

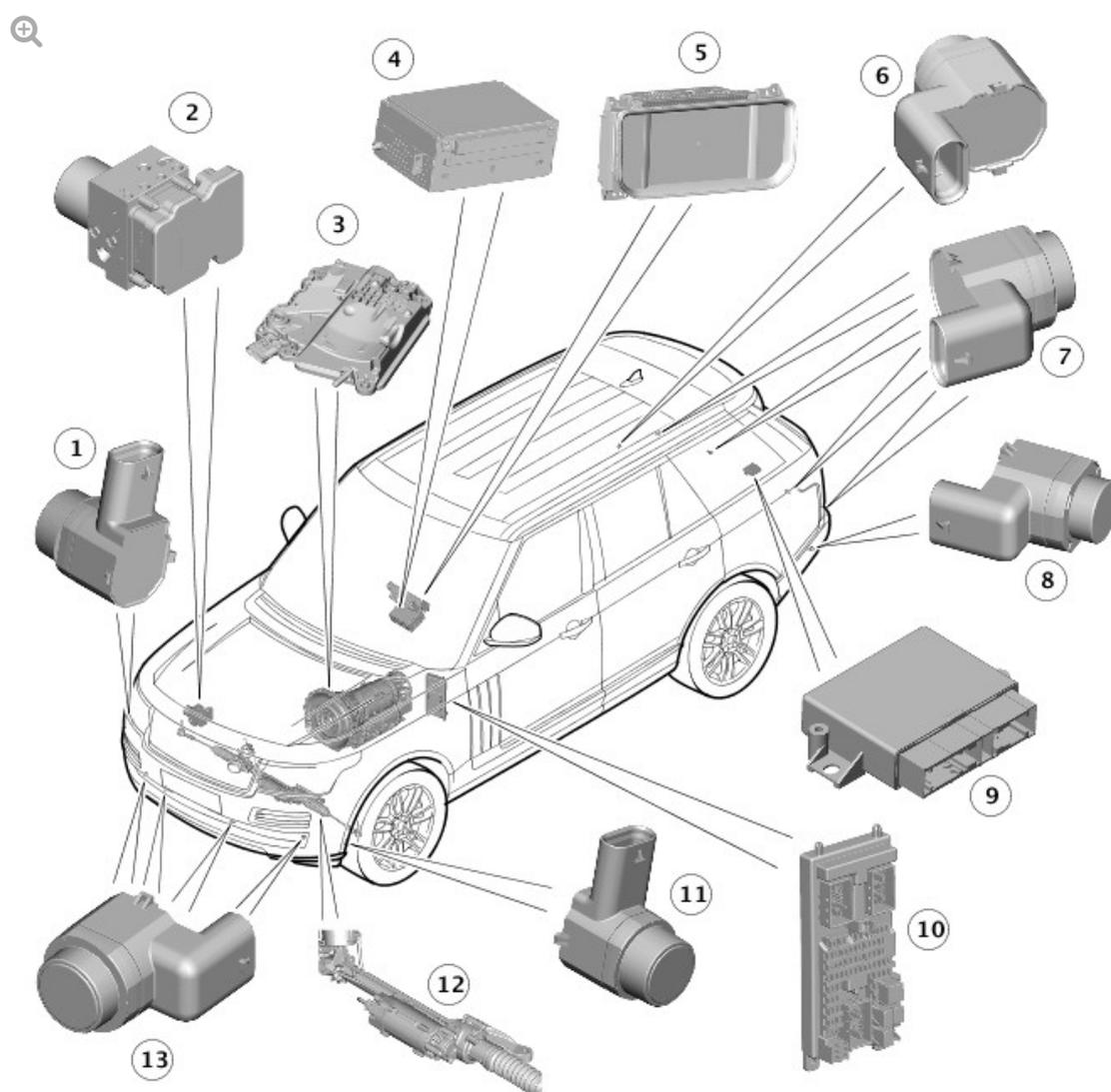
2016.0 RANGE ROVER (LG), 413-13

# PARKING AID

DESCRIPTION AND OPERATION

## COMPONENT LOCATION

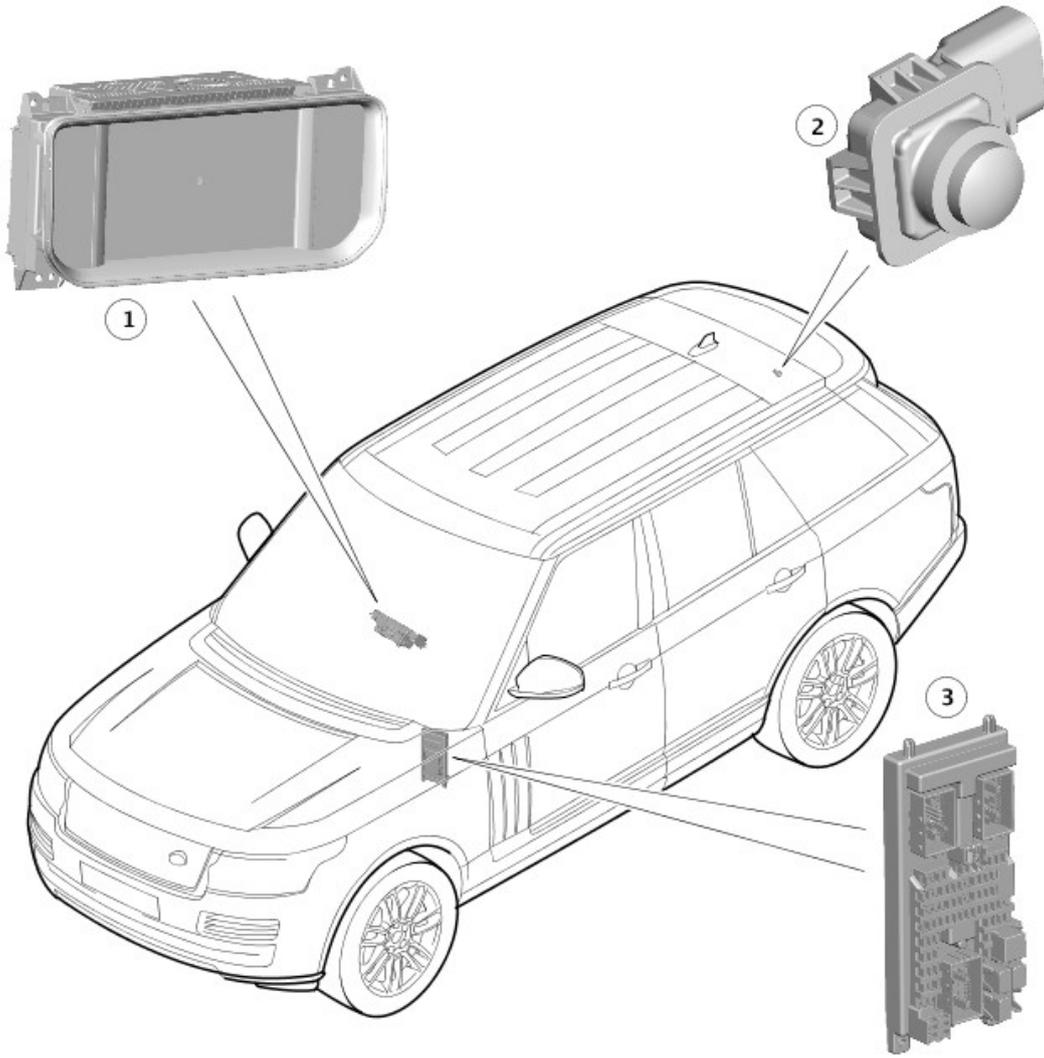
### PARKING AID AND PARK ASSIST - COMPONENT LOCATIONS



E158311

ITEM	DESCRIPTION
1	Front Right Park Assist Sensor
2	ABS (anti-locking braking system) Control Module
3	TCM (transmission control module)
4	IAM (integrated audio module)
5	TS (touch screen)
6	Rear Right Park Assist Sensor
7	Rear Parking Aid Sensor (4 of)
8	Rear Left Park Assist Sensor
9	PACM (parking aid control module)
10	CJB (Central junction box)
11	Front Left Park Assist Sensor
12	Steering Gear
13	Front Parking Aid Sensors (4 of)

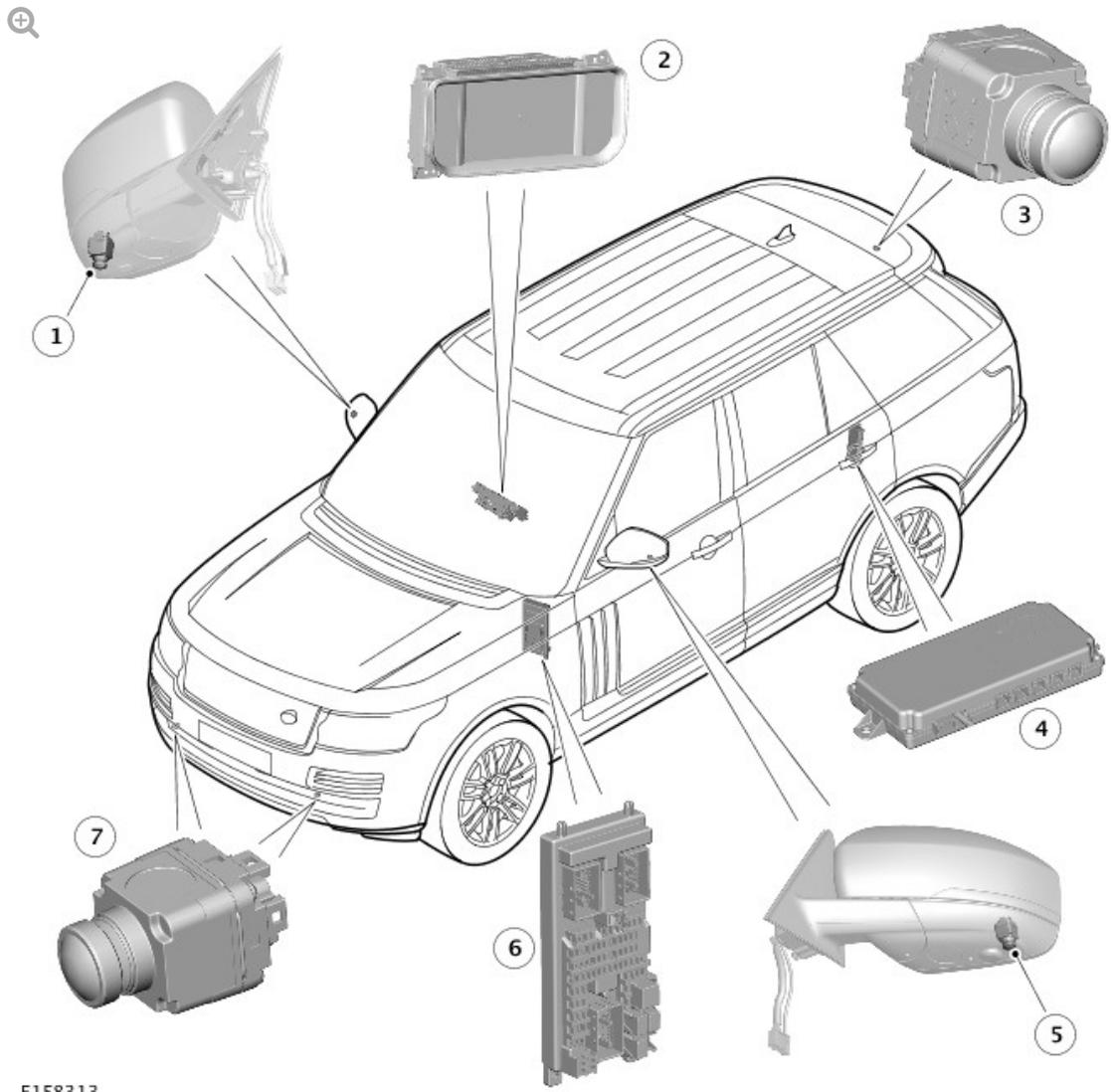
## REAR VIEW CAMERA - COMPONENT LOCATION



E158312

ITEM	DESCRIPTION
1	TS (touch screen)
2	RVC (rear view camera)
3	CJB (central junction box)

