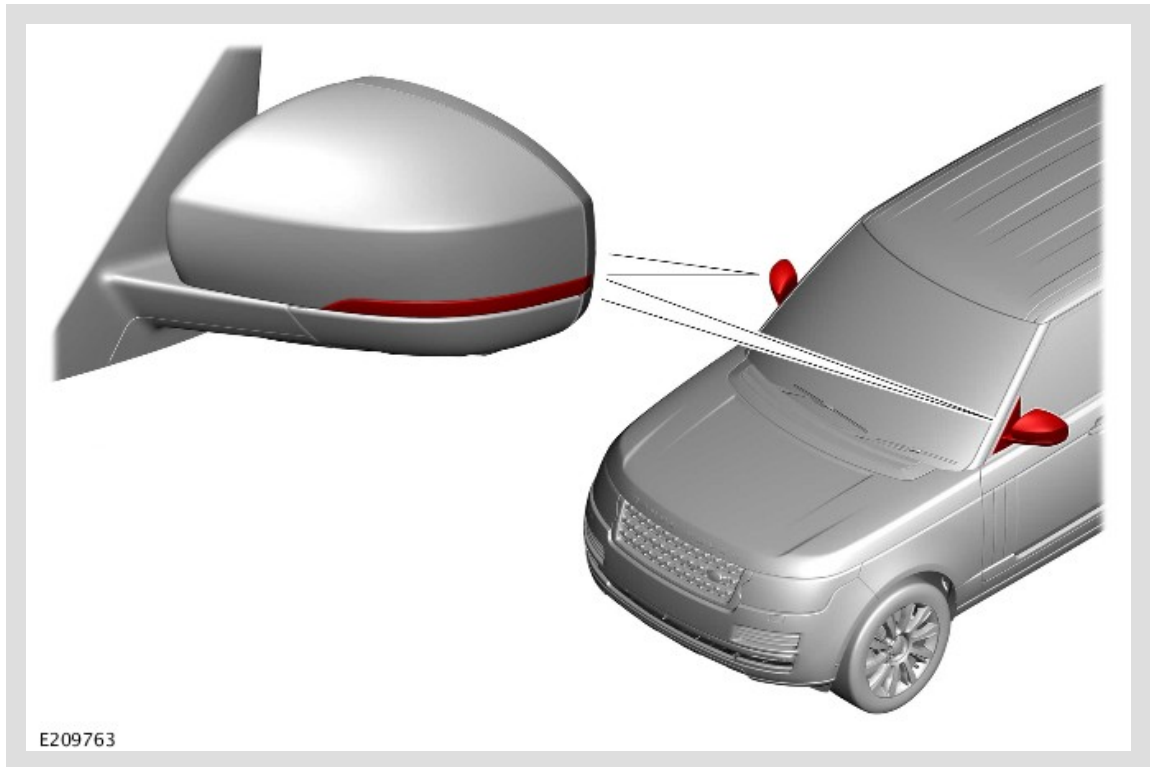
LICENSE PLATE LAMP



Two license plate lamps are installed in the tailgate handle, above the license plate. Each lamp uses Light Emitting Diodes (LED).

The lamps are secured in the upper tailgate handle with integral clips. The lamps can be released from the handle using a small, flat blade screwdriver. The license plate lamps are active at all times when the side lamps are switched on.

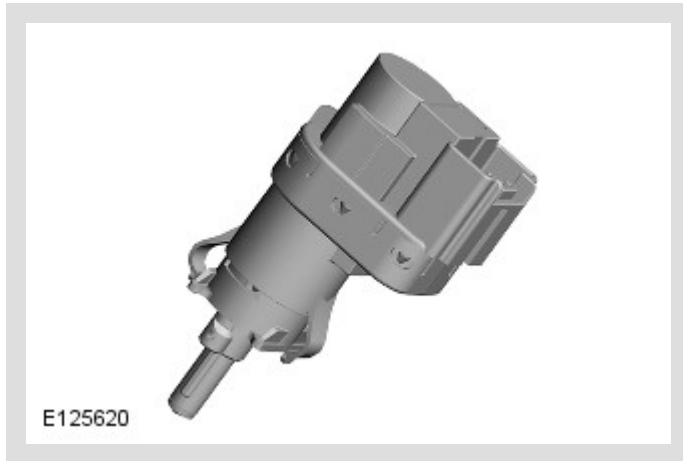
SIDE REPEATER LAMPS



The side repeater lamps are located in the door mirrors.

