

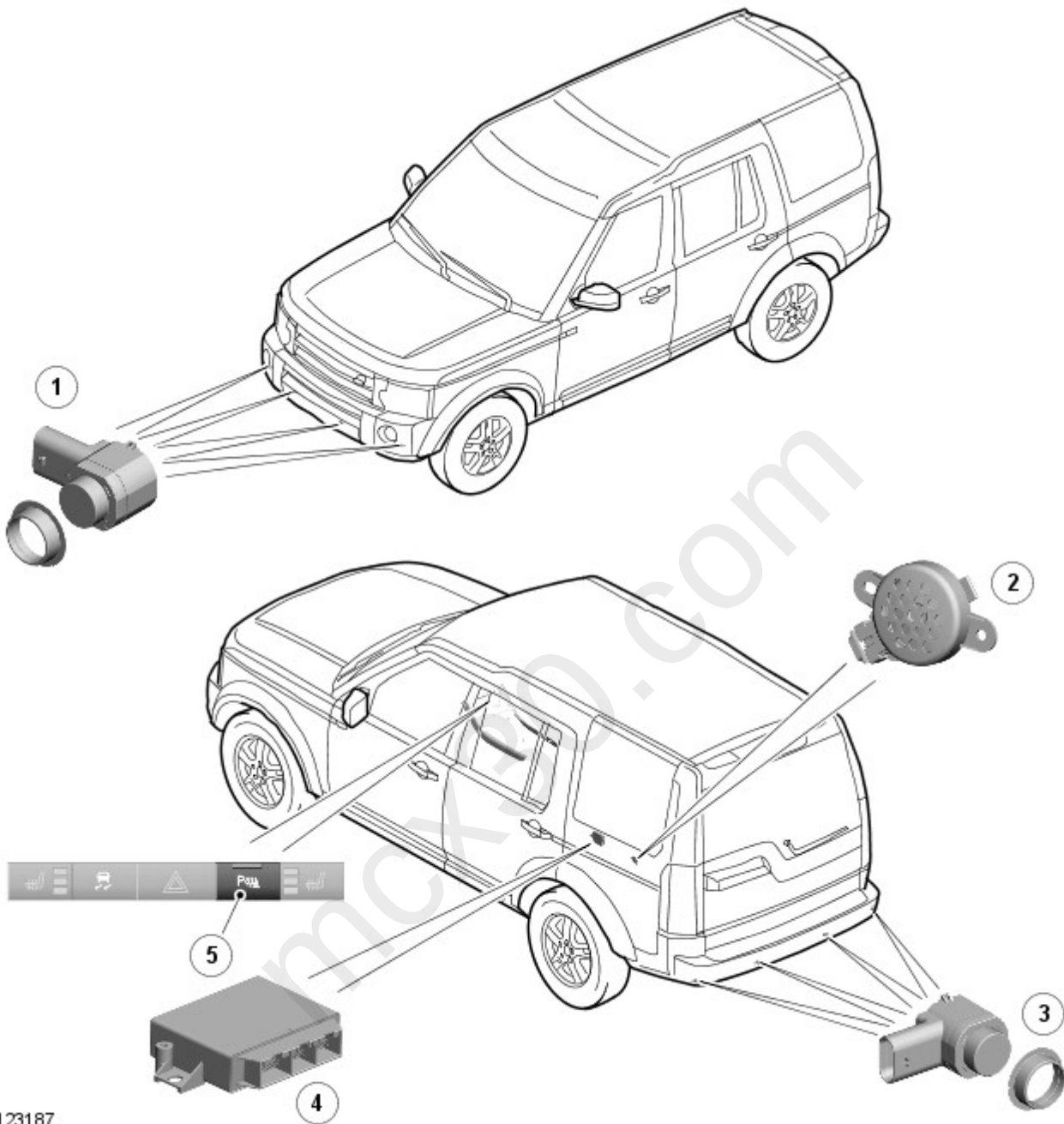
Parking Aid -

Description	Nm	lb-ft
Parking aid module nuts	5	4

Parking Aid - Parking Aid

Description and Operation

Parking Aid Component Location



E123187

Item	Part Number	Description
1	-	Front sensors
2	-	Parking aid sounder
3	-	Rear sensors
4	-	Parking aid module
5	-	Parking aid switch

OVERVIEW

A proximity camera system has been introduced as an optional fit. The system provides additional guidance to the driver when maneuvering at low-speeds and parking the vehicle. The proximity camera system is discussed in detail after the 'Parking Aid' section.

The camera system has also been developed to aid the driver when towing and reversing a trailer; refer to 'Tow Assist' for further information.

PARKING AID OVERVIEW

The parking aid provides an audible warning to the driver when any obstacles are in the path of the vehicle during a forward (if front sensors fitted) or reversing maneuver. The purpose of the system is to assist the driver when parking or

maneuvering in restricted space. It is not designed as a crash avoidance system or a replacement for visual interpretation by the driver.

The parking aid system is not standard on all vehicles and some vehicles may be fitted with rear sensors only. Higher specification vehicles may be fitted with both front and rear sensors.

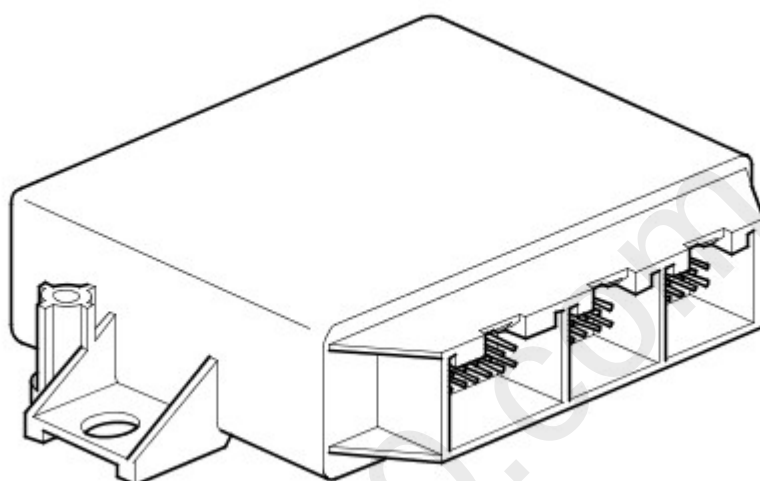
The system comprises 4 ultrasonic sensors in the rear bumper, 4 ultrasonic sensors in the front bumper (if fitted), a control module, a fascia mounted control switch, a rear sounder unit and a front sounder unit (integral with the instrument cluster).

The system operates using ultrasonic signals which are transmitted by the sensors. The reflected echo from this output is received by the sensors and used by the parking aid module to calculate the distance from an object.

The fascia mounted switch allows the driver to deactivate the rear and front (if fitted) parking aid system, if operation is not required.

Parking Aid Module

The parking aid module is located in the rear left hand side of the luggage compartment, behind the side trim panel.



E44157

The parking aid module uses a single microprocessor to perform the following tasks:

- Control of the ultrasonic sensors
- Monitoring of the sensors
- Evaluation of received echo signals from the sensors
- Noise and disturbance suppression
- Control of the parking aid sounders
- Monitoring of the sounders and associated wiring
- Control and monitoring of the switch status **LED (light emitting diode)** and associated wiring
- Evaluation and monitoring of the control inputs
- Management of diagnostic and test functions
- Monitoring of power supply
- Communication via diagnostic link.

Inputs and Outputs

Three connectors on vehicles with front and rear sensors and two connectors on vehicles with rear sensors only provide the interface between the parking aid module and the external parking aid components.

The module receives inputs from the following:

- Reverse selected - **CAN (controller area network)** message from transmission control module (automatic transmission) or transfer box control module (manual transmission)
- Forward gear selected (not in reverse or neutral) - CAN message from transmission control module (automatic transmission) or transfer box control module (manual transmission)
- Parking aid switch
- Parking brake applied - CAN message
- Trailer fitted - CAN message for **CJB (central junction box)**
- Ignition - power supply

The module outputs signals to the following:

- Sensors - power and ground connections
- Sensors - digital signal - transmit and receive signals
- Rear sounder - varying frequency output
- Front sounder - CAN message to instrument cluster
- Parking aid switch - power supply for switch LED operation

Controller Area Network (CAN) Signals

The parking aid module sends and receives a number of digital signals via the medium speed CAN. The received signals are used for operation of the parking aid system.

The parking aid module receives the messages shown in the following table which are used to control the parking aid system.

Message	Transmitted by
Vehicle speed	ABS (anti-lock brake system) module
Selected gear position - Automatic transmission	Transmission control module
Selected gear position - Manual transmission	Transfer case control module
Electric park brake on/off	Electric park brake module
Vehicle movement status	ABS module
Trailer connected	CJB
Ambient temperature	ATC (automatic temperature control) module
Engine running status	Diesel engine control module
Stored odometer reading	Instrument cluster
Vehicle voltage level	Instrument cluster
Minute counter	Instrument cluster
Car configuration	Instrument cluster
Diagnostic physical request	A Land Rover approved diagnostic system via diagnostic socket
Diagnostic functional request	A Land Rover approved diagnostic system via diagnostic socket
Master configuration identification	Instrument cluster

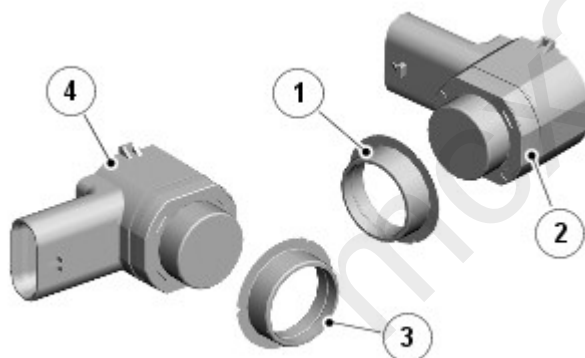
Diagnostics

The parking aid module has a diagnostic connection via the medium speed CAN to enable faults to be retrieved using a Land Rover approved diagnostic system. Additionally, an on-board diagnostic routine within the parking aid module constantly monitors the system and alerts the driver to a system fault by emitting a tone from the front or rear sounder, depending on the fault.