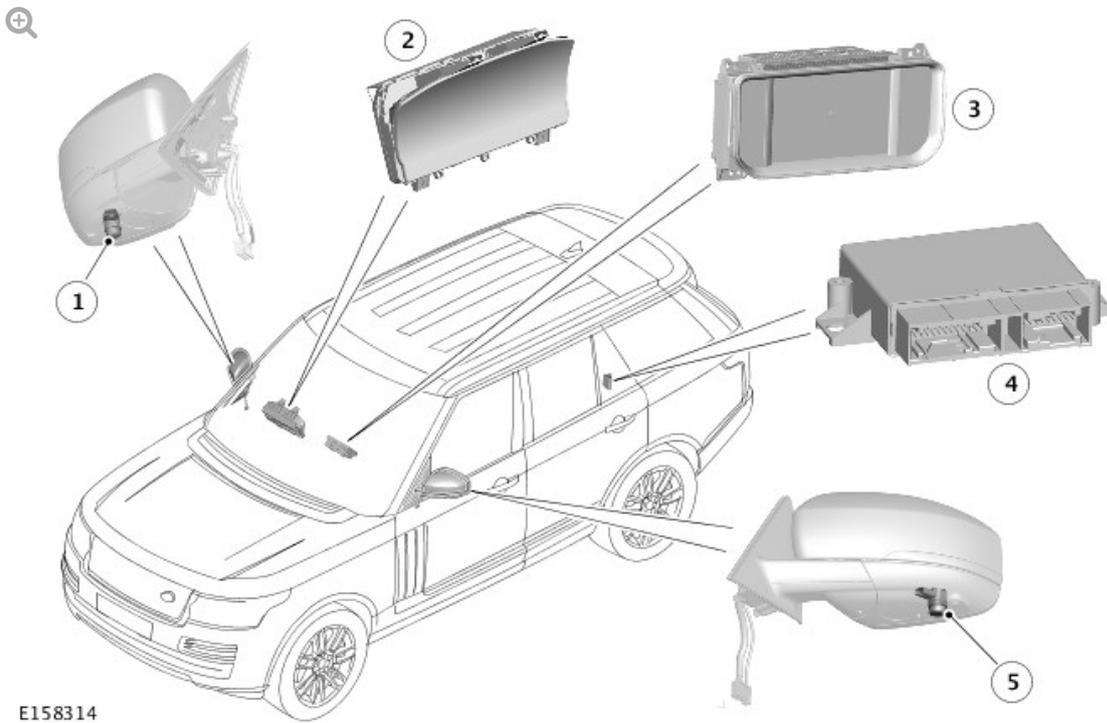
### PROXIMITY CAMERA SYSTEM - COMPONENT LOCATION



E158313

ITEM	DESCRIPTION
1	Right Door Mirror Camera
2	TS (touch screen)
3	RVC (rear view camera)
4	CCM (camera control module)
5	Left Door Mirror Camera
6	CJB (central junction box)
7	Front Bumper Camera (2 of)

**WADE SENSING SYSTEM - COMPONENT LOCATION**



E158314

ITEM	DESCRIPTION
1	Right Door Mirror Wade Sensing Sensor
2	IC (instrument cluster)
3	TS (touch screen)
4	GPSM (general proximity sensor module)
5	Left Door Mirror Wade Sensing Sensor

## OVERVIEW

### PARKING AID

The parking aid system provides an audible warning to the driver when any obstacles are in the path of the vehicle during forward or reverse parking maneuvers.

The system consists off:

- PACM (parking aid control module).

- Parking aid switch.
- Four ultrasonic sensors in the front bumper.
- Four ultrasonic sensors in the rear bumper.

During low speeds, the PACM uses the ultrasonic sensors to monitor the area around the front and rear bumpers. If an object is detected within a monitored area, the module then outputs a warning using the audio system speakers. The sensors can detect solid objects such as posts, walls and other vehicles. Objects very close to the ground may not be detected, but because of their low height may not cause damage to the vehicle.

**CAUTION:**

When washing the vehicle do not aim high pressure water jets directly at the sensors. Do not use abrasive materials or hard/sharp objects to clean the sensors. Only use approved vehicle shampoo.

**PARK ASSIST**

**CAUTION:**

Park assist is a supplement to, and not a replacement for, good observation and a safe driving style. It is the driver's responsibility at all times, to make sure the maneuvers are carried out safely.

Park assist is an aid to maneuvering the vehicle in and out of parking spaces and parking bays.

The park assist system operates using four additional sensors; two sensors mounted on each side of the front and rear bumpers, together with front and rear parking aid sensors.

The system consists of three different options:

- Parallel Parking: Will identify a suitably sized parking space in a line of parked vehicles and then parallel park the vehicle.
- Perpendicular Parking: Will identify a suitably sized parking bay in a row of parked vehicles and then reverse park the vehicle.
- Park Out: Will aid maneuvering of the vehicle from out of a parallel parking space where other vehicles are parked behind or in front of the vehicle, or both.

## REVERSE TRAFFIC DETECTION

The RTD (reverse traffic detection) system provides a warning to the driver of any moving vehicle, at either side that may cause an accident during a reversing manoeuvre. To avoid this, the system is able to use the following warning modes to inform the driver, when the vehicle is in a reversing manoeuvre:

- An amber warning icon, which flashes in the relevant exterior mirror, and warning tones via the audio system.
- The rear camera screen, or
- The parking aid screen is shown on the TS, with the warning icon on the relevant side.

The RTD function is a part of the blind spot monitoring system.

## WADE SENSING SYSTEM

The wade sensing system feature provides intuitive information of the vehicles capability during wading through water. The purpose is to assist the average driver whilst driving through water, particularly when the visibility is poor.

The GPSM hosts software to deliver the wade sensing functionality using two downward facing, door mirror mounted ultrasonic sensors that are connected to the GPSM, which provide the input signals to the GPSM which measure the reflection from the water surface to calculate the depth of the water through which the vehicle is traveling.

## CAMERA SYSTEMS

### CAUTION:

It remains the driver's responsibility to detect obstacles and estimate the vehicle's distance from them when reversing.

### Rear View Camera

The rear view camera provides additional information to the driver when reversing the vehicle. When the reverse gear is selected, the RVC (rear view camera) system automatically displays a wide-angle color image of the view from the rear of the vehicle onto the TS (touch screen).

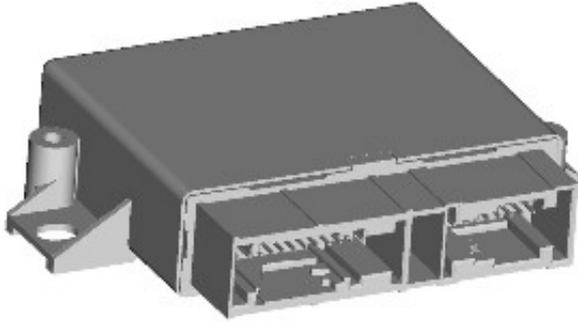
### Proximity Camera

The proximity camera system provides the driver with a visual-aid when maneuvering the vehicle at low speeds. The system uses a CCM (camera control module) to capture the camera data and display the resulting images on the TS (touch screen), providing the driver with a 360° view around the vehicle. The proximity camera system is also supported by various driving-aid features where graphical information and warnings are superimposed onto the images displayed on the TS.

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## DESCRIPTION

### PARKING AID CONTROL MODULE



E156975

The PACM (parking aid control module) is located in the luggage compartment, behind the left quarter trim panel of the luggage compartment.

The PACM (parking aid control module) has two connectors which provide power, ground and HS (high speed) CAN (controller area network) chassis bus connections, front parking aid sensors and rear parking aid sensors.

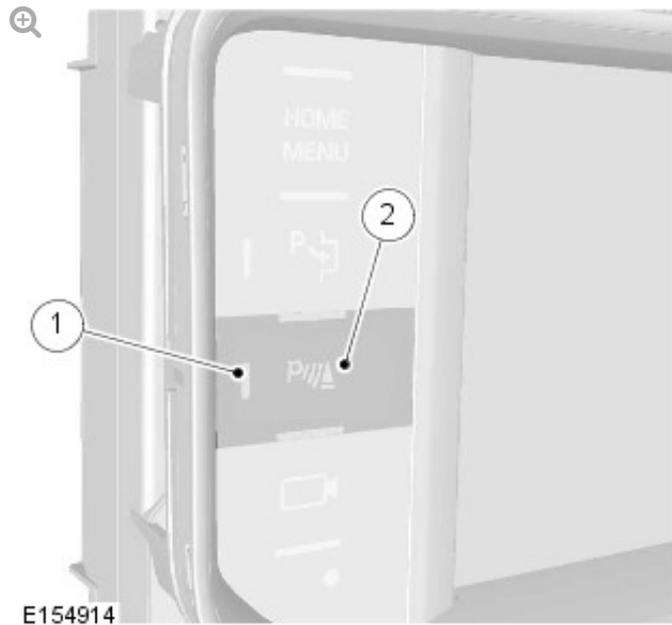
The HS CAN chassis bus connections provide for the receipt of the following information from other systems:

- ABS (anti-lock brake system) Module - Road Speed Signal.
- TCM (transmission control module) - Reverse Gear Engaged Signal.

The PACM (parking aid control module) also outputs messages on the HS CAN chassis bus. The GWM (gateway module) processes these messages and converts them into MS (medium speed) CAN comfort messages, which are sent to the TS (touch screen). The TS converts then converts the MS CAN comfort messages into MOST (media orientated system transport) signals. These signals are then used by the AAM (audio amplifier module) to emit the applicable warning tones from the front or rear audio speakers when an object is detected by the front or rear parking aid sensors. A

warning tone can also be emitted to alert the driver to a fault in the parking aid system.

## PARKING AID SWITCH



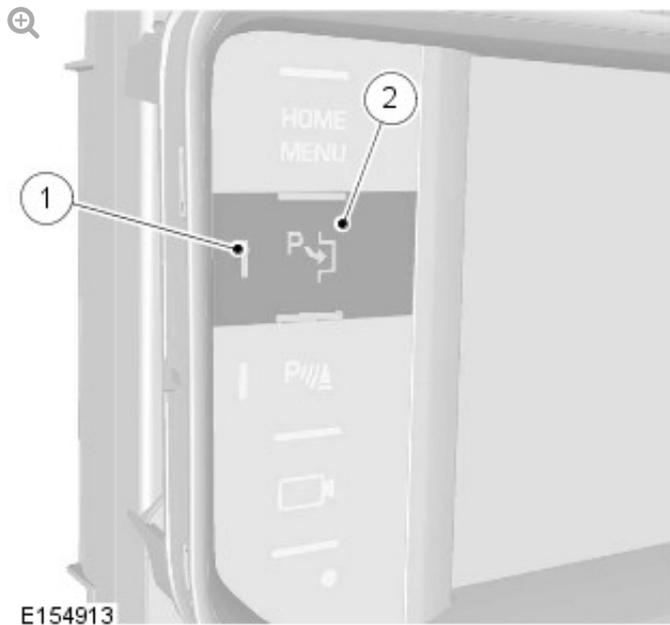
ITEM	DESCRIPTION
1	Parking Aid Switch Indicator
2	Parking Aid Soft Key

The parking aid switch is located in the left TS (touch screen) switch pack.

The parking aid switch allows the driver to select the parking aid system on or off. When pressed, the switch momentarily connects a ground to the PACM (parking aid control module). The LED (light emitting diode) indicates when the parking aid system is active and is controlled by the PACM.

The parking aid system will remain off until the next ignition cycle, reverse gear is selected, or the system is manually switched back on again.

## PARK ASSIST SWITCH



ITEM	DESCRIPTION
1	Park Assist Switch Indicator
2	Park Assist Soft Key

The park assist switch is located in the left TS (touch screen) switch pack.

A short press of the park assist button will turn the park assist system on/off and parallel parking will be the first available option. Further presses on the button will scroll through the remaining options.

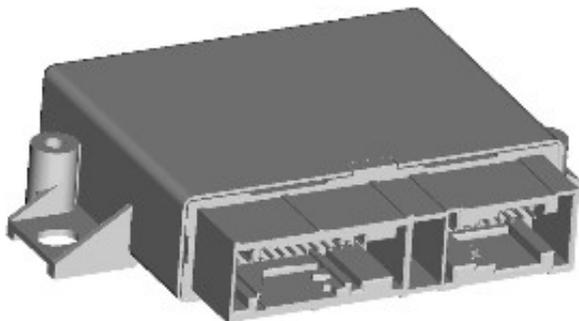
The sequence of options is:

- Parallel parking.
- Perpendicular parking.
- Park out.
- Park assist off.

