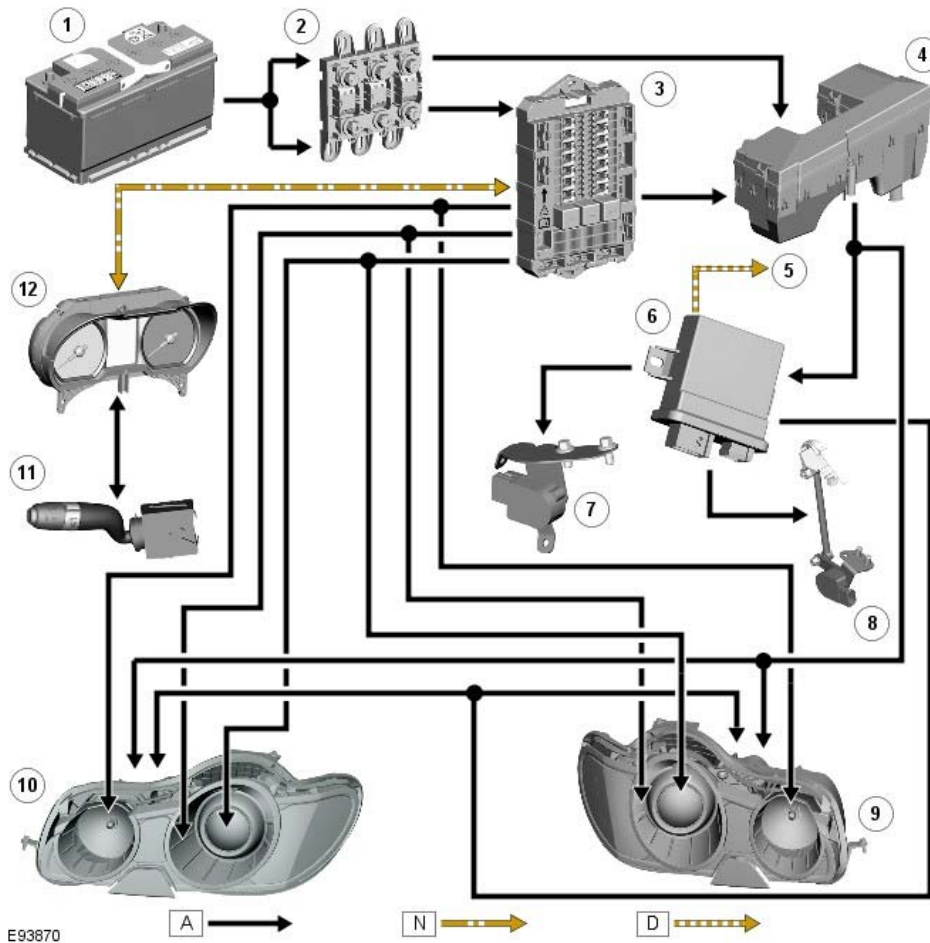


# Exterior Lighting - Exterior Lighting - System Operation and Component Description

Description and Operation

## Control Diagram

XENON HEADLAMPS - CONTROL DIAGRAM



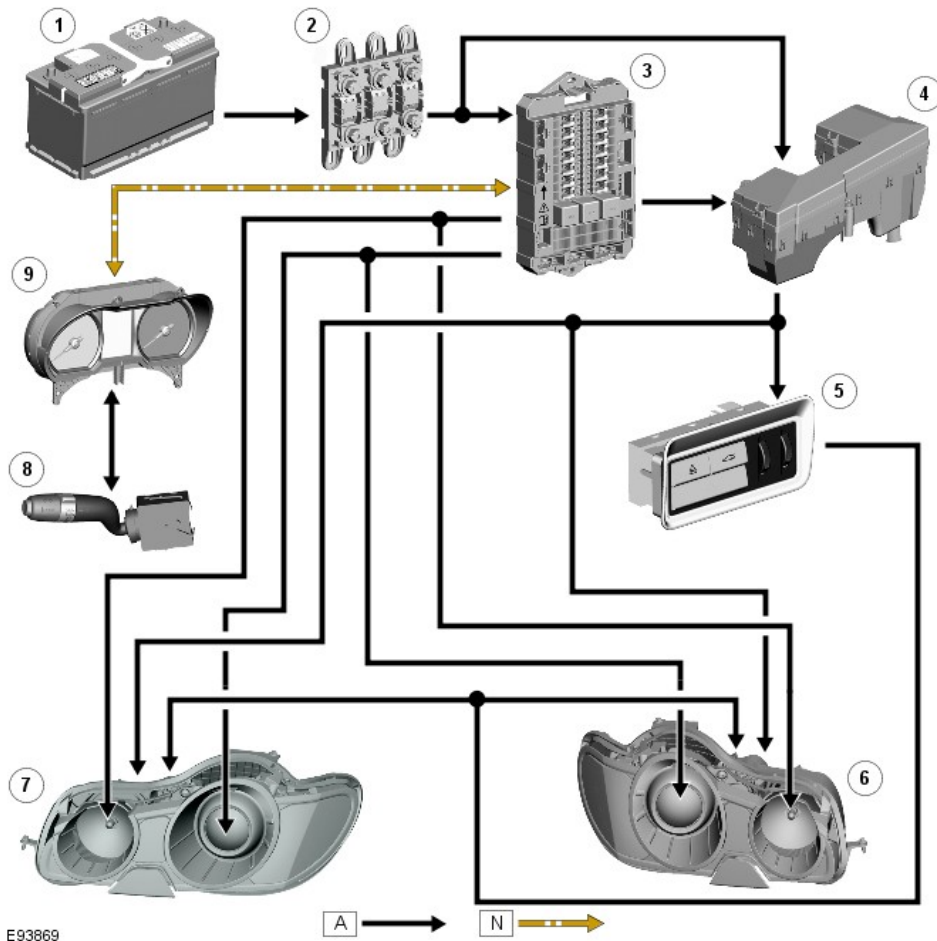
E93870

**ItemDescription**

A = Hardwired; D = High speed CAN bus; N = Medium speed CAN bus

1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	EJB (engine junction box)
5	Medium speed CAN (controller area network) bus to other vehicle systems
6	Headlamp leveling module
7	Front height sensor
8	Rear height sensor
9	RH (right-hand) headlamp assembly
10	LH (left-hand) headlamp assembly
11	Lighting control switch - LH steering column multifunction switch
12	Instrument cluster

