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Exterior Lighting -

Bulb Specifications

Bulb	Type	Rating
Approach lamps	Capless W5W	5W
Front fog lamps	Halogen H11	55W
Halogen headlamps - High beam	Halogen H7	55W
Halogen headlamps - Low beam - NAS	Halogen H11	55W
Halogen headlamps - Low beam - ROW	Halogen H7	55W
High mounted stop lamp (HMSL)	W16W	16W
License plate lamps	Capless W5W	5W
NAS - Side marker lamps - front/rear	Capless W5W	5W
Rear fog lamps	Bayonet P21	21W
Reverse lamps	Bayonet P21	21W
Side lamps - Front	Capless W5W	5W
Side turn signal lamps	Capless W5W	5W
Stop/Tail lamps	Bayonet - Twin filament P21/5	21W/5W
Turn signal indicators - Front - NAS	Bayonet 7507 or PY21W	21W
Turn signal indicators - Front - ROW	Bayonet P21W	21W
Turn signal indicators - Rear	PY21	21W
Xenon headlamps - Low/High beam	Xenon D1S	35W

Torque Specifications

Description	Nm	lb-ft
Front fog lamp Torx bolts	2	1
Headlamp retaining bolts	6	4
Tail lamp retaining screws	1	1

Part Number

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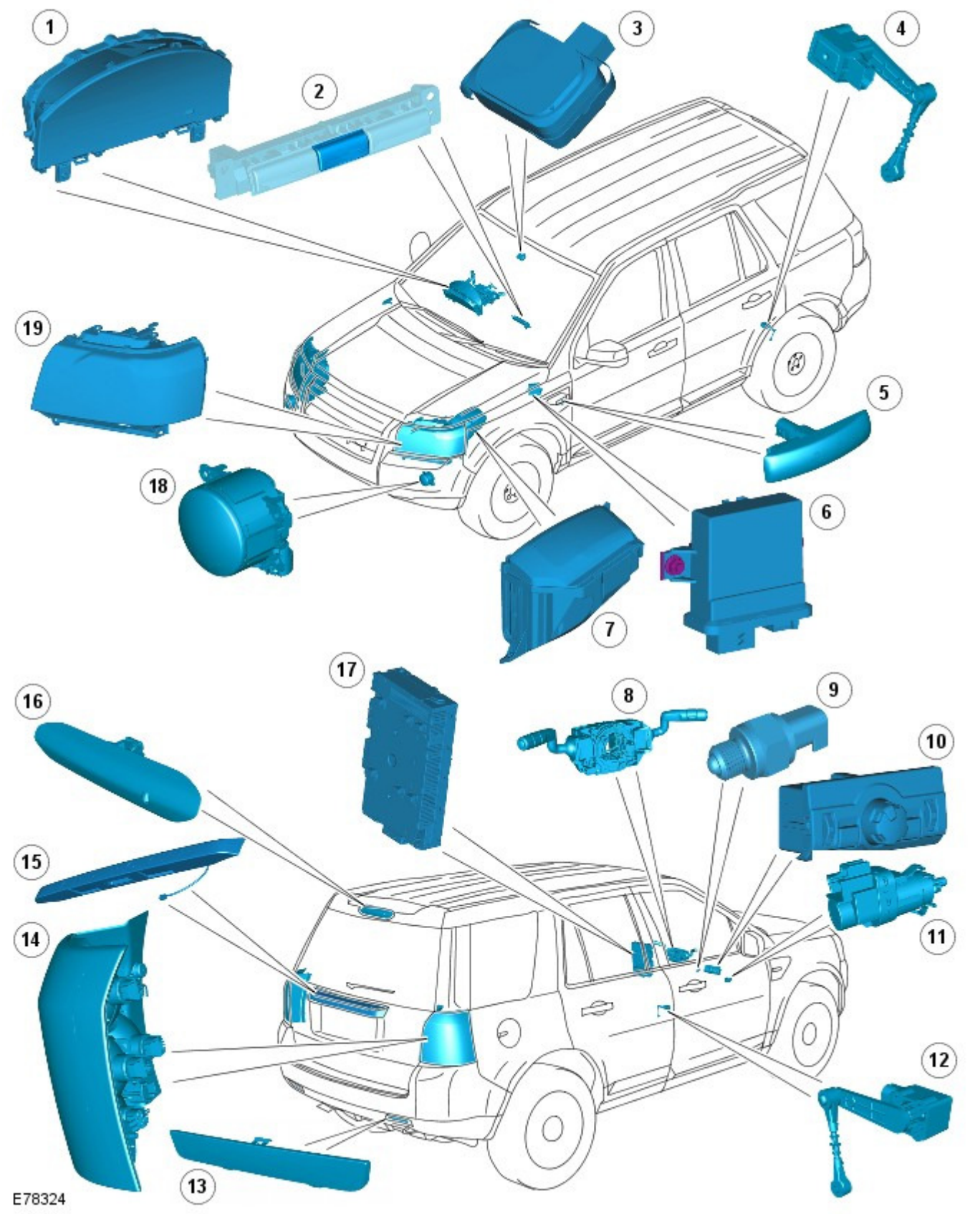
Exterior Lighting - Exterior Lighting

Description and Operation

COMPONENT LOCATION



Item	Part Number	Description
1	-	Instrument cluster
2	-	Hazard flasher switch

3		Rain/Light sensor
4		Rear height sensor (Xenon headlamps only)
5		Side turn signal lamp
6		Headlamp leveling module or Adaptive Front lighting System (AFS) control module
7		Battery Junction Box (BJB)
8		Column stalk multifunction switch
9		Reverse lamp switch (Manual transmission only)
10		Light switch module
11		Stop lamp switch
12		Front height sensor (Xenon headlamps only)
13		Reflector
14		Rear lamp assembly
15		License plate lamps
16		High mounted stop lamp
17		Central Junction Box (CJB)
18		Front fog lamp
19		Headlamp assembly

OVERVIEW

Three levels of exterior lighting are available depending on vehicle specification:

- Halogen headlamps
- Bi-xenon High Intensity Discharge (HID) headlamps
- Bi-xenon HID Adaptive Front lighting System (AFS) headlamps.

A light switch module is located in the instrument panel and allows the driver to select the appropriate operation of the exterior lighting systems.

The rear lamp assemblies contain side lamps, stop lamps, reverse lamps, turn signal indicators and rear fog lamps. On North American Specification (NAS) vehicles the rear lamp assembly also includes a side marker lamp. The rear lamp assemblies require removal for bulb replacement. Two reflectors are mounted in the rear bumper.

All versions of the headlamps have impact resistant polycarbonate lens'. Removable covers at the rear of the headlamps allow for bulb replacement. The headlamps require removal for bulb replacement.

The halogen headlamps have large complex surface reflectors to optimise the beam patterns in low beam only. A high beam only reflector is located on the inboard side of the headlamp. Headlamp leveling on the halogen headlamps is manually adjusted using a rotary thumbwheel located in the light switch module which operates leveling motors located in the headlamp.

The bi-function HID headlamps and the AFS headlamps use a projector unit with a D1S xenon bulb which operates in both low and high beam. An additional halogen high beam only reflector is located on the inboard side of the headlamp. Headlamp leveling is automatic on the HID headlamps. Front and rear height sensors are located on the Left Hand (LH) side of the front and rear axles. These measure the vehicle attitude and a headlamp leveling module, which is located on the bulkhead 'A' pillar behind the glovebox, automatically controls the headlamp vertical alignment.

Headlamp powerwash is a standard fitment on HID headlamps.

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

The exterior lighting is controlled by the CJB. The CJB is the main controlling module for vehicle body systems and is located behind the glovebox in the instrument panel.

The CJB provides circuit protection for all exterior lighting circuits.

Exterior Bulb Type/Rating

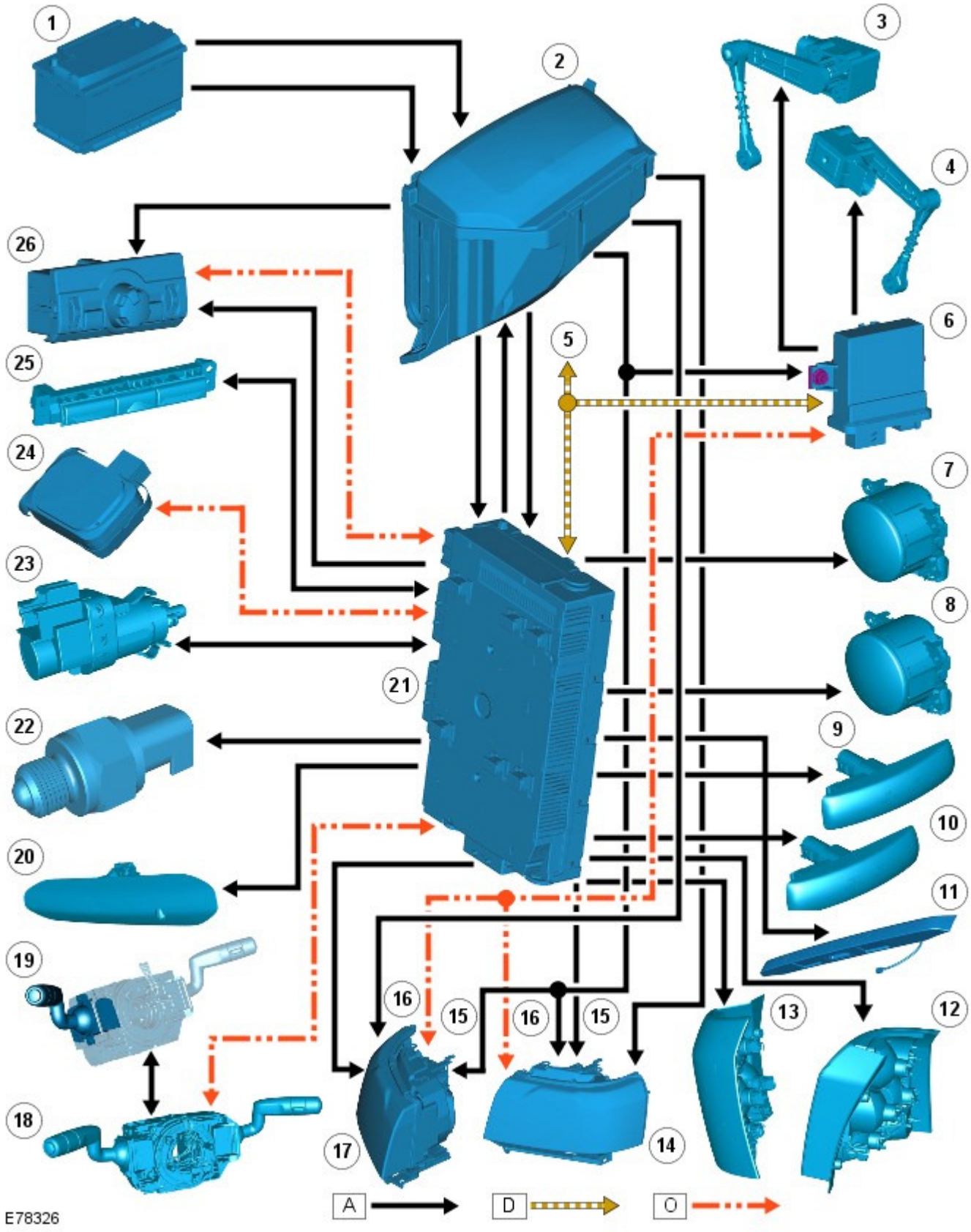
The following table shows the bulbs used for the exterior lighting system and their type and specification.