The switch allows the driver to select the park assist system on or off. When pressed, the switch momentarily connects a ground to the PACM (parking aid control module). The LED indicates when the park assist system is active. The LED is controlled by the PACM.

The control switch allows the driver to activate/deactivate the park assist system if operation is required or not required.

## GENERAL PROXIMITY SENSOR MODULE



E156975

The GPSM (general proximity sensor module) is located in the passenger compartment, behind the rear left seat bolster trim panel, above the CCM (camera control module).

The GPSM has two connectors which provide for power, ground and HS (high speed) CAN chassis bus connections, and the sensors in the door mirrors.

The control module is able to transmit and receive the following important information on the HS CAN chassis bus:

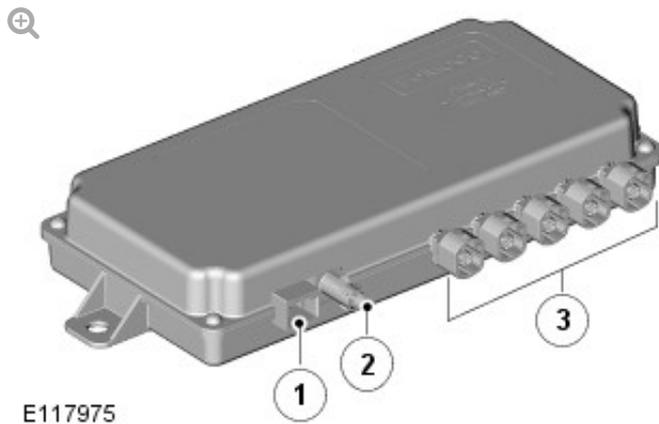
- +/- offset from the ISCM (integrated suspension control module).
- Water depth to the TS (touch screen) and IC (instrument cluster), via the GWM (gateway module).

When the vehicle is started, the GPSM receives the CCF (car configuration file) from the CJB (central junction box), then the CJB energizes the extended ignition relay in the RJB (rear junction box). The ignition relay

supply the GPSM with power, and it is ready to operate.

The control module has a diagnostic connection via the HS CAN chassis bus to enable faults to be retrieved using the Land Rover approved diagnostic equipment. Additionally an on-board diagnostic routine within the control module constantly monitors the system and alerts the driver to a system fault by emitting a 3 second continuous tone through the front audio speakers when the ignition is switched on.

## CAMERA CONTROL MODULE



ITEM	DESCRIPTION
1	Power Supply, Ground and BUS Connector
2	Connection to the TS (touch screen)
3	Five Camera Connections

The CCM (camera control module) is located in the passenger compartment, behind the rear left seat bolster trim panel, under the GPSM (general proximity sensor module).

Connections to the module include:

- MS (medium speed) CAN comfort network.
- Five camera inputs.
- Video signal output to the TS (touch screen).

- Power supply and ground.

The CCM gathers the camera images and analyses and alters them by adjusting perspectives and applying corrections. The resulting processed images are then relayed to the TS via the NTSC (national television system committee) analogue video line.

The CCM 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 CCM 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.

In addition to the data lines, the camera receives a power supply and a ground from the CCM.

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

## CAMERAS



E154908

ITEM	DESCRIPTION
1	Rear View Camera



E154907

ITEM	DESCRIPTION
1	Proximity Camera

The camera system uses VGA (video graphic array) resolution cameras which are permanently powered whenever the ignition is 'on'. Depending on vehicle specification, either one or five cameras will be used.

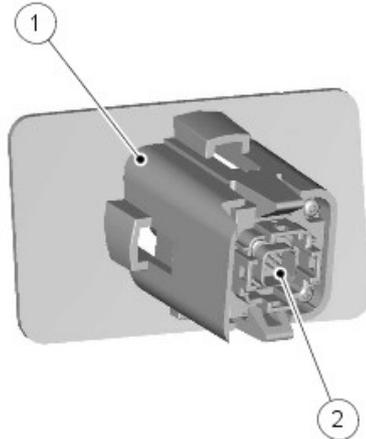
On the RVC (rear view camera), the camera is fitted in the tailgate, next to the exterior handle.

On the proximity camera system, you will find two cameras mounted in the front bumper, one mounted in each door mirror and one mounted in the tailgate.

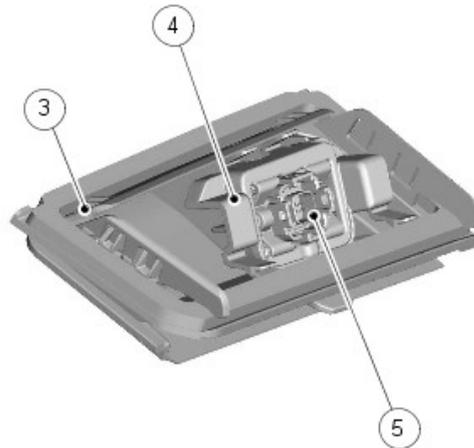
The camera provides an image covering a zone approximately 130° wide by 112° deep and is capable of capturing approximately thirty frames per second.

## CAMERA MOUNTING

 A



B



E154906

ITEM	DESCRIPTION
A	Front View Camera Mounting
B	Rear View Camera Mounting (Proximity Camera Shown)
1	Front View Camera Bracket in Bumper
2	Front View Camera
3	Exterior Tailgate Handle Bezel
4	Rear View Camera Bracket
5	Rear View 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 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 2 mm. In the event of camera replacement, a calibration routine must be performed.

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## OPERATION

### PARKING AID

The parking aid system is activated when:

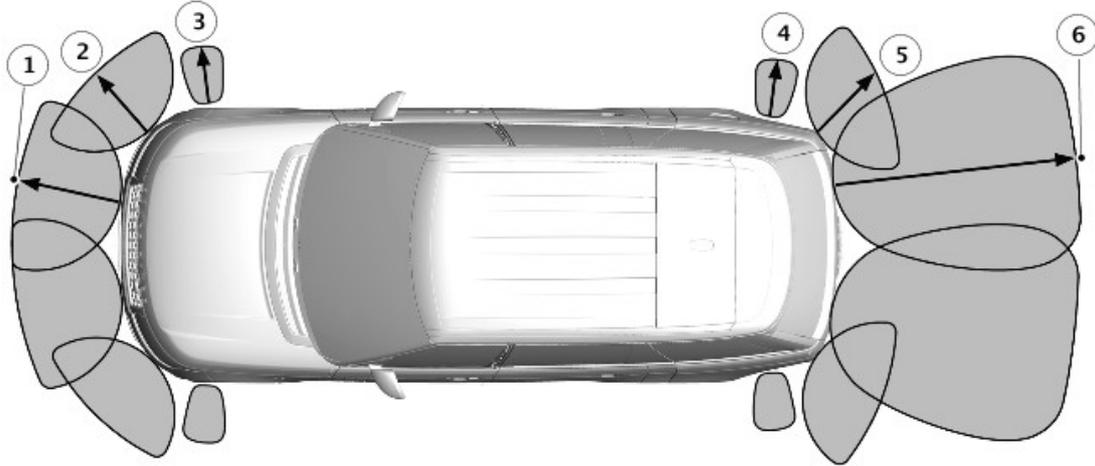
- Reverse (R) gear is selected directly from Park (P).
- Drive (D) is subsequently selected, and the vehicle speed is less than 16 km/h (10 mph).
- Drive (D) is selected directly from Park (P) and the Parking aid switch is operated. The front and side sensors are activated only. The sensors will remain active until the vehicle speed is less than 16 km/h (10 mph).
- Parking aid switch is operated for 3 seconds, and the vehicle's speed decreases to less than 10 km/h (6 mph), or Reverse (R) gear is selected.

### **Audible Warnings**

The control module processes the distance readings from the ultrasonic parking aid sensors to determine if there are any objects within the detection areas. If there are no objects no audible warning will be emitted. If an object is detected, repeated audible warnings are emitted via the audio system speakers. The time delay between the audible warnings decreases as the distance between the detected object and the vehicle decreases until eventually a continuous tone is emitted from the audio

system speakers.

## Distance Calculation for Audible Warnings



E158315

FRONT INNER	SENSOR LOCATION	MAXIMUM DETECTION RANGE AUDIO TONE	CONTINUOUS AUDIO TONE
1	Front Inner	Approximately 1200 mm (47 inches)	Approximately 300 mm (12 inches)
2	Front Outer	Approximately 1200 mm (47 inches)	Approximately 300 mm (12 inches)
3	Front Side	Approximately 1200 mm (47 inches)	Approximately 300 mm (12 inches)
4	Rear Side	Approximately 1200 mm (47 inches)	Approximately 300 mm (12 inches)
5	Rear Outer	Approximately 1200 mm (47 inches)	Approximately 300 mm (12 inches)
6	Rear Inner	Approximately 1800 mm (71 inches)	Approximately 300 mm (12 inches)

## Detection Calculation

In the combined mode, the sensors emit a series of ultrasonic impulses and then switch to receiver mode to receive the echo reflected by an obstacle within the detection range. The received echo signals are amplified and converted from an analogue signal to a digital signal by the sensor. The digital signal is passed to the PACM (parking aid control module) and compared with pre-programmed 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 from the object using the elapsed time between the transmitted and received impulse. The duration of the impulse duration is determined by the module, with the sensor controlling the frequency of the impulse output.

When in reverse gear, both the front and rear sensors are active, when in a forward gear, only the front sensors are active.

In receiver mode, the sensor receives impulses that were emitted by adjacent sensors. The PACM uses this information to precisely determine the position and distance of the object.

If no objects are detected there are no further warning tones. If an object is detected, repeated audible tones are emitted from either the front or rear audio speakers as appropriate. The time delay between the tones decreases as the distance between the object and the vehicle decreases, until at approximately 300 mm (12 inches), the audible tone becomes 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 approximately 3 seconds if there is no change in the distance between an object and the corner sensor.

When approaching several objects within detection range, the PACM recognizes the distance from the vehicle to the nearest object.

The PACM will prioritize the objects detected, the nearest object detected will take priority and the corresponding audio outputs will be emitted. For example if 2 objects are detected (one front one rear) the nearest detected object will take priority and relevant audible tone will be heard.

If two objects are detected at equal distance (one front one rear) the audible tones will alternate between the front and rear audio speakers.

The volume output of the parking aid audible tones can be adjusted using the audio volume control when the parking aid system is activated. The volume can also be adjusted from the home menu screen by selecting 'Setup', 'System' followed by 'Volume Presets' on the TS (touch screen). The volume can be adjusted using the + or - selections on the TS.

The PACM receives a signal on the HS (high speed) CAN chassis bus from the CJB with contribution of the GWM (gateway module), when a trailer is fitted. When this signal is detected, the PACM suspends operation of the rear parking aid system. The ignition needs to be cycled once the trailer has been disconnected to activate the rear parking aid system.

## **Diagnostics**

If the on-board diagnostic system identify a fail, the following warnings will be apply:

- The IC displays an error message.
- The front audio system speakers will emit a 3 second continuous tone.
- A DTC (diagnostic trouble code) is logged in the PACM module.

The PACM (parking aid control module) has a diagnostic connection via the HS (high speed) CAN chassis bus to enable faults to be retrieved using the Land Rover approved diagnostic equipment. Additionally an on-board diagnostic routine within the PACM constantly monitors the system and alerts the driver to a system fault by emitting a 3 second continuous tone through the front audio speakers when the ignition is switched on. The control switch LED will also flash 6 times when reverse gear is selected or

the parking aid system switch is pressed.

## PARK ASSIST

Park assist is an aid to maneuvering the vehicle in and out of parking spaces and parking bays. Once the system has identified a parking space using its ultrasonic sensors, it automatically steers the vehicle into place, the driver continues to brake, accelerate and select the correct gear. Informative graphics and messages are displayed in the IC (instrument cluster) message center, to guide the driver through each stage of the maneuver.

Vehicles with park assist have a separate switch to activate the system.

Park assist solely uses ultrasound sensors:

- Four sensors in the front bumper (parking aid sensors).
- Two further sensors positioned on either side at the front of the vehicle to detect available spaces.
- Four sensors in the rear bumper (parking aid sensors).
- Two further sensors on the outer sides of the rear bumper.

The park assist sensors are hardwired connected to the PACM (parking aid control module). Scanned information is constantly transmitted to the module.