HALOGEN HEADLAMPS - CONTROL DIAGRAM



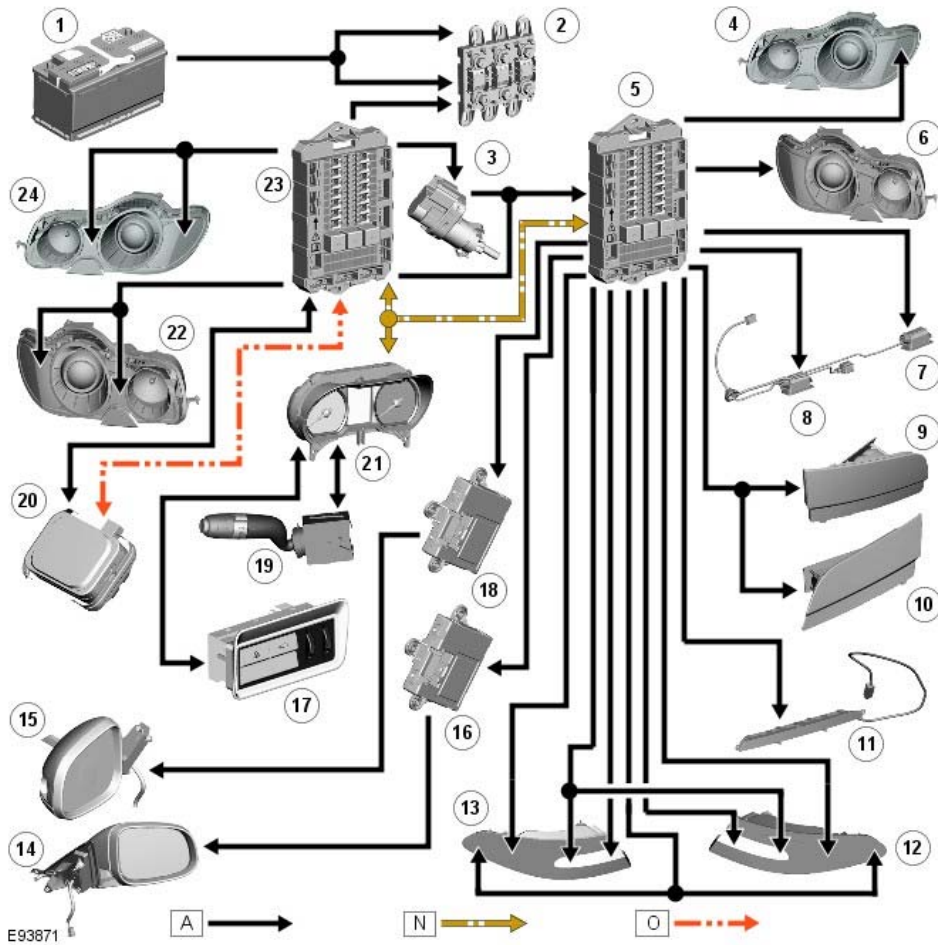
E93869

**ItemDescription**

**A** = Hardwired; **N** = Medium speed CAN bus

1	Battery
2	BJB
3	CJB
4	EJB
5	Auxiliary lighting switch
6	RH headlamp assembly
7	LH headlamp assembly
8	Lighting control switch - LH steering column multifunction switch
9	Instrument cluster

SIDE LAMPS/TURN SIGNAL INDICATORS/FOG LAMPS - CONTROL DIAGRAM



E93871

**ItemDescription**

A = Hardwired; N = Medium speed CAN bus; O = LIN bus

1	Battery
2	<b>BJB</b> - Megafuse
3	Stop lamp switch
4	LH turn signal indicator
5	<b>RJB</b> (rear junction box)
6	RH turn signal indicator
7	RH licence plate lamp
8	LH licence plate lamp
9	LH fog lamp
10	RH fog lamp
11	High mounted stop lamp
12	RH tail lamp assembly
13	LH tail lamp assembly
14	RH door mirror side repeater
15	LH door mirror side repeater
16	RH front door module
17	Auxiliary lighting switch
18	LH front door module
19	Lighting control switch - LH steering column multifunction switch
20	Rain/light sensor
21	Instrument cluster
22	RH headlamp assembly - side lamp and side marker lamp (if fitted)
23	<b>CJB</b>
24	LH headlamp assembly - side lamp and side marker lamp (if fitted)

**System Operation**

**CENTRAL JUNCTION BOX (CJB) AND REAR JUNCTION BOX (RJB)**

The **CJB** is an integrated unit which controls body functions and power distribution. The **CJB** is located on the RH 'A' pillar.

The **RJB** also controls body functions and power distribution and is located in the RH side of the luggage compartment.

### Central Junction Box

The **CJB** receives inputs from the following switches via the instrument cluster and the medium speed **CAN** bus:

- **LH** Steering column multifunction switch
  - Side lamp position
  - Headlamp position
  - Automatic (AUTO) position
  - Timer delay positions
  - Turn signal indicators
  - Headlamp flash and main beam positions.

The **CJB** receives direct inputs from the following components:

- Stop lamp switch
- Rain/light sensor.

The **CJB** provides power supplies to the following lamps:

- **LH** and **RH** front side lamps
- **LH** and **RH** front side marker lamps (if fitted)
- **LH** and **RH** static bending lamp (if fitted)
- **LH** and **RH** low beam headlamp
- **LH** and **RH** high beam headlamp.

### Rear Junction Box

The **RJB** provides power supplies to the following lamps:

- **LH** and **RH** tail lamps
- **LH** and **RH** stop lamps
- **LH** and **RH** front turn signal indicators
- **LH** and **RH** rear turn signal indicators
- **LH** and **RH** licence plate lamps
- **LH** and **RH** side marker lamps
- High mounted stop lamp
- Rear fog lamps
- Reverse lamps.