If a parking aid system fault has occurred, the parking aid module will relay the occurrence of the fault to the driver in the following ways:

- The status LED will flash at a frequency of 2Hz if the system is active and fault is detected in the sensors, sounders, related wiring or the module.
- The front sounder will emit an error tone for 3 seconds at a frequency of 1500Hz if a fault is detected with the front sensors or the rear sounder develops a fault.
- The rear sounder will emit an error tone for 3 seconds at a frequency of 1500Hz if a fault is detected with the rear sensors, the switch, the LED in the switch or if there is a CAN bus error.

Sensors



E125149

Item	Part Number	Description
1	-	Front sensor housing
2	-	Front sensor
3	-	Rear sensor housing
4	-	Rear sensor

Four sensors are positioned in the rear bumper and the front bumper (if fitted). Each sensor housing has two raised location keys which locate in corresponding grooves in the bumper mounting hole and sets the correct orientation for the sensor bodies. The housings are clipped into the bumper from the front. The sensors are then clipped into the housings from the rear.

Each sensor has a three pin connector which connects into a common harness linking all four sensors. This harness is connected to the main vehicle body harness for the rear sensors or the engine compartment harness for the front sensors. The three pins are for sensor negative and positive feeds and a signal line.

Each sensor comprises a plastic housing which contains a piezoelectric disc. The disc resonates at a frequency of 38.4 kHz, producing an ultrasonic signal output. The disc also receives the reflected echo signal.

The parking aid module controls the operating mode of each sensor by the output of a digital signal on the signal line. Each sensor has two modes of operation; combined transmitter and receiver mode or receiver mode only.

In the combined mode, the sensor emits a series of ultrasonic impulses and then switches to receiver mode to receive the echo reflected by an obstacle in the detection range. These echo signals are amplified and converted from an analogue signal to a digital signal by the sensor. The digital signal is then transmitted to the parking aid module and compared with

preprogrammed data stored in an [EEPROM \(electrically erasable programmable read only memory\)](#) within the module. The module receives this data via the signal line from the sensor and calculates the distance to the obstacle according to the elapsed time between the transmitted and received impulse. The duration of the impulse transmission is determined by the module. The frequency of the impulse is determined by the sensor.

In the receiver mode, the sensor will receive impulses that were emitted by adjacent sensors. The module uses this information to precisely determine position and distance of the obstacle.

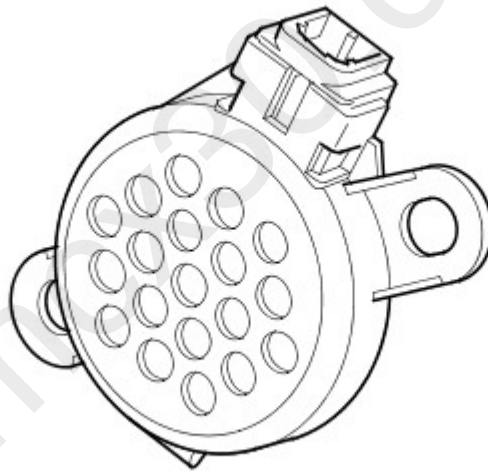
Parking Aid Switch



E 122823

The parking aid switch, located in the center console, is non-latching with an integral LED. The switch receives a 12V output to drive the LED when required. The switch is also connected to ground. When the switch is operated, the momentary completion of the ground is interpreted by the parking aid module as a signal to enable or disable the parking aid system.

Parking Aid Sounder



E44161

The parking aid sounder is controlled by the parking aid module and emits a series of tones of varying frequency to inform the driver of the distance between the vehicle and a detected object.

The rear parking aid sounder is located in the left-hand side of the luggage compartment, behind the side trim panel, below the window. The sounder is secured with two, self tapping screws into the body. The sounder is connected to the parking aid module via a harness connector.

The front parking aid uses the instrument cluster sounder and is activated by CAN messages from the parking aid module to the instrument cluster.

PARKING AID OPERATION AND DISTANCE CALCULATION

On vehicles with rear only parking aid sensors, when reverse gear is selected, the parking aid sensors are automatically activated. The parking aid module only activates the system if reverse is selected for more than 1 second. This avoids nuisance audible warnings when the gear selector lever is being moved between Drive and Park.

When the rear system is activated, the parking aid module illuminates the indicator LED in the parking aid switch, switches on the ultrasonic sensors and generates a single chime on the parking aid sounder to indicate the system is active. If an object is in the range of the sensors when the system is activated, a series of audible warnings are emitted by the parking aid sounder immediately.

If parking aid operation is not required, it can be suspended temporarily by pressing the parking aid switch. On vehicles with rear only parking aid sensors, the system can be enabled again by pressing the switch again or switching the ignition

'off' then 'on'. The parking aid will then automatically become active again in reverse gear. The system also remains on when going from reverse gear to neutral. The assumption being that the driver may still want to manoeuvre the vehicle going backwards in neutral.

The parking aid module receives a signal on the CAN from the CJB when a trailer is fitted. When this signal is detected, the parking aid module suspends operation of the rear parking aid sensors.

On vehicles with front and rear systems, the front system is activated when the ignition is 'on', the vehicle is out of Park and the EPB (electronic parking brake) is off. If the vehicle speed subsequently goes above approximately 10 mph (16 km/h), the front system will switch off. When the speed drops below approximately 6 mph (16 km/h), the front system activates again. If the EPB is applied or Park is selected, the Parking Aid system is deactivated.

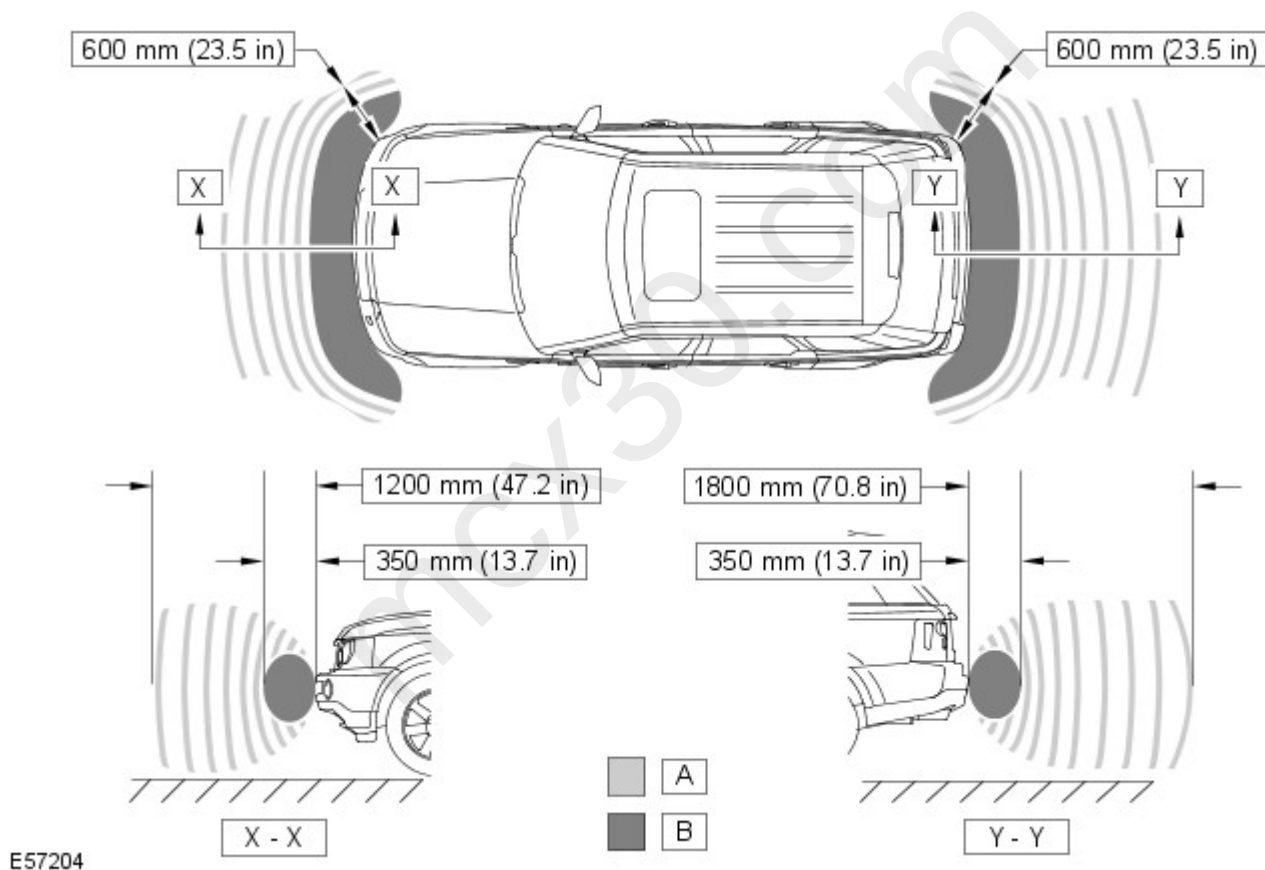
Sensor Operation

The parking aid module processes the distance readings from the ultrasonic sensors to determine if there are any objects within the detection areas. If there are no objects in the detection areas, there are no further audible warnings. If an object is detected, repeated audible warnings are produced on the parking aid sounder.

The maximum detection range is 1800 mm (70 in). When an object is detected, the time delay between the audible warning tones decreases as the distance between the detected object and the vehicle decreases until, at approximately 350 mm (13.7 in), the audible warning tone is continuous.

After the initial detection of an object, if there is no decrease in the distance between an object and the central sensors, the time delay between the audible warnings remains constant. If an object is detected by one of the corner sensors only, the audible warnings stop after about 5 seconds if there is no change in the distance between the object and the corner sensor.