The park assist system is active when the following input conditions exist:

- The park assist switch is activated.
- The vehicle is traveling forwards below 18 km/h (11 mph).
- The vehicle must be parallel to a line of parked vehicles .
- The front wheels must be straight ahead position.

The auto searching is active while the vehicle's speed is below 30km/h (18mph). If the vehicle's speed exceeds the 30km/h (18mph), the park assist system will be deactivated automatically, and the park assist button indicator will extinguish. If the park assist is selected when the vehicle is

moving between 18 km/h (11mph) and 30km/h (18mph), the 'Parallel Park Maximum Speed 30 kph' will be displayed in the IC (instrument cluster) message center.

### **CAUTION:**

Park assist is a driving aid only. It remains the driver's responsibility to drive with due care and attention during parking maneuvers.

### **NOTES:**

- Park assist sensors may not detect some obstructions, e.g. narrow posts, small objects close to the ground, mesh fences and, in some circumstances, bicycles or motor cycles parked alongside the kerb.
- All sensors must be kept clean and free from debris or obstructions, e.g., leaves, mud, snow, ice, frost or insects. Failure to keep the sensors clean may result in sensor miscalculation or false indications.

Park assist must not be used if:

- A temporary spare wheel is in use.
- A sensor is damaged or the bumper is damaged sufficiently to affect a sensor mounting point.
- A sensor is obstructed by items attached to the vehicle, e.g., bumper covers, a bicycle rack, a trailer, stickers, etc.
- The vehicle is being used to transport a load that extends beyond the vehicle perimeter, for example a trailer.

Once a parking space has been identified, the PACM (parking aid control module) calculates the parking trajectory, communicating output information to the following vehicle systems:

- The PSCM (power steering control module) via HS (high speed) CAN chassis bus. The trajectory calculations are processed by the PSCM ready for the first stage of the parking maneuver. Once a vehicle speed signal is received (vehicle reversing) the PSCM independently controls the steering trajectory.
- The IC (instrument cluster) message center by HS CAN chassis and powertrain bus, via the GWM (gateway module). The message center displays the relevant park assist information/instructions to the driver.
- The front and rear parking aid sensor information are transmitted from the PACM to the TS (touch screen), via the GWM (Gateway Module). The TS has a gateway function too, to provide the AAM (audio amplifier module) with sensor information via the MOST ring. The audible warning tones are emitted through the audio system speakers.

During any park assist manoeuvre, the parking aid system will remain active and will sound when objects are detected near the vehicle. A parking manoeuvre can be cancelled at any point by holding/turning the steering wheel or by pressing the park assist button.

### **Service Information**

If the on-board diagnostic system identify a fail, the following warnings will apply:

- The IC displays an error message.
- The front audio system speakers will emit a 3 second Continuous tone.
- A DTC is logged in the PACM module.

### **Searching For Parking Space**

Once the driver has identified a possible parking space the park assist system carries out the following checks and procedures:

- The system constantly searches for a space on the passenger side of the vehicle. Space on the driver's side is searched via instruction from

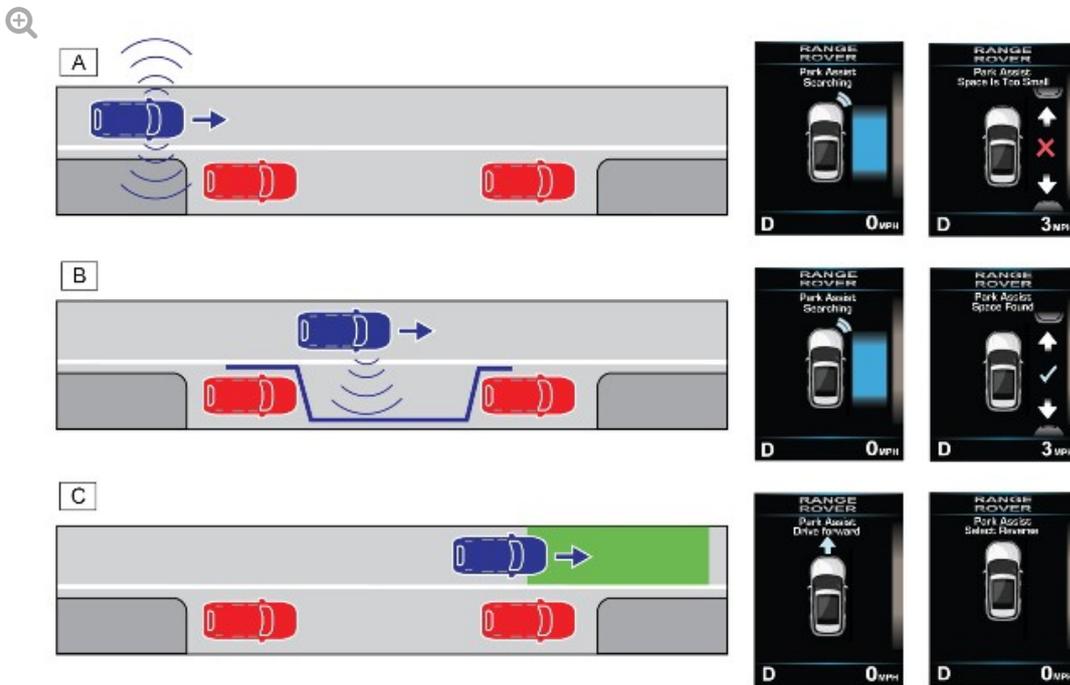
direction indicator operation. The park assist display appears in the message center and shows the 'Searching' message and graphic. For park assist to search effectively, maintain a distance of 0.5 to 1.5 meters (1.6 to 4.9 ft) between the vehicle and the line of parked vehicles/obstacles in which you want to park.

- As the vehicle moves forward, parallel to a row of parked vehicles, it detects the parked vehicles.
- The system can detect a space up to four meters away from the side of vehicle. The system will only select a space which is 1.2 times the length of the vehicle (or greater) and deep enough to park the vehicle.
- When the vehicle detects a sufficient size parking space, the driver is instructed to stop the vehicle and select reverse gear.
- The system calculates the appropriate trajectory to park the vehicle into the detected space.

**CAUTION:**

Make a visual check before starting the reversing maneuver to make sure the space has not changed in any way.

If the driver is in slow moving traffic the system will be activated frequently when passing by other vehicles.



E158317

ITEM	DESCRIPTION
A	Park Assist System Activated Searching for Space.
B	Park Assist Detects and Measures Space.
C	Vehicle Comes to End of Space and Stops Ready for Next State.

## Reversing Into Space

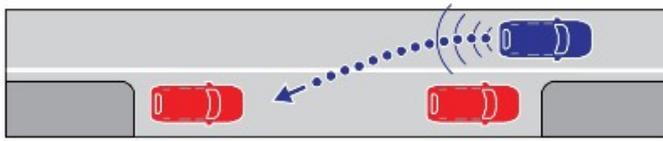
When reverse gear is selected the IC (instrument cluster) message center displays the appropriate parking instructions. Park assist will then take control of the vehicle's steering system and the steering wheel must be released. Release the foot brake carefully to move the vehicle slowly into the parking space.

## NOTES:

- The driver must maintain full control of the accelerator and brakes throughout the maneuver.
- Do not move the vehicle until the 'Parallel Parking. Reverse with care' message is displayed.
- If the steering wheel is manually turned while park assist has control of the steering, Park assist will deactivate and the park assist button indicator will extinguish.
- If the vehicle's speed exceeds 5 km/h (3 mph) during the parking maneuver, Park assist will display a message until the vehicle's speed decreases to less than 5 km/h (3 mph). If the vehicle's speed exceeds 7 km/h (4 mph), Park assist will deactivate and the indicator lamp in the park assist button will extinguish.

The following checks and procedures are applied:

- The driver follows message center instructions, moving the vehicle backwards along the trajectory calculated by the park assist system
- Detected obstacles at 0.9m generate an intermittent sound tone over the vehicle rear speakers.
- Detected obstacles at 0.3m generate a constant sound tone over the vehicle rear speakers.
- On reaching the end of the reversing maneuver the driver is instructed to apply the foot brake to stop the vehicle.
- The driver selects a forward gear to prepare for the next stage of the parking manoeuver.
- If the vehicle has been parked in a large space the maneuver is complete and the system operation ends.



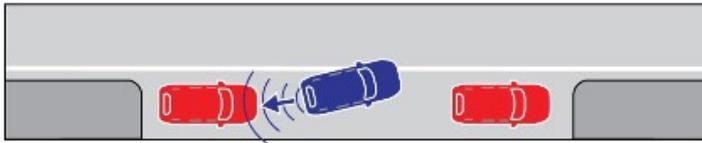
E158318

## Correction Within Parking Space

If the vehicle is not in the correct position after the initial reversing maneuver, the driver is instructed to select a forward gear with the 'Stop! Select D and await next instruction' or 'Stop! Select R and await next instruction' messages. When the adequate gear is selected, the IC message center displays the appropriate parking instructions.

The following checks and procedures are applied:

- The driver follows message center instructions, moving the vehicle forwards along the trajectory calculated by the park assist system.
- Detected obstacles at 0.4m generate an intermittent sound tone over the vehicle front speakers.
- Detected obstacles at 0.3m generate a constant sound tone over the vehicle front speakers.
- On reaching the end of the forward maneuver the driver is instructed to apply the foot brake to stop the vehicle.
- The driver selects reverse gear to prepare for the next stage of the parking manoeuvre.
- If the vehicle is in the final position the maneuver is complete and the system operation ends.



E158319

If the vehicle is parking in a smaller space more shuffling may be required to complete the parking maneuver.

Driver selects forward gear - further shuffling is completed.



E158320

When the parking manoeuver is complete, the 'Stop! Park Assist finished' message will be displayed on the message center.

## Park Out

Park out is an aid to maneuvering out of tight parallel parking spaces. For the system to operate correctly, the vehicle must be parked in a space where other vehicles (or objects) are parked in front of or behind the vehicle, or both.

### **CAUTION:**

Make a visual check before starting the maneuver to make sure the parking space has not changed in any way. For example, a pedestrian has stepped into the parking space.

### **NOTES:**

- If the vehicle's speed exceeds 6 km/h (4 mph) during the maneuver, Park out will display a SLOW DOWN! message until the vehicle's speed decreases to less than 6 km/h (4 mph). If the vehicle's speed is not reduced, Park out will deactivate and the indicator lamp in the Park assist button will extinguish.
- If the steering wheel is manually adjusted while park out has control of the steering system, Park out will deactivate and the indicator lamp in the park assist button will extinguish.

To apply the park out function the following steps and procedures will be executed by the driver and the park assist system:

- To activate, repeatedly press the Park assist button until the park out option is selected. The indicator lamp in the button illuminates.
- When first activated, Park out searches for an exit on the front passenger side of the vehicle. To search for an exit on the driver's side, signal a turn in that direction.
- The 'Parking Exit' display appears in the message center and will display the relevant 'Enough space to exit' message and graphic.

- The message center will now show the 'Release wheel, measuring'... message and graphic.
- An instruction to 'Select R and await next instruction' will appear in the message center.
- Park out will then take control of the vehicle's steering system and the steering wheel must be released. 'Reverse With Care' will appear in the message center. Release the foot brake carefully to manoeuvre the vehicle slowly out of the parking space. Follow the instructions displayed in the message center. The driver must maintain full control of the accelerator and brakes throughout the manoeuvre.
- If further maneuvering is required to exit the parking space, follow the instructions, 'Stop! Select D and await next instruction' or 'Stop! Select R and await next instruction' displayed in the message center.
- When the manoeuvre is completed, the instruction message 'Stop and Take Wheel Park Assist Finished' will be displayed in the message center.

## REVERSE TRAFFIC DETECTION

### **CAUTION:**

The RTD (reverse traffic detection) system is a supplement to, not a replacement for, safe driving, good observation and use of the exterior and rear-view mirrors.