Bulb	Type	Rating
Halogen Headlamps - Low beam - Rest Of World (ROW)	Halogen H7	55W
Halogen Headlamps - Low beam - North American Specification (NAS)	Halogen H11	55W
Xenon headlamps - Low/High Beam	Xenon D1S	35W
Headlamps - High Beam	Halogen H7	55W
Front fog lamps	Halogen H11	55W

Bulb	Type	Rating
Rear fog lamps	Bayonet P21	21W
Turn signal indicator lamps - Front - ROW	Bayonet PY21W	21W
Turn signal indicator lamps - Front - NAS	Bayonet 7507A or PY21W	21W
Side turn signal lamps - Up to 2009MY	Capless W5W Clear	5W
Side turn signal lamps - From 2009MY	Capless WY5W Orange	5W
Turn signal indicator lamps - Rear - Up to 2009MY	Bayonet PY21 Orange	21W
Turn signal indicator lamps - Rear - From 2009MY	Bayonet Silvervision PY21W SV	21W
Side lamps - Front	Capless W5W	5W
Stop/Tail lamps	Bayonet - Twin filament P21/5	21W/5W
High mounted stop lamp	W16W	16W
License plate lamps	Capless W5W	5W
Reversing lamps	Bayonet P21	21W
NAS - Side marker lamp (rear)	Capless W5W	5W

CONTROL DIAGRAM

NOTE: **A** = Hardwired; **D** = High speed CAN bus; **O** = LIN bus



Item		Description
1		Battery
2		Battery Junction Box (BJB)
3		Front height sensor
4		Rear height sensor
5		High speed Controller Area Network (CAN) bus to other vehicle systems
6		Headlamp leveling module
7		Right Hand (RH) front fog lamp

8		Left Hand (LH) front fog lamp
9		LH side turn signal lamp
10		RH side turn signal lamp
11		License plate lamps
12		LH rear lamp assembly
13		RH rear lamp assembly
14		LH headlamp assembly
15		AFS control module
16		Headlamp leveling motor
17		RH headlamp assembly
18		Steering wheel module
19		LH steering column multifunction switch
20		High mounted stop lamp
21		Central Junction Box (CJB)
22		Reverse switch (manual transmission only)
23		Stoplamp switch
24		Rain/light sensor
25		Hazard flasher switch
26		Light switch module
27		Fuse 15A (F33)

CENTRAL JUNCTION BOX (CJB)

The CJB receives exterior lighting related inputs from the following switches:

- Light switch module
- Side lamp position
- Headlamp position
- Automatic (AUTO) position (if fitted)
- Front fog lamp switch (if fitted)
- Rear fog lamp switch
- Dimmer control
- Headlamp leveling control (if fitted).
- Brake switch
- LH steering column multifunction switch for turn signal indicators and high beam/headlamp flash
- Hazard flasher switch
- Rain/light sensor (LIN signal).

Circuit Protection

Two 60 Amp fusible links in the battery junction box protect the power feed to the CJB LH and RH lighting circuits respectively. All exterior lighting circuits are protected by Field Effect Transistors (FETs), located in the CJB, which can detect overloads and short circuits.

The FETs respond to heat generated by increased current flow caused by a short circuit. On a normal circuit this would cause the fuse to blow. The FETs respond 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 CJB stores fault codes which can be retrieved using a Land Rover approved diagnostic system. The fault code will identify that there is a fault on a particular output which assist in fault detection.

Alarm Indications

The exterior lighting system is used for alarm 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 operating a number of times. For additional information, refer to: Anti-Theft - Active (419-01A Anti-Theft - Active, Description and Operation).

Lights On Warning chime

When the ignition in the off (power mode 0) or auxiliary (power mode 4) mode and the lighting control rotary 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 on. The chime is generated from the instrument cluster sounder on receipt of a lights on signal, a door open signal and an ignition switch off signal from the CJB on the high speed CAN bus.

Crash Signal Activation

When a crash signal is transmitted from the Restraints Control Module (RCM), the CJB activates the hazard flashers and the turn signal indicators in the instrument cluster. The hazard flashers will continue to operate until the ignition mode is changed to the auxiliary power mode 4or the off power mode 0 or the RCM no longer transmits the crash signal.
For additional information, refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20B Supplemental Restraint System, Description and Operation).

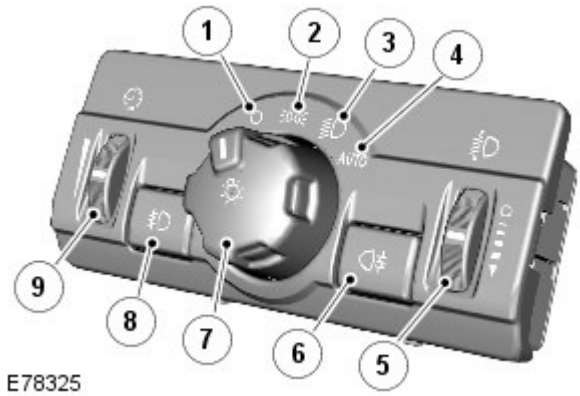
Headlamp Timer

The CJB controls a 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.

This feature can only be activated by pulling the high beam ' flash-to-pass' on the LH steering column multifunction switch. It can be deactivated either by timing out or by pulling the multifunction switch again.

The default setting can be changed by a Land Rover or authorized dealer . The default timing is set to 30s but can be changed to 0s (OFF), 30s (default), 60s, 90s, 120s, 150s and 180s.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

LIGHT SWITCH MODULE



Item		Description
1		Off position
2		Side lamps position
3		Headlamps position
4		Automatic headlamps position (if fitted)
5		Headlamp leveling rotary control (halogen headlamps only)
6		Rear fog lamp switch
7		Lighting control rotary switch
8		Front fog lamps switch
9		Interior illumination dimmer rotary control

The light switch module is located in the driver's side of the instrument panel and allows the driver to control the operation of the exterior lighting system. Three variants of the module are available to cover different vehicle specifications and market variants.

All switch operations are detected by the light switch module and sent as Local Interconnect Network (LIN) messages to the CJB.

Lighting Control Rotary Switch

The light control module has a central rotary switch which allows the following selections:

- All exterior lamps off
- Side lamps on
- Headlamps on
- Automatic headlamps active.

Headlamp Leveling (ROW halogen headlamps only)

NOTE: Headlamp levelling is not available on NAS vehicles with halogen headlamps.

A rotary leveling thumbwheel is located on the RH side of the light switch module. The rotary thumbwheel is connected to a rheostat which gives a variable output to the headlamp leveling stepper motors. The motors respond to the output and move to adjust the headlamp vertical alignment as required.

The control has no defined positions but can be adjusted as required to compensate for a drop in height at the rear of the vehicle and avoid dazzle to oncoming drivers.

Dimmer Control

A rotary dimmer thumbwheel is located on the LH side of the light switch module. The dimmer control provides a Pulse Width Modulated (PWM) output to control the illumination brightness of the instrument panel and other instrument panel illumination.

The dimmer switch operates using a rotary thumbwheel which 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 PWM output of between 8 and 12V to determine the brightness of the illumination.

Fog Lamps

Two switches are provided for selection of the front and rear fog lamps. The front fog lamp switch is only fitted to vehicles with front fog lamps.

The fog lamp switches are momentary switches, which when pressed, generate a LIN bus message from the light switch module to the CJB. The fog lamps remain active until deselected using the applicable fog lamp switch or the headlamps are switched off or the ignition power mode 6 is changed to the off power mode 0.

Automatic Headlamps

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 the LIN bus to control the headlamp functionality.

A 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).

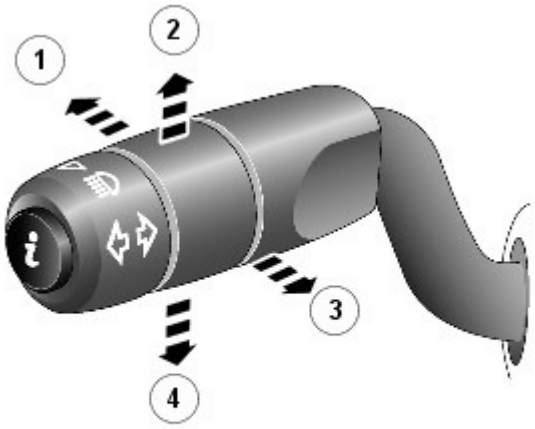
The light sensor measures the ambient light around the vehicle in a vertical direction and also the angular light level from the front of the vehicle. The rain/light sensor uses vehicle speed signals, wiper switch position and the park position of the front wipers to control the system.

The automatic headlamp operation uses ambient light levels which are monitored by photodiodes 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, license plate lamps and rear tail lamps. The automatic headlamps are activated under the following conditions:

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

Operation of the automatic headlamps requires the ignition to be on (power mode 6), the lighting control rotary switch to be in the 'AUTO' position and a lights on request signal from the light sensor.

LEFT HAND STEERING COLUMN MULTIFUNCTION SWITCH



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Item		Description
1		High beam
2		RH turn signal indicator
3		Headlamp high beam flash
4		LH turn signal indicator

The steering column multifunction switch is located on the left hand side of the steering column and controls the following functions:

- Headlamp low/high beam
- Headlamp high beam flash
- Left/right turn signal indicator lamps
- Trip computer functions.

The high beam on and flash functions are hardwired to the steering wheel module. When the switch is operated in either position a ground path via the switch is completed for the selected function which is sensed by the steering wheel module. The steering wheel module then issues a message on the Local Interconnect Network (LIN) bus to the CJB which activates the selected function.

The turn signal indicator lamps are connected and operate in a similar way with the ground path completed for the selected function which is sensed by the steering wheel module the module then issues a message relating to the selected function to CJB which in turn activates the requires turn signal indicator.

HEADLAMP ASSEMBLY

Three headlamp variants are available depending on model specification; halogen, bi-xenon and bi-xenon with Adaptive Front lighting System (AFS).