Detection Area



Item	Part Number	Description
A	-	Intermittent Warning Tone
B	-	Continuous Warning Tone

Detection Calculation

When operating in the combined transmitter and receiver mode, the sensor outputs a number of ultrasonic pulses and receives the reflected echo signal. The parking aid module amplifies the received echo signals and compares them with a preprogrammed threshold to calculate the distance to the object. This is achieved by determining the elapsed time between the transmission and reception of the ultrasonic signal.

When operating in receiver mode, the sensor receives echo signals transmitted by an adjacent sensor. This mode is used to improve the accuracy of the system.

The detection cycle consists of the parking aid module operating one sensor in the combined transmitter and receiver mode and transmitting a number of ultrasonic pulses. The module then switches the transmitting sensor and the adjacent sensor(s) to receiver mode. After a short time delay, this sequence is repeated using a different sensor to transmit the ultrasonic pulse and continues until all four sensors have output an ultrasonic signal. This sequence is completed in 100ms. The module uses several measurements of the same sensors to remove errors from the calculation.

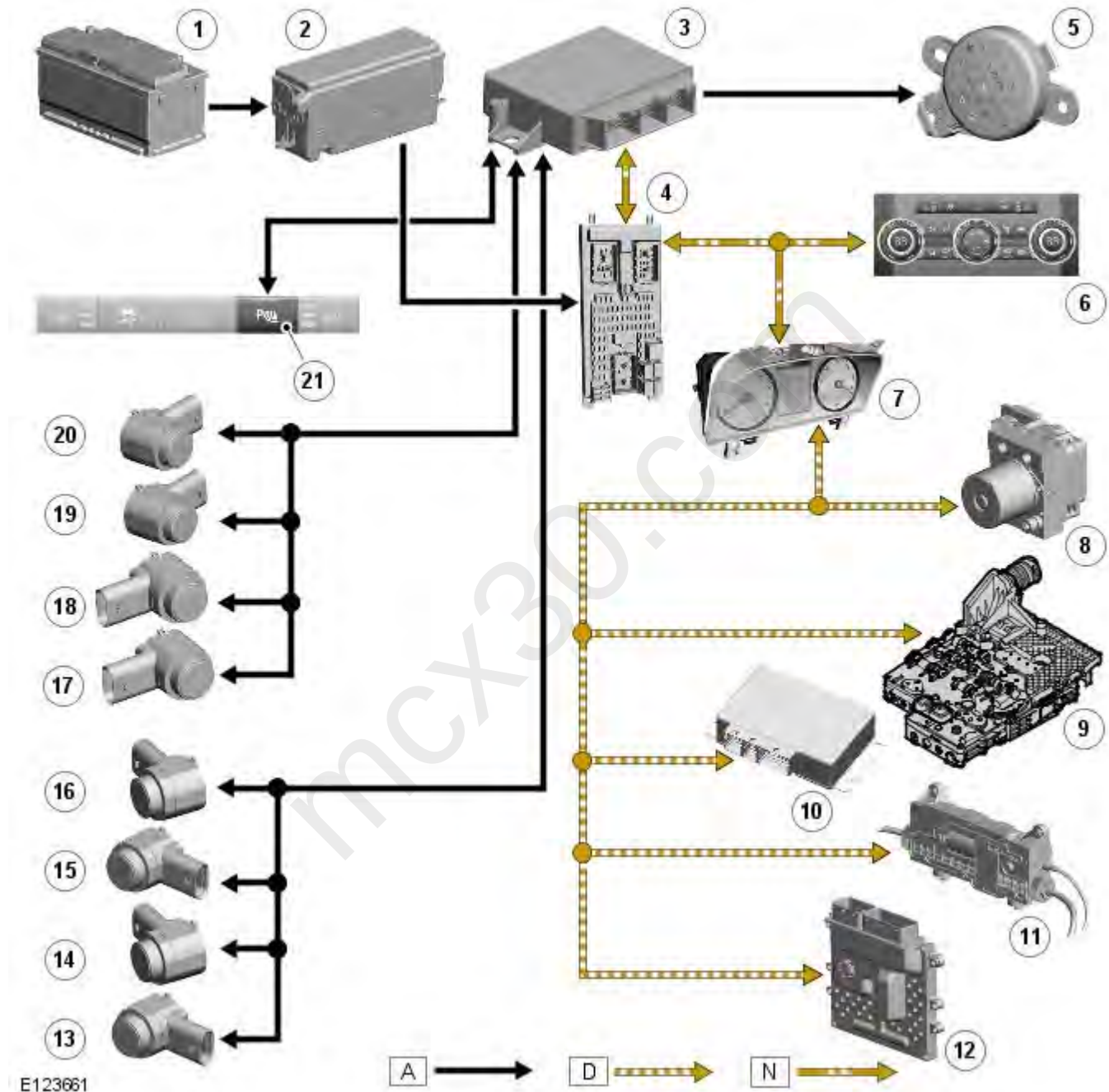
If the object is directly behind a sensor, the distance is calculated using the time between the transmission and reception of the signal. If the object is positioned between two sensors, the parking aid module uses both signals to determine the correct distance using triangulation.

To perform the triangulation calculation, the parking aid module must know the distance between the individual sensors in the bumper. This information is stored in the module memory. From the received distance from each sensor and using the known distance between adjacent sensors, the module can calculate the minimum distance from the vehicle to the object.

When approaching several objects, the module recognizes the distance from the vehicle to the nearest object.

CONTROL DIAGRAM

• NOTE: **A** = Hardwired; **D** = High Speed CAN Bus; **N** = Medium Speed CAN Bus

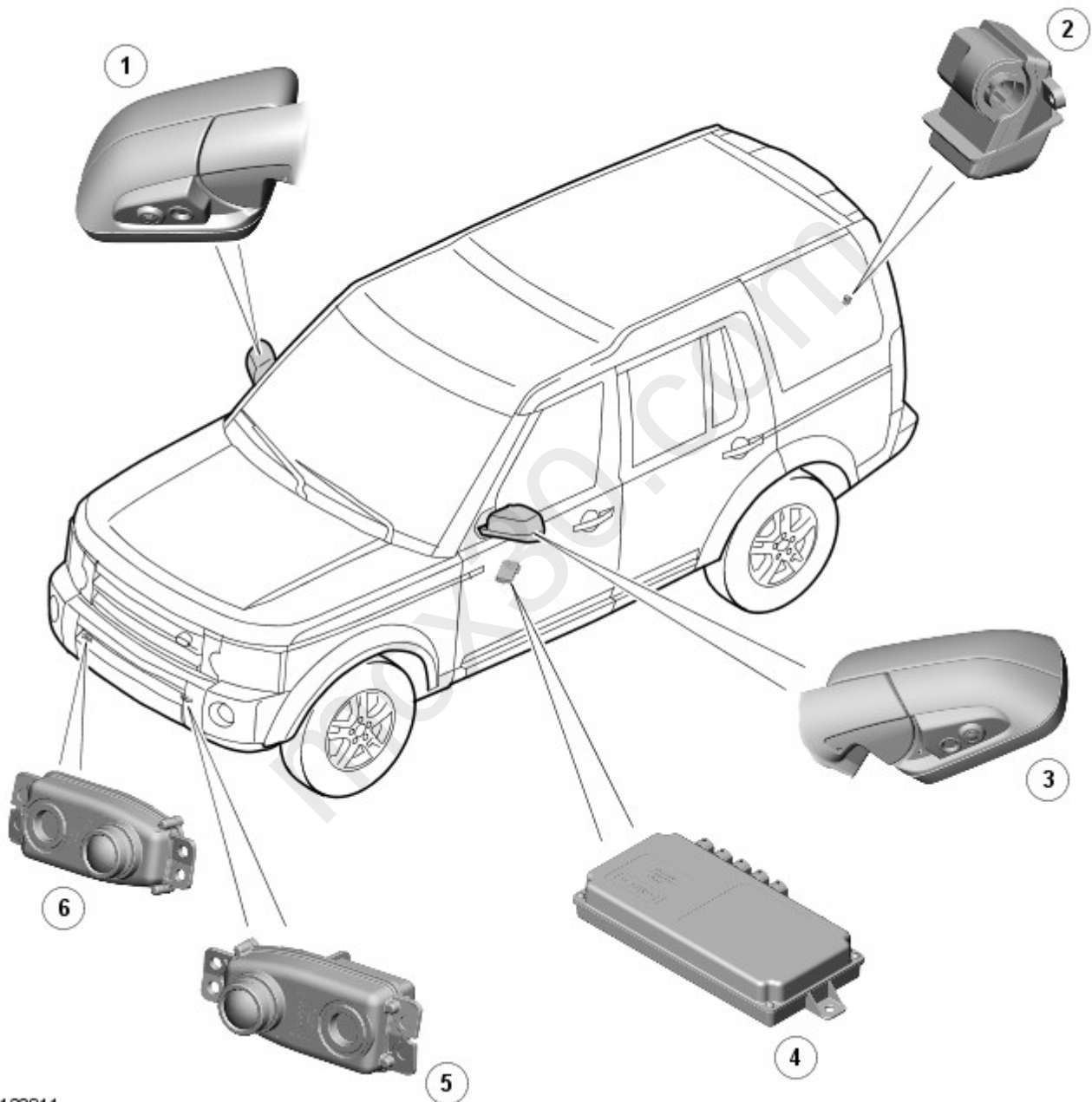


Item	Part Number	Description
1	-	Battery
2	-	Battery Junction Box (BJB)
3	-	Parking aid module
4	-	Central Junction Box (CJB)
5	-	Rear parking aid sounder
6	-	Automatic Temperature Control (ATC) module
7	-	Instrument cluster
8	-	ABS module
9	-	Transmission control module
10	-	Transfer box control module
11	-	Electric park brake module

12	-	Engine control module
13	-	Left outer front sensor
14	-	Left inner front sensor
15	-	Right inner front sensor
16	-	Right outer front sensor
17	-	Left outer rear sensor
18	-	Left inner rear sensor
19	-	Right inner rear sensor
20	-	Right outer rear sensor
21	-	Parking aid switch