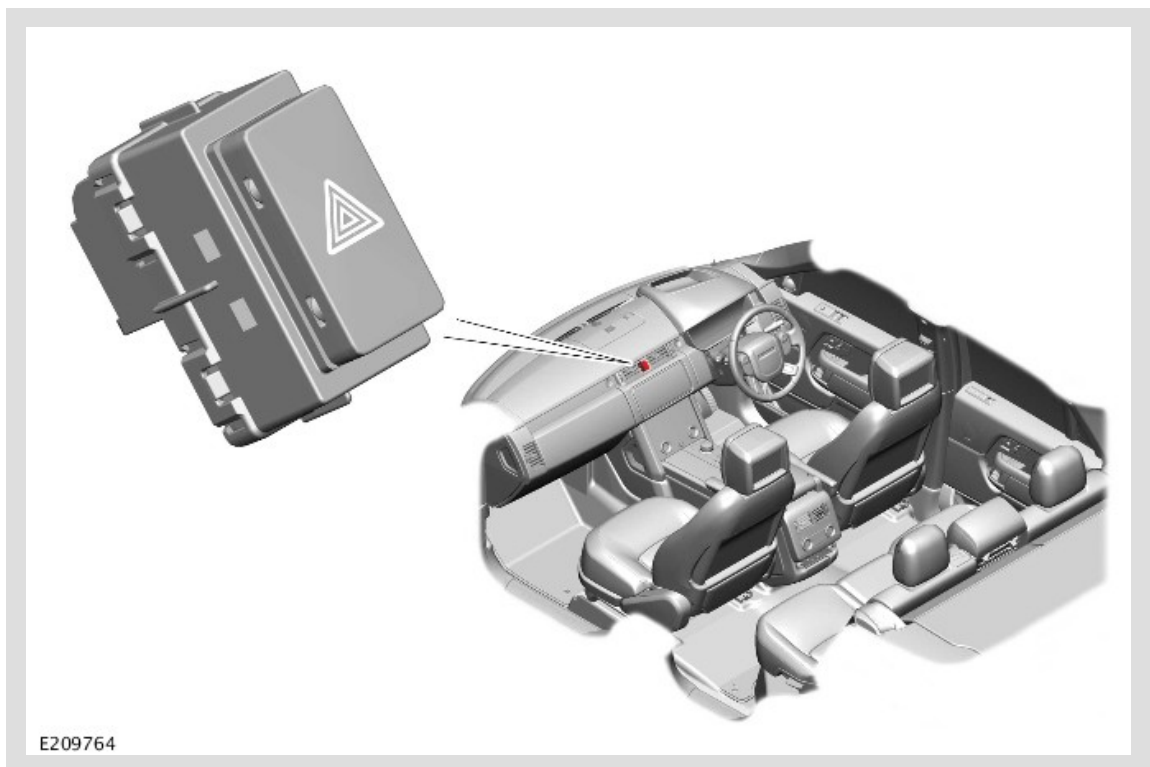
The side repeater lamps use Light Emitting Diodes (LED). The side repeater lamps have the same functionality as the front and rear turn signal indicator lamps and are operated by the left steering column multifunction switch or by the hazard warning lamp switch. The steering column multifunction switch is only active with Power Mode 6, the hazard warning lamp switch is active at all times, regardless of the Power Mode. When active, the side repeater lamps will flash at a frequency cycle of 400ms on and 400ms off. If a side repeater lamp fails, the turn signal indicator lamps continue to flash at the normal rate.

STOP LAMP SWITCH



The stop lamp switch is a two pole switch mounted in the brake pedal bracket and operated by the brake pedal. The output connections of the two poles are hardwired to the Body Control Module/Gateway Module (BCM/GWM). The input connection of one pole is a hardwired signal feed from the BCM/GWM. The input connection of the second pole is hardwired to ground. The BCM/GWM compares the signals from the two poles to confirm the status of the stop lamp switch, which it uses to operate the stop lamps.

HAZARD WARNING LAMPS



The hazard warning lamps are controlled by a non-latching switch in the centre of the instrument panel. The hazard warning lamps operate at all times when selected and are not dependent on the ignition Power Mode.