The **RJB** also provides a power supply to the **LH** and **RH** door modules. The door modules use the power supply to activate the turn signal indicator side repeater lamps located in the door mirrors, on receipt of a medium speed **CAN** bus message from the **RJB**.

### Circuit Protection

The **CJB** and the **RJB** provide circuit protection for their respective lighting circuits. The exterior lighting circuits are protected by Field Effect Transistors (FET's). The FET's can detect overloads and short circuits and respond to heat generated by increased current flow caused by a short circuit.

On a normal conventionally protected circuit this would cause a fuse to blow. The FET's respond to the heat increase and disconnect the power 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 **CJB** and the **RJB** store fault codes which can be retrieved using a Jaguar approved diagnostic system. The fault code will identify that there is a fault on a particular output circuit which will assist with fault diagnosis and detection.

### Alarm Indications

The exterior lighting system is used for alarm arm and disarm requests to show alarm system status.

When the driver locks and arms the vehicle, a visual indication of a successful lock and arm request is displayed to the driver by a single flash of the hazard flashers. If the vehicle is superlocked, then the hazard flashers will flash a second time (200 ms off and 200 ms on) to confirm the superlock request.

If the alarm is activated, the hazard flashers are operated for 10, 30 second cycles of 200 ms on and 200 ms off, with a 10 second delay between each cycle.

- **NOTE:** On North American Specification (NAS) vehicles, the delay between the cycle when the alarm is activated is 60 seconds.

### Lights on Warning

When the ignition is in the off power mode 0 or accessory power mode 4 and the lighting control switch is in the side lamp or headlamp position, a warning chime will sound if the driver's door is opened. This indicates to the driver that the exterior lights have been left switched on.

The chime is generated from the instrument cluster sounder on receipt of a lights on signal, a driver's door open signal and an ignition off power mode 0 or accessory power mode 4 signal via a medium speed **CAN** bus signal from the **CJB**.

### Headlamp Timer

The **RJB** controls the headlamp timer function which allows the headlamps to remain on for a period of time after leaving the vehicle. This is a driver convenience feature which illuminates the driveway after leaving the vehicle.

To operate the timer function the lighting control switch must be in one of the three headlamp timer positions when the ignition status is changed from ignition on power mode 6 to the off power mode 0. The timer function will then be initiated and the low beam headlamps will be illuminated for the selected timer period.

- **NOTE:** If the lighting switch is in the AUTO position, the headlamp timer will not function when the ignition is changed to off power mode 0.

When the lighting control switch is in the autolamp exit delay position, the lighting control switch reference voltage flows through 4 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed **CAN** bus to the **RJB** that autolamps has been selected.

Depending on the selected exit delay position, the reference voltage to the autolamp exit delay switch is routed through 3, 2 or 1 resistors which is detected by the instrument cluster. The cluster outputs a message on the medium speed **CAN** bus to the **RJB** that autolamp exit delay period has been selected at 30, 60 or 120 seconds respectively.

### Crash Signal Activation

When a crash signal is transmitted from the **RCM (restraints control module)**, the **RJB** activates the hazard flashers. The hazard flashers continue to operate until the ignition is in the off power mode 0 or accessory power mode 6. Once this ignition state has occurred, the **RCM** will cease to transmit the crash signal.

## LIGHTING CONTROL SWITCH

The instrument cluster outputs 2 reference voltages to the rotary lighting control switch: one feed being supplied to the light selection function of the switch and the second feed being supplied to the auto headlamp exit delay function. The switch position is determined by instrument cluster by the change in returned signal voltage which is routed through up to 4 resistors in series depending on the selection made.

**OFF** - When the lighting control switch is in the off position, the reference voltage flows through 1 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed **CAN** bus to the **CJB** that no lighting selection is made. The reference voltage to the auto headlamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed **CAN** bus to the **CJB** that auto headlamp or exit delay has not been selected.

**SIDE LAMPS** - When the lighting control switch is in the side lamp position, the reference voltage flows through 2 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed **CAN** bus to the **CJB** to activate the side lamps. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed **CAN** bus to the **CJB** that auto headlamp or exit delay has not been selected.

**HEADLAMPS** - When the lighting control switch is in the headlamp position, the reference voltage flows through 3 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed **CAN** bus to the **CJB** to activate the headlamps. The reference voltage to the auto headlamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed **CAN** bus to the **CJB** that auto headlamp or exit delay has not been selected.

**AUTOLAMPS** - When the lighting control switch is in the auto headlamp position, the reference voltage flows through 4 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed **CAN** bus to the **CJB** to activate the autolamp function. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed **CAN** bus to the **CJB** that auto headlamp has been selected.

## AUXILIARY LIGHTING SWITCH

### Headlamp Leveling Rotary Thumbwheel (Halogen headlamps only)

A power supply is passed to the headlamp leveling thumbwheel from the ignition relay in the **EJB**. Depending on the position of the thumbwheel, the voltage passes through 1, 2 or 3 resistors connected in series. The voltage through the resistors is passed to the headlamp leveling motor controller in each headlamp. The received voltage is determined as a request for the appropriate level position and the controller powers the headlamp level motors to the applicable position for each headlamp.

### Rear Fog Lamp Switch

The instrument cluster supplies a reference voltage and return to the rear fog lamp switch. The fog lamp switch is a non-latching, momentary switch.

When the fog lamp switch is off the reference voltage is passed through a 1Kohm resistor. The voltage through the resistor is returned to the instrument cluster that determines that no request for fog lamp operation has been made.

When the driver presses the fog lamp switch, the reference voltage is passed through a 330 ohm resistor. The change in return voltage is sensed by the instrument cluster which determines fog lamp operation has been requested. The instrument cluster transmits a medium speed **CAN** bus signal to the **RJB** providing the lighting control switch is in the correct position. The **RJB** reacts to the message and provides a power supply to the 3 **LED (light emitting diode)**'s in each rear fog lamp. A fog lamp warning lamp in the instrument cluster will also be illuminated when the fog lamps are operating.