PROXIMITY CAMERA SYSTEM

Proximity Camera Component Location



E123811

Item	Part Number	Description
1	-	Right-hand mirror camera
2	-	Rear view camera
3	-	Left-hand mirror camera
4	-	Control module
5	-	Left-hand-front bumper camera
6	-	Right-hand-front bumper camera

OVERVIEW

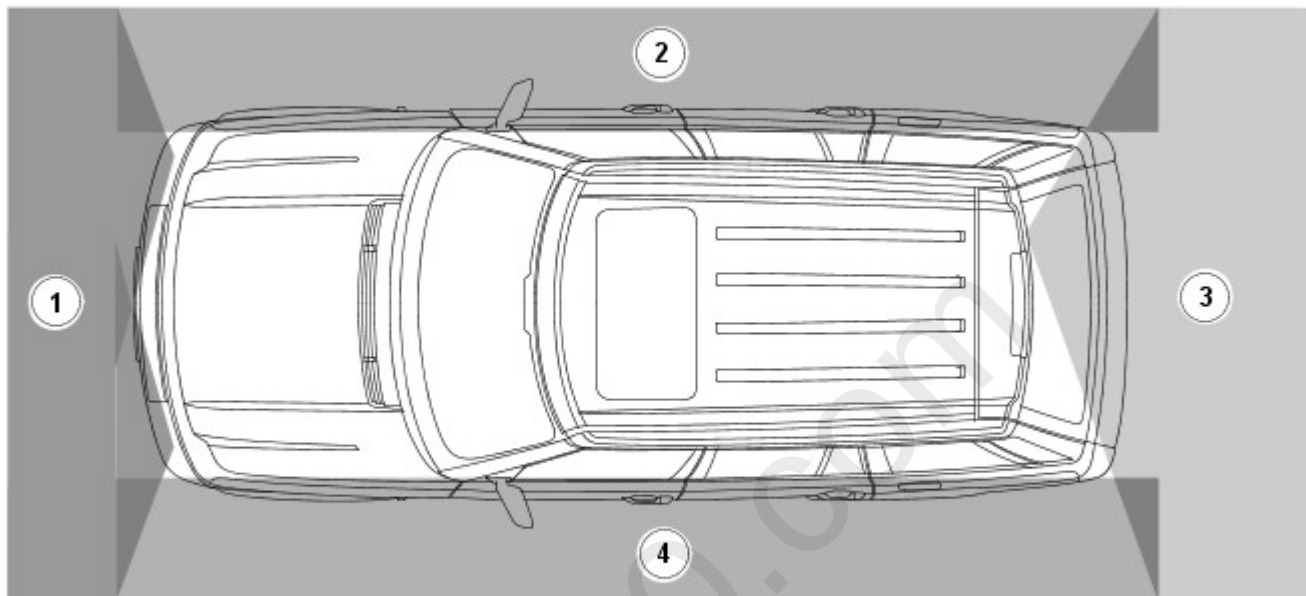
The proximity camera system provides the driver with a visual-aid when maneuvering the vehicle at low speeds. The

system uses a dedicated control module to capture the camera data and display the resulting images on the TSD (Touch Screen Display), providing the driver with a 360° view around the vehicle. The camera system is also supported by various driving-aid features where graphical information and warnings are superimposed onto the images displayed on the TSD.

The proximity camera system uses five VGA (Video Graphic Array) resolution cameras:

- two mounted in the front bumper
- one mounted in each door mirror
- one mounted in the rear tailgate handle assembly.

Camera Coverage Zones

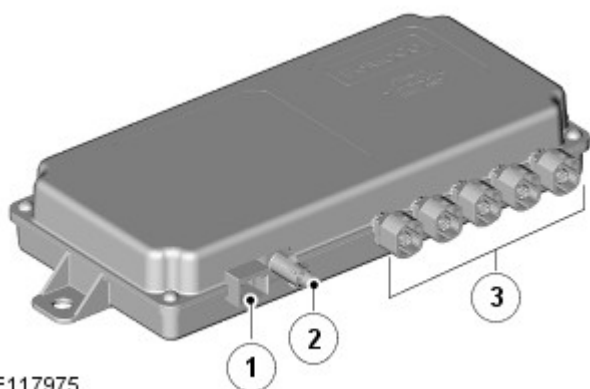


E117972

Item	Part Number	Description
1	-	Front camera coverage zone
2	-	Right-hand mirror camera coverage zone
3	-	Rear camera coverage zone
4	-	Left-hand mirror camera coverage zone

SYSTEM DESCRIPTION

Proximity Camera Control Module



E117975

Item	Part Number	Description
1	-	Power supply, ground and BUS connector
2	-	Connection to touch screen display
3	-	Five camera connections

The proximity camera control module is located under the left-hand-front seat; connections to the module include:

- medium speed CAN network
- five camera inputs
- video signal output to the TSD
- power supply and ground.

The control module gathers the camera images and analyses and alters them by adjusting perspectives and applying corrections. The resulting processed images are then relayed to the touch screen display via the NTSC (National Television System Committee) analogue video line.

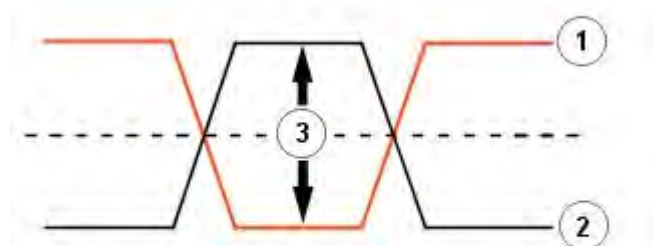
The control module also adds guidance and warning overlays to the camera images to create the various driving-aid features supported by the camera proximity system; for example, visual direction is made available when reversing the vehicle.

The module communicates with each individual camera via the LIN (local interconnect network) bus connection. This data link transmits diagnostic information, for example camera serial numbers and fault notifications to the control module. Camera adjustments, for instance a correction to color-balance are also communicated via the LIN bus link to the camera.

Image signals are relayed to the control module via the LVDS (Low Voltage Differential Signal) lines. The system uses the LVDS communication protocol to enable fast, interference-free data transmission. Data transmission speeds run in the region of 800 Mbps, this however is dependant on image content.

This LVDS communication link features a twisted pair of wires carrying a 'high' signal and a 'low' signal, similar to the high speed CAN with regard to a 'mirrored' signal. The voltage differential level operates between 250 - 450 mV.

LVDS Signal



E118323

Item	Part Number	Description
1	-	LVDS 'low' signal
2	-	LVDS 'high' signal
3	-	250 – 450 mV Differential

In addition to the data lines the camera receives a power supply and a ground from the control module.

- NOTE: Care must be taken when routing, disconnecting and reconnecting the camera harnesses.

Cameras

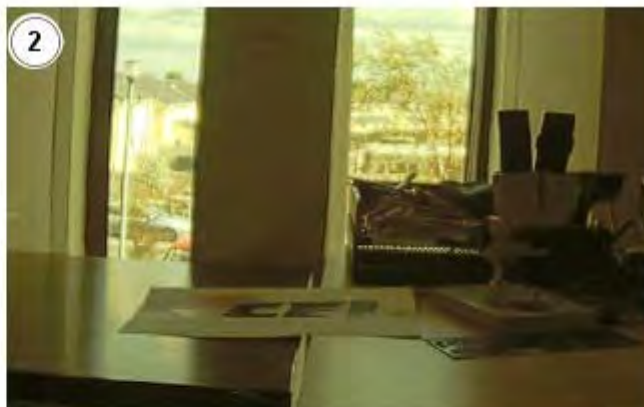


E117977

The system uses five VGA resolution cameras, permanently powered whenever the ignition is 'on'. Each camera provides an image covering a zone approximately 130° wide by 112° deep and is capable of capturing approximately thirty frames per second.

The cameras employ high-quality digital, HDR (High Dynamic Range) imaging, which is a set of techniques that allows a greater range of luminance between light and dark areas of an image scene. This allows HDR to more accurately represent the varying intensity levels found in the image scenes that can range from direct sunlight to deep shadows.

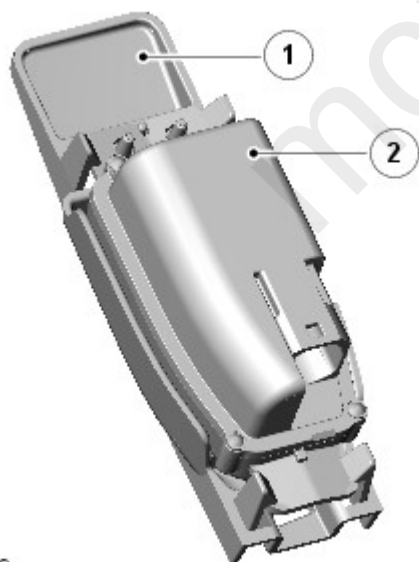
HDR Image Comparisons



Item	Part Number	Description
1	-	Shadow without HDR
2	-	Shadow with HDR
3	-	Sunlight without HDR
4	-	Sunlight with HDR

• NOTE: Reversing lights are crucial to successful night operation of the rear view camera.

Camera mounting



E117979

Item	Part Number	Description
1	-	Camera 'break free' bracket
2	-	Camera

To reduce the cost of accident repair the mounting of the front bumper cameras feature a 'snap free' bracket. On impact, the bracket will release the camera preventing damage to the camera itself. Depending on the severity of the accident it may also be possible to reuse the brackets as they are manufactured from a memory type plastic.

The front cameras are not 'handed' so therefore interchangeable. This is also applicable for the door-mirror cameras, although these cameras do feature the approach lighting LED integral within the camera body.

The positioning accuracy of all the cameras is crucial for the successful operation of the proximity camera system. The

camera housings are manufactured using metal to maintain a structural stability in high-ambient temperatures. Without this stability a loss of image focus would be a possibility, therefore care must be taken when mounting the cameras in ensuring they sit correctly into their locations. Secure mounting of the cameras provides an initial 'build up' tolerance accurate to 2mm. In the event of camera replacement a calibration routine must be performed.