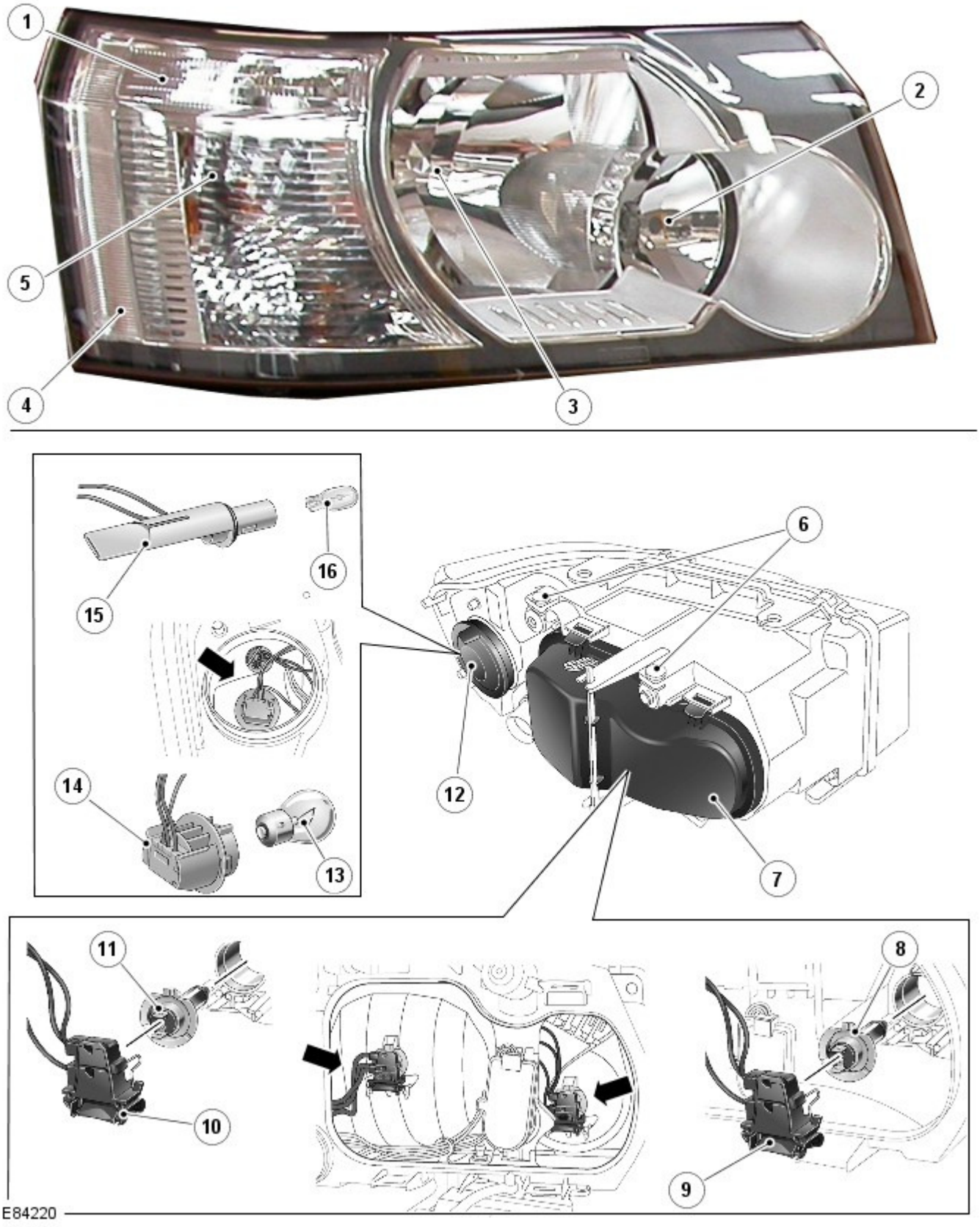
The headlamps are sealed units, with scratch resistant polycarbonate lenses bonded to the headlamp body. Two sealed access covers and a sealed housing provide a watertight environment for the headlamp internal components. To prevent fogging of the lens and to allow the headlamp unit to 'breath' in response to internal temperature changes, a vent is located at the outer rear face of the headlamp body. The vent is covered by a Gortex waterproof membrane. This allows ventilation of the headlamp while preventing the ingress of water.

The headlamps can be quickly removed for bulb replacement due to the unique 'Rail Lock' system. Headlamp access requires the removal of 2 bolts securing the headlamp to the bonnet closing panel. A locking lever at the rear of the headlamp can then be lifted, releasing a locking tab at the base of the headlamp body. The headlamp can then be pulled forward on the rail and, after disconnection of the harness connector, removed from the vehicle. The 'Rail Lock' system ensures that the headlamp alignment is not compromised during the removal process.

Each headlamp has two access covers at the rear. The larger cover requires the locking lever to be released from its guide slots to allow access to the cover. The cover can then be removed by releasing 2 tabs to allow the high and low beam bulbs to be changed. The circular rubber cover is a push fit onto the rear of the lamp assembly. Removal of the cover gives access to the side lamp and turn signal indicator bulbs.

On NAS vehicles, the side lamp is colored orange. The side lamp lens is designed so that light from the side lamp bulb also illuminates the orange colored reflector area at the side of the lamp without the need for an additional bulb.

Halogen Headlamps

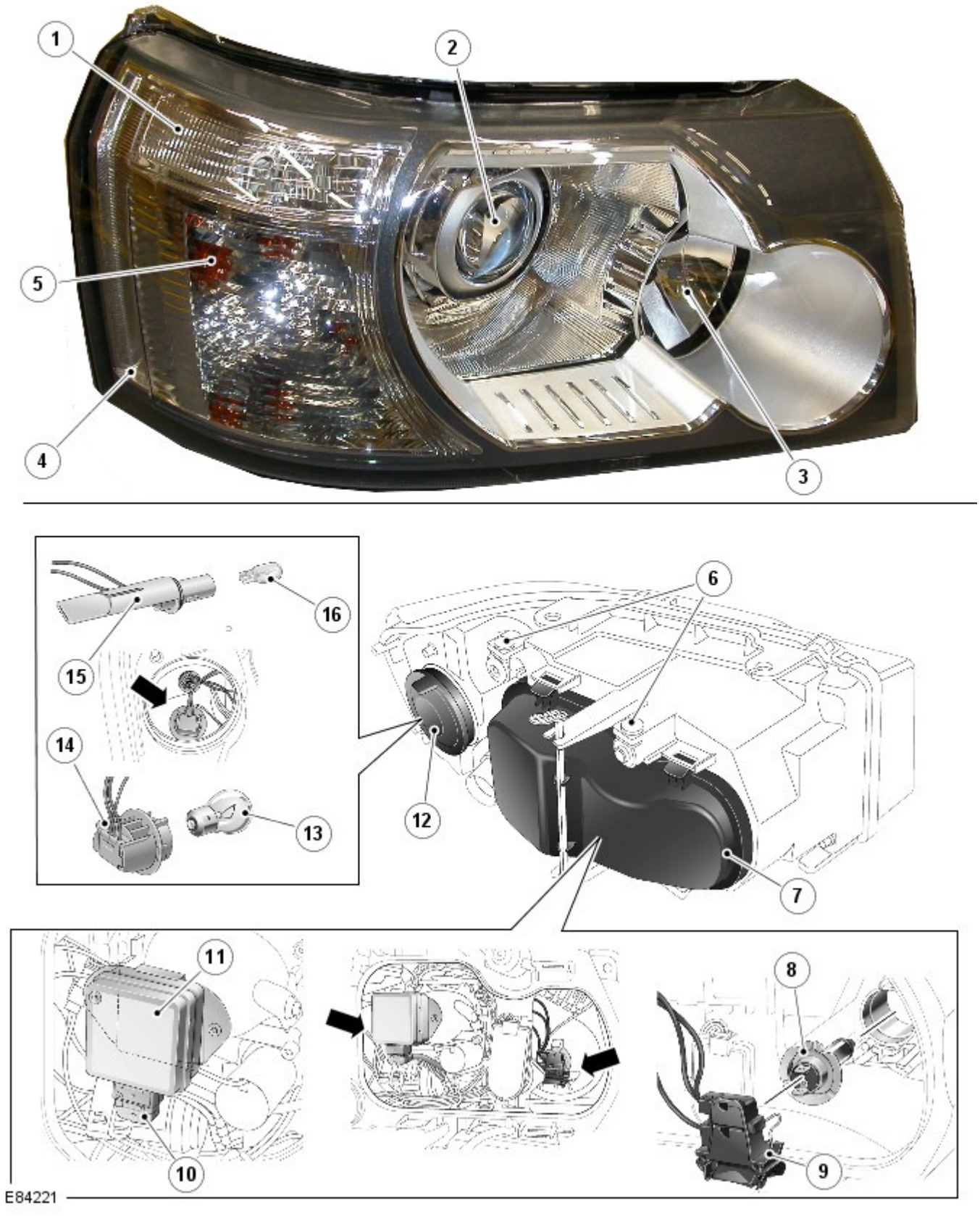


Item		Description
1		Side lamp (and side marker lamp on NAS vehicles)
2		High beam halogen headlamp
3		Low beam halogen headlamp
4		Side marker reflex (NAS only)
5		Turn signal indicator
6		Manual beam adjusters
7		Cover

8		High beam halogen bulb
9		High beam bulb holder
10		Low beam bulb holder
11		Low beam halogen bulb
12		Cover
13		Turn signal indicator bulb
14		Turn signal indicator bulb holder
15		Side lamp bulb holder
16		Side lamp bulb

The ROW halogen headlamp has 2 H7 55W halogen bulbs for both high and low beam for ROW vehicles. On NAS vehicles, the low beam halogen headlamp uses an H11 55W halogen bulb.

Bi-Xenon Headlamps



Item		Description
1		Side lamp (and side marker lamp on NAS vehicles)
2		Low and high beam bi-xenon headlamp
3		High beam halogen headlamp
4		Side marker reflex (NAS only)
5		Turn signal indicator
6		Manual beam adjusters
7		Cover

8		High beam halogen bulb
9		High beam bulb holder
10		Bi-xenon D1S bulb electrical connector
11		Bi-xenon D1S bulb
12		Cover
13		Turn signal indicator bulb
14		Turn signal indicator bulb holder
15		Side lamp bulb holder
16		Side lamp bulb

The xenon headlamp uses a complex surface reflector for the halogen fill-in high beam only unit. This uses the same halogen H7 55W bulb as used on the halogen headlamp. A bi-xenon projector module is fitted for the low beam headlamp but also operates as a high beam unit.

Safety Precautions

The following safety precautions must be followed when working on the xenon 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, e.g. 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 lamp in a mounted condition in the reflector.

WARNING: **The Xenon system generates up to 28000 volts and contact with this voltage could lead to fatality. Make sure that the headlamps are switched off before working on the system.**

Headlamp Construction and Functionality

The xenon lamp or High Intensity Discharge (HID) lamp as they are sometimes called, comprises an ellipsoidal lens with a solenoid controlled shutter to change the beam output from low to high beam.

NOTE: If the light control module rotary switch is in the OFF position, the xenon lamps do not operate when the high beam 'flash' function is operated. If the rotary switch is in the headlamps position or AUTO position with the low beam lamps active, the xenon low beam will remain on 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 xenon 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, the lens, a shutter controller and the xenon bulb, which as an assembly is known as the projector module.

The reflector provides the mounting for the xenon bulb which is an integral part of the igniter. The igniter locates in an aperture at the rear of the reflector and is secured with 2 Torx screws to ensure correct alignment in the reflector.

A shutter is used to change the beam projection from low beam to high beam and visa versa. The shutter controller is a solenoid which operates the shutter mechanism via a lever. When the shutter is in the low beam position, it masks some of the light emitted from the reflector, providing a defined low beam cut-off.

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 cover at the rear of the lamp assembly and moving a small lever located at the side of the projector module.

The xenon bulb illuminates when an arc of electrical current is established between two 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 blue/white light.

To operate at full efficiency, the xenon bulb goes through three stages of operation before full output for continuous operation is achieved. The three 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 igniters. The warm-up phase begins once the arc is established. The xenon control modules regulate the supply to the bulbs 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 stabilises ensuring a continual current flow between the electrodes. When the warm-up phase is complete, the xenon control modules change 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 system is controlled by the CJB, the two xenon control modules and the two igniters. 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 regulated power supply from the control modules.

ADAPTIVE FRONT LIGHTING SYSTEM (AFS)

The system operates by the AFS control module receiving inputs from the engine control module for engine running signal, the ABS module for steering angle and vehicle speed and a reverse gear input from the transmission.

The AFS control module processes these signals and provides an output to the headlamp leveling motors to adjust the headlamp horizontal aim according to vehicle speed and steering angle.

NOTE: In markets with Daytime Running Lamps (DRL), the AFS system will not operate when the DRL are active.