When the hazard warning lamps are selected on, all of the turn signal indicators operate as previously described and both left and right turn signal indicators in the Instrument Cluster (IC) also flash. The hazard warning lamps flash at a rate of 400ms on and 400ms off. When the hazard warning lamps are active, they override any request for turn signal indicator operation.

If a trailer is attached, the trailer turn signal indicators will flash at the same frequency as the vehicle turn signal indicators. The trailer warning indicator in the IC will also flash. If a trailer turn signal indicator bulb is defective, the trailer warning indicator will not flash.

The hazard warning lamps can also be activated by a crash signal from the Restraints Control Module (RCM). This is received by the Body Control Module/Gateway Module (BCM/GWM) which activates the hazard warning lamps. The hazard warning lamps can be cancelled when crash mode is cancelled by the RCM.

TRAILER LIGHTING

Several different types of trailer socket can be installed to the vehicle depending on market specifications. Refer to the Electrical Reference Library for specific socket details.

The Body Control Module/Gateway Module (BCM/GWM) monitors the turn signal indicators and can detect if more than two lamps are attached. When a trailer is detected, the trailer warning indicator in the Instrument Cluster (IC) will flash in synchronization with the turn signal indicator.

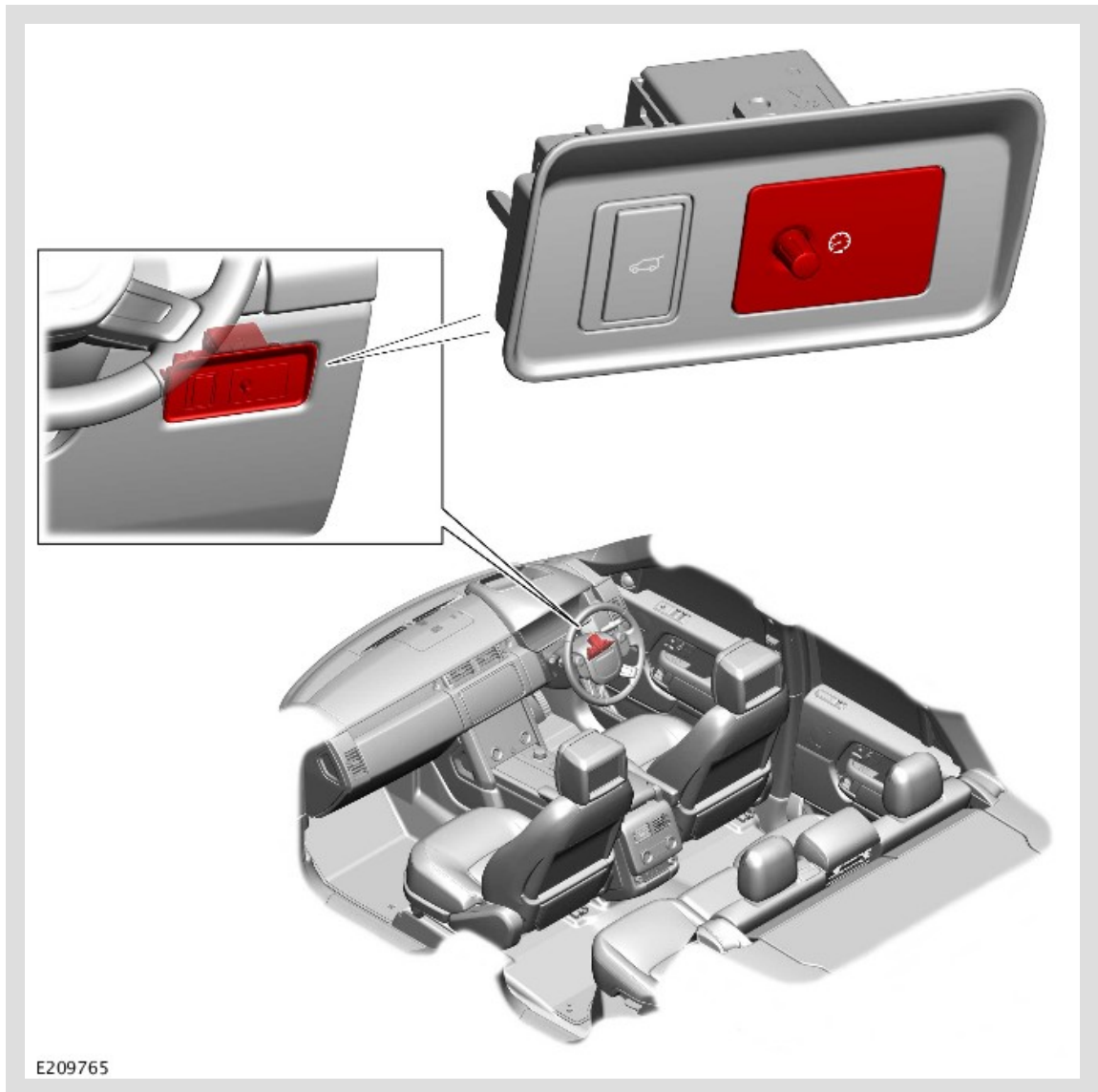
If one or more of the turn signal indicators on the vehicle or the trailer are defective, the trailer warning indicator will not flash to alert the driver to the failure.

