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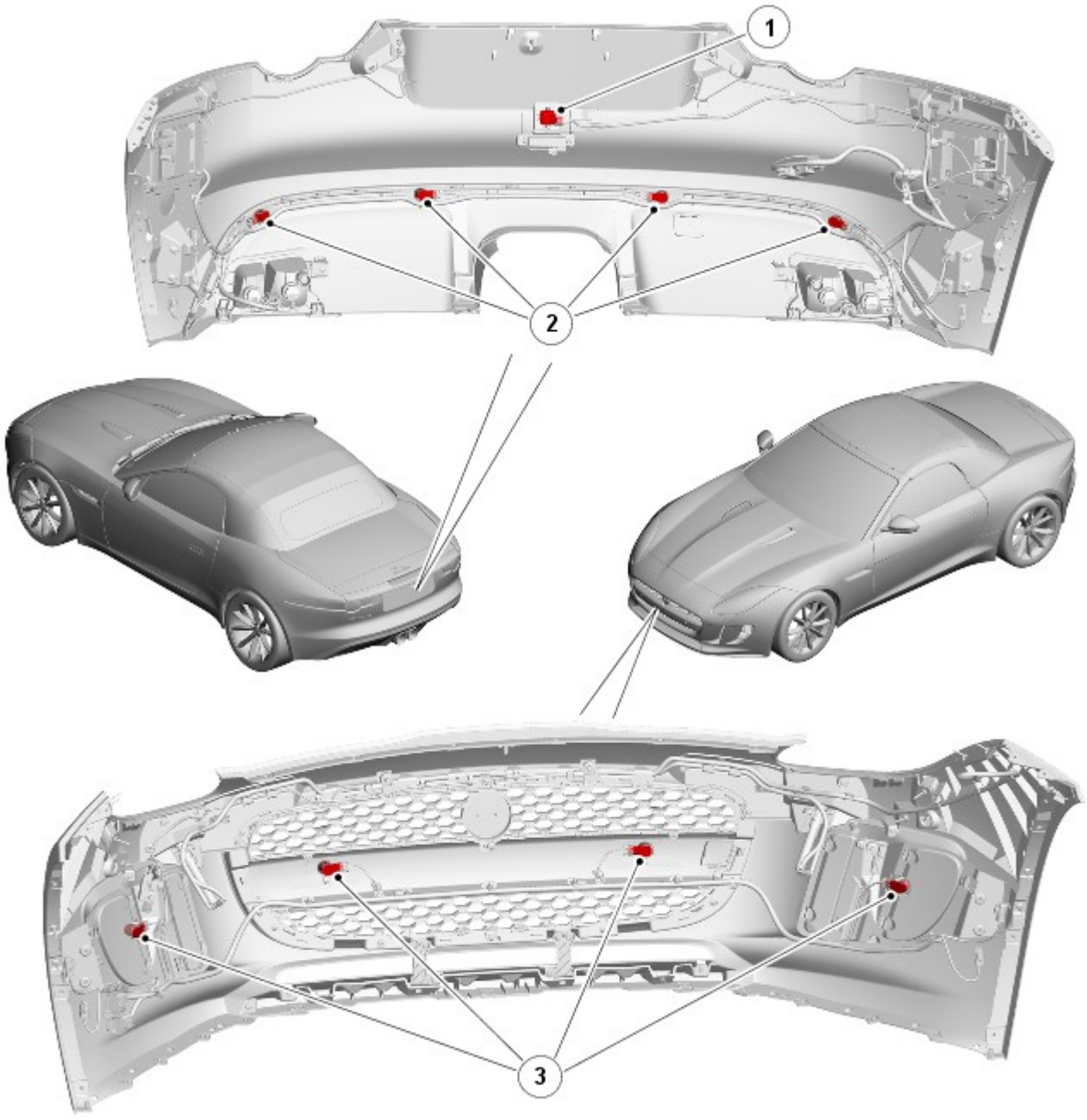
Parking Aid - Parking Aid