### **NOTE:**

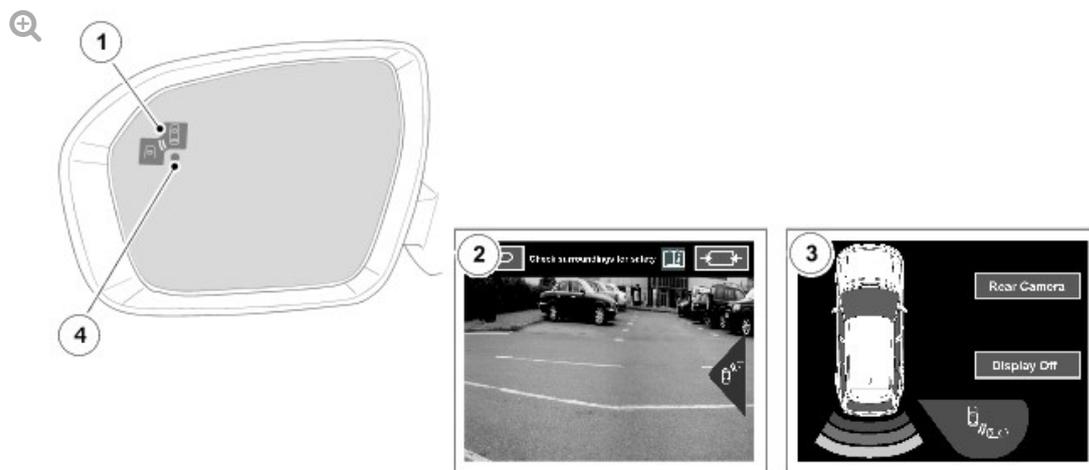
RTD is automatically disabled when a trailer is connected and when park assist is active.

The RTD can be enabled or disabled via the IC (instrument cluster) menu. When RTD is disabled, an amber dot (4) will be displayed in both door mirrors.

Since the RTD function is a part of the parking aid system, it is available up to 16 km/h (10mph).

The RTD system will automatically disable if any of the sensors become partially or completely obscured. Additionally, the amber warning indicator dot will illuminate on the exterior mirrors, and the 'Reverse Traffic Sensor Blocked' message will appear on the IC message center.

If a fault with a radar sensor is detected, an amber warning indicator dot will illuminate in the exterior mirrors and the message 'Reverse Traffic Detection System Not Available' is displayed in the IC message center.



E158316

ITEM	DESCRIPTION
1	Amber Warning Icon on Exterior Mirror
2	Rear Camera Screen with Icon on TS (touch screen)
3	Parking Aid Screen with Icon on TS
4	Reverse Traffic Detection Dot Icon (system is unavailable)

Even if the detected fault only affects the radar sensor on 1 side of the vehicle, the whole system is disabled. If the fault is temporary, the system will operate correctly once the engine has been switched off and then on again.

## WADE SENSING SYSTEM

The GPSM (general proximity sensor module) incorporates a software, which is able to provide the wade sensing functionality. Two ultrasonic sensors are located on the underside of the door mirrors. The ultrasonic sensors are connected with hardwired connection to the GPSM directly. The GPSM supplies the sensors with an ignition power and an earth lead connection. The sensors give a signal voltage, which is proportional to the measured reflection from the water. The water depth calculation is based on the reflection from the water surface, which is measured by the sensors, and:

- +/- offset from suspension height adjustment from the ISCM (integrated suspension control module) via the HS (high speed) CAN chassis bus.
- +/- depth effect of road gradient.

#### **CAUTION:**

The sensors and the area below the sensors must be kept clean and free from snow, ice, mud and other debris. Failure to keep the sensors clean may result in sensor miscalculation.

- If the door mirrors are in the fold position, Wade sensing will operate but will give false readings.
- The door mirrors must be in the normal (unfolded) position when using the wade sensing system.

#### **NOTE:**

Wade sensing will not operate if the vehicle is fitted with Deployable side steps, Fixed side steps, or Side tubes.

These inputs are used to provide the driver audible and visual information about the depth of water and the gradient of the vehicle as compared to

the water level, when the vehicle is moving through the water. The wade sensing system can display the water depth information on the IC (instrument cluster) virtual display, and on the TS (touch screen) through the CAN bus. Since the GPSM is connected to the HS CAN chassis bus, the water depth information is transmitted via the GWM (gateway module). The GWM converts the HS CAN chassis signal to MS (medium speed) CAN comfort bus message, which is received by the TS and IC. The audible tones are transmitted by the audio system.

**CAUTION:**

When using the wade sensing feature, the driver is advised not to wade through flowing or rough water.

- The wade sensing system cannot detect the true level of water if a layer of ice or snow exists on the water surface.
- The wade sensing system should not be used during off-road driving, as rapid increases in water depth cannot be detected in time to deliver a warning message to the driver.

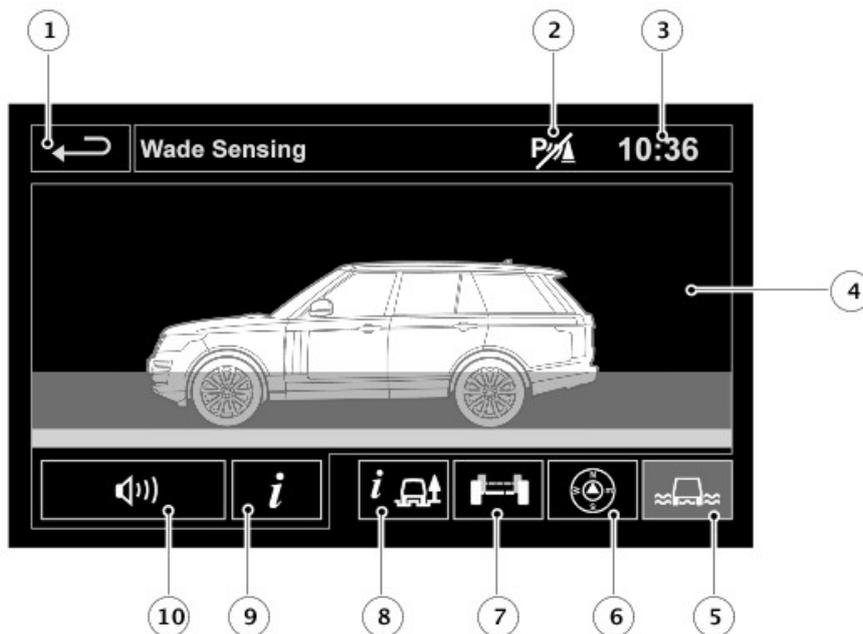
The wade sensing screen can be selected from the TS '4X4' or 'Extra Features' menus.



E154941

ITEM	DESCRIPTION
1	Extra Features Menu to Reach The Wade Sensing Display

The TS is able to display the current and maximum water depths. The system will warn the driver as the maximum depth for wading approaches.



E158322

ITEM	DESCRIPTION
1	'Back' Soft Key
2	Parking Aid System Disabled
3	Clock
4	Wade Sensing Screen
5	Wade Sensing Selected
6	Compass Display
7	4X4i Display
8	Terrain Response Display
9	Information Display
10	Audio On/Off Soft Key

The TS provides the driver with the following information:

- Initial wading advice.
- Maximum vehicle wade depth.
- Advised to select 'Off Road' suspension height to support maximum wade ability.
- Ice wade warning, preventing potential damage to the vehicle.
- Near max wade depth.
- Max wade depth reached.
- Max wade depth exceeded.
- Road Gradient - level, nose down, nose up and laterally uneven.

The system warns the driver via the TS and IC and audible tones, when the maximum depth approaches. If the system limitations are exceeded, the TS view will grey out. Wade sensing is suspended if the vehicle's speed exceeds 16 km/h (10 mph). Wade sensing will automatically reactivate, if the vehicle's speed drops back down to 10 km/h (6 mph). If the vehicle's speed

exceeds 30 km/h (19 mph) for 30 seconds, wade sensing will automatically switch off.

### **CAUTION:**

Wading performance is improved if the vehicle suspension is set to 'Off Road' height. Wade sensing will not operate if the vehicle is fitted with deployable side steps, fixed side steps, or side tubes, or if the exterior mirrors are in the fold position. Parking aid, park assist and intelligent stop/start systems are all disabled when wade sensing is operating.

The PACM (parking aid control module) receives an information on the HS CAN chassis bus, about the operating of wade sensing system.

## **CAMERA SYSTEM**

### **Rear View Camera**

A shielded co-axial cable connection between the camera and the TS (touch screen) is used for the video image transmission.

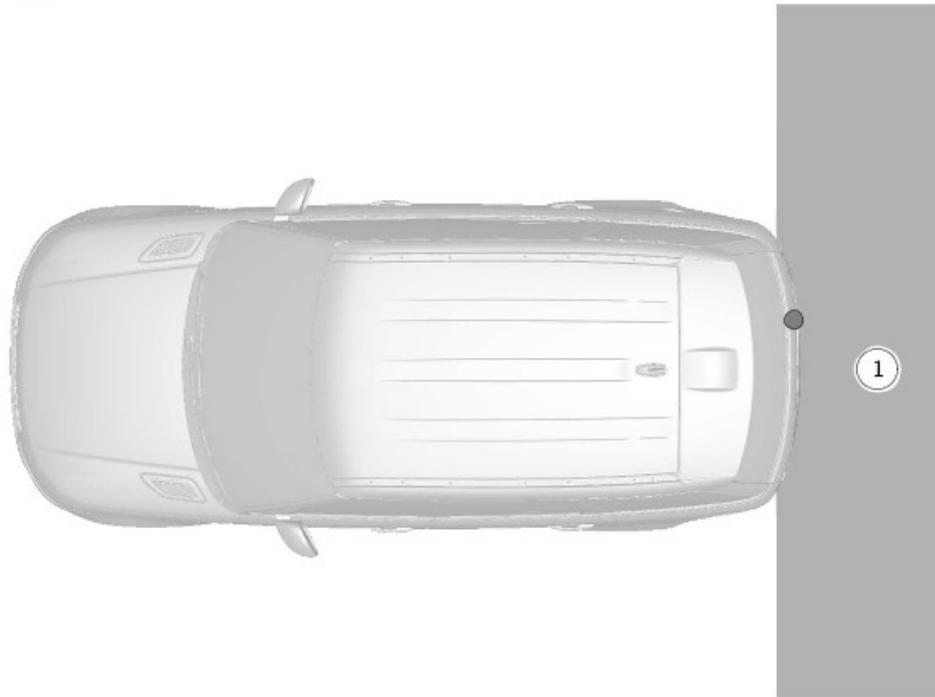
The camera receives power at all times when the ignition is in power mode 6 or 7 from the RJB. When reverse gear is selected, the CJB sends a reverse gear selected signal on the MS (medium speed) CAN body bus. This signal is transmitted by the GWM (gateway module) to the rear view camera, which connects to the MS CAN comfort bus. The camera then sends a message to entertainment system requesting for the image to be displayed and the TS. The displaying of the TS is a wide-angle color image of the view from the rear of the vehicle.

When reverse gear is deselected, the camera image remains on the TS for 5 seconds after the transmission has been put into drive 'D', 'P', 'N', or 'S'. This is to prevent the TS switching between screens if the vehicle is being maneuvered into a parking space. If the vehicle forward speed exceeds 16 km/h (10 mph) within the 5 second period, the camera image is removed

from the TS.

If the TS display is switched off, the camera image will be automatically displayed when reverse gear is selected. When reverse gear is deselected and the 5 second period has expired, the TS will revert back to its switched off state.

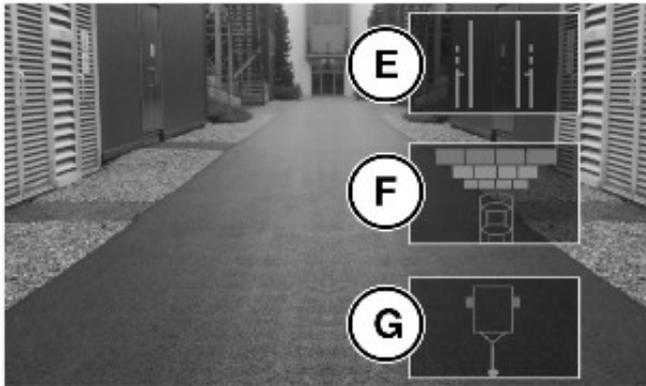
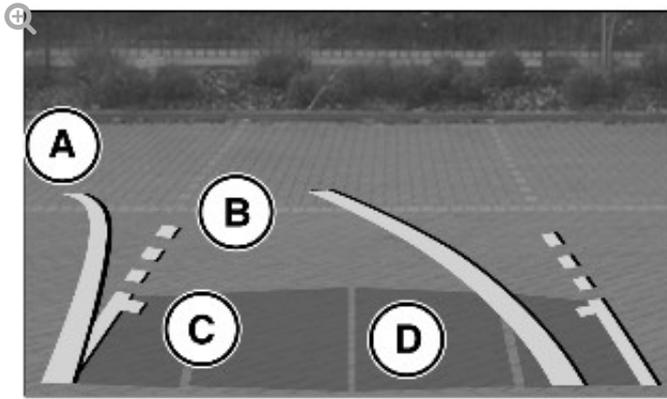
### Rear View Camera Coverage Zone



E156742

ITEM	DESCRIPTION
1	Rear View Camera Coverage Zone

The RVC (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, automatically displays a wide-angle color image of the view from the rear of the vehicle onto the TS. Overlay graphics are displayed by a combination of signals received on the MS CAN comfort bus to the TS.