DAYTIME RUNNING LAMPS

Daytime Running Lamps (DRL) are a market requirement in certain countries.

For market information and DRL functionality refer to the DRL section. For additional information, refer to: Daytime Running Lamps (417-04 Daytime Running Lamps, Description and Operation).

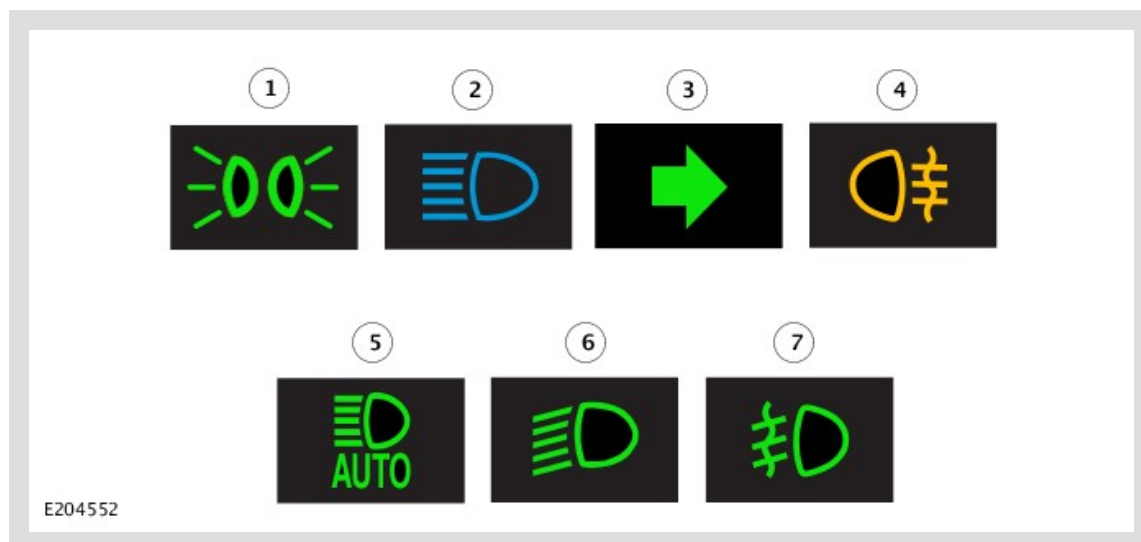
INSTRUMENT PANEL DIMMER CONTROL



The dimmer rotary thumbwheel controller is located adjacent to the right of the steering column on right hand drive (RHD) vehicles. it is located to the left of the steering column on left hand drive (LHD) vehicles. The dimmer control provides a PWM output to control the illumination brightness of the Instrument Cluster (IC), switches and other instrument panel illumination.

The dimmer rotary thumbwheel is connected to a rheostat and a high side switch. The rheostat is a variable resistor which provides a high or low resistance according to its set position. This output is passed to a switchable capacitor or a high side switch. The high side switch uses the output from the rheostat to determine the switching frequency of the capacitor which provides the Pulse Width Modulation (PWM) output of between 8 and 12V to determine the brightness of the illumination.

WARNING INDICATORS



ITEM	DESCRIPTION
1	Side lamps
2	Headlamp high beam and Adaptive High Beam
3	Turn signal indicators
4	Rear fog lamps
5	Auto High Beam (AHB)
6	Dynamic Bending & dipped beam warning lamp
7	Front fog lamps

The warning indicators are activated by the Body Control Module/Gateway Module (BCM /GWM). Messages are sent from the BCM/GWM using High Speed (HS) Controller Area Network (CAN) bus messages to the IC.