The **RJB** will only activate the rear fog lamps if the headlamps are selected on or are active with auto headlamp activation. When the headlamps are turned off the fog lamps are also turned off. When the headlamps are next switched on, the fog lamps will not be activated until the driver requests fog lamp operation.

- **NOTE:** The fog lamps do operate when **DRL (daytime running lamps)** are active.

## HEADLAMP LEVELING

### Manual Headlamp Leveling - Halogen headlamps only

A power supply is passed to the headlamp leveling motor in each headlamp from the ignition relay in the **EJB**. When a signal voltage is received from the headlamp leveling rotary thumbwheel, the headlamp leveling motor controller in each headlamp uses the power supply to operate the motors and move the headlamp to the requested position.

### Static Dynamic Headlamp Leveling - Xenon headlamps only

The headlamp leveling module receives a power supply from the ignition relay in the **EJB**. The same power supply is also supplied to the headlamp leveling motor in each headlamp assembly. The front and rear height sensors are connected to the headlamp leveling module and receive a power and ground from the module. Each sensor has a signal line to the headlamp leveling module to return height information to the module. The module uses the height signals from the sensors to calculate the vehicle attitude and supplies a signal to each motor to power the headlamp to the required position.

## Component Description

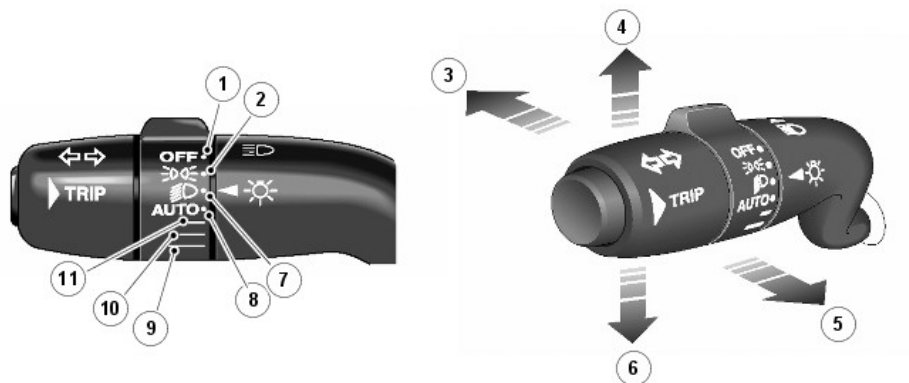
### EXTERIOR BULB TYPE/RATING

The following table shows the bulbs used for the exterior lighting system and their type and specification.

- **NOTE:** The tail lamps, side marker lamps, stop lamps, high mounted stop lamp and rear fog lamps are illuminated by **LED's** and are non-serviceable components.

Bulb	Type	Rating
Halogen headlamp - Projector module low/high beam - Not NAS	H7	55W
Halogen headlamp - Projector module low/high beam - NAS only	H11	60W
Xenon headlamp - Projector module low/high beam - All markets	D1S	35W
High beam only (halogen) - High/low beam (xenon) - All markets	H7	55W
Front side lamps - all markets	W5W Halogen cool blue (HCB)	5W
Front turn signal indicators - Not NAS	PY21W	21W
Front turn signal indicators - NAS only	3457AK	27W
Rear turn signal indicators - All markets	PSY19W	19W
Turn signal indicator side repeaters - All markets	WY5W	5W
Reverse lamps - All markets	PS19W	19W
Licence plate lamps - All markets	W5W	5W

## LIGHTING CONTROL SWITCH



E82943

**ItemDescription**

1	Off position
2	Side lamp position
3	High beam position
4	RH turn signal indicator
5	Headlamp flash/high beam off position
6	LH turn signal indicator
7	Headlamp position
8	AUTO headlamp position
9	Headlamp timer 120 second delay position
10	Headlamp timer 60 second delay position
11	Headlamp timer 30 second timer delay position

The lighting control switch is located on the LH steering column multifunction switch. The lighting control switch is a rotary control with positions for the following lighting functions:

- Off
- Side lamps
- Headlamps
- AUTO headlamps
- Headlamp timer (3 time period selections).

The LH steering column multifunction switch also provides for the following functions:

- Low beam headlamps
- High beam headlamps
- Headlamp flash
- LH and RH turn signal indicators
- Trip computer function button.

Refer to: [Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

The switch has a turn signal indicator lane change function. If the switch is gently pushed to either turn signal indicator position and then released, the applicable turn signal indicators will flash 3 times and then will be automatically cancelled. If a turn signal indicator bulb fails, the green turn signal warning indicator in the instrument cluster will flash at twice the normal rate and the audible ticking from the instrument cluster sounder will also be at twice the normal rate.

**AUXILIARY LIGHTING SWITCH**

- NOTE: RHD (right-hand drive) switch shown



E98399

**ItemDescription**

1	Headlamp leveling rotary thumbwheel (halogen headlamps only)
2	Instrument panel illumination dimmer thumbwheel
3	Luggage compartment lid release switch
4	Forward alert switch (if fitted)
5	Rear fog lamp switch

The auxiliary lighting switch is located in the instrument panel, adjacent to the steering column. The switch has a rear fog lamp switch and a rotary thumbwheel to adjust headlamp leveling on vehicles with halogen headlamps. The auxiliary lighting switch also has a forward alert switch (if fitted) and a rotary thumbwheel for instrument panel illumination dimming.

The rear fog lamp switch is a non-latching switch which provides a momentary signal to the instrument cluster. The fog lamps can only be activated if the ignition is in power mode 6 and the headlamp or auto headlamps are selected on. If the fog lamp switch is pressed when the fog lamps are operating, they will be switched off. If the lighting control switch is moved to the side lamp or off position or if the auto headlamps turns off the headlamps the rear fog lamps will be extinguished. If the headlamps are subsequently turned on the rear fog lamp operation will not be active and the rear fog lamp switch must be pressed to activate the lamps.