Description and Operation

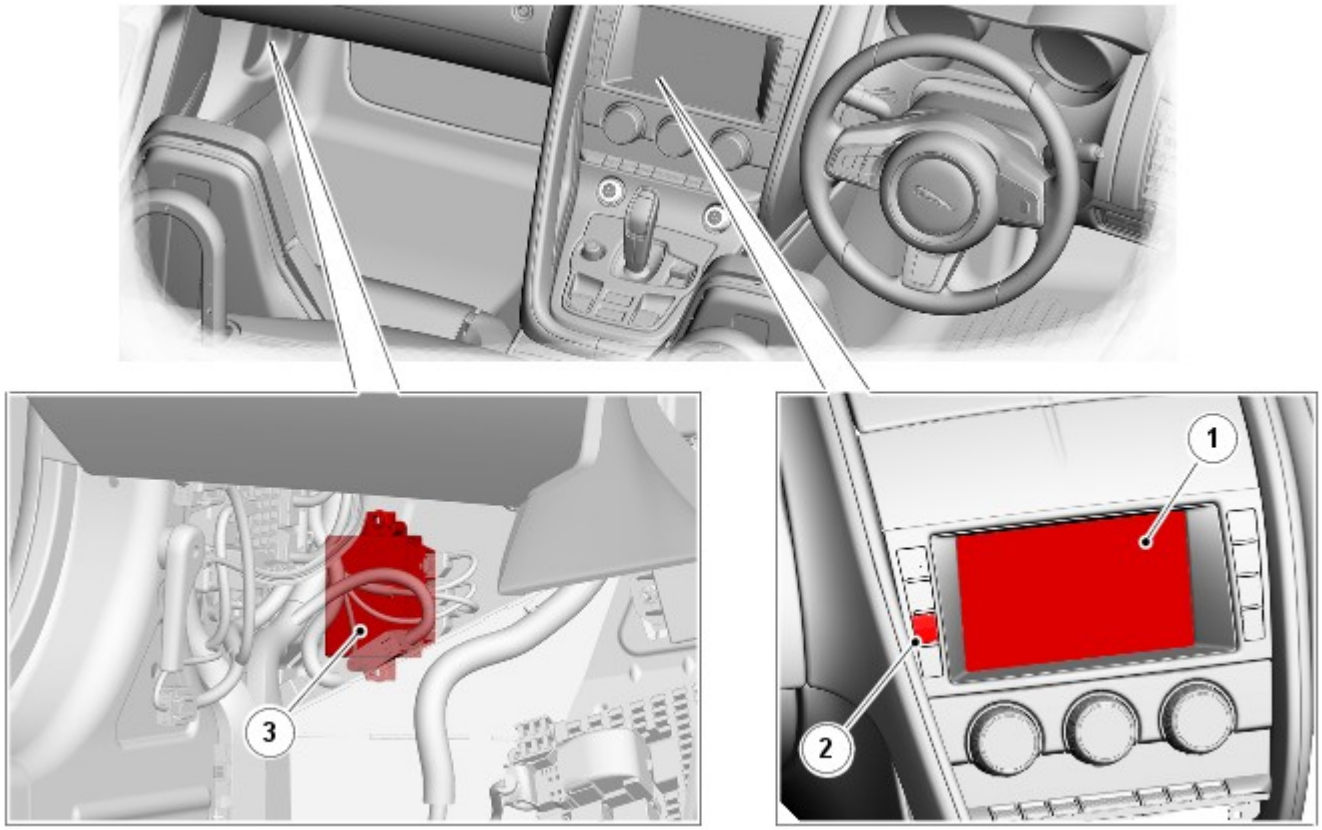
COMPONENT LOCATION - SHEET 1 OF 2



E154766

Item	Description
1	Rear view camera
2	Rear parking aid sensors
3	Front parking aid sensors

COMPONENT LOCATION - SHEET 2 OF 2



E154767

Item	Description
1	Touch screen
2	Parking aid switch
3	Parking aid control module

OVERVIEW

Front and rear parking aid systems are fitted as standard in some markets and are available as options in all other markets. For the front parking aid system to be fitted, the vehicle must also have a rear parking aid system. In all markets, a rear view camera can be fitted as an option provided the vehicle has a front parking aid system.

The rear parking aid system consists of four parking aid sensors at the rear of the vehicle and a parking aid control module. Vehicles with a front parking aid system also have four parking aid sensors at the front of the vehicle and a parking aid switch. Vehicles with a rear view camera have an analogue camera at the rear of the vehicle.