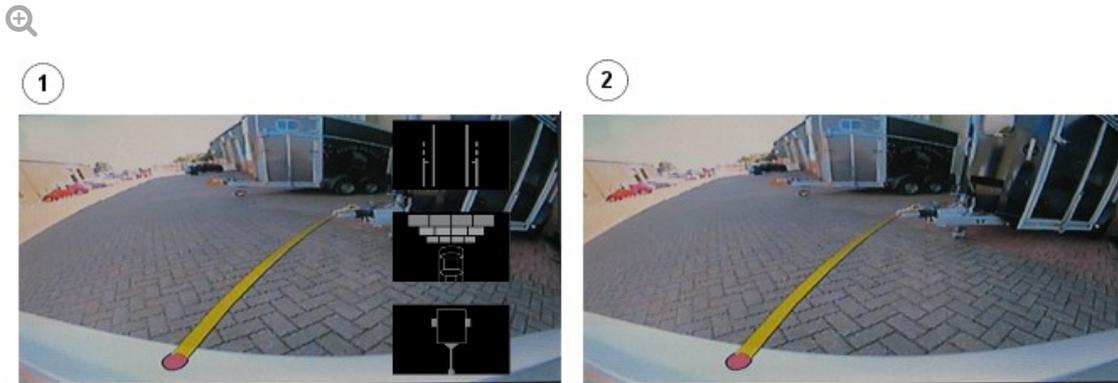
E141731

ITEM	DESCRIPTION
A	Solid Line: The Projected Path Based on Current Steering Wheel Position.
B	Dotted Line: The Safe Working Width of the Vehicle (including exterior mirrors).
C	Tailgate Access Guideline: Do Not Reverse Beyond This Point if Tailgate Access is Required.
D	Parking Sensor Activation: A Colored Area Appears, To Indicate Which Rear Sensor(s) Has Been Activated.
E	User Option. Touch to Enable/Disable A, B & C.
F	User Option. Touch to Enable/Disable D.
G	User Option. Touch to Enable/Disable Hitch Assist Guidance Lines.

## Tow Hitch Assist

The RVC (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 TS (touch screen). Within the settings menu the driver can activate the hitch guidance feature. Hitch guidance provides a trajectory line indicating the path of the towball in relation to the steering angle applied to the vehicle.

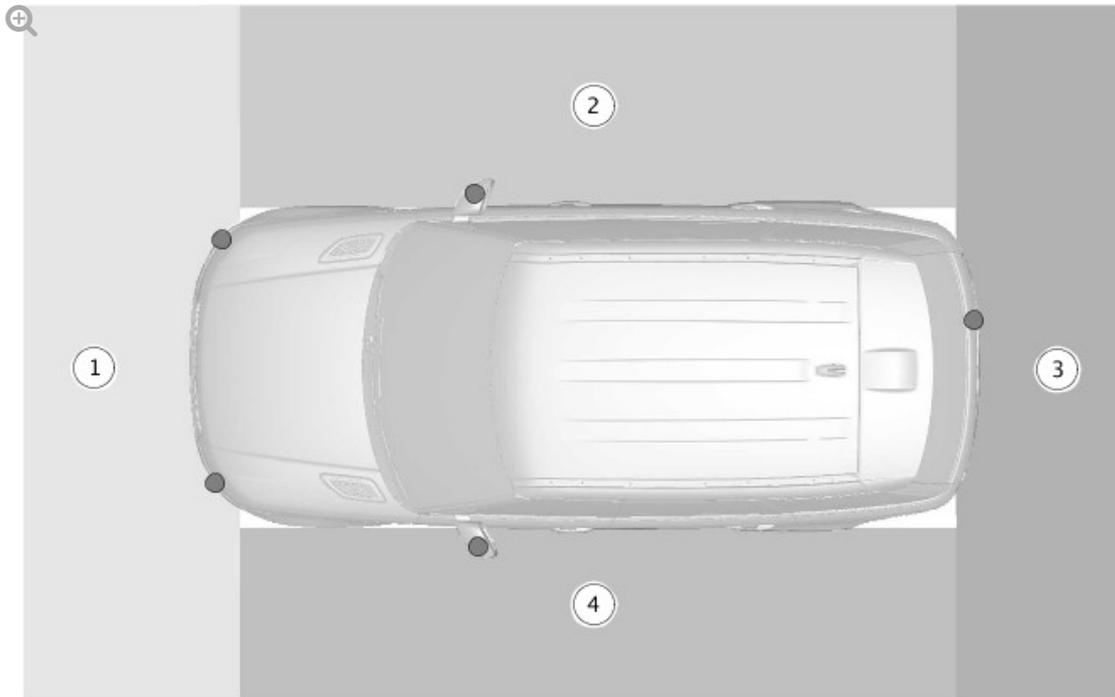


E152127

ITEM	DESCRIPTION
1	TS (touch screen) - Rear View Menu Screen
2	Tow Ball Trajectory Line

### Proximity Camera System

The proximity camera system provides the driver with a visual-aid when maneuvering the vehicle at low speeds. The system uses the CCM (camera control module) to capture the camera data and display the resulting images on the TS, 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 TS.



E156741

ITEM	DESCRIPTION
1	Front Camera Coverage Zone
2	Right Door Mirror Camera Coverage Zone
3	Rear Camera Coverage Zone
4	Left Door Mirror Camera Coverage Zone

### Automatic operation

- 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 TS.
  - The vehicle speed reduces under 18km/h.
- With the ignition 'on' and 'Reverse' selected, the camera system will display the view from the rear of the vehicle.

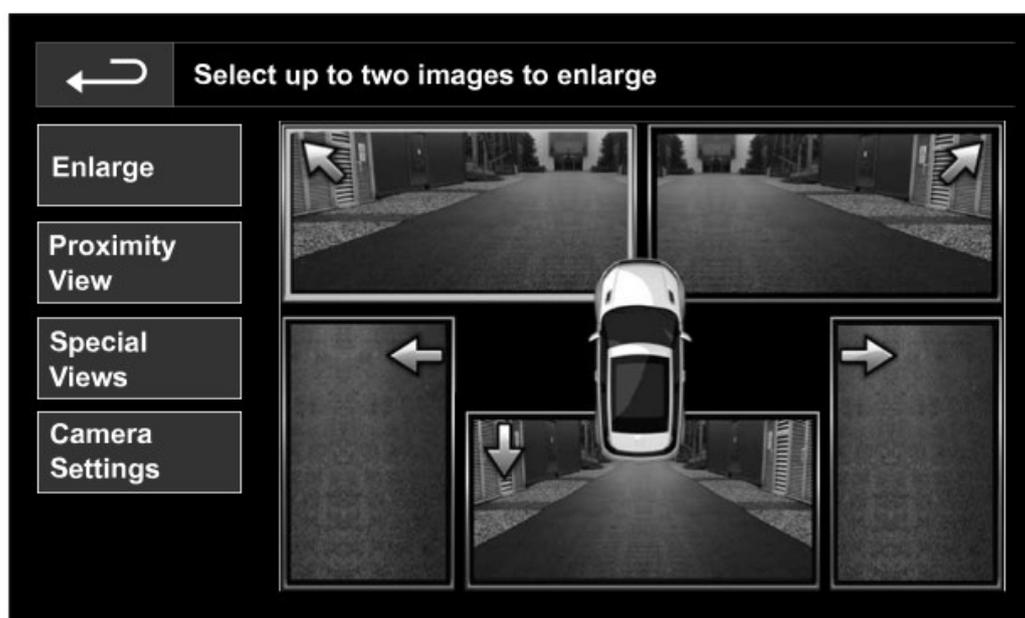
## Manual Operation

- The camera home page is accessed using the 'Cameras' icon on the 'Navigation' home screen on the TS or via the 'Extra Features' menu.
- Camera views can be accessed at all times.

### Selecting Views

Camera settings soft key is only visible on Japanese specification vehicles.

Camera home screen frame rate is reduced to 15 frames per second, all other camera views are shown at 30 frames per second.



E141729

- 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.

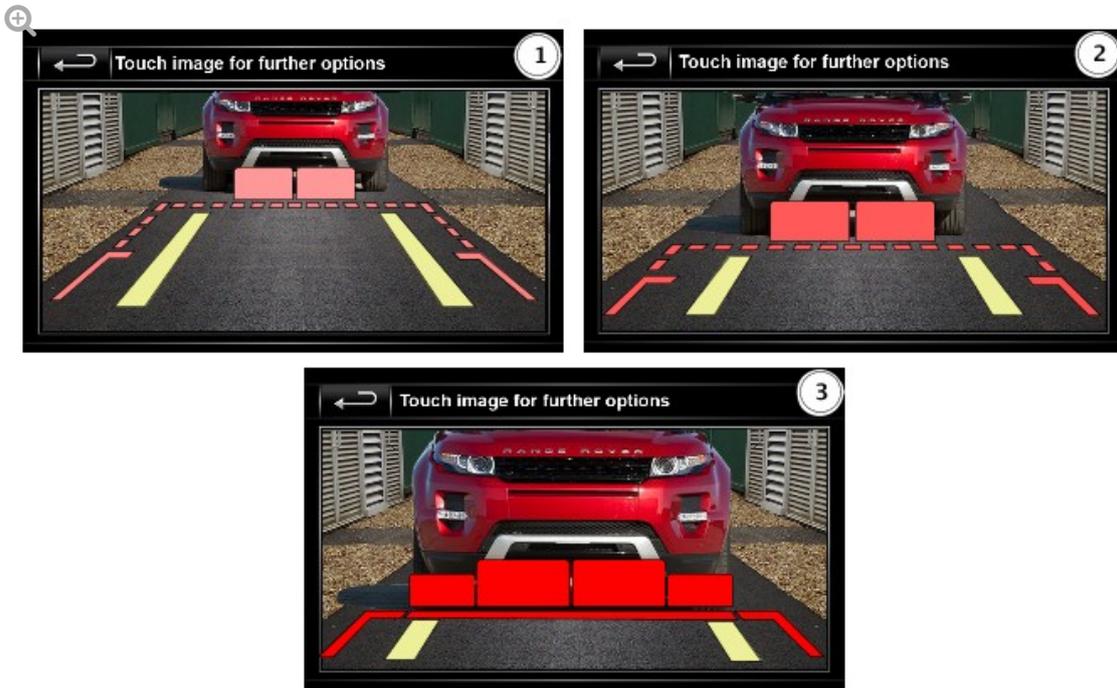
## **Proximity Camera System**

The proximity camera 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 CCM (camera control module) through the MS (medium speed) CAN comfort bus via the GWM (gateway module).

The reversing-aid graphics can be disabled in the settings menu or by touching the TS (touch screen) whilst reverse gear is selected and the camera view is displayed.