OPERATION

BODY CONTROL MODULE/GATEWAY MODULE

The Body Control Module/Gateway Module (BCM/GWM) controls the exterior lighting system through interconnections as follow:

- Left steering column multifunction switch
- Side lamp position
- Low beam position
- Automatic ('AUTO') position (if equipped)

- Rear fog lamp switch
- Front fog lamp switch
- Turn signal indicators
- High beam switch
- Headlamp flash
- Stop lamp switch
- Automatic headlamp leveling
- Hazard warning lamp switch
- Rain/light sensor.

CIRCUIT PROTECTION

There are 2 60 Amp fusible links in the Battery Junction Box (BJB) protect the power feed to the Body Control Module/Gateway Module (BCM/GWM). There is 1 fuse for the left and right lighting circuits respectively. All exterior lighting circuits are protected by Field Effect Transistors (FETs), located in the BCM/GWM, which can detect overloads and short circuits.

An FET responds to heat generated by increased current flow caused by a short circuit. On a normal circuit this would cause the fuse to blow. The FET responds to the heat increase and disconnect the supply to the affected circuit. When the fault is rectified or the FET has cooled, the FET will reset and operate the circuit normally. If the fault persists the FET will cycle, disconnecting and reconnecting the power supply. The BCM /GWM stores fault codes which can be retrieved using the Jaguar Land Rover (JLR) approved diagnostic equipment. The fault code will identify that there is a fault on a particular output which assists in fault detection.

ALARM INDICATIONS

The exterior lighting system is used for arm and disarm requests. When the driver locks or unlocks the vehicle, a visual indication of a successful lock or unlock request is displayed to the driver by the hazard flashers. For additional information, refer to: Anti-Theft - Active (419-01 Anti-Theft - Active, Description and Operation).

LIGHTS ON WARNING CHIME

A warning chime will sound if the driver door is opened and the all the following conditions exist:

- The ignition is off (Power Mode 0) or auxiliary (Power Mode 4).
- The left steering column multifunction switch is in the side lamp or Low beam position.

This indicates to the driver that the exterior lights have been left on. The chime is generated from the Instrument Cluster (IC) sounder on receipt of:

- A lights-on signal.
- A door open signal.
- An ignition off signal from the Body Control Module/Gateway Module (BCM/GWM) on the High Speed (HS) Controller Area Network (CAN) chassis bus.