The parking aid systems operate using ultrasonic signals which are transmitted by the sensors. The reflected echos from these outputs are received by the sensors and used by the parking aid control module to calculate the distance from an object. The parking aid control module is connected to the integrated audio module to provide the driver with an audible warning. If an obstacle is sensed by the rear parking aid sensors, the rear audio system speakers will sound. If an obstacle is sensed by the front parking aid sensors (if fitted), the front audio system speakers will sound.

The parking aid switch allows the driver to activate/deactivate the parking aid systems if operation is required or not.

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

When the parking aid system is activated, the parking aid control module processes signals received from the sensors to determine if there is an object within the detection range of the sensors. A parking aid graphic is automatically displayed in the touch screen. If the vehicle has a parking aid camera fitted, the camera display is automatically displayed in the touch screen in preference to the parking aid graphic. To view the parking aid graphic, a single touch of the touch screen will remove the camera image display and show the parking aid graphic.

DESCRIPTION

Parking Aid Control Module

E117295

The parking aid control module is located on the bulkhead panel at the front of the left footwell, under the floor trim.

The parking aid control module has three electrical connectors which provide for power, ground and high speed CAN (controller area network) bus connections, front parking aid sensors and rear parking aid sensors.

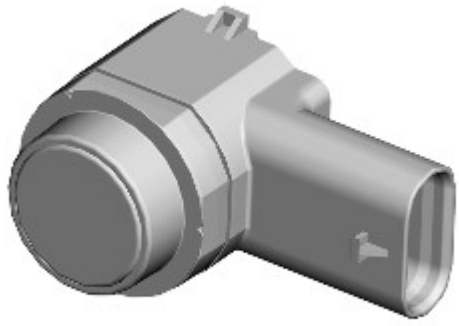
The high speed CAN bus connections provide for the receipt of the following information from other systems:

- ABS (anti-lock brake system) control module - Road speed signal
- TCM (transmission control module) - Reverse gear engaged signal.

The parking aid control module also outputs messages for the integrated audio module on the high speed CAN bus. The gateway module processes these messages and converts them into medium speed CAN messages, which are passed to the integrated audio module. These signals are then used to generate 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.

The parking aid control module has a diagnostic connection via the high speed CAN bus to enable faults to be retrieved using the Jaguar 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. The parking aid switch LED (light emitting diode) will also flash 6 times when reverse gear is selected or the parking aid switch is pressed.

Parking Aid Sensors



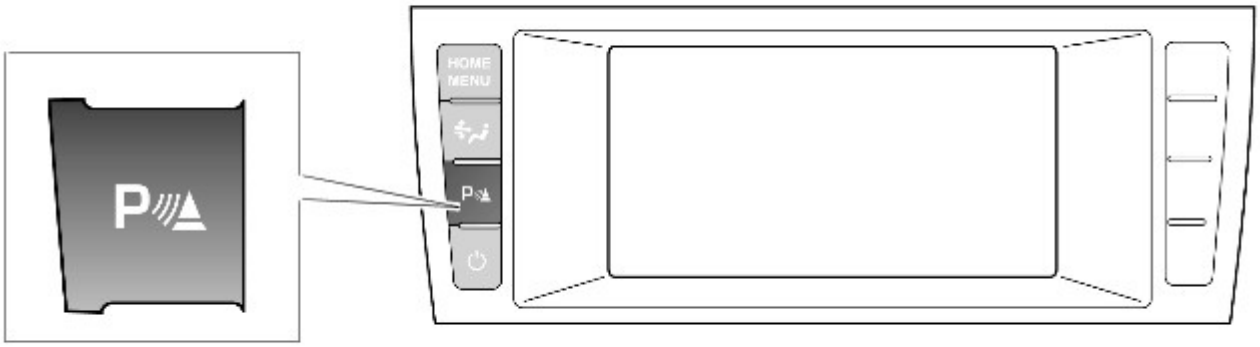
E154768

Rear parking aid sensors are installed on brackets on the inner top edge of the rear valance, with the head of each sensor protruding through the valance.