**HEADLAMP ASSEMBLY**

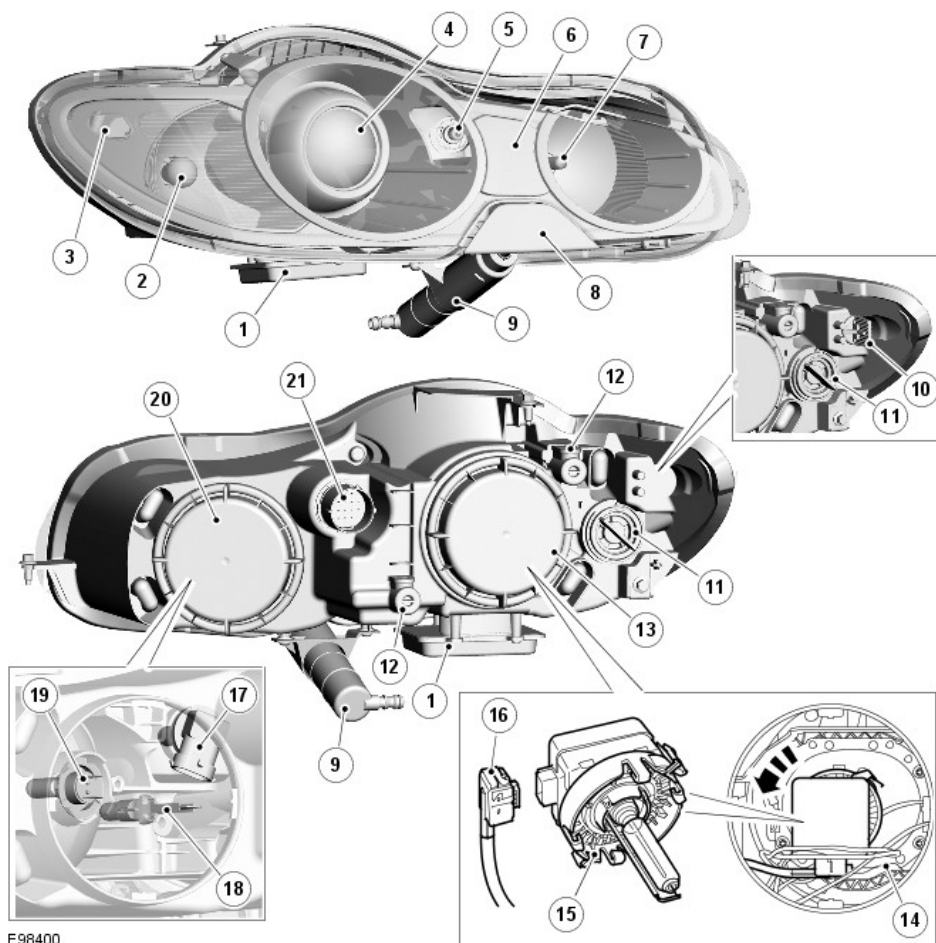
Two types of headlamp are available; xenon or halogen. The headlamp is secured in the front of the vehicle with three bolts; one outboard bolt is screwed into the front upper cross member, one inboard bolt in the front upper body gusset and one bolt located at the rear of the headlamp assembly which locates in the front fender reinforcing panel. Bulb replacement requires the removal of the 3 bolts and the headlamp assembly.

The rear of the headlamp has removable panels which allow access to the bulbs for replacement. A large cover can be rotated counter-clockwise for removal allows access the headlamp low beam halogen or xenon D1S bulb. Another large removable cover can be rotated for removal to provide access to the high beam bulb, side lamp bulb and cornering/static bending lamp bulb (if fitted).

The headlamps have 2 adjustment screws on the rear which allow for the manual setting of the vertical and horizontal alignment.

On NAS vehicles, the headlamp is regarded as 'Visual Optically Left' aiming. The adjustment screws must be turned equal amounts to maintain the correlation in the vertical axis only. There is no horizontal adjustment. Refer to the Service Repair Procedures manual for headlamp alignment data and procedures.

Each headlamp has an integral 16 pin connector which provides inputs and outputs for the various functions of the headlamp assembly.



E98400

**ItemDescription**

1	Xenon control module (not fitted on halogen low beam headlamps)
2	Turn signal indicator
3	Side marker lamp (NAS only)
4	Projector module - Low beam headlamp(Halogen) – Low/High beam headlamp (xenon)
5	Cornering/static bending lamp (if fitted)
6	Side lamp
7	High beam headlamp
8	Power wash jets trim cover
9	Headlamp powerwash
10	Side marker lamp bulb (NAS only)
11	Turn signal indicator bulb
12	Headlamp adjuster screw (2 off)
13	Cover - Low beam headlamp projector module bulb
14	Mounting collar
15	Xenon igniter unit and bulb
16	Xenon igniter electrical connector
17	Cornering/static bending lamp bulb (if fitted)
18	Side lamp bulb
19	High beam headlamp bulb
20	Cover - Side lamp, cornering/static bending lamp (if fitted) and high beam headlamp bulbs
21	Electrical connector

**Bi-Xenon Headlamp**

The bi-xenon headlamp uses a projector lens, similar to the halogen headlamp. The projector module comprises an ellipsoidal lens and a reflector. The projector reflector collects the light produced by the halogen bulb and projects the light into a focal plane containing a shield. The contour of the shield is projected onto the road by the lens. A complex surface reflector is used for the halogen fill in high beam lamp. This type of reflector is divided into separate parabolic segments, with each segment having a different focal length. The low and high beam bulbs are quartz halogen H7, with a rating of 55W. The bulbs are retained in the headlamp unit with conventional wire retaining clips.

A tourist lever mechanism is located on the right hand side of the projector module. This mechanism moves a flap to blank off a portion of the beam spread to enable the vehicle to be driven in opposite drive hand markets without applying blanking decals to the headlamp lens. The beam is changed by removing the access cover at the rear of the lamp assembly and moving a small lever located near the bulb holder, at the side of the projector.

• NOTE: The tourist lever is not fitted to NAS vehicles.

**⚠ WARNING:** The Xenon system generates up to 30000 volts and contact with this voltage could lead to fatality. Make sure that the headlamps are switched off before working on the



system.