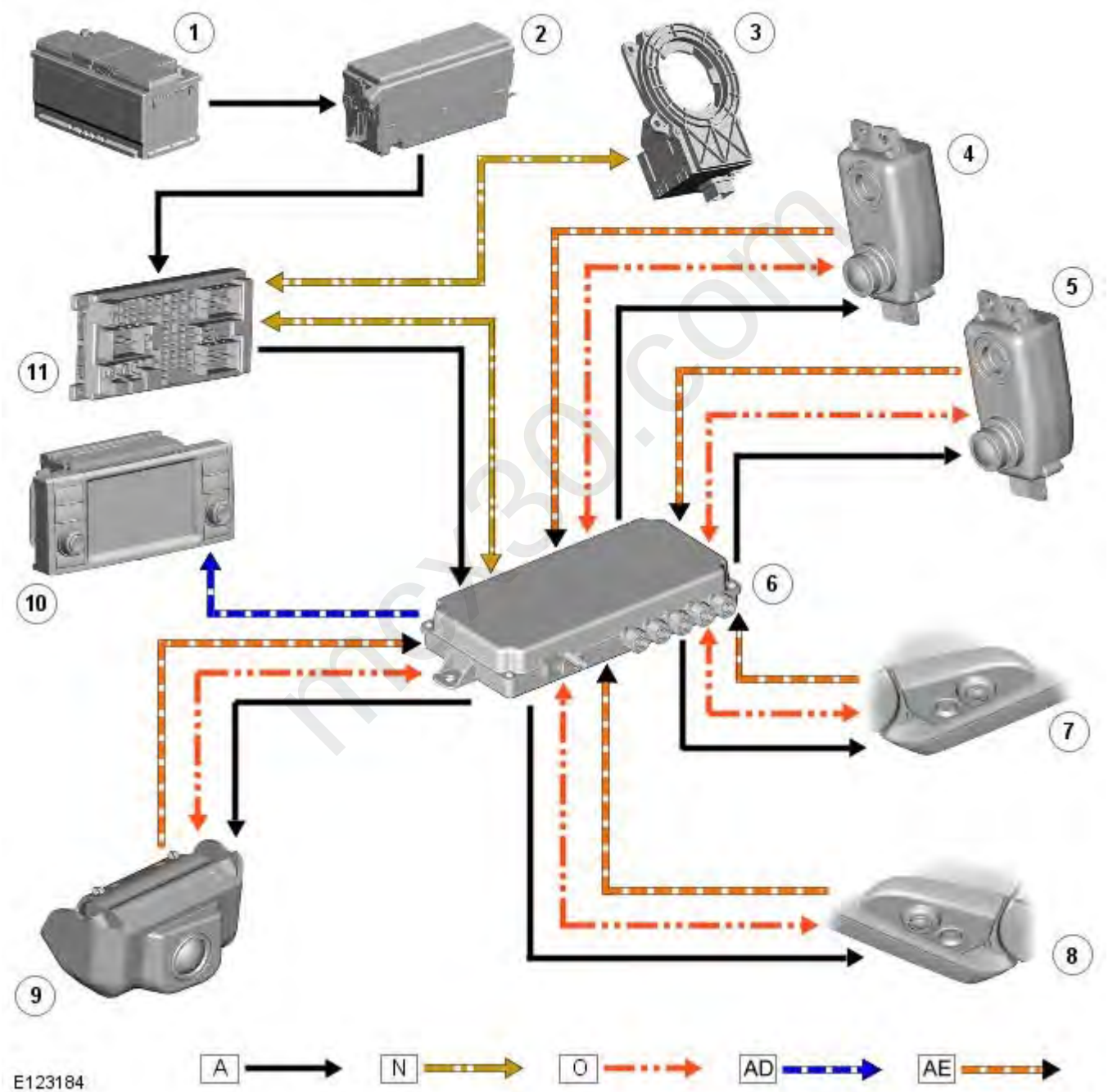
Camera obstruction detection

In the instance of soiling of the camera lens, the system has the capability to detect obstructions and notify the driver that the lens requires cleaning via a prompt in the TSD. The obscured camera scene is highlighted with an amber arrow.

Camera obstruction detection operates by the system looking for non-moving particles on the captured image. The level of obstruction has to reach approximately 85% coverage of the lens before the obstruction notification is issued. To achieve this level of obstruction at the camera, the general vehicle soiling level will be very high and therefore obstruction of the camera is to be expected.

CONTROL DIAGRAM

• NOTE: A = Hardwired; N = Medium Speed CAN; O = LIN Bus; AD = NTSC Signal; AE = LVDS Signal.



Item	Part Number	Description
1	-	Battery
2	-	BJB (battery junction box)
3	-	Steering wheel angle sensor
4	-	Front bumper camera
5	-	Front bumper camera
6	-	Proximity camera control module
7	-	Mirror camera

8	-	Mirror camera
9	-	Rear view camera
10	-	Touch Screen Display (TSD)
11	-	Central Junction Box (CJB)

SYSTEM OPERATION

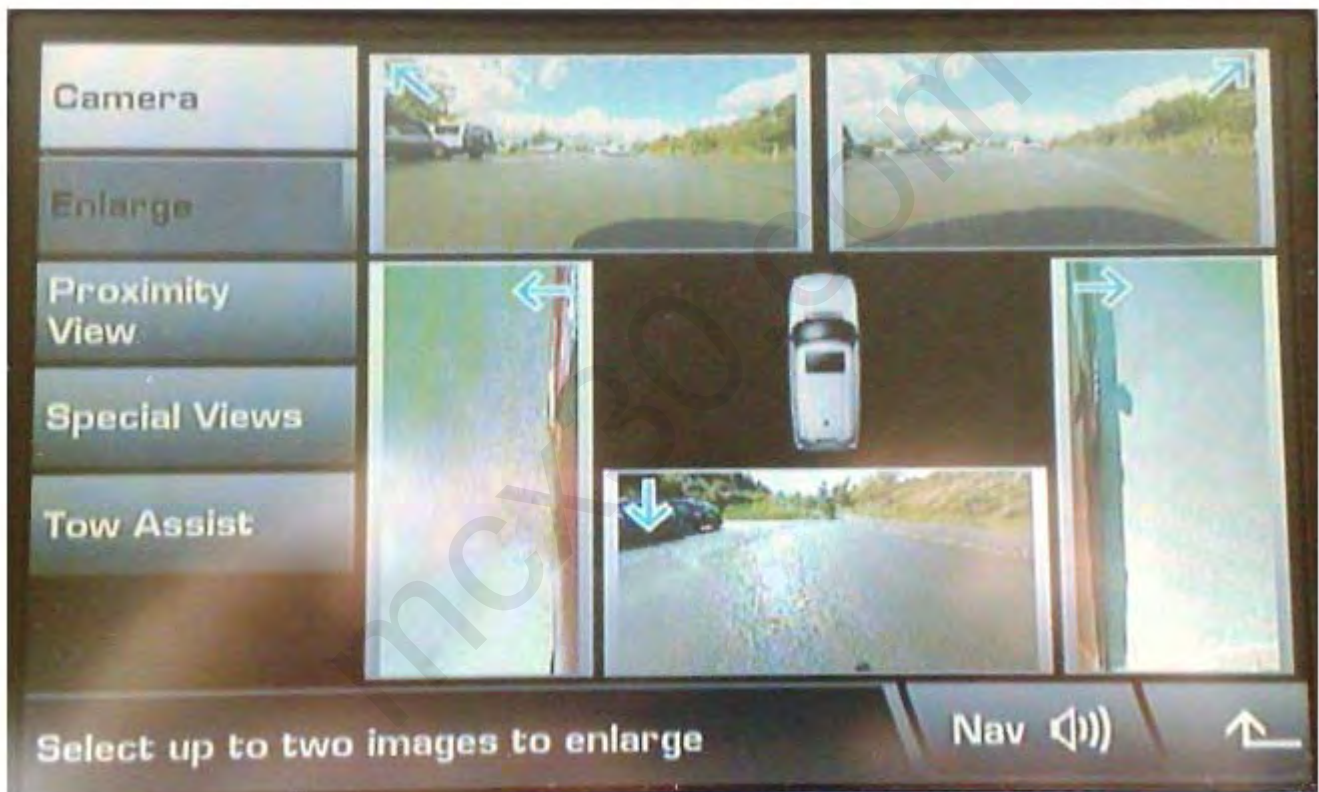
Automatic Operation

- With the ignition 'on' and either 'Park' or 'Neutral' selected the screen displays images of the area surrounding the vehicle.
- When either 'Drive' or 'Reverse' are selected the relevant camera view for the direction of movement is shown.
- Once the vehicle speed exceeds 18 km/h (11 mile/h) the images will automatically switch off.
- Once automatically switched off, the camera view will be disabled until:
 - another ignition cycle occurs and the system is automatically functioned, or
 - the camera system is manually selected on the Touch Screen Display (TSD).

Manual Operation

- The camera home page is accessed using the 'Cameras' icon on the 'Navigation' home screen on the TSD
- Camera views can be accessed when the vehicle is stationary with either 'Park' or 'Neutral' selected.
- Camera views can also be accessed when either 'Drive' or 'Reverse' are selected and will remain viewable when the vehicle is in motion.