The AFS control module is connected on the high speed CAN bus to receive information from other vehicle systems. The control module is connected to the AFS power module on a dedicated Local Interconnect Network (LIN) bus. The AFS control module calculates, using input data from other systems, the required position of the horizontal adjustment of the projector modules. The position information is then output on the LIN bus to the AFS power module located on each headlamp assembly. This module then outputs the appropriate signals to power the AFS stepper motors in the headlamp to the appropriate position.

The horizontal position of the projector modules is dependant on a number of input variables. The position is determined by vehicle speed and steering angle. When reverse gear is elected, the projector modules are moved to the straight ahead position to avoid glare to other road users.

The angles of each projector module differ to give the correct spread of light, for example, when turning left, the left hand projector module will have a greater swivelling angle than the right hand projector module.

In the event of a failure of the AFS system, a warning indicator in the instrument cluster flashes to warn the driver. The AFS warning indicator illuminates when the ignition switch is in power mode 6 and will flash continuously until the fault is rectified.

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.

HEADLAMP LEVELING

Headlamp leveling provides for the adjustment of the vertical aim of the headlamps to minimize glare to other road users when the vehicle attitude changes due to vehicle loading.

Two types of headlamp leveling are available dependant on the type of headlamps fitted to the vehicle:

- Manual headlamp leveling - Halogen headlamps only (ROW vehicles only)
- Automatic headlamp leveling - Xenon headlamps only.

Manual Headlamp Leveling - ROW Halogen Headlamps Only

Manual headlamp levelling is only available on ROW vehicles with halogen headlamps.

NOTE: Headlamp levelling is not available on NAS vehicles with halogen headlamps.

The manual system comprises the following components:

- Two headlamp levelling motors
- Headlamp leveling rheostat rotary control.

When the ignition is in ignition power mode 6, power is supplied to the light control module via the ignition relay in the BJB and a fuse in the CJB. Power is also supplied via the ignition relay in the BJB to the headlamp leveling motor in each headlamp assembly.

Movement of the leveling rotary control produces a variable voltage output, which is sensed by the motors. The motors react to the supplied voltage and move the headlamp to the requested position which relates to the supplied voltage from the leveling rotary control. The headlamps can only be lowered from their unladen position to compensate for changes in vehicle attitude due to loading.

The manual headlamp leveling rotary control has no defined positions which relate to the vehicle loading. The approximate rotary thumbwheel control position for a given loading is shown in the following table:

Rotary Control Rotation	Vehicle Load
0	Driver only or Driver and front seat passenger
1/4	Driver and passengers in all seats
½	Maximum gross vehicle weight
Full	Maximum rear axle load

Automatic Headlamp Leveling - Xenon Headlamps Only

Automatic headlamp leveling is only available on vehicles with xenon headlamps. The system is not a Dynamic headlamp levelling system and changes in vehicle inclination due to positive and negative acceleration are not compensated.

Automatic headlamp leveling provides for the static, periodic adjustment of the vertical aim of the headlamps to minimise glare to other road users when the vehicle attitude changes due to loading.

Automatic headlamp leveling is controlled by a headlamp leveling module which is located on the bulkhead, adjacent to the instrument panel on the passenger side 'A' pillar.

NOTE: On vehicles with the AFS system, the headlamp leveling software is incorporated into the AFS control module and the module is known as the AFS control module.

The headlamp leveling system comprises the following components and information from other vehicle systems:

- Front and rear vehicle height sensors
- Two headlamp leveling, vertical adjustment motors
- Headlamp leveling module (or AFS control module if vehicle is fitted with AFS)
- Ignition in power mode 6.

When the ignition is in power mode 6, power is supplied, via the ignition relay in the BJB, to the light control module, the headlamp leveling motors (or AFS motors if fitted) and to the headlamp leveling module (or AFS control module if fitted).

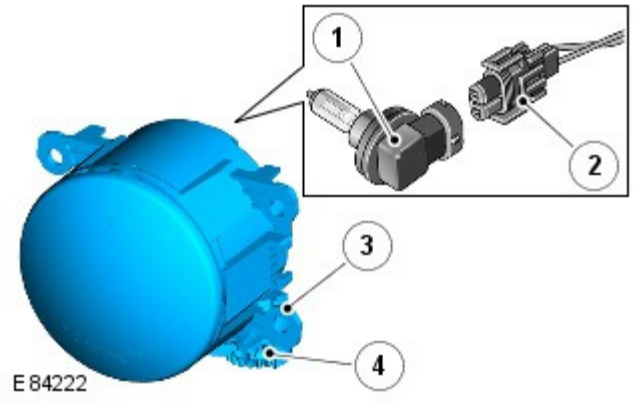
When the light control module rotary switch is moved to the side lamp or headlamp position, a Local Interconnect Network (LIN) bus message is passed from the light control module to the CJB for the selected function. The CJB then issues a 'lights on' message on the high speed CAN bus to the headlamp leveling module (or AFS control module if fitted).

The headlamp leveling module (or AFS control module if fitted) uses signals from the front and rear height sensors to periodically re-align the vertical aim of the headlamps to their optimum position.

DAYTIME RUNNING LAMPS (DRL)

DRL are a market requirement in certain countries.
For additional information, refer to: Daytime Running Lamps (DRL) (417-04 Daytime Running Lamps (DRL), Description and Operation).

FRONT FOG LAMP



Item		Description
1		Bulb and holder
2		Harness connector
3		Attachment hole (4 off)
4		Beam alignment adjuster

Front fog lamps are available as an option or standard fitment on vehicles fitted with HID headlamps and headlamp powerwash.

Two front fog lamps are located in apertures in the front bumper. Each lamp is secured in the bumper with 3 Torx screws which are covered with a removable finisher. The fog lamp has an adjuster which is used to set the fog lamp to the correct alignment.

The fog lamp uses a 55W halogen H11 bulb which is located in an integral holder. The holder is located in a hole in the rear of the fog lamp housing and is turned to lock in position.

The front fog lamps are controlled by the CJB. When the ignition switch is in ignition power mode 6 and the light control module rotary switch is in the side lamp or headlamp position, the front fog lamp button can be pressed to activate the front fog lamps. A front fog lamp warning indicator is illuminated in the instrument cluster when the front fog lamps are active.

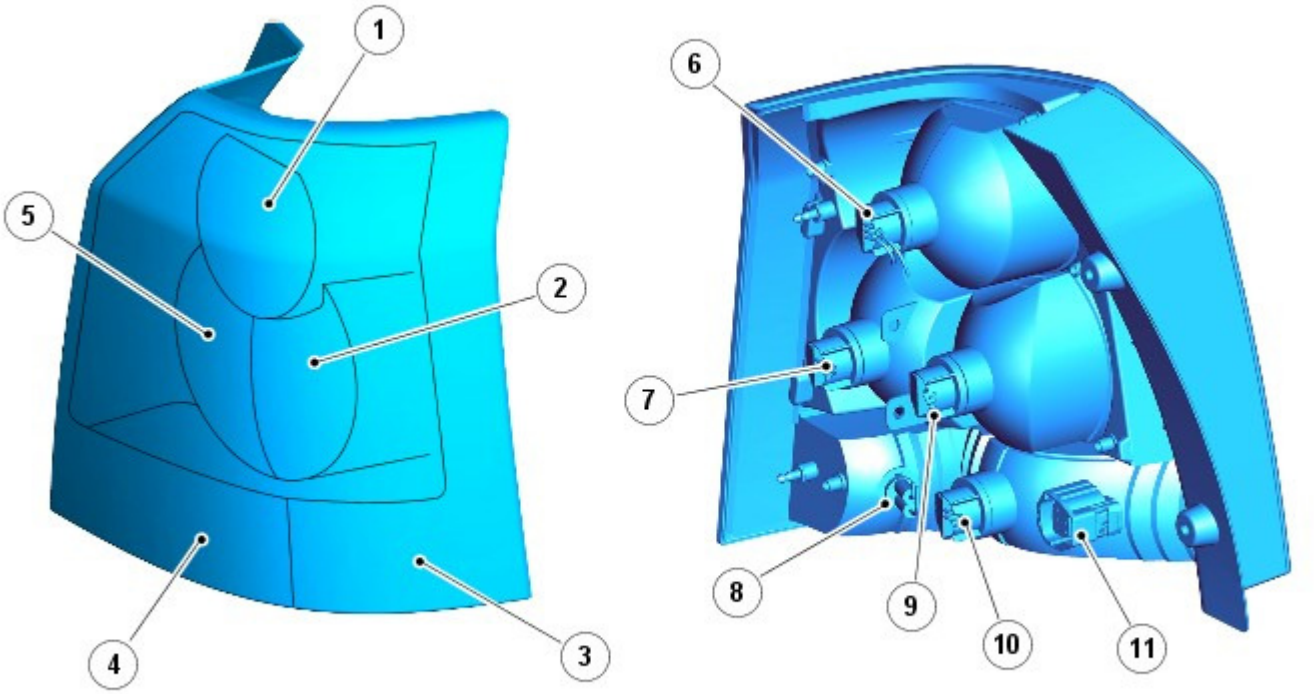
Front Fog Lamp Functionality (NAS and Canadian Markets Only)

The front fog lamps operate as described previously but with the following differences which cover local laws governing lamp usage.

If the low beam headlamps and the front fog lamps are on at the same time, when the high beam headlamps are switched on, the front fog lamps will be automatically switched off. When the high beam headlamps are subsequently switched off, the front fog lamps will be switched on automatically.

NOTE: The front fog lamps will also be switched off if the high beam 'flash' function is operated.

REAR LAMP ASSEMBLY



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Item		Description
1		Stop/tail lamp
2		Reversing lamp
3		Side marker lamp (NAS only)
4		Rear fog lamp
5		Turn signal indicator lamp
6		Stop/tail lamp bulb holder
7		Turn signal indicator lamp bulb holder
8		Side marker bulb holder (NAS only)
9		Reversing lamp bulb holder
10		Rear fog lamp bulb holder
11		Connector plug

The rear lamp assembly is a one piece unit which contains a stop/tail lamp, a turn signal indicator lamp, a reversing lamp and a fog lamp. Five bayonet fitting bulbs are used (six on NAS vehicles with the addition of a side marker lamp). These are located in holders which fit into the applicable hole in the lamp housing and are locked by rotating. Each bulb holder is connected by wires to a connector on the rear of the lamp housing.

The rear lamp assembly is located in a recess in the vehicle body. Two studs on the outer edge of the lamp housing locate in plastic clips the vehicle body. The lamp is secured with two screws which are located on the inner edge of the lamp housing, near the tailgate aperture.

Rear Stop/Tail Lamp

The upper lamp is a combined stop and tail lamp and uses a 21W/5W bayonet fitting bulb. The stop lamp uses the 21W bulb filament and the side lamp uses the 5W bulb filament.

The stop lamp is activated when the ignition is in the ignition power mode 6 and the brake pedal switch is active (by depressing the brake pedal). The high mounted stop lamp 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. The ABS module send a high speed CAN bus message to the CJB which supplies power to the stop lamps and high mounted stop lamp.

The side lamps are operated by selecting side lamps or headlamps on the light switch module. The side lamps are operational at all times and are not dependant on the ignition power mode 6. The side lamps will also be illuminated when the light switch module is in the AUTO position and a 'lights on' signal is received by the CJB from the rain/light sensor.

Turn Signal Indicator Lamp

The turn signal indicator lamp is located below the stop/tail lamp and uses a orange colored, 21W bayonet fitting bulb. On vehicles from 2009MY a 'Silvervision' bulb is used.