## **Reversing Visual Warnings**



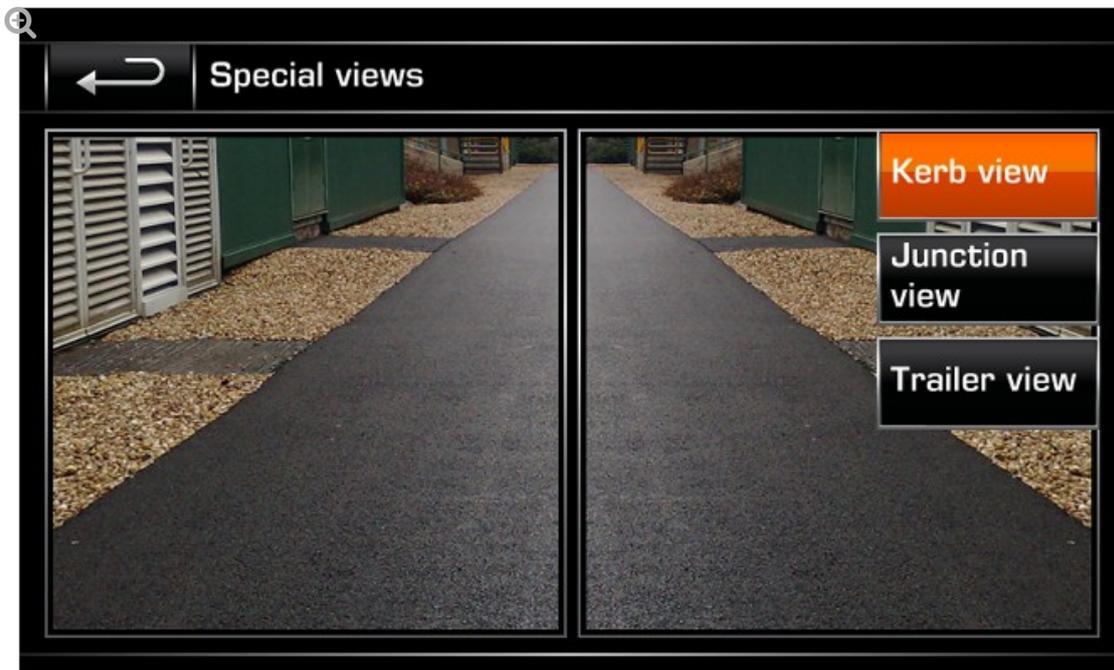
E148937

ITEM	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 5 seconds.
- Drive is selected and the vehicle speed is greater than 18 km/h (11 mile/h).

### Special Views



E148971

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:

- Kerb 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**

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 CCM, through the recognition of a new serial number during the 'camera count' procedure that takes place during the 'ignition on' phase via the LIN bus.

If a new camera is installed calibration must be performed using the diagnostic equipment and the vehicle's TS. During the calibration procedure, setup software in the control module overlays fine colored lines on the TS 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 TS.

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.

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

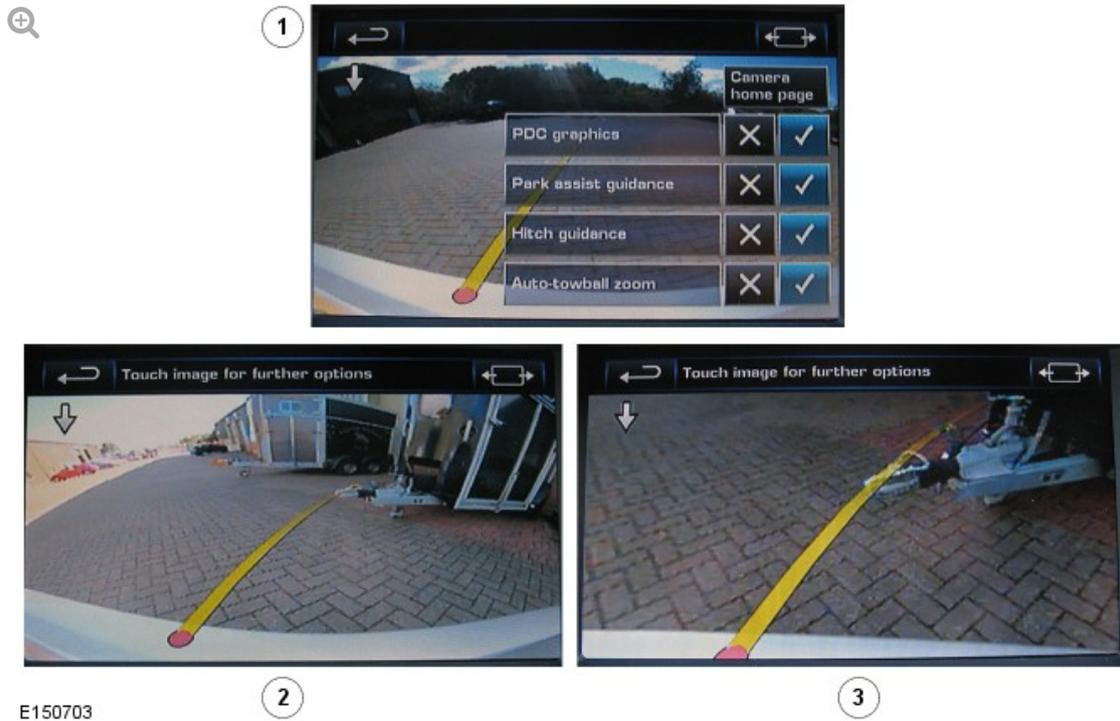
### **System Fault**

In the event of camera fault, a DTC is logged in the CCM, and an icon is presented to the driver on the TS where the camera image would normally be viewed.

### **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 TS.

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.



E150703

ITEM	DESCRIPTION
1	TS (touch screen) Image – Auto Towball Zoom Feature
2	Tow Ball Trajectory Line
3	Automatic Zoom

### Tow Assist - New Trailer

When the CJB detects the trailer electrical plug has been connected, the trailer setup screen is displayed automatically on the TS (touch screen) 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'.

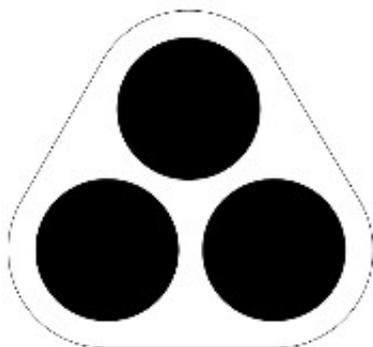
#### Trailer Setup – Step 1 of 6

- 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 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'.

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'.

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 and then select 'Finish'.

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'.

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**

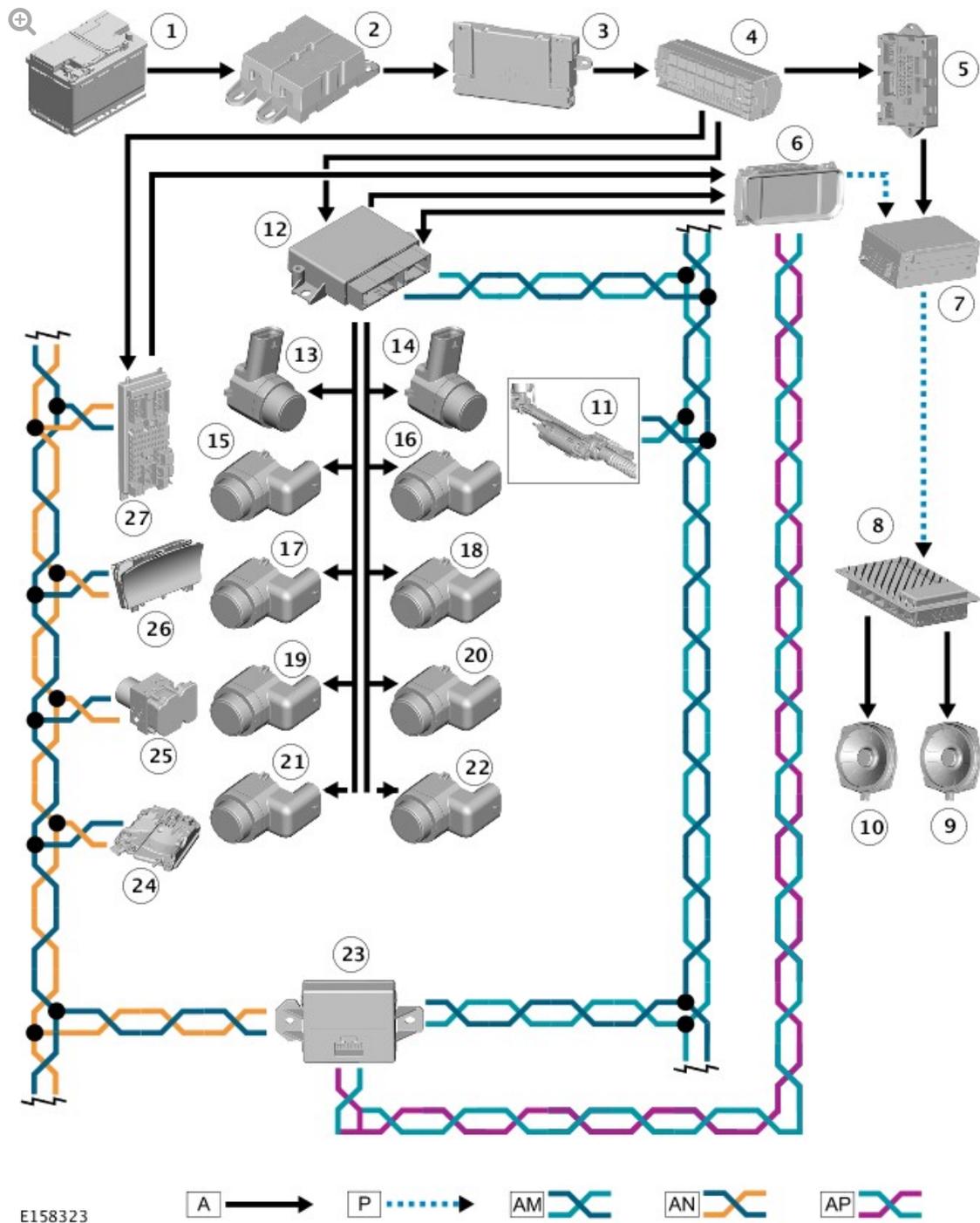
When the CJB detects the trailer electrical plug has been connected, the trailer setup screen is displayed automatically on the TS (touch screen) with the question: 'Has a trailer been connected?'

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

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## CONTROL DIAGRAM

### PARKING AID AND PARK ASSIST - CONTROL DIAGRAM

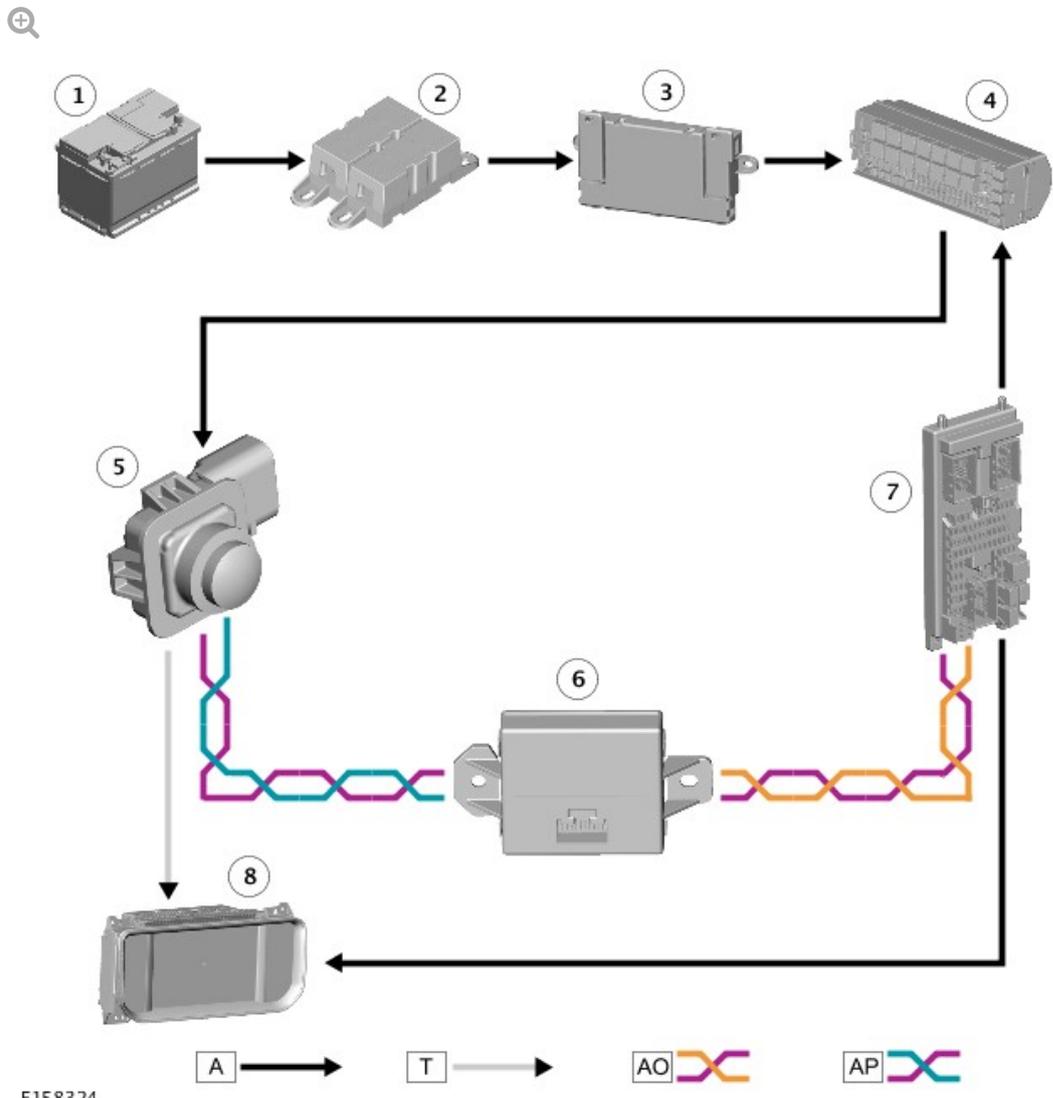


A = HARDWIRED; P = MOST (MEDIA ORIENTED SYSTEM TRANSPORT) BUS; AM = HIGH SPEED CAN (CONTROLLER AREA NETWORK) CHASSIS BUS, AN = HIGH SPEED CAN POWERTRAIN BUS, AP = MEDIUM SPEED CAN COMFORT BUS.