Selecting Views



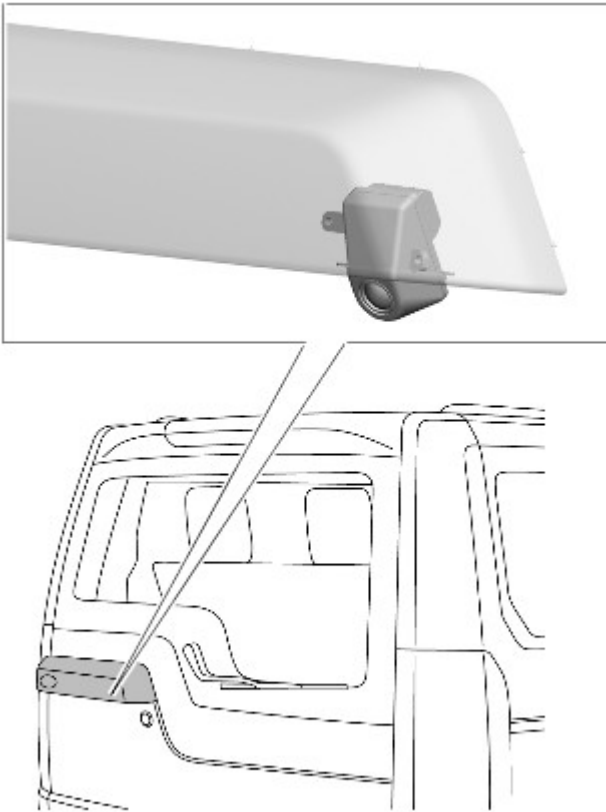
E123183

- Displayed on the home page are real-time images transmitted from each of the five cameras.
- Any two of the images can be selected and enlarged to view side-by-side on the screen.
- When viewing any two images, any single image can then be selected to view as a full screen image which can be zoomed and panned around using the magnifier and arrow icons.

Manual Proximity View

- Selecting proximity view from the camera home screen will display a combination of three images from the front passenger side cameras. These images provide the driver with an enhanced view of the area forward and opposite the driver.

Rear View Camera



E123188

The rear view camera provides additional information to the driver when reversing the vehicle. When reverse gear is selected the camera integrated into the tailgate handle assembly, automatically displays a wide-angle color image of the view from the rear of the vehicle onto the TSD.

The rear view images are overlaid with:

- Dashed lines representing the perimeter of the vehicle.
- Solid lines representing the predicted trajectory of the vehicle; calculated from the steering wheel angle sensor.
- Colored bars represent the amount of distance between the vehicle and the object being approached. Working in conjunction with the standard 'rear parking aid' this adds a visual representation to the existing audible warning. The distance data is received from the parking aid module via the medium speed CAN.

The reversing-aid graphics can be disabled for the current drive cycle in the settings menu.

Reversing Visual Warnings



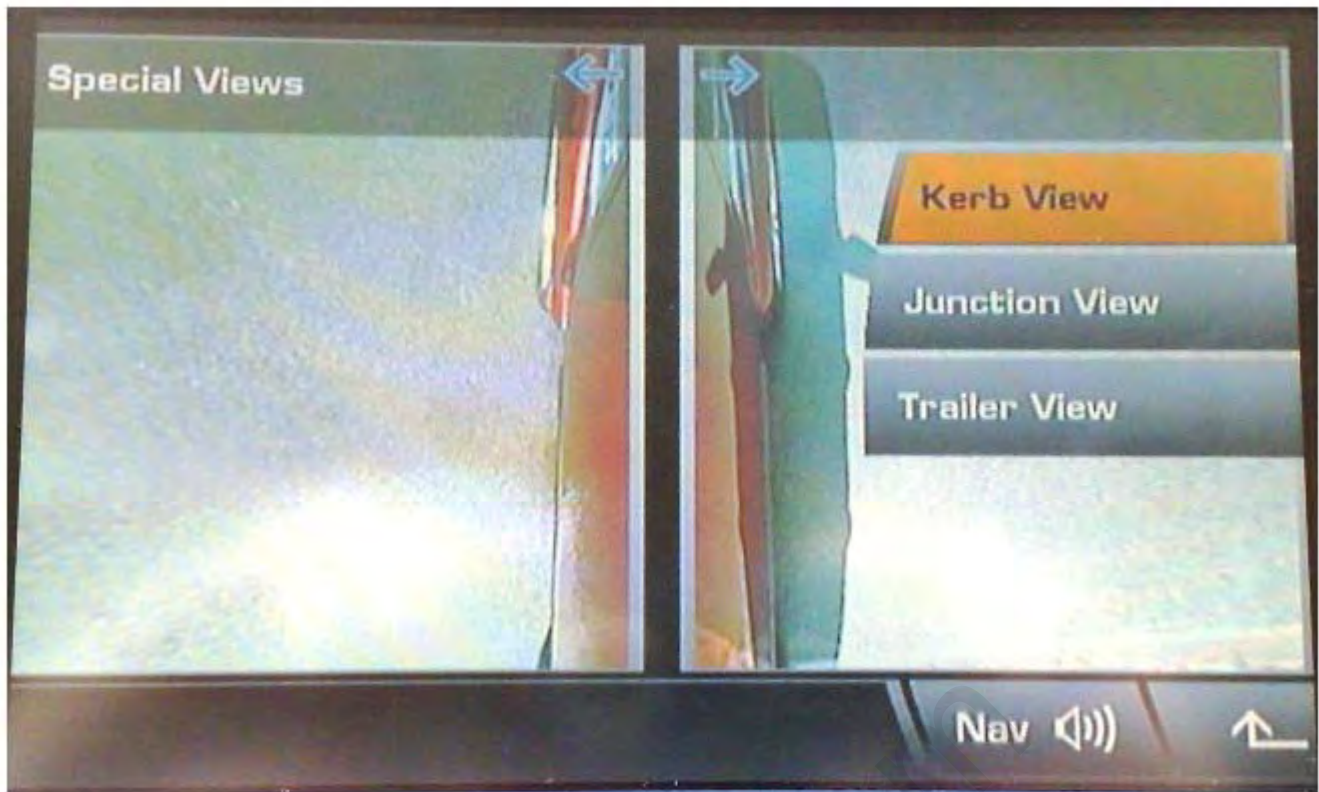
E117982

Item	Part Number	Description
1	-	Object being approached - 'yellow strip' with steady intermittent warning tone
2	-	Object being approached - 'orange strip' with faster intermittent warning tone
3	-	Object being approached - 'red strip' with continuous warning tone

The rear view image will not be displayed when any of the following apply:

- Drive is selected for longer than 15 seconds.
- Drive is selected and the vehicle speed is greater than 18 km/h (11 mile/h).

Special Views



E124989

The special views are a selection of pre-set views that provide the driver with some useful driving aids. These can be considered as a shortcut to some pre-determined images that have been developed to assist the driver in various situations:

- Curb view: downward view from the two door mirror cameras.
- Junction view: outward view from the two front cameras.
- Trailer view: rear camera view of trailer being towed.

System Calibration

To achieve viewing accuracy from the proximity cameras, strict tolerances are calibrated into the system when the vehicle is static. Continual dynamic adaptation of the system then takes place when the vehicle is in motion. This is an automated process performed by the proximity camera control module.

This level of accuracy must be maintained after any service procedures are performed on the vehicle that affects the proximity camera system. Should the control module or any one of the cameras require replacement, static re-calibration must be carried out using the approved Land Rover diagnostic equipment.

Camera replacement is detected by the proximity camera control module, through the recognition of a new serial number during the 'camera count' procedure that takes place during the 'ignition on' phase via the [LIN](#). This detection will log a [DTC \(diagnostic trouble code\)](#) advising a calibration routine should be performed.

Alignment adjustments to the cameras are performed using the diagnostic equipment and the vehicle's TSD (touch screen display). During the calibration procedure, setup software in the control module overlays fine colored lines on the TSD highlighting reference points on the bodywork. For example, the mirror camera image must capture the side repeater indicator, the shut-line of the doors and the lower sill trim.

Direction arrows are pressed to shift the image in the desired direction to meet the reference points viewed on the TSD.

Adjustments include:

- Up
- Down
- Left
- Right
- Rotation

When the reference points correspond exactly, the setting is saved and the calibration procedure is complete for that camera.

• **NOTE:** If body repairs are performed that affect the camera system, a calibration procedure must be executed after the repairs are completed.

System Fault

There are two possible types of fault relative to the cameras:

- Camera fault (no communication).

- Camera view obscured (see 'Camera Obstruction Detection' section for further information).

In the event of camera fault, a [DTC](#) is logged in the proximity camera control module and an icon is presented to the driver on the TSD (touch screen display) where the camera image would normally be viewed.

Each camera view has an orientation icon displayed in the top left hand corner and has two color states:

- Blue – ok
- Amber – camera problem

TOW HITCH ASSIST

The rear view camera provides additional information to the driver when hitching a trailer to the vehicle. When reverse gear is selected the camera integrated into the tailgate handle assembly, automatically displays a wide-angle color image of the view from the rear of the vehicle onto the TSD (touch screen display).

Within the settings menu the driver can activate the Hitch Guidance and Auto-towball Zoom feature. Hitch guidance provides a trajectory line indicating the path of the towball in relation to the steering angle applied to the vehicle. 'Auto-towball Zoom' initiates an automatic image zoom when the trailer is within 60cm of the towball to allow more accurate alignment of vehicle to trailer.



E125150

Item	Part Number	Description
1	-	Touch Screen Display – Auto towball Zoom feature
2	-	Tow ball trajectory line
3	-	Automatic zoom

TOW ASSIST

Tow Assist aids the driver with the reversing of a trailer by displaying information on the TSD (touch screen display).

The system uses a tracking target sticker attached to the trailer to monitor and predict the direction of the trailer. Calculations are made by the proximity camera control module, based on the relationship of angles between the vehicle and trailer and the current steering wheel position.

Tow Assist becomes active when a trailer is attached to the vehicle and the trailer electrical plug is attached to the vehicle socket. The [CJB](#) detects the connection has been made and sends a message via the medium speed [CAN](#) to the proximity camera control module.

• **NOTE:** If the connection is not detected, setup can be manually prompted by touching the 'Tow Assist' icon on the 'Camera' menu.

Tow Assist – New Trailer

When the CJB detects the trailer electrical plug has been connected, the trailer setup screen is displayed automatically on the TSD with the question: 'Has a trailer been connected?'

Selecting 'Yes' will bring up the first of a number of trailer setup screens. On first use the setup screens take the user

through a series of configuration options for the connected trailer. To configure a new trailer select 'Add New' and then 'OK'.