The following safety precautions must be adhered to when working on the xenon low beam headlamp system:

- **DO NOT** attempt any procedures on the xenon headlamps when the lights are switched on.
- Handling of the D1S xenon bulb must be performed using suitable protective equipment; for example gloves and goggles. The glass part of the bulb must not be touched.
- Xenon bulbs must be disposed of as hazardous waste.
- Only operate the bulb in a mounted condition in the projector module installed in the headlamp.

The xenon headlamp is known as 'bi-xenon' because it operates as both a low and high beam headlamp unit. The xenon lamp, or High Intensity Discharge (HID) lamp as they are sometimes referred to, comprises an ellipsoidal lens with a solenoid controlled shutter to change the beam output from low to high beam.

- **NOTE:** If the lighting control switch is in the 'off' position, both the xenon lamp and the halogen high beam lamp will operate when the high beam 'flash' function is operated.

The xenon headlamp system is controlled by the **CJB** using a control module for each headlamp and an igniter. The control modules and the igniters provide the regulated power supply required to illuminate the bulbs through their start-up phases of operation.

The xenon headlamp is a self contained unit located within the headlamp assembly. The unit comprises a reflector, an adaptor ring, the lens, a shutter controller and the xenon bulb, which together forms an assembly known as the projector module. The reflector is curved and provides the mounting point for the xenon bulb. The bulb locates in a keyway to ensure the correct alignment in the reflector and is secured by a plastic mounting ring. The bulb is an integral component of the igniter and is electrically connected by a connector located in the igniter unit.

The shutter controller is a solenoid which operates the shutter mechanism via a lever. The shutter is used to change the beam projection from low beam to high beam and vice versa.

The xenon bulbs illuminate when an arc of electrical current is established between 2 electrodes within the bulb. The xenon gas sealed in the bulb reacts to the electrical excitation and the heat generated by the current flow to produce the characteristic blue/white light.

To operate at full efficiency, the xenon bulb goes through 3 full stages of operation before full output for continuous operation is achieved. The 3 phases are: start-up phase, warm-up phase and continuous phase.

In the start-up phase, the bulb requires an initial high voltage starting pulse of up to 30000 volts to establish the arc. This is produced by the igniter. The warm-up phase begins once the arc is established. The xenon control module regulates the supply to the bulb to 2.6A which gives a lamp output of 75W. During this phase, the xenon gas begins to illuminate brightly and the environment within the bulb stabilizes, ensuring a continual current flow between the electrodes. When the warm-up phase is complete, the xenon control module changes to continuous phase. The supply voltage to the bulb is reduced and the operating power required for continual operation is reduced to 35W. The process from start-up to continuous phase is completed in a very short time.

The xenon control modules (one per headlamp) receive an operating voltage from the **CJB** when the headlamps are switched on. The modules regulate the power supply required through the phases of start-up.

The igniters (one per headlamp) generate the initial high voltage required to establish the arc. The igniters have integral coils which generate high voltage pulses required for start-up. Once the xenon bulbs are operating, the igniters provide a closed circuit for the regulated power supply from the control modules.

#### Halogen Low/high Beam Headlamp

The halogen low/high beam headlamp uses a projector lens, similar to the xenon headlamp. The projector module comprises an ellipsoidal lens and a reflector. The projector reflector collects the light produced by the halogen bulb and projects the light into a focal plane containing a shield. The contour of the shield is projected onto the road by the lens. The low/high beam bulbs are quartz halogen and are retained in the headlamp unit with conventional wire retaining clips.

A tourist lever mechanism is located on the right hand side of the projector module. This mechanism moves a flap to blank off a portion of the beam spread to enable the vehicle to be driven in opposite drive hand markets without applying blanking decals to the headlamp lens. The beam is changed by removing the access cover at the rear of the lamp assembly and moving a small lever located near the bulb holder, at the side of the projector.

#### Halogen High Beam Headlamp - Xenon and Halogen

The xenon and halogen headlamps use a complex surface reflector for the halogen fill in high beam lamp only lighting unit, which is of the same design on both headlamp types. This type of reflector has the reflector divided into separate parabolic segments, with each segment having a different focal length.

The high beam headlamp bulbs are quartz halogen and are retained in the headlamp unit with conventional wire retaining clips.

#### Cornering Lamps

- **NOTE:** The cornering lamps are not fitted to NAS vehicles.

The cornering lamps are an optional feature designed to illuminate the direction of travel when cornering at low speeds. The design of the lens projects a spread of light from the vehicle at approximately 45 degrees to the vehicle axis. The cornering lamp is incorporated into the headlamp assembly and shares the same housing as the low beam headlamp. The cornering lamp uses a 35W Halogen H8 bulb which is permanently located in an integral holder which is connected on the headlamp housing. The holder is located in an aperture in the headlamp housing and rotated to lock. The bulb is accessible via a removable cover on the base of the headlamp housing.

The cornering lamps are controlled by the **LH** steering column multifunction switch with the lighting control switch in the headlamp position and the ignition in power mode 6. The cornering lamps are supplied power via the ignition circuit to ensure that they do not function with the headlamp delay feature. The cornering lamps are deactivated if the vehicle speed exceeds 25 mph (40 km/h). Only one cornering lamp will illuminate at any one time. If the left hand turn signal indicators are selected on, the left hand cornering lamp will be illuminated and vice versa, providing the vehicle speed and lighting control switch positions are correct.

#### Static Bending Lamps

- **NOTE:** The static bending lamps are not fitted to NAS vehicles.

The static bending lamps are designed to illuminate the direction of travel when cornering at low speeds. The static bending lamp functionality, which is controlled by the **CJB** and the headlamp leveling module, operates using inputs from the steering angle sensor and vehicle speed information from the **ABS (anti-lock brake system)** module. The static bending lamp is incorporated into the headlamp assembly and shares the same housing as the low beam headlamp. The design of the lens projects a spread of light from the vehicle at approximately 45 degrees to the vehicle axis. The static bending lamp uses a 35W Halogen H8 bulb which locates in a holder which is connected via wires to the main connector on the headlamp housing. The holder is located in an aperture in the headlamp housing and rotated to lock. The bulb is accessible via a removable cover at the rear of the headlamp housing.