ITEM	DESCRIPTION
1	Battery
2	BJB2 (battery junction box 2)
3	BJB (battery junction box)

4	RJB (rear junction box)
5	QCCM (quiescent current control module)
6	TS (touch screen)
7	IAM (integrated audio module)
8	AAM (audio amplifier module)
9	Front Speakers
10	Rear Speakers
11	Steering Gear
12	PACM (parking aid control module)
13	Front Left Park Assist Sensor
14	Front and Rear Right Park Assist Sensor
15	Front and Rear Left Outer Parking Aid Sensor
16	Front Right Outer Parking Aid Sensor
17	Front Left Inner Parking Aid Sensor
18	Front Right Inner Parking Aid Sensor
19	Rear Left Outer Parking Aid Sensor
20	Rear Right Outer Parking Aid Sensor
21	Rear Left Inner Parking Aid Sensor
22	Rear Right Inner Parking Aid Sensor
23	GWM (gateway module)
24	TCM (transmission control module)
25	ABS (anti-locking braking system)
26	IC (instrument cluster)
27	CJB (central junction box)

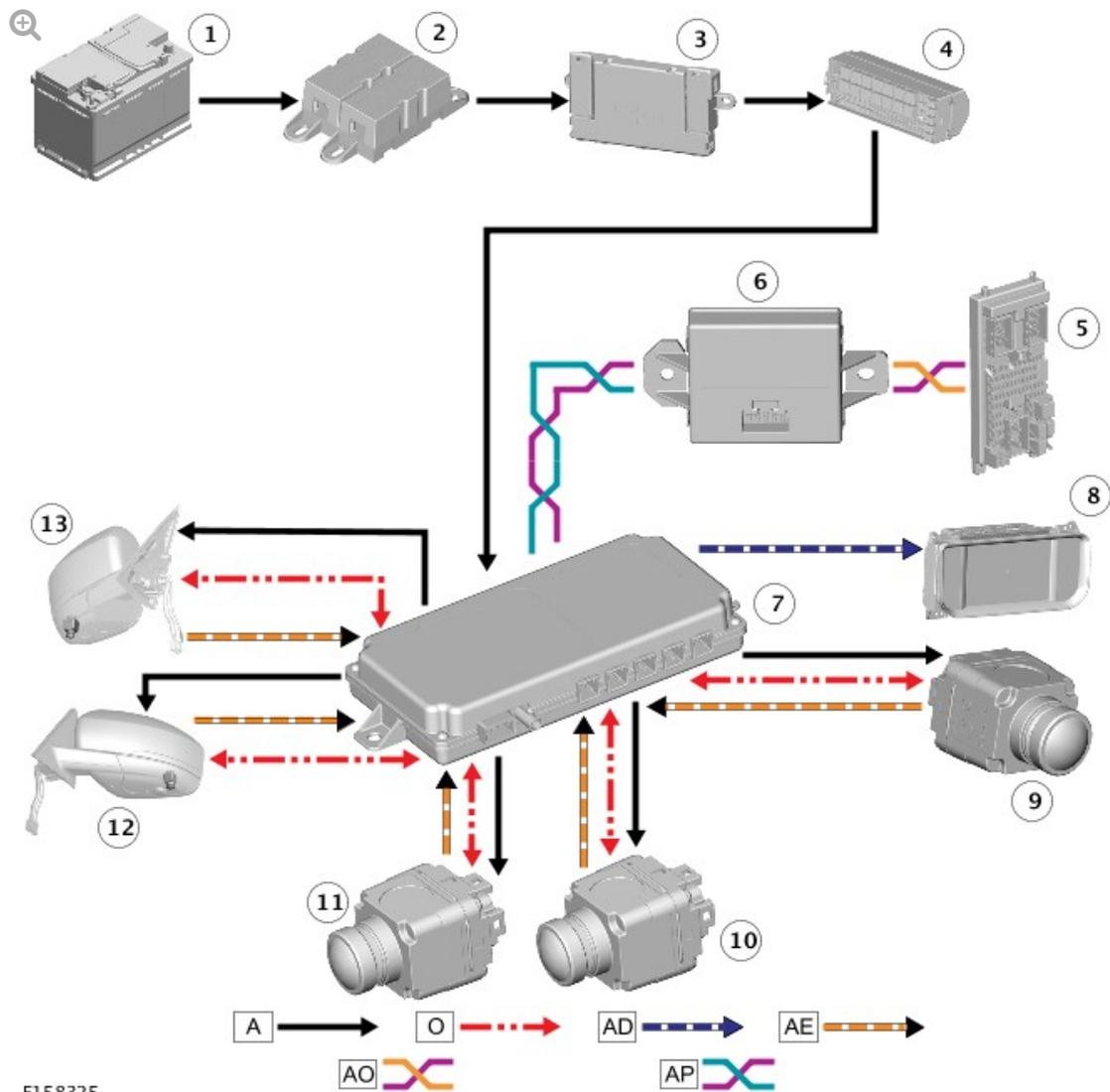
## REAR VIEW CAMERA SYSTEM - CONTROL DIAGRAM



A = HARDWIRED; T = COAXIAL WIRE; AO = MEDIUM SPEED CAN (CONTROLLER AREA NETWORK) BODY BUS, AP = MEDIUM SPEED CAN COMFORT BUS.

ITEM	DESCRIPTION
1	Battery
2	BJB2 (battery junction box 2)
3	BJB (battery junction box)
4	RJB (rear junction box)
5	RVC (rear view camera)
6	GWM (gateway module)
7	CJB (central junction box)

## PROXIMITY CAMERA SYSTEM - CONTROL DIAGRAM

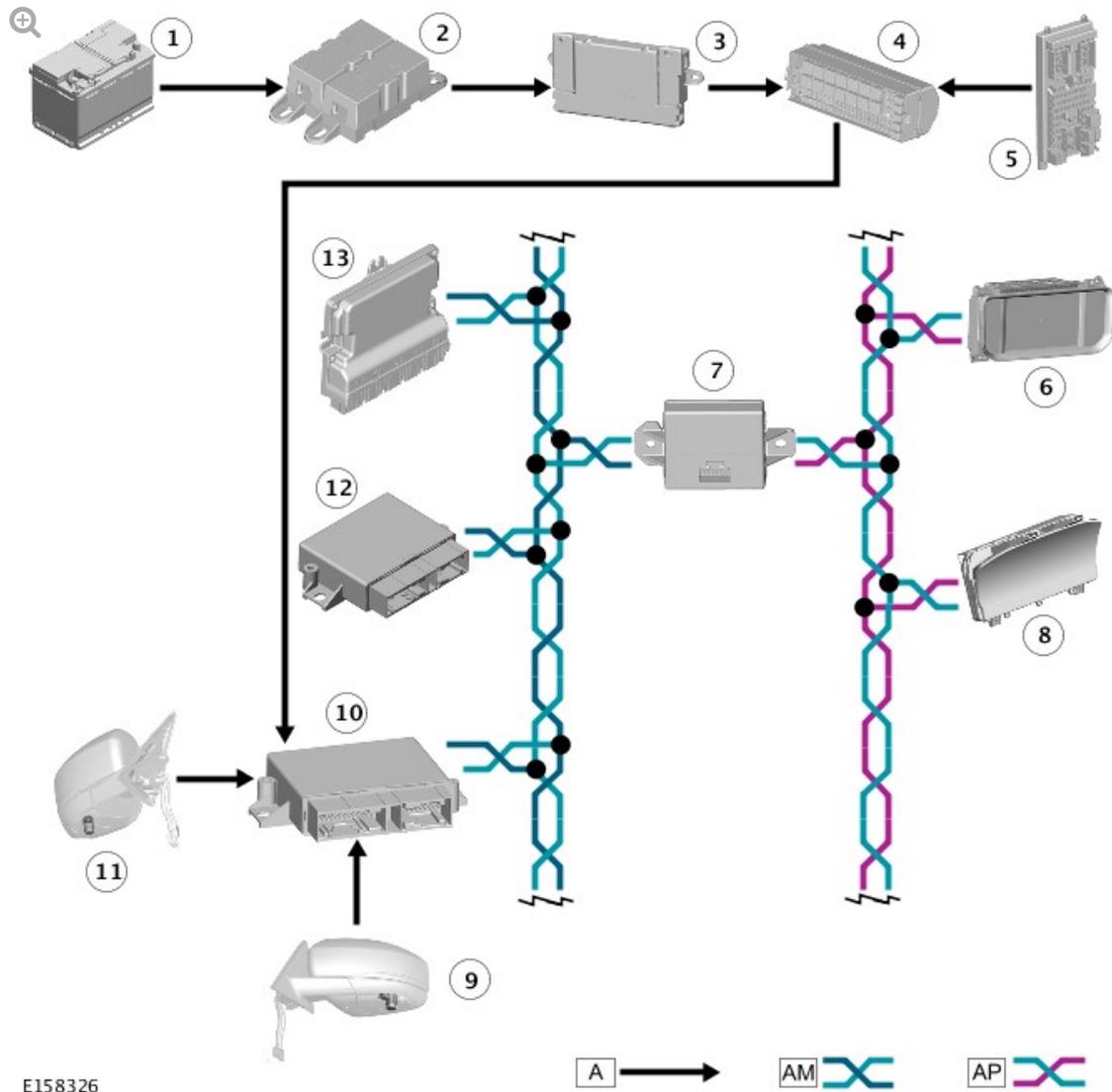


NOTE: A = HARDWIRED; O = LIN (LOCAL INTERCONNECT NETWORK) BUS; AD = NSTC (NATIONAL TELEVISION SYSTEM COMMITTEE); AE = LVDS (LOW-VOLTAGE DIFFERENTIAL SIGNALING); AO = MEDIUM SPEED CAN (CONTROLLER AREA NETWORK) BODY BUS; AP = MEDIUM SPEED CAN COMFORT BUS.

ITEM	DESCRIPTION
1	Battery
2	BJB2 (battery junction box 2)
3	BJB (battery junction box)
4	RJB (rear junction box)

5	CJB (central junction box)
6	GWM (gateway module)
7	CCM (camera control module)
8	TS (touch screen)
9	RVC (rear view camera)
10	Front Right Camera
11	Front Left Camera
12	Left Door Mirror Camera
13	Right Door Mirror Camera

### WADE SENSING SYSTEM - CONTROL DIAGRAM



NOTE: A = HARDWIRED; AM = HIGH SPEED CAN (CONTROLLER AREA NETWORK) CHASSIS BUS; AP = MEDIUM SPEED CAN COMFORT BUS.

ITEM	DESCRIPTION
1	Battery
2	BJB2 (battery junction box 2)
3	BJB (battery junction box)
4	RJB (rear junction box)
5	CJB (central junction box)
6	TS (touch screen)
7	GWM (gateway module)
8	IC (instrument cluster)
9	Left Door Mirror Wade Sensing Sensor
10	GPSM (general proximity sensor module)
11	Right Door Mirror Wade Sensing Sensor
12	PACM (parking aid control module)
13	ISCM (integrated suspension control module)