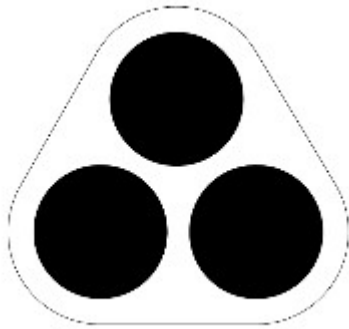
Trailer Setup – Step 1 of 6

- Choose from the list of generic trailer descriptive names for the trailer attached, then select 'Next'.

Trailer Setup – Step 2 of 6

- Position the trailer straight behind the vehicle, to allow more accurate positioning of the target. Stick the self adhesive tracking target to the front of the trailer within the orange highlighted zone as displayed, then select 'Next'.
- The highlighted zone will turn green when the target sticker is correctly positioned.

Tracking target sticker



E125745

Trailer Setup – Step 3 of 6

- Select the correct number of axles for the chosen trailer, then select 'Next'.

Trailer Setup – Step 4 of 6

- Select the preferred camera view for use with this trailer, then select 'Next'.
- **NOTE: The Side Cameras view is more suited to tall and/or long trailers for example caravans. The Reverse Camera view is more suited to small and/or short trailers.**

Trailer Setup – Step 5 of 6

- Using the numeric pad, enter the Hitch Length of the trailer, then select 'Next'.
- **NOTE: Hitch Length is the distance from the hitch point to the pivot point of the trailer. The pivot point will vary depending on the number of axles, and will be:**
 - the center-line of the axle on a single axle trailer,
 - the mid-point between the axles on a twin axle trailer,
 - the center line of the center axle on a triple axle trailer.

Trailer Setup – Step 6 of 6

- Using the distance adjustment buttons, set the orange overlay graphics at the width of the trailer wheels, or trailer edges when a tall trailer is to be used, then select 'Finish'.
- **NOTE: The orange overlay graphics determine the position of the trailer reverse guidance lines.**

A confirmation message will appear to show that the trailer information has been retained.

Finally, highlight the trailer that has been memorized, and select 'OK'.

- **NOTE: In order to learn the central position of the trailer, the vehicle must be driven forwards at less than 15mph with the steering wheel in the straight-ahead position. There is currently no confirmation for when this process has completed, however the status can be derived by selecting Reverse gear and noting the presence of message 'Trailer tracking in progress'. Whilst tracking feature is learning the central position, the trailer trajectory lines will appear in a light blue color, when process is complete they will change to a dark purple color.**

The Tow Assist feature is now ready to use.

Tow Assist – Previously Saved Trailer

When the CJB detects the trailer electrical plug has been connected, the trailer setup screen is displayed automatically on the TSD with the question: 'Has a trailer been connected?'

Selecting 'Yes' from the previous screen brings a list of pre-set, or previously saved, trailers. Highlight the required trailer, and select 'OK'.

- **NOTE: In order to learn the central position of the trailer, the vehicle must be driven forwards at less than 15mph with the steering wheel in the straight-ahead position. There is currently no confirmation for when this process has completed, however the status can be derived by selecting Reverse gear and noting the presence of message 'Trailer tracking in progress'. Whilst tracking feature is learning the central position, the trailer trajectory lines will appear in a light blue**

color, when process is complete they will change to a dark purple color.

The Tow Assist feature is now ready to use.

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Parking Aid - Parking Aid

Diagnosis and Testing

Principle of Operation

For a detailed description of the parking aid system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: [Parking Aid](#) (413-13 Parking Aid, Description and Operation).

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 checked and/or the donor vehicle.

- **NOTE:** Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.
 - **NOTE:** Do not change sensors under warranty that have damage to the sensor face.
1. **1.** Verify the customer concern.
 2. **2.** Ensure that the sensor face is clear of contamination that could effect the performance of the sensor.
 3. **3.** Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
● Sensor condition and installation ● Sounder(s) ● Switch	● Fuses ● Harnesses and connectors ● Sensor(s) ● Parking aid switch ● Parking Aid Module (PAM)

4. **4.** If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
5. **5.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

On-Board Self-test

As part of the strategy of the system, the self-test will inform the driver of any faults by a combination of the LED and tones:

- The status LED will flash if the system is active and a fault is detected in the sensors, sounders, wiring or module
- The front sounder will emit an error tone for 3 seconds if a fault is detected with the front sensors or if the rear sounder develops a fault
- The rear sounder will emit an error tone for 3 seconds if a fault is detected with the rear sensors, the switch, or the LED in the switch, or if there is a Controller Area Network (CAN) bus error

DTC Index

For a list of 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: Parking Aid Module \(PAM\)](#) (100-00 General Information, Description and Operation).

Parking Aid - Parking Aid Camera

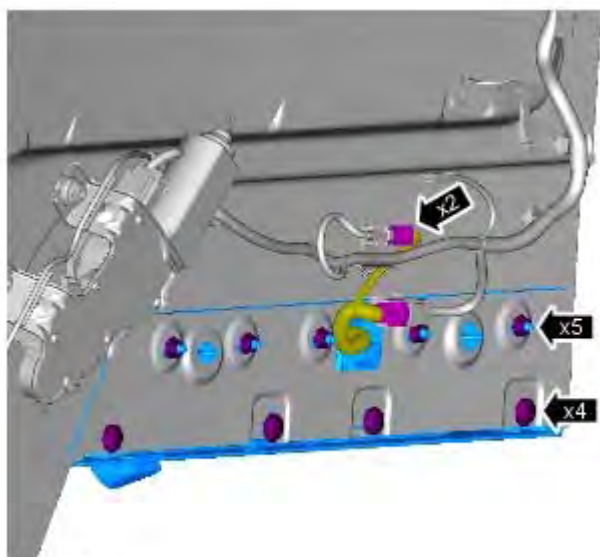
Removal and Installation

Removal

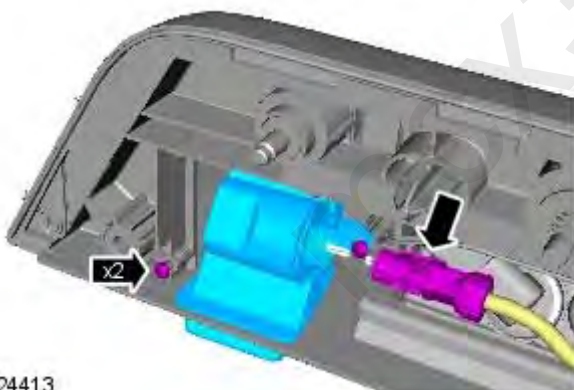
- NOTE: Removal steps in this procedure may contain installation details.
- NOTE: The ignition must be switched off.

1. Refer to: [Liftgate Trim Panel](#) (501-05 Interior Trim and Ornammentation, Removal and Installation).

2. Torque: 10 Nm



E124412



E124413

3.  CAUTION: Take extra care not to damage the wiring harnesses.

Installation

1. To install, reverse the removal procedure.

Parking Aid - Parking Aid Camera Module

Removal and Installation

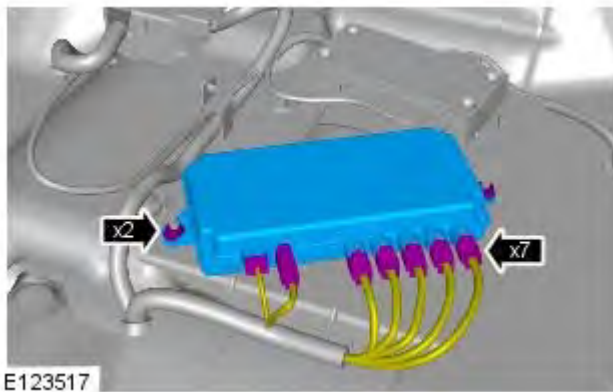
Removal

- NOTE: Removal steps in this procedure may contain installation details.
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Disconnect the battery ground cable.

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

2. Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).



3.  CAUTION: Take extra care not to damage the wiring harnesses.

Torque: 5 Nm

Installation

1.  CAUTION: If a new component has been installed, configure using Land Rover approved diagnostic equipment.

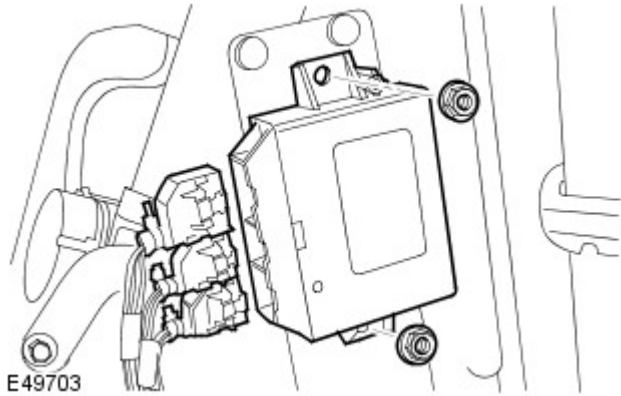
To install, reverse the removal procedure.

Parking Aid - Parking Aid Module

Removal and Installation

Removal

1. Remove the C-pillar lower trim panel.
For additional information, refer to: [C-Pillar Lower Trim Panel](#) (501-05 Interior Trim and Oramentation, Removal and Installation).
2. Remove the parking aid module.
 - Disconnect the 3 electrical connectors.
 - Remove the 2 nuts.



Installation

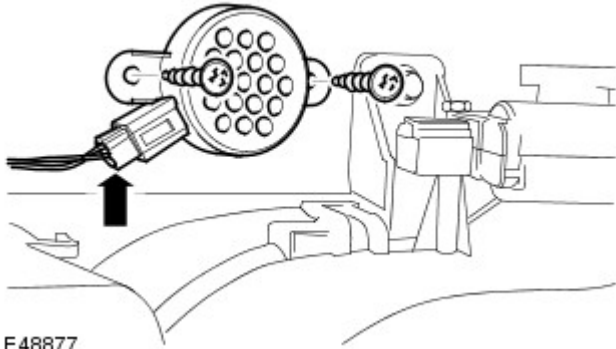
1. Install the parking aid module.
 - Tighten the nuts to 5 Nm (4 lb.ft).
 - Connect the electrical connectors.
2. Install the C-pillar lower trim panel.
For additional information, refer to: [C-Pillar Lower Trim Panel](#) (501-05 Interior Trim and Oramentation, Removal and Installation).