The turn signal indicator lamps are operated by the left hand steering column multifunction switch or by the hazard flasher switch. The steering column multifunction switch is only active with the ignition in the ignition power mode 6, the hazard flasher switch is active at all times. When active, the turn signal indicator lamps will flash at a frequency cycle of 360ms on and 360ms off.

If a bulb fails, the remaining turn signal indicator lamp bulb on that side of the vehicle flashes at normal speed. The applicable turn signal indicator in the instrument cluster will flash at double speed to alert the driver to the bulb failure.

Reversing Lamp

The reversing lamp is located adjacent to the turn signal lamp and uses a 21W bayonet fitting bulb.

The reversing lamp is active when the ignition is in the ignition power mode 6 and the CJB receives a reverse selected signal on the medium speed Controller Area Network (CAN) bus. The automatic transmission has a reverse switch which senses when reverse is selected.

Rear Fog Lamp

The rear fog lamp is located at the bottom of the rear lamp and uses a 21W bayonet fitting bulb.

The rear fog lamp is controlled by the light control module. When the ignition switch is in the ignition power mode 6 and the light control module is in the side lamp or headlamp position, the rear fog lamp switch on the light control module can be pressed to activate the rear fog lamps. A rear fog lamp warning indicator is illuminated in the instrument cluster when the rear fog lamps are active.

Side Marker Lamp (NAS only)

The side marker lamp is located in the outer part of the rear lamp, adjacent to rear fog lamp and uses a W5W wedge fitting bulb.

The side marker lamp bulb, which is fitted in a holder locates in an aperture in the rear lamp housing and is rotated to lock in position. The side marker lamp is active at all times when the side lamps are selected on using the light control module. The side marker lamps will also be illuminated when the light control module rotary switch is in the 'AUTO' position and a 'lights on' signal is received by the CJB from the light sensor.

HAZARD FLASHERS

The hazard flashers are controlled by a non-latching switch in the centre of the instrument panel. The hazard flashers operate at all times when selected and are not dependant on the ignition power mode.

When the hazard flashers are selected on, all of the front, rear and side turn signal indicator lamps operate as previously described and both left and right turn signal indicators in the instrument cluster also flash. The hazard warning flashers flash at a rate of 360ms on and 360ms off. When the hazard flashers are active, they override any request for turn signal lamp operation.

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

The hazard flashers can also be activated by a crash signal from the Restraints Control module (RCM). This is received by the CJB which activates the hazard flashers. The hazard flashers can be cancelled by changing the ignition power mode to the auxiliary power mode 4 or the off power mode 0 or the crash mode is cancelled by the restraints control module.

LICENSE PLATE LAMPS

Two license plate lamps are fitted in the tailgate handle, above the license plate in the upper tailgate. Each lamp uses a 5W capless type bulb.

The lamps are secured in the upper liftgate 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 or headlamps are switched on.

HIGH MOUNTED STOP LAMP

The high mounted stop lamp is located in the liftgate. Access to the lamp is by removal of the upper liftgate interior trim

panel. After releasing the lamp retaining clips, the lamp can be removed from outside the vehicle.

The lamp comprises a plastic housing with a red colored lens. The lamp is illuminated by a single 16W capless type bulb.

The high mounted stop lamp is activated, along with the tail lamp stop lamps, when the ignition is in ignition power mode 6 and the brake pedal switch is active (by pressing the brake pedal).

The high mounted stop lamp and the stop lamps can also be activated by the ABS when Hill Descent Control (HDC) is active. A signal on the high speed CAN bus from the ABS module is passed to the CJB which supplies power to the stop lamps.

SIDE TURN SIGNAL LAMPS

The side turn signal lamps are located in the front fender air vents. On vehicles from 2009MY, the side turn signal lamps have clear lenses and orange colored bulbs. The lamps are clipped into an aperture in the vent panel and can be removed by sliding rearwards and releasing the front edge of the lamp from the vent.

The side turn signal lamps use a 5W capless bulb which is located in a holder. The lamps have the same functionality as the front and rear turn signal indicator lamps and are operated by the left hand steering column multifunction switch or by the hazard flasher switch. The steering column multifunction switch is only active with the ignition in the ignition power mode 6, the hazard flasher switch is active at all times, regardless of the power mode. When active, the side turn signal lamps will flash at a frequency cycle of 360ms on and 360ms off. If a side turn signal lamp bulb fails, the turn signal indicator lamps continue to flash at the normal rate.

TRAILER LIGHTING

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

The CJB monitors the turn signal indicator lamps and can detect if more than two lamps are fitted (the side turn signal lamps are not monitored). When a trailer is detected, the trailer warning indicator in the instrument cluster will flash in synchronisation with the turn signal indicators.

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

DIAGNOSTICS

The diagnostic socket is located in the lower instrument panel closing panel, on the driver's side, below the steering column. Various lighting system functions are monitored by different systems which can store fault information. This can be retrieved using a Land Rover approved diagnostic system.

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Exterior Lighting - Headlamps

Diagnosis and Testing

Principles of Operation

For a detailed description of the exterior lighting system, refer to the Description and Operation section 417-00 - Exterior Lighting of the workshop manual.

Safety Information

WARNINGS:

The Xenon Headlamp system generates up to 28,000 volts. Make sure that the headlamps are switched off before working on the system. Failure to follow this instruction may lead to fatality.

The following safety precautions must be followed when working on the Xenon Headlamp System:

- DO NOT attempt any procedures on the Xenon Headlamps or circuits when the system is energized.
- Handling of the xenon bulb must be performed using suitable protective equipment, e.g. gloves and goggles. The glass part of the bulb must not be touched.
- Only operate the lamp in a mounted condition in the reflector.
- All safety procedures and precautions must be followed to prevent personal injury.

CAUTION: Xenon bulbs must be disposed of as hazardous waste.

There are instructions on the correct procedures for Xenon Headlamp System repairs in the manual, refer to section 100-00 - General Information, Standard Workshop Practices of the workshop manual.

Inspection And Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
    - Note that intermittent fault reports may be due to the cycling operation of the field effect transistors (FETs)
2. Visually inspect for obvious mechanical or electrical faults.

Visual Inspection Chart

Mechanical	Electrical
• Headlamp(s) condition and installation • Bulb(s) and installation • Bulb holder(s) and installation • Lighting control switch and installation • Left-hand Steering Column Multifunction Switch and installation	• Fuses • Relays • Wiring harness • Loose or corroded connector(s) • Battery junction box (BJB) • Central junction box (CJB) • Adaptive Front Lighting System (AFS) module • Headlamp Power modules • Instrument Cluster (IPC) • Steering Angle Sensor Module (SASM) • Transmission Control Module (TCM) • Engine Control Module (ECM) • Anti-lock Brake System Module • Air Suspension Control Module • Local Interconnect Network (LIN) circuits • Controller area network (CAN) circuits

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Because the DTCs are stored in more than one module, a complete vehicle read is recommended
    - Make sure that all DTCs are cleared following rectification

DTC Index

Adaptive Front Lighting System (AFS) Control Module

NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

NOTE: Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

NOTE: Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

NOTE: Prior to installation/replacement of the Headlamp Assembly carry out all relevant internal visual and mechanical checks for correct cable location and termination including: checks for corroded, bent or backed out pins or terminals, incorrectly inserted connectors and harness damage due to chaffing or incorrect routing.

NOTE: If the control module has been removed and reinstalled, carry out a DTC code clear, cycle the ignition state to off, then on. This will erase any DTCs that have been logged during the module installation procedure

For a complete list of all Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Headlamp Control Module (HCM) (100-00 General Information, Description and Operation).

Symptom Chart

Symptom	Possible Causes	Action
Low beam lamp(s) inoperative High beam lamp(s) inoperative	• Bulb failure • Fuse(s) blown • Circuit fault • Lighting control switch fault • Left-hand steering column multifunction switch fault	Check the bulb and fuse condition (see visual inspection). Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch operation. Refer to the electrical guides. Check for DTCs indicating a headlamp or related circuit fault.
Low beam lamp(s) dim High beam lamp(s) dim	• Incorrect bulb rating • Tourist lever set in the wrong position • Circuit fault • Lighting control switch fault • Left-hand steering column multifunction switch fault	Check the bulb condition and rating. Check the tourist lever is set correctly. Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Refer to the electrical guides.
Low beam lamp(s) stuck on High beam lamp(s) stuck on	• Circuit fault • Lighting control switch fault • Left-hand steering column multifunction switch fault • Headlamp timer function fault	Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch operation. Check the headlamp timer function. Refer to the electrical guides. Check for DTCs indicating a headlamp circuit fault
Headlamp low/high beam switching function inoperative	• Circuit fault • Left-hand steering column multifunction switch fault • Xenon lamp shutter mechanism fault	Check the headlamp circuits. Check the left-hand steering column multifunction switch operation. Check the xenon lamp shutter mechanism operation. Refer to the electrical guides. Check for DTCs indicating a headlamp circuit fault
Warning lamp(s) inoperative	• Fuse(s) blown • Lighting control switch fault • Left-hand steering column multifunction switch inoperative • Circuit fault • Instrument cluster fault	Check the fuse(s) (see visual inspection). Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.

Symptom	Possible Causes	Action
Headlamp Wet - Internal	• Condensation • Water Ingress	Check for outstanding Technical Service Bulletins (TSBs) relating to 'Headlamp Internal Condensation'. Carry out the instructions in the service bulletin to determine if the fault is related to condensation or water ingress.

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Exterior Lighting - Headlamp Adjustment

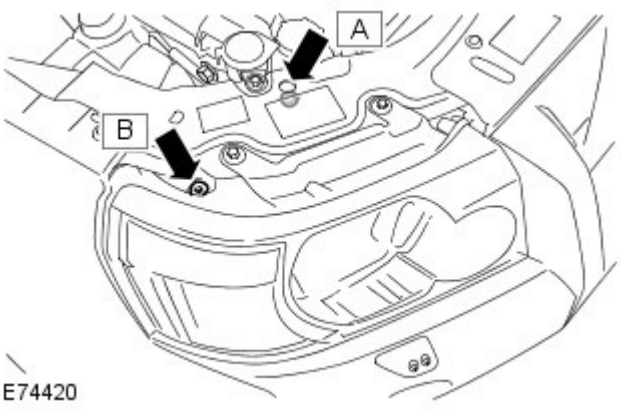
General Procedures

NOTE: The headlamp setting is 1.2 % below horizontal and parallel.

NOTE: NAS vehicles have vertical adjustment only.

1. Align the headlamp beam setting equipment to one headlamp.

2. Switch the headlamps on and to dipped beam.



3. NOTE: NAS vehicles have vertical adjustment only.
   - Adjust the headlamps with an Allen Key.
   - Rotate the adjusters A and B by an equal amount for vertical alignment.
   - Rotate the adjuster 'B' for horizontal alignment.

4.
   - To adjust the second headlamp, repeat the above procedure.