The front parking aid sensors are installed in brackets on the inside of the center grille bar and each outer grille of the front bumper, with the head of each sensor protruding through the center grille bar/outer grille.

The parking aid sensors are ultrasonic proximity detectors that measure the distance from the vehicle to nearby objects. An electrical connector on each parking aid sensor provides power, ground and signal connections with the parking aid control module.

Parking Aid Switch



E154769

The parking aid switch is located in the left switchpack of the touch screen.

The switch is a non-latching push switch which allows the driver to select the parking aid system on or off. When pressed, the switch momentarily connects a ground to the parking aid control module. An LED in the switch illuminates when the parking aid system is active. The LED is controlled by the parking aid control module.

Rear View Camera

E154770

The rear view camera is installed in a bracket on the inside of the rear bumper, immediately below the rear license plate, with the camera lens protruding through the bumper.

The rear view camera is a VGA (video graphics array) resolution analogue camera that provides an image covering a zone approximately 130° wide by 112° deep and is capable of capturing approximately thirty frames per second. An electrical connector on the camera provides power, ground, medium speed CAN bus and shielded co-axial cable connections. The co-axial cable connection is used for video image transmission between the camera and the touch screen.

The camera provides additional information to the driver when reversing the vehicle. When reverse gear is selected the camera automatically displays a wide-angle color image of the view from the rear of the vehicle on the touch screen. Overlay graphics are displayed by a combination of signals received on the medium speed CAN by the touch screen.

The positioning accuracy of the camera is crucial for successful operation, therefore care must be taken when installing a cameras to ensure it sits correctly in the bracket. In the event of camera replacement, a calibration routine must be performed.

OPERATION

Parking Aid Systems

If reverse (R) is the first gear selected after the ignition is switched on, both the front (if fitted) and rear parking aid sensors will become operational. When a forward drive gear is subsequently selected, all of the rear parking aid sensors are de-activated; if fitted, all of the front parking aid sensors remain operational until vehicle speed increases above 16 km/h (10 mph), park (P) is selected or the parking aid switch is pressed.

If drive (D) is the first gear selected after the ignition is switched on, the front parking aid sensors can be activated by pressing the parking aid switch.

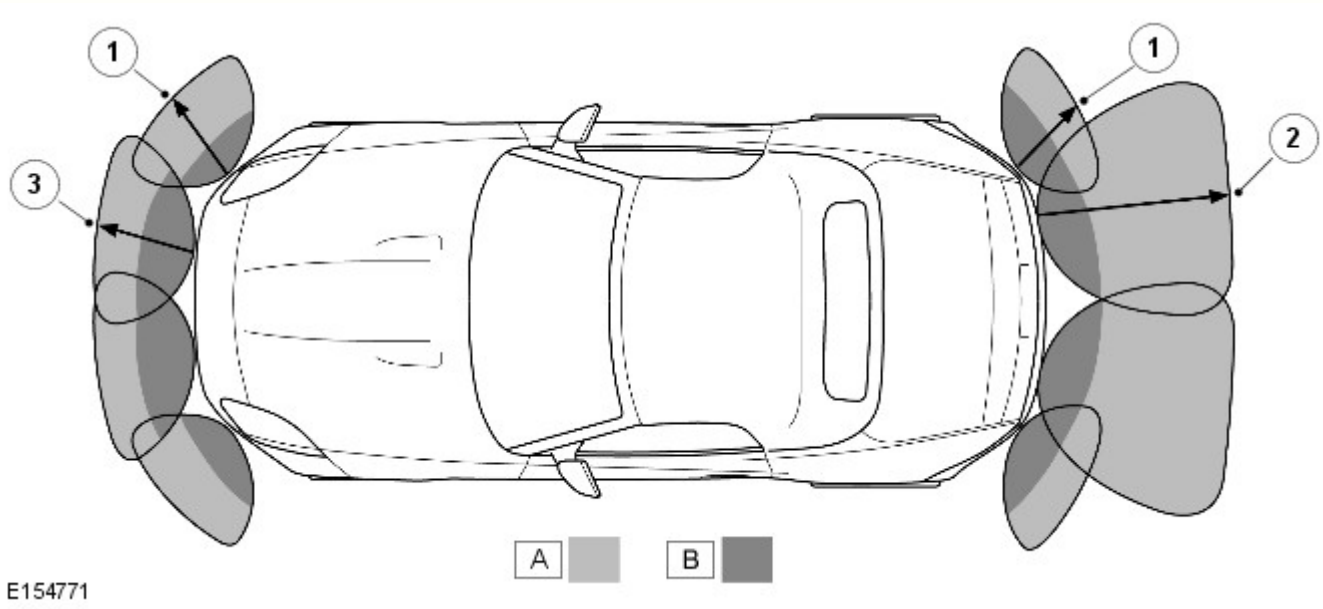
NOTE: The parking aid systems can not be activated while the vehicle is in park (P).