Parking Aid - Parking Aid Speaker

Removal and Installation

Removal

1. Remove the C-pillar lower trim panel.
For additional information, refer to: [C-Pillar Lower Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Remove the loadspace trim mounting bracket.
 - Remove the 2 screws.
 - Release the 2 clips.
3. Remove the rear parking aid speaker.
 - Disconnect the electrical connector.
 - Remove the 2 screws.



Installation

1. To install, reverse the removal procedure.

Parking Aid - Front Parking Aid Camera

Removal and Installation

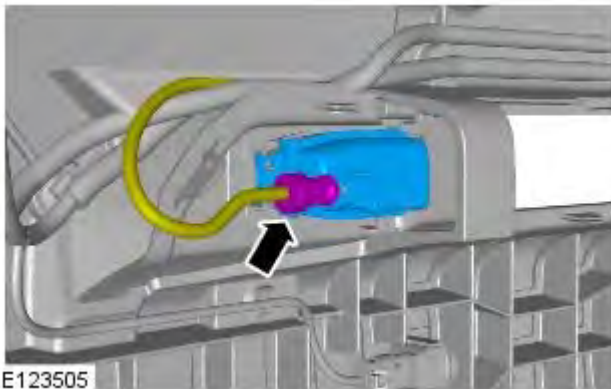
Removal

- NOTE: Removal steps in this procedure may contain installation details.
- NOTE: The ignition must be switched off.

1.  **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Refer to: [Front Bumper Cover](#) (501-19 Bumpers, Removal and Installation).



3. **3. CAUTIONS:**



LH illustration shown, RH is similar.



Make sure that the component is correctly located on the locating dowels.



Take extra care not to damage the wiring harnesses.

Installation

1.  **CAUTION:** If a new component has been installed, configure using Land Rover approved diagnostic equipment.

To install, reverse the removal procedure.

Parking Aid - Front Inner Parking Aid Sensor

Removal and Installation

Removal

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

1. Disconnect the battery ground cable.

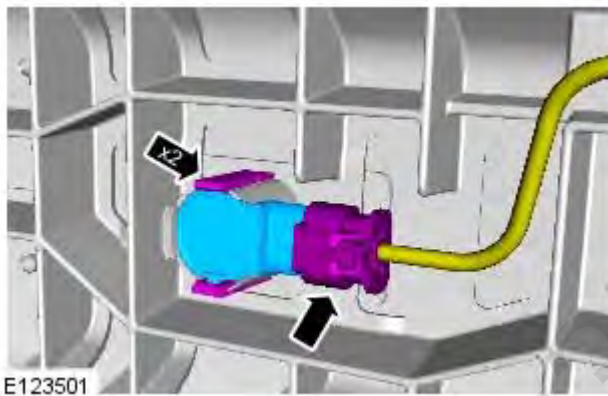
Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

2.  **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

3. Refer to: [Front Bumper Cover](#) (501-19 Bumpers, Removal and Installation).

- 4.



Installation

1. To install, reverse the removal procedure.

Parking Aid - Front Outer Parking Aid Sensor

Removal and Installation

Removal

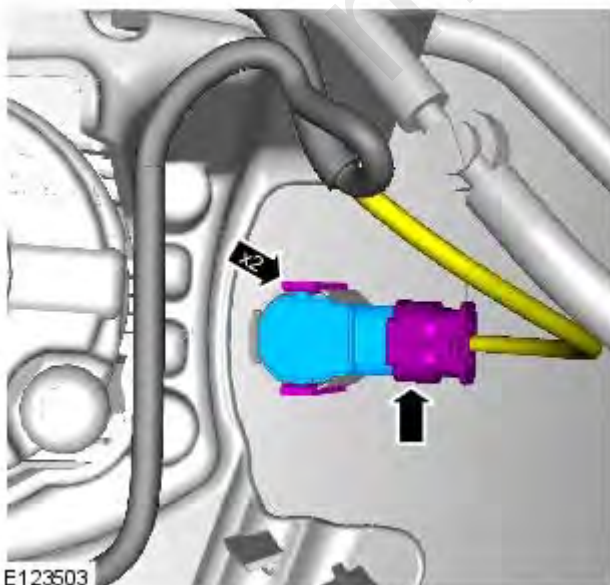
- NOTE: Removal steps in this procedure may contain installation details.
- NOTE: RH illustration shown, LH is similar.
- NOTE: The ignition must be switched off.

1.  **WARNING:** Make sure to support the vehicle with axle stands.

Remove the front wheel and tire.

2. Refer to: [Front Fender Moulding](#) (501-08 Exterior Trim and Ormentation, Removal and Installation).

3. Torque: 1 Nm



- 4.

Installation

1. To install, reverse the removal procedure.

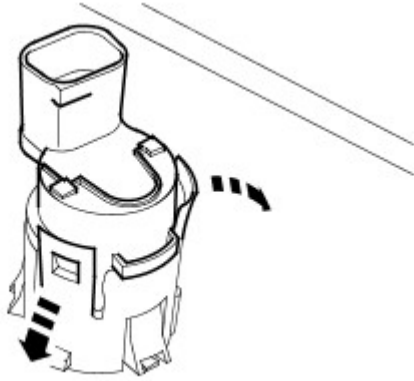
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Parking Aid - Rear Inner Parking Aid Sensor

Removal and Installation

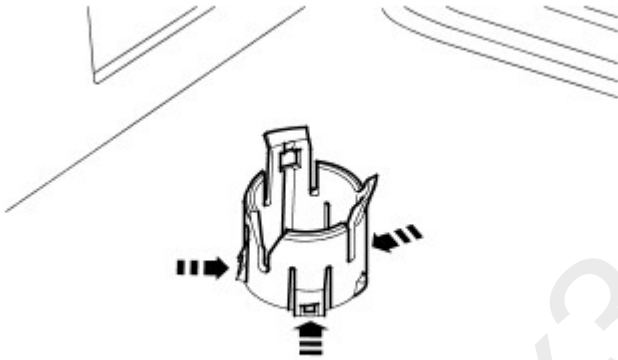
Removal

1. Remove the rear bumper cover.
For additional information, refer to: Rear Bumper (501-19, Description and Operation).
2. Remove the parking aid sensor.
 - Release the 2 clips.



E45116

3. Remove the parking aid sensor trim panel.
 - Release the 3 clips.



E45117

Installation

1. Install the parking aid sensor trim panel.
2. Install the parking aid sensor.
3. Install the rear bumper cover.
For additional information, refer to: Rear Bumper (501-19, Description and Operation).

Parking Aid - Rear Outer Parking Aid Sensor

Removal and Installation

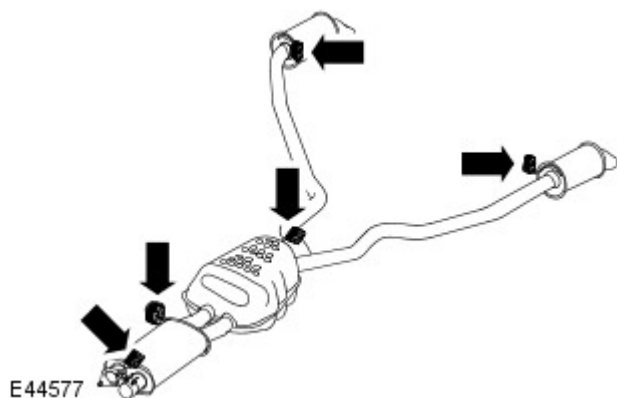
Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

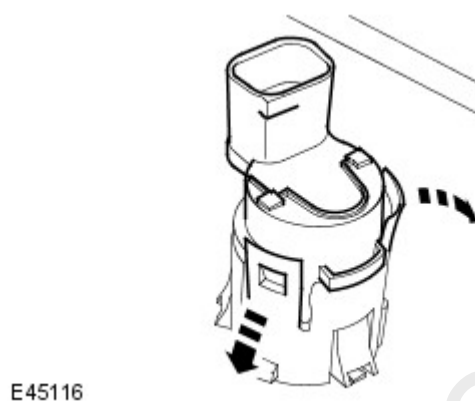
2. Release the 5 exhaust hangers.

- Support the exhaust assembly.



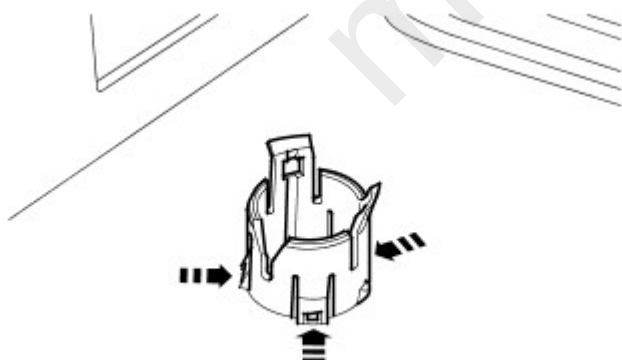
3. Remove the parking aid sensor.

- Disconnect the electrical connector.
- Release the 2 clips.



4. Remove the parking aid sensor trim panel.

- Release the 3 clips.



Installation

1. To install, reverse the removal procedure.

Parking Aid - Side Parking Aid Camera

Removal and Installation

Removal

- NOTE: Removal steps in this procedure may contain installation details.
- NOTE: RH illustration shown, LH is similar.
- NOTE: The ignition must be switched off.

1. Refer to: [Exterior Mirror Cover](#) (501-09 Rear View Mirrors, Removal and Installation).

2. **2. CAUTIONS:**



Take extra care not to damage the component.



Take extra care not to damage the wiring harnesses.

Torque: 0.5 Nm



Installation

1. **1. CAUTION:** If a new component has been installed, configure using Land Rover approved diagnostic equipment.

To install, reverse the removal procedure.