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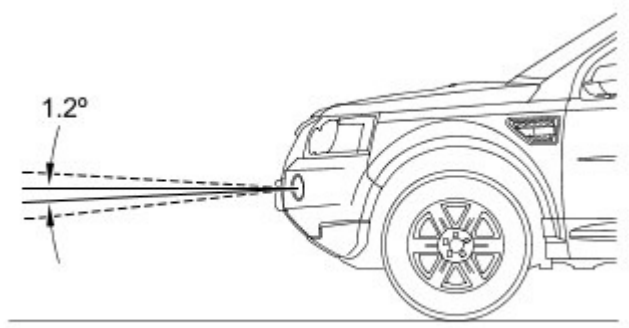
Exterior Lighting - Front Fog Lamp Adjustment

General Procedures

1. Align the beam setting equipment to one fog lamp.



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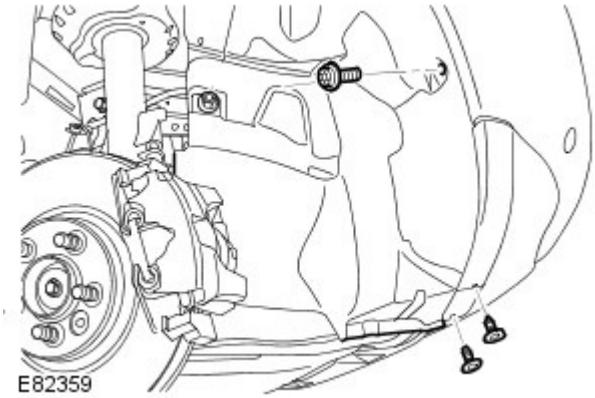
2. NOTE: The fog lamp beam should be set at 1.2% below the horizontal and parallel.

   Check the fog lamp beam alignment.

3. Turn the steering on to full lock for access.



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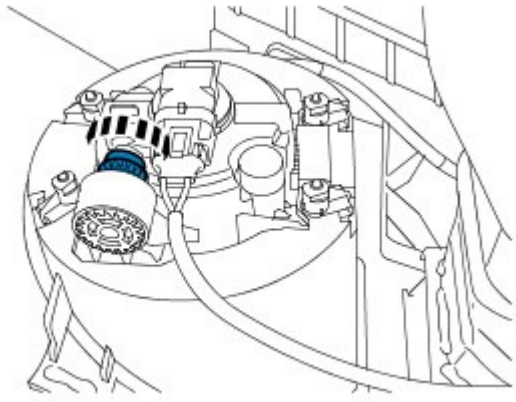
4. Release the front bumper cover from the fender splash shield.



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5. Adjust the fog lamp using the thumb wheel.

6. Install the fender splash shield.

7. To adjust the second fog lamp, repeat the above procedure.

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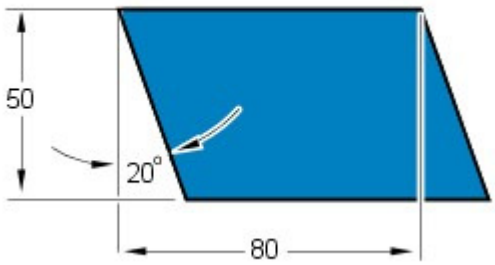
Exterior Lighting - Headlamp Masking

General Procedures

NOTE: This process is for vehicles fitted with halogen headlamps only.

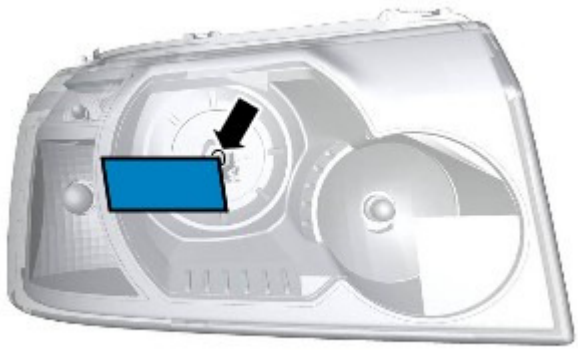
Right-hand drive vehicles

1.



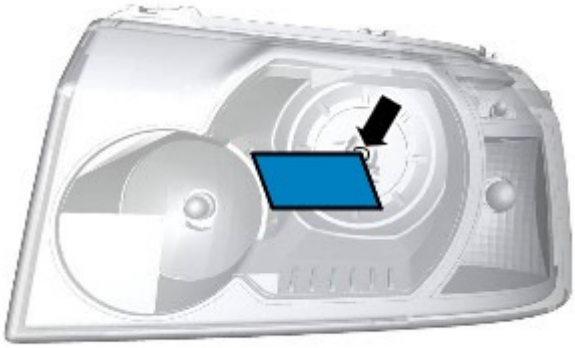
E94239

2.



E94240

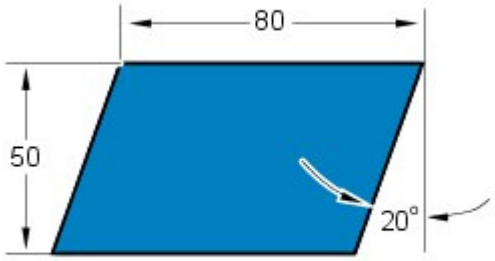
3.



E94241

Left-hand drive vehicles

4.



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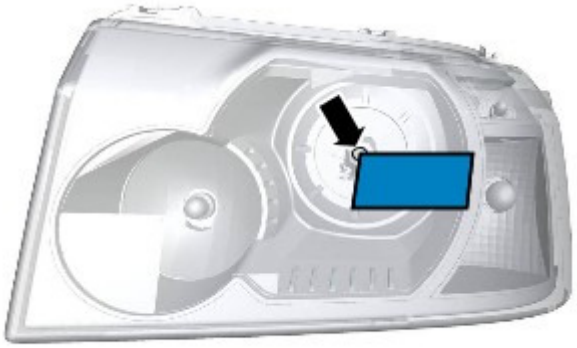
5.

E94242

6.



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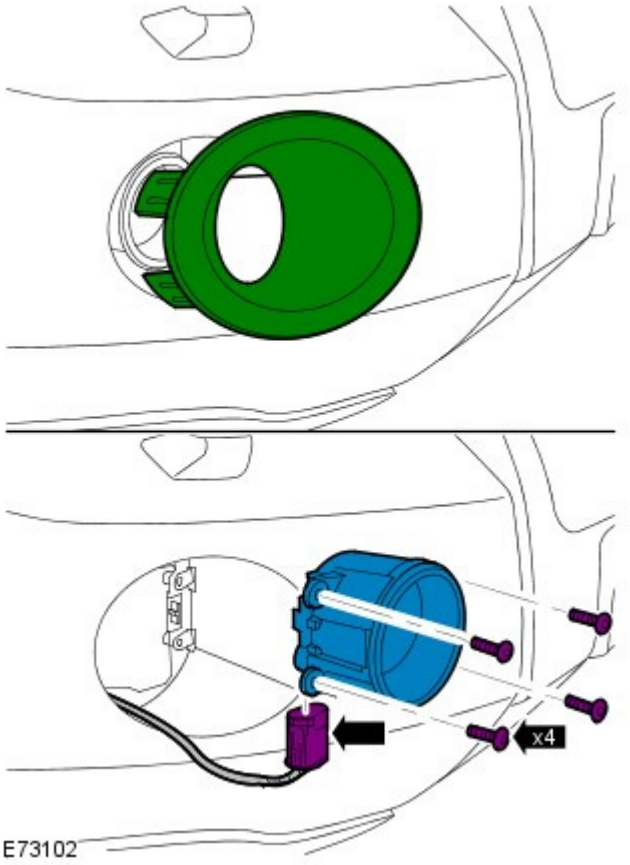
Exterior Lighting - Front Fog Lamp LH

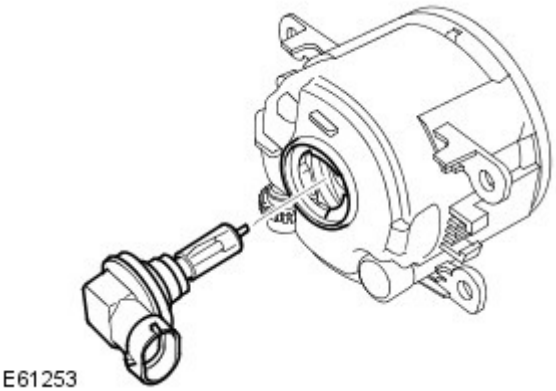
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.



1. *Torque:* 2.5 Nm



2. NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.
2. Check the fog lamp beam alignment.

   Refer to: Front Fog Lamp Adjustment (417-01 Exterior Lighting, General Procedures).

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Exterior Lighting - Headlamp Assembly

Removal and Installation

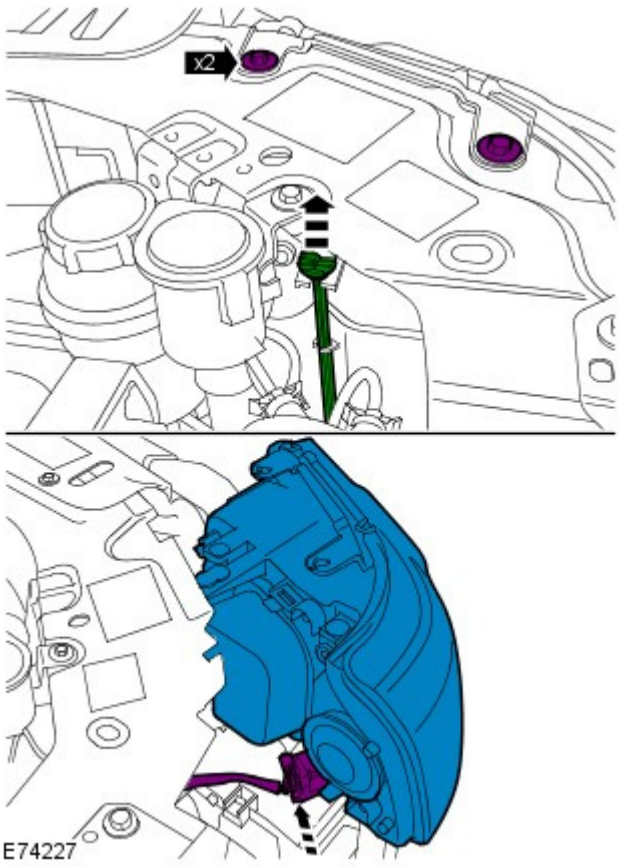
Removal

WARNING: Vehicles fitted with Xenon headlamps, the following precautions must be observed. Failure to comply may result in exposure to ultra violet rays, severe electric shock, burns or the risk of explosion. Ensure the headlamps are switched off at all times. Eye and hand protection must be worn. Never switch on the lamps or test the bulbs with the lamp holder released from the headlamp.

NOTE: Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

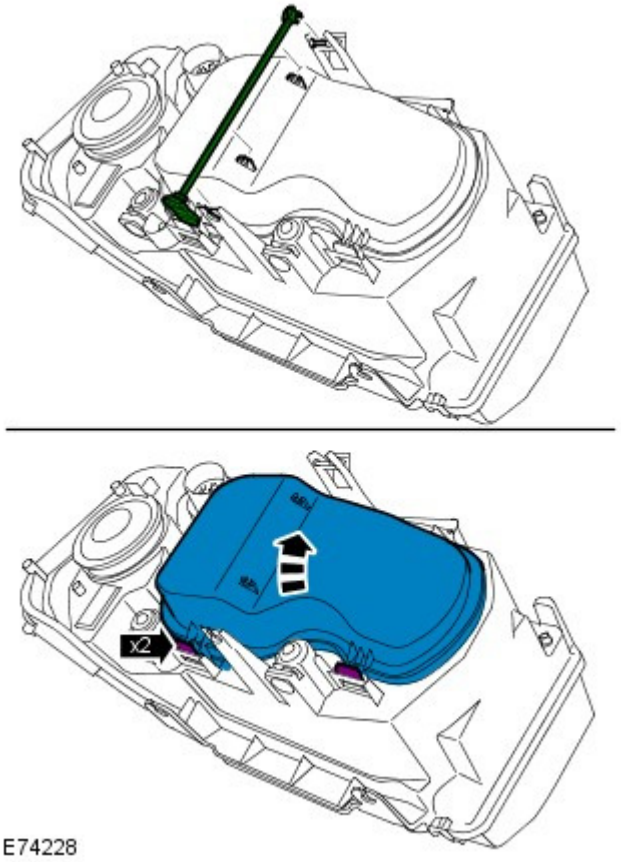
   Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).