AUDIBLE WARNINGS

The parking aid control module processes the distance readings from the 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.

The volume output of the parking aid audible tones can be adjusted using the audio volume control when the parking aid system is activate. The volume can also be adjusted from the touch screen home menu by selecting **Setup** , **System** , **Volume presets** , **Parking aid** , then using the **+** or **-** soft keys.

OBJECT DETECTION



A = Maximum Detection Range; B = Continuous Audio Tone Range.

Item Number	Sensor Location	Maximum Detection Range (Repeated Audio Tones)	Continuous Audio Tone Range
1	Rear/Front Outer	Approximately 600 mm (24 inches)	Approximately 300 mm (12 inches)
2	Rear Inner	Approximately 1800 mm (71 inches)	Approximately 300 mm (12 inches)
3	Front Inner	Approximately 1000 mm (39 inches)	Approximately 500 mm (20 inches)

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 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 is determined by the module, with the sensor controlling the frequency of the impulse output.

In receiver mode, the sensor receives impulses that were emitted by adjacent sensors. The module 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 (front outer and all rear sensors) or 500 mm (front inner sensors), 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 control module recognizes the distance from the vehicle to the nearest object.

The parking aid control module 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 the relevant audible tone will be produced.

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

DIAGNOSTICS

The parking aid control module has a diagnostic connection via the high speed CAN bus to enable faults to be retrieved using the Jaguar 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. The parking aid switch LED will also flash 6 times when reverse gear is selected or the parking aid switch is pressed.

Rear View Camera

The rear view camera receives power at all times when the ignition is on or the engine is running. When R is selected, the rear view camera receives a reverse gear selected signal from the TCM via the high speed CAN bus, gateway module and medium speed CAN bus. The camera then sends a medium speed CAN message to the touch screen to display the image.

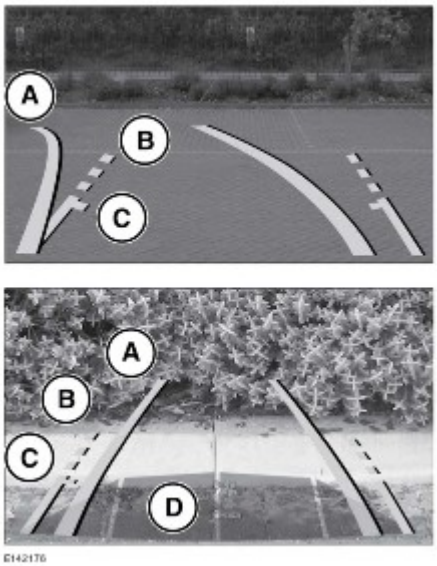
When R is deselected, the camera image remains on the touch screen for 5 seconds after the transmission has been put into D, P, N or S. This is to prevent the touch screen switching between screens if the vehicle is being maneuvered into a parking space. If the vehicle forward speed exceeds 16 km/h (10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

If the touch screen 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 touch screen will revert back to its switched off state.

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 representing the distance between the vehicle and the object being approached. Working in conjunction with the rear parking aid sensors, this adds a visual representation to the existing audible warning. The distance data is received from the parking aid control module via the medium speed CAN .