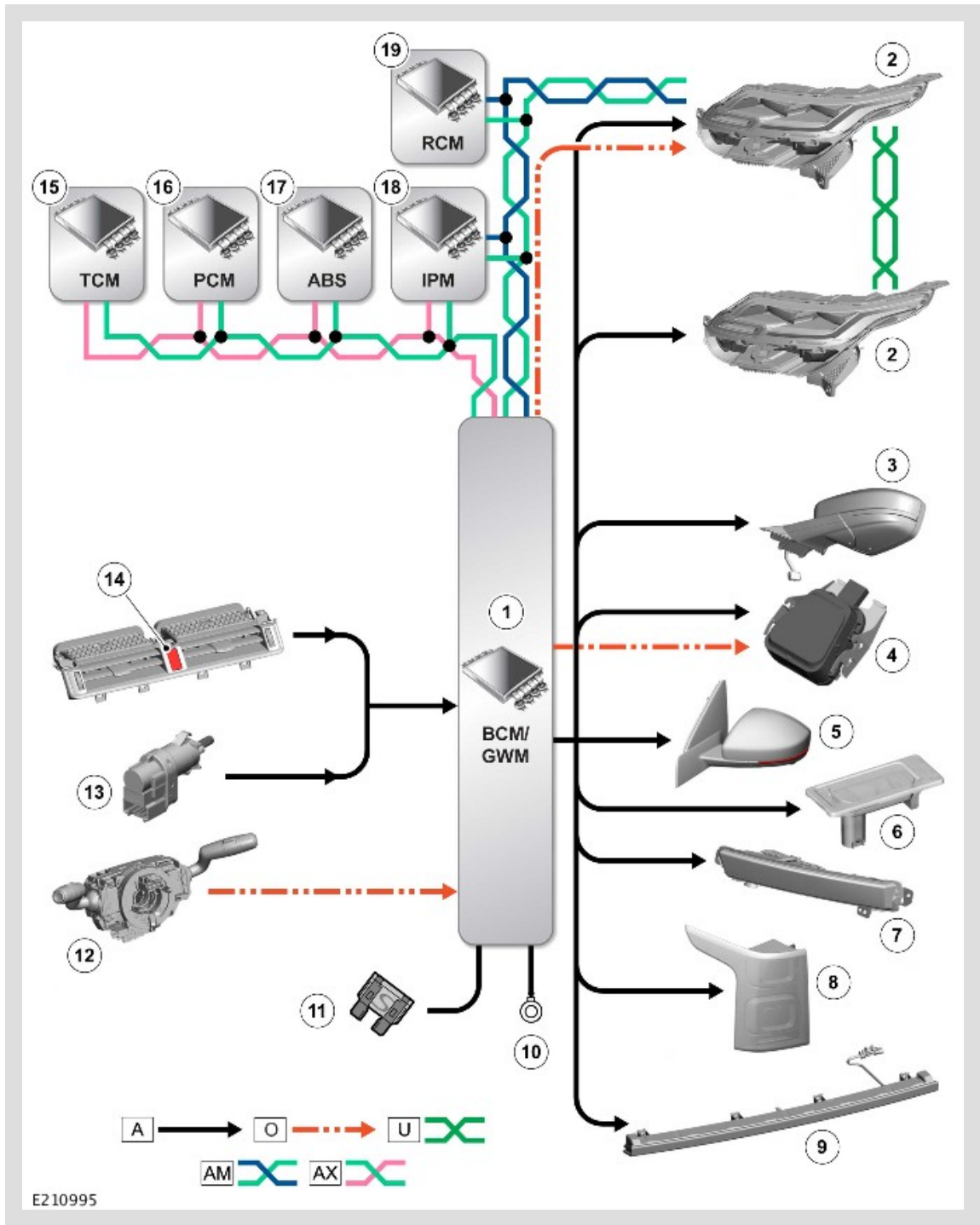
CRASH SIGNAL ACTIVATION

In the event of an accident of a severity to activate and deploy the airbags, the Restraints Control Module (RCM) sends a request to the Body Control Module/Gateway Module (BCM/GWM) via the High Speed (HS) Controller Area Network (CAN) chassis bus to activate the hazard warning lamps. The hazard warning lamps will continue to operate until the ignition mode is changed to the auxiliary Power Mode 4, or the off Power Mode 0, or the RCM no longer transmits the crash signal. For additional information, refer to: Airbag and Safety Belt Pretensioner Supplemental Restraint System (501-20 Supplementary Restraint System, Description and Operation).

HEADLAMP DELAY TIMER

The Body Control Module/Gateway Module (BCM/GWM) controls a headlamp delay function which illuminates the driveway after leaving the vehicle. The BCM/GWM activates the low beam headlamps for the required delay period. The delay timer is set within the information and message center 'Vehicle Set-up Menu'. The default timing is 30 s, but the timing can be changed to between 0 s (off), 30 s (default), 60 s, 120 s and 240 s. For additional information, refer to: Message Center (413-08 Message Center, Description and Operation).

CONTROL DIAGRAM



A = HARDWIRED; O = LOCAL INTERCONNECT NETWORK (LIN) BUS; U = PRIVATE BUS; AM = HIGH SPEED (HS) CONTROLLER AREA NETWORK (CAN) CHASSIS BUS; AX = FLEXRAY

ITEM	DESCRIPTION
1	Body Control Module/GateWay Module (BCM/GWM)
2	Headlamp assembly (2 off)
3	Approach lamps (2 off)
4	Rain/light sensor
5	Side repeater lamps in door mirrors (2 off)

6	License plate lamp (2 off)
7	Front Fog Lamp assembly (2 off)
8	Rear Lamps assembly (2 off)
9	High Mounted Stop Lamp (HMSL)
10	Ground
11	Fuse
12	Left steering column multifunction switch
13	Stop lamp switch
14	Hazard warning lamp switch
15	Transmission Control Module (TCM)
16	Powertrain Control Module (PCM)
17	Anti-lock Brake System (ABS)
18	Image Processing Module (IPM)
19	Restraints Control Module (RCM)