2. *Torque:* 4 Nm

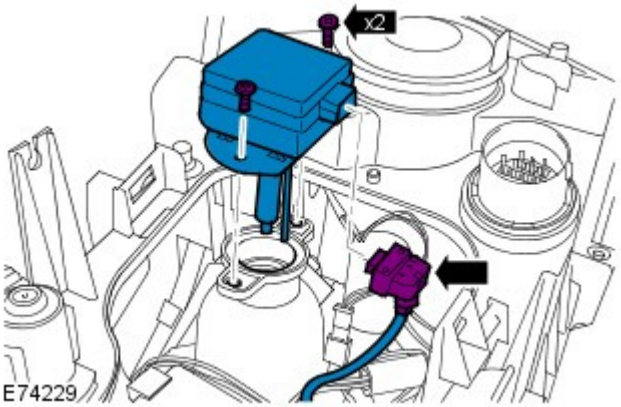
3. NOTE: Do not disassemble further if the component is removed for access only.

4.



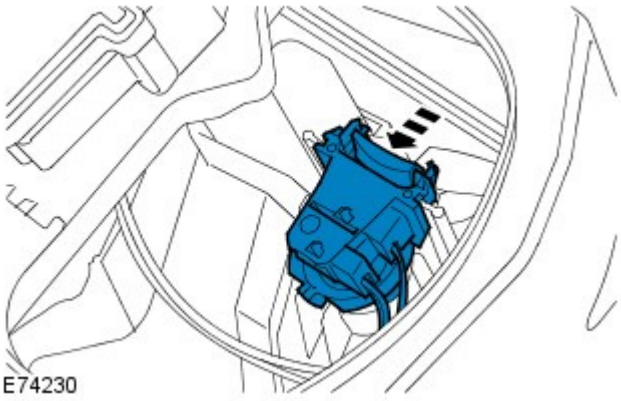
E74228

5.



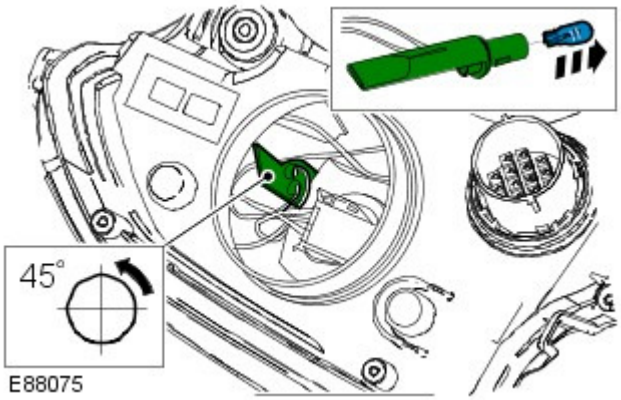
E74229

6.

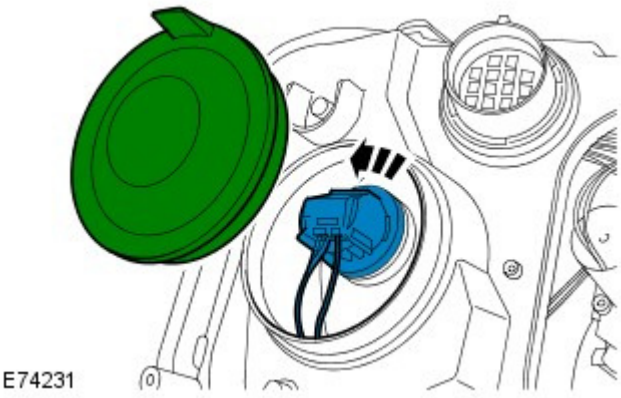


E74230

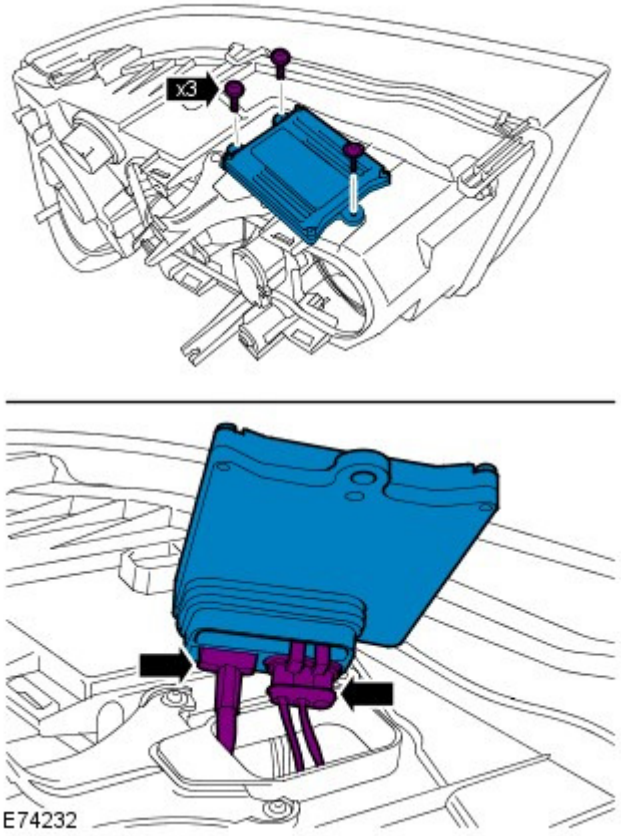
7.



8.



9.



Installation

1. To install, reverse the removal procedure.

2. Check the headlamp alignment and adjust if necessary.

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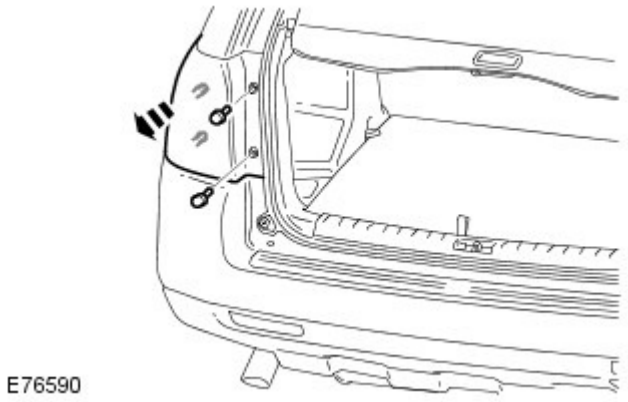
Exterior Lighting - Rear Lamp Assembly

Removal and Installation

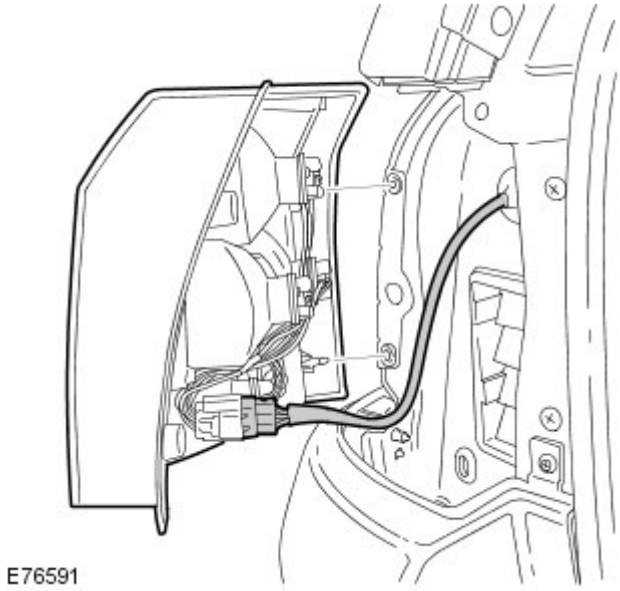
Removal

NOTE: Removal steps in this procedure may contain installation details.

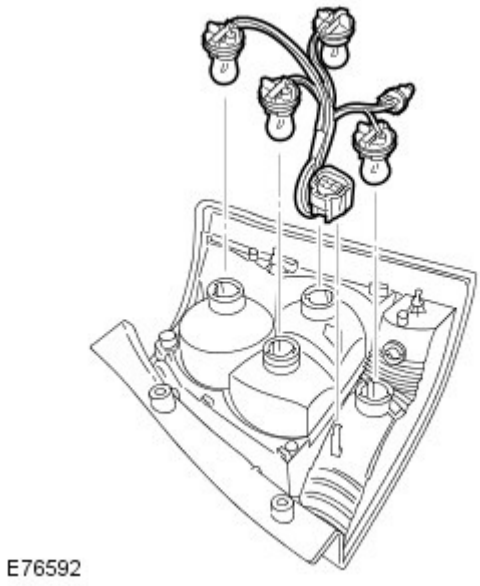


1. CAUTION: Take extra care not to damage the edges of the component.

   Torque: 2 Nm



2.



3. NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

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Exterior Lighting - High Mounted Stoplamp

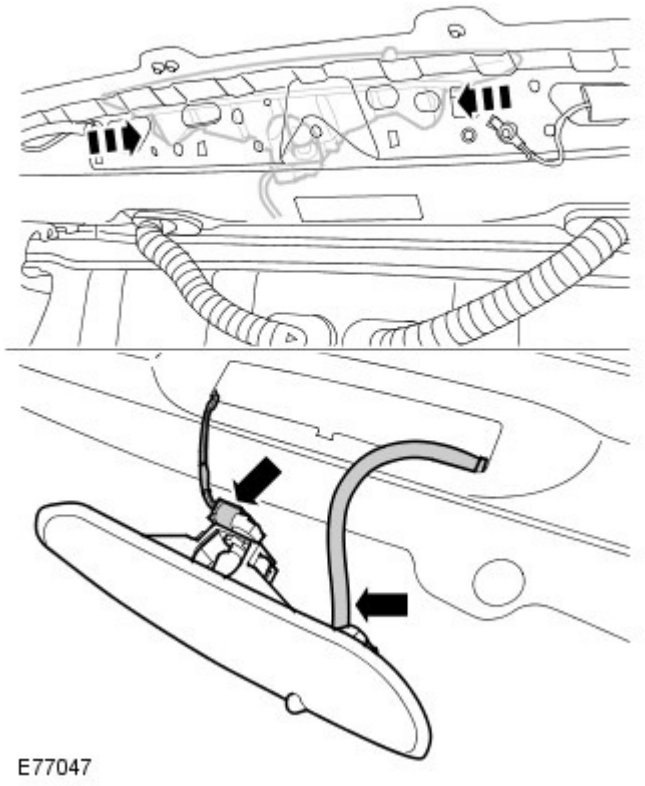
Removal and Installation

Removal

1. Remove the liftgate upper trim panel.

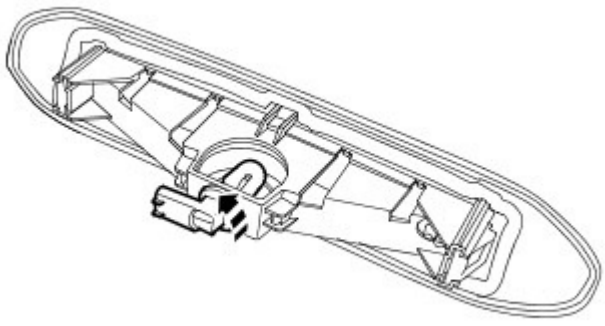
   Refer to: Liftgate Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