The static bending lamps operate with a steering angle sensor **CAN** bus signal which is received by the **CJB**. The **CJB** monitors this signal and vehicle speed and activates the static bending lamp bulb. When the operation parameters of the lamp are reached, the **CJB** fades the static bending lamp bulb on using a **PWM (pulse width modulation)** voltage over a period of approximately 2 seconds. When the lamp is switched off, the **CJB** fades the bulb off by decreasing the **PWM** voltage in a linear manner depending on steering angle and vehicle speed. The cornering lamps can only be active for a maximum of 3 minutes.

- **NOTE:** Static bending lamps only operate when the transmission is in **DRIVE** or in **SPORT**.

#### Turn Signal Indicators

The turn signal indicator lamp is incorporated into the outer part of the headlamp assembly. The turn signal indicator lamp uses a PY21W bayonet orange colored bulb in ROW markets, a S8W 27/7W wedge bulb is used in NAS markets. The bulb is fitted into a holder which connects with contacts in the headlamp housing. The holder is fitted into an aperture in the headlamp housing and rotated to lock into position.

When active, the turn signal indicator lamps will flash at a frequency cycle of 380ms on and 380ms off. If a bulb fails, the remaining turn signal lamps bulbs continue to flash at normal speed. The turn signal indicators in the instrument cluster will flash at double speed to indicate the bulb failure to the driver.

### Side Lamps

The side lamp is located between the headlamp projector module and the high beam headlamp. The side lamp uses a W5W wedge fitting bulb which locates in a holder which connected via wires to the main connector on the headlamp housing. The holder is a push fit into a receptacle in the headlamp housing. The bulb is accessible by removal of the inner cover on the rear of the headlamp housing. Access to the bulb requires removal of the headlamp from the vehicle. The side lamps are operated by selecting side lamps or headlamps on the lighting control switch. The side lamps are functional at all times and are dependant on a particular ignition mode status. The side lamps will also be illuminated when the lighting control switch is in the AUTO position and a 'lights on' signal is received by the CJB from the rain/light sensor

### Side Marker Lamps (NAS only)

The side marker lamp is located in the outer part of the headlamp assembly. The side marker lamp uses a W5W wedge fitting bulb. The bulb is fitted into a holder which connects with contacts in the headlamp housing. The holder is fitted into an aperture which connects with contacts in the headlamp housing. The side marker lamp is active at all times when the side lamps are active.

## AUTOMATIC HEADLAMP OPERATION

The automatic headlamp function is a driver assistance system. The driver can override the system operation by selection of side lamp or headlamp on if the ambient light conditions require front and rear lighting to be active. The automatic headlamp system uses a light sensor and the CJB, which are connected via a LIN (local interconnect network) bus to control the headlamp functionality. 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.

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 automatic headlamp operation uses ambient light levels which are monitored by photodiode incorporated in the rain/light sensor. The rain/light sensor sends a lights on/off request to the CJB on the LIN bus, which responds by switching on the low beam headlamps, front side lamps and rear tail lamps. The automatic headlamps are activated under the following conditions:

- Twilight
- Darkness
- Rain
- Snow
- Tunnels
- Underground or multistoried car parks.

Operation of the automatic headlamps requires the ignition to be in ignition mode 6, the lighting control switch to be in the 'AUTO' position and a lights on request signal from the light sensor. If the rain sensor signal activates the fast speed wipers, the low beam headlamps are activated, providing the lighting control switch is in the 'AUTO' position.

## HEADLAMP LEVELING

Headlamp leveling provides for the adjustment of the vertical aim of the headlamps. The leveling system is primarily required to minimise glare to other road users when a heavy load is in the rear of the vehicle. Two systems of headlamp leveling are available; manual and static dynamic.

### Manual Headlamp Leveling

The manual system uses a thumbwheel rheostat to adjust the vertical alignment of the headlamps to compensate for differing vehicle loading. The rotary thumbwheel is located on the auxiliary lighting switch, adjacent to the illumination dimmer thumbwheel. Three positions are available to adjust the headlamps to a position to prevent glare to other road users.

### Static Dynamic Headlamp Leveling

The static dynamic headlamp leveling system uses the following components:

- Front and rear vehicle height sensors
- Two headlamp leveling, vertical adjustment motors
- Headlamp leveling module
- Ignition in mode 6
- Vehicle speed information from ABS module.

The static dynamic system uses height sensors fitted to the front and rear suspension and a headlamp leveling module which periodically monitors the vehicle attitude and adjusts the headlamp vertical alignment accordingly.

Static dynamic headlamp leveling is controlled by a headlamp leveling module located in the lower instrument panel, behind the glovebox.

The height sensors are both located on the RH side of the vehicle. The front sensor is attached to the front suspension lower arm with a strap and to the front sub frame with a bracket and 2 bolts. The rear sensor is attached to the rear suspension upper control arm with a cable tied clip and to the rear sub frame with a bracket and 2 bolts. Each sensor has 3 connections to the headlamp leveling module; power, ground and signal.