E77047

3. NOTE: Do not disassemble further if the component is removed for access only.



E77048

Installation

1. To install, reverse the removal procedure.

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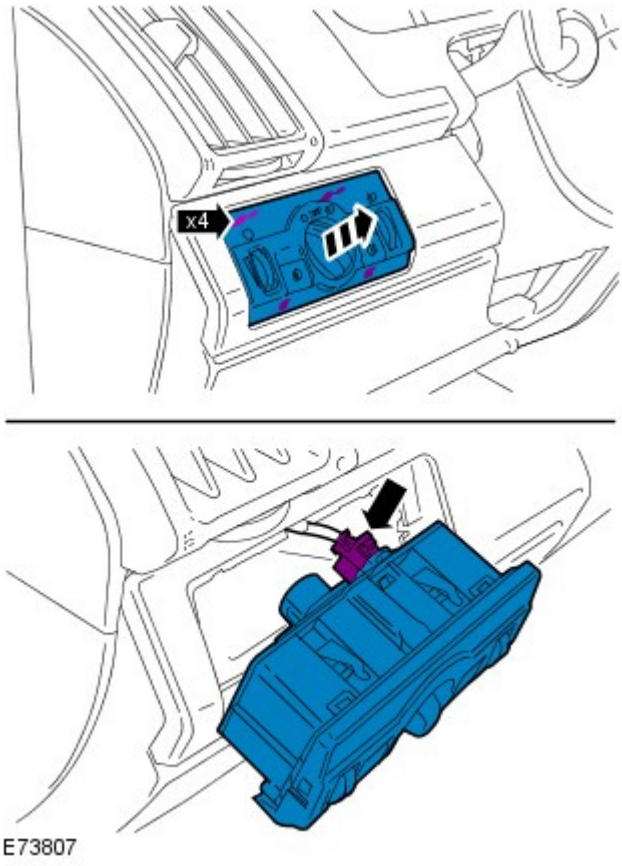
Exterior Lighting - Headlamp Switch

Removal and Installation

Removal



1. CAUTION: Protect the surrounding trim to avoid damage.

Installation

1. To install, reverse the removal procedure.

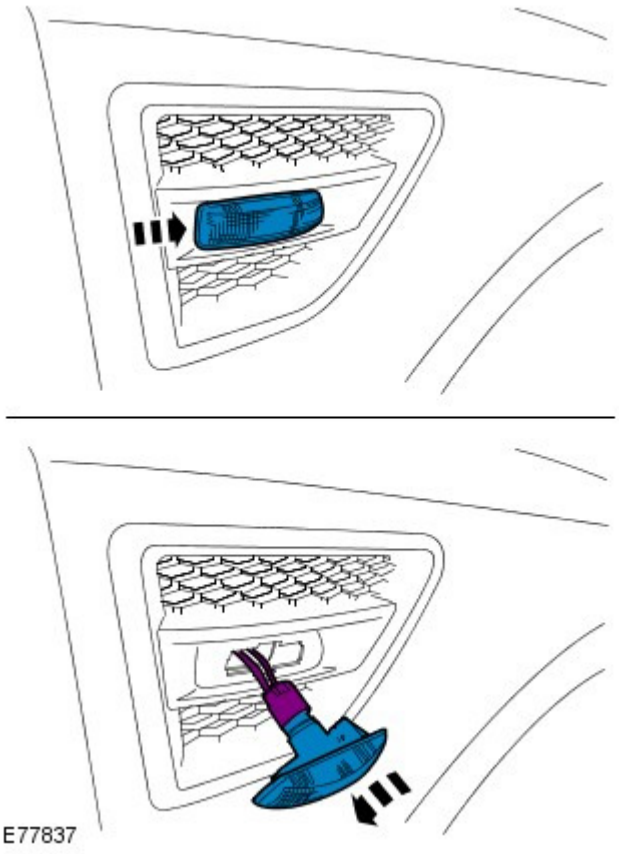
Published: 11-May-2011

Exterior Lighting - Side Turn Signal Lamp

Removal and Installation

Removal

1.



Installation

1. To install, reverse the removal procedure.

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Exterior Lighting - Headlamp Leveling Module

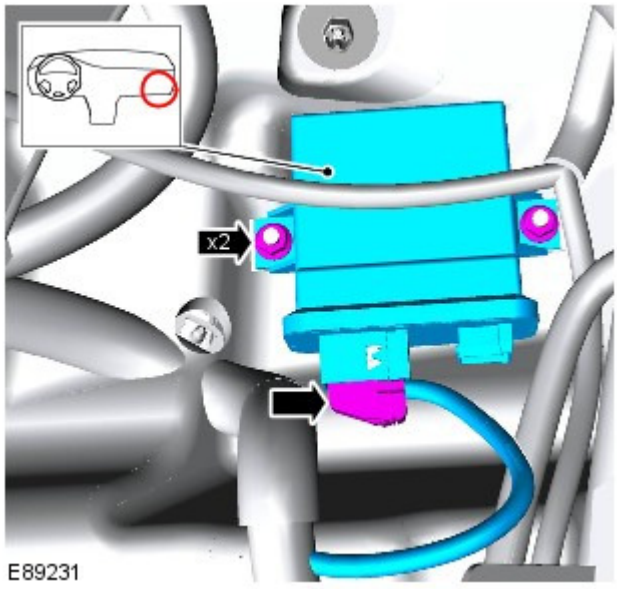
Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Remove the glove compartment.

   Refer to: Glove Compartment (501-12 Instrument Panel and Console, Removal and Installation).



2. *Torque:* 7 Nm

Installation

1. To install, reverse the removal procedure.

2. Using the Land Rover approved diagnostic system, calibrate a new module.

Published: 11-May-2011

Exterior Lighting - Trailer Module

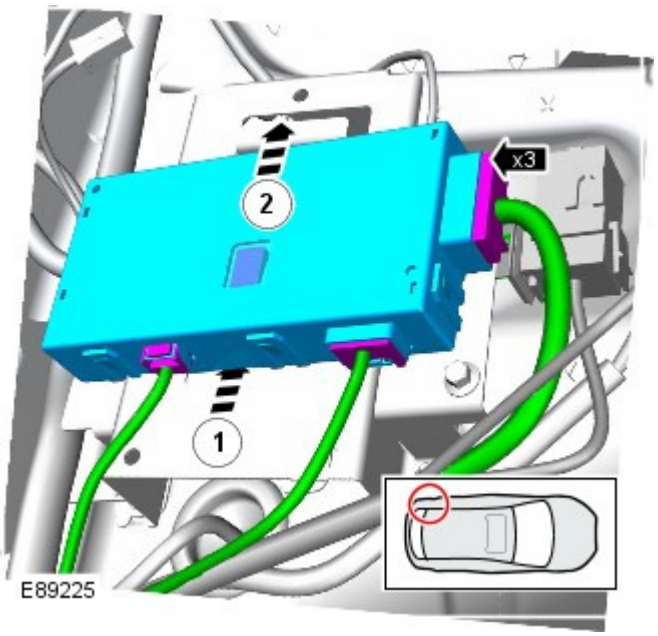
Removal and Installation

Removal

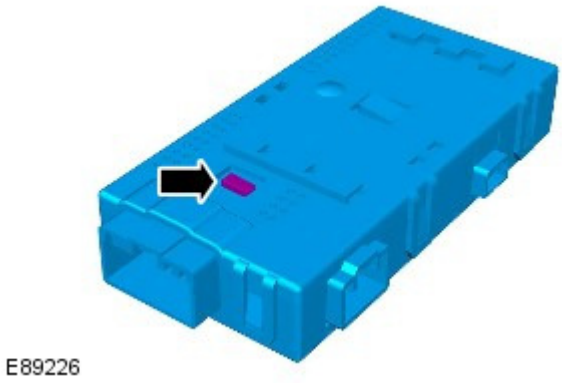
NOTE: The trailer module is fitted with a replaceble fuse.

1. Remove the LH rear quarter trim panel.

   Refer to: Rear Quarter Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).



2. Remove the trailer module.



3. NOTE: Do not disassemble further if the component is removed for access only.

   Remove the fuse.

Installation

1. To install, reverse the removal procedure.

2. Using the Land Rover approved diagnostic system, calibrate a new module.

Published: 11-May-2011

Exterior Lighting - Stoplamp Switch

Removal and Installation

Removal

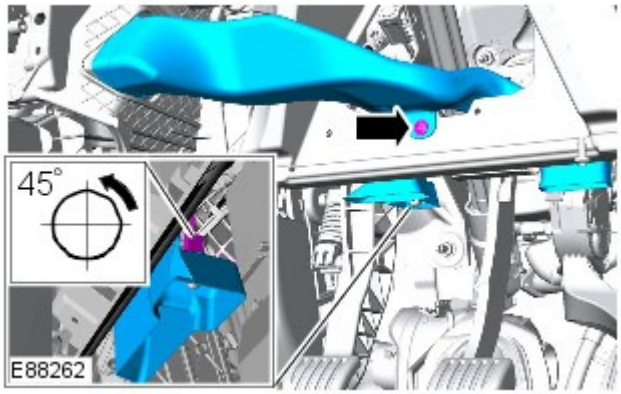
Right-hand drive vehicles

1. Remove the cover and disconnect the battery ground cable.

   Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

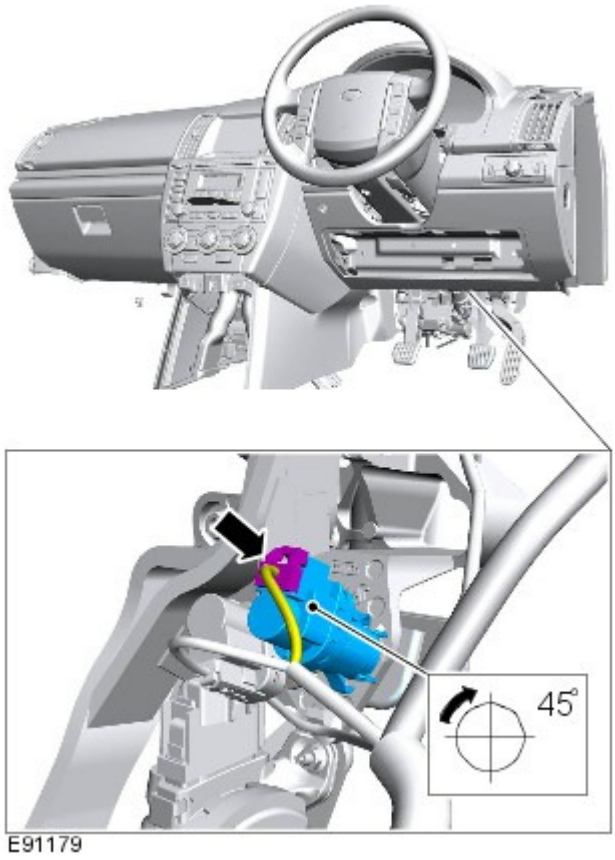
2. Remove the driver lower air bag.

   Refer to: Driver Lower Air Bag Module (501-20B Supplemental Restraint System, Removal and Installation).



3.

All vehicles



4. CAUTION: The switch has a latching device that only allows the switch to be removed or installed when the switch plunger is depressed.

   NOTE: RHD illustration shown, LHD is similar.

Installation

1. To install, reverse the removal procedure.