## DAYTIME RUNNING LAMPS (DRL)

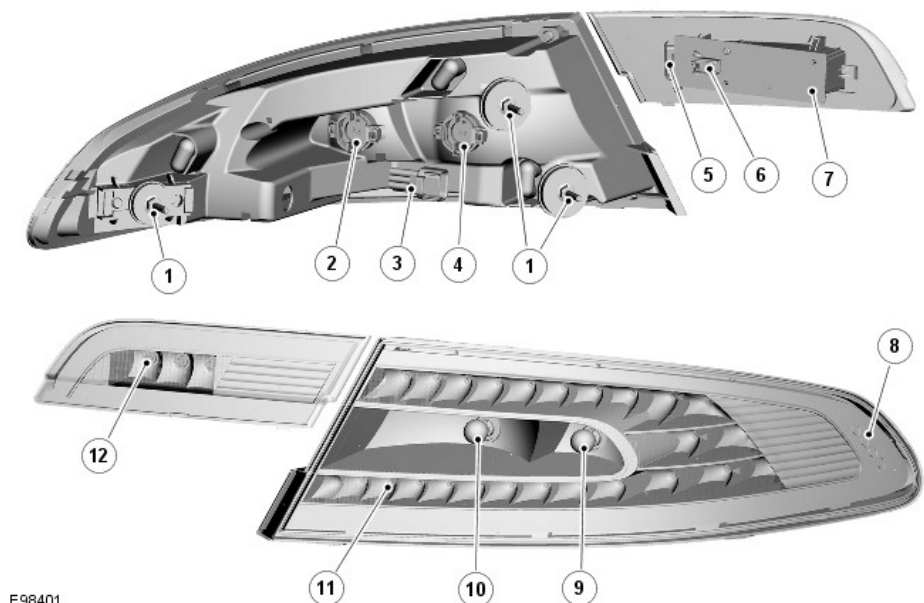
Refer to [DRL](#) section for details.

Refer to: [Daytime Running Lamps \(DRL\)](#) (417-04 Daytime Running Lamps (DRL), Description and Operation).

## REAR LAMP ASSEMBLY

The rear lamp assembly is a 2 piece unit, with one part located in the rear quarter panel and the second part attached to the luggage compartment lid. The outer rear lamp assembly is located in a recess in the vehicle body. The lamp is secured with 2 studs inboard studs on the lamp body which are secured to the vehicle body with 2 nuts. A third outboard stud and nut secures a clip to the vehicle body. To remove the lamp assembly, only the 2 inboard nuts require removal. The outboard nut retains a sliding clip in position on the vehicle body. To remove the rear lamp assembly, remove the 2 inboard nuts and slide the lamp rearwards to release the outboard clip.

The inner rear lamp is located in a recess in the luggage compartment lip and secured with a clip.



E98401

**ItemDescription**

1	Nut (3 off)
2	Reverse lamp bulb and holder
3	Rear lamp electrical connector
4	Turn signal indicator bulb and holder
5	Securing clip
6	Rear fog lamp electrical connector
7	Rear fog lamp LED's and Printed Circuit Board (PCB)
8	Side marker LED's (4 off - all markets)
9	Reverse lamp
10	Turn signal indicator lamp
11	Side lamp/stop lamp LED's (24 off)
12	Rear fog lamp LED's (3 off)

**Rear Stop and Side Lamp**

The turn signal indicator, side and stop lamps and reverse lamps are located in each outer rear lamp assembly. The side lamps and stop lamps use 24 LED's. The 24 LED's are illuminated at a higher intensity than the side lamp when the stop lamp switch is operated by pressing the brake pedal. A side marker lamp is fitted to the outer rear lamp assembly and is fitted in all markets. The side marker lamp also uses 4 LED's and are active at all times when the side lamps are selected on.

The stop lamps can also be activated by the adaptive speed control system. A signal from the adaptive speed control module is sent via the high speed CAN bus to the RJB which activates the stop lamps until an off message is received.

**Turn Signal Indicator**

The turn signal indicator lamp uses a Phillips Hypervision glass filament bulb. The bulb is located in a holder which has contacts which mate with contacts on lamp body. The holder locates in the lamp body and is rotated to lock.

If a bulb fails, the remaining turn signal indicator lamps continue to flash at the normal speed. The applicable turn signal indicator in the instrument cluster will flash at double speed to indicate the bulb failure to the driver.

**Reverse Lamp**

The reverse lamp also uses a Phillips Hypervision glass filament bulb. The bulb is located in a holder which has contacts which mate with contacts on lamp body. The holder locates in the lamp body and is rotated to lock.

The reverse lamps are activated on receipt of a reverse selected message sent on the medium speed CAN bus to the RJB.

**Rear Fog Lamp**

The rear fog lamps are located in separate units attached to the luggage compartment lid. The rear fog lamps each use 3 high intensity LED's. The fog lamp locates in a recess in the luggage compartment lid has a seal to prevent the ingress of water into the luggage compartment. The lamp is secured in the recess with a metal securing clip. The rear fog lamp is activated using a button located on the auxiliary lighting switch in the instrument panel.

**LICENCE PLATE LAMPS**

Two licence plate lamps are located in the luggage compartment lid trim finisher. One is located adjacent to the emergency luggage compartment lid release key barrel cover and the other is adjacent to the rear view camera (if fitted). The licence plate lamps are active at all times when the side lamps are operating. Each lamp can be removed from the finisher by inserting a wide, flat screwdriver blade or similar tool in a slot between the lamp lens and the finisher and gently levering the lamp from the surround. The bulb is a push fit in a holder which in turn is a press fit in the lamp housing.

**HIGH MOUNTED STOP LAMP**

The high mounted stop lamp is located at the bottom of the rear windshield. The lamp is secured to a bezel in the parcel shelf with 2 screws.

The high mounted stop lamp uses 12, red colored LED's which illuminate through a clear lens. The high mounted stop lamp functionality is the same as that described for the stop lamps.

### **TURN SIGNAL INDICATOR SIDE REPEATER LAMPS**

The turn signal indicator side repeaters are located in each door mirror. On vehicles from 10MY the lamp is an LED unit which illuminates in an orange color. The LED unit is secured to the mirror bezel with 2 screws and is connected to the mirror wiring harness with a 2 pin connector.

The side repeaters have the same functionality and operate in conjunction with the front and rear turn signal indicators and the hazard warning flashers.

### **HAZARD FLASHERS**

The hazard flashers are activated by a non-latching switch located in the switch pack located in the center of the instrument panel. The hazard flashers operate at all times when selected and operate independent of the ignition mode.

When the hazard flashers are selected on by the driver, a ground path is momentarily completed to the CJB which activates the front and rear and side repeater turn signal indicators. A second press of the switch is sensed by the CJB and the hazard flasher are deactivated. When the hazard flashers are active, they override any request for turn signal indicator operation.

The hazard flashers can also be activated by a crash signal from the RCM.

Refer to: [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) (501-20B Supplemental Restraint System, Description and Operation).