Rear View Image and Overlays

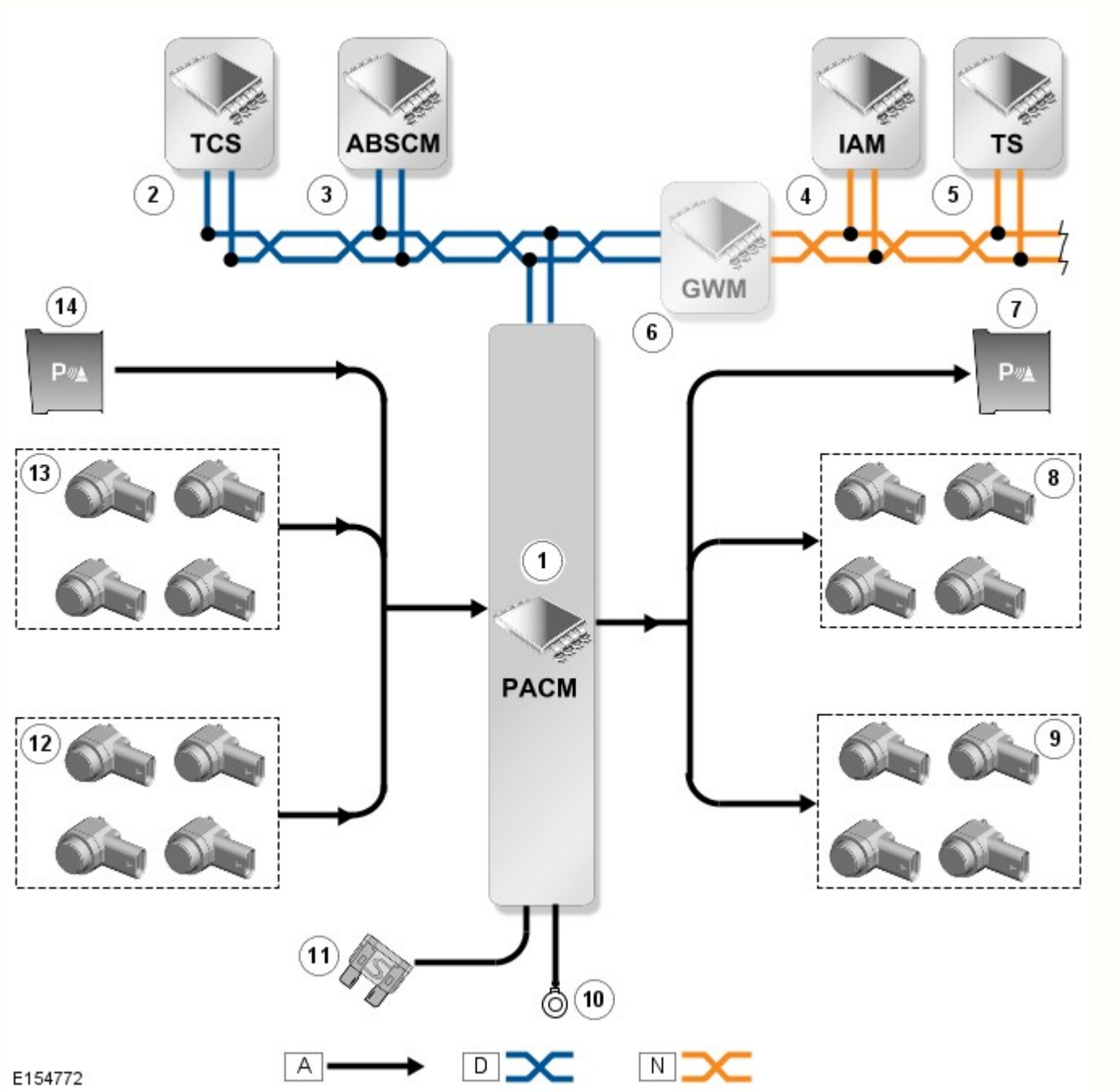


Item	Description
A	Solid line: The projected path based on current steering wheel position.
B	Dotted line: The safe working width of the vehicle (including exterior mirrors).
C	Luggage compartment access guideline: Do not reverse beyond this point if luggage compartment access is required.
D	Parking aid sensor activation: A colored area appears, to indicate which rear parking aid sensors have been activated.

SYSTEM FAULT

In the event of camera fault, a DTC (diagnostic trouble code) is logged in the camera and an icon is presented to the driver on the touch screen where the camera image would normally be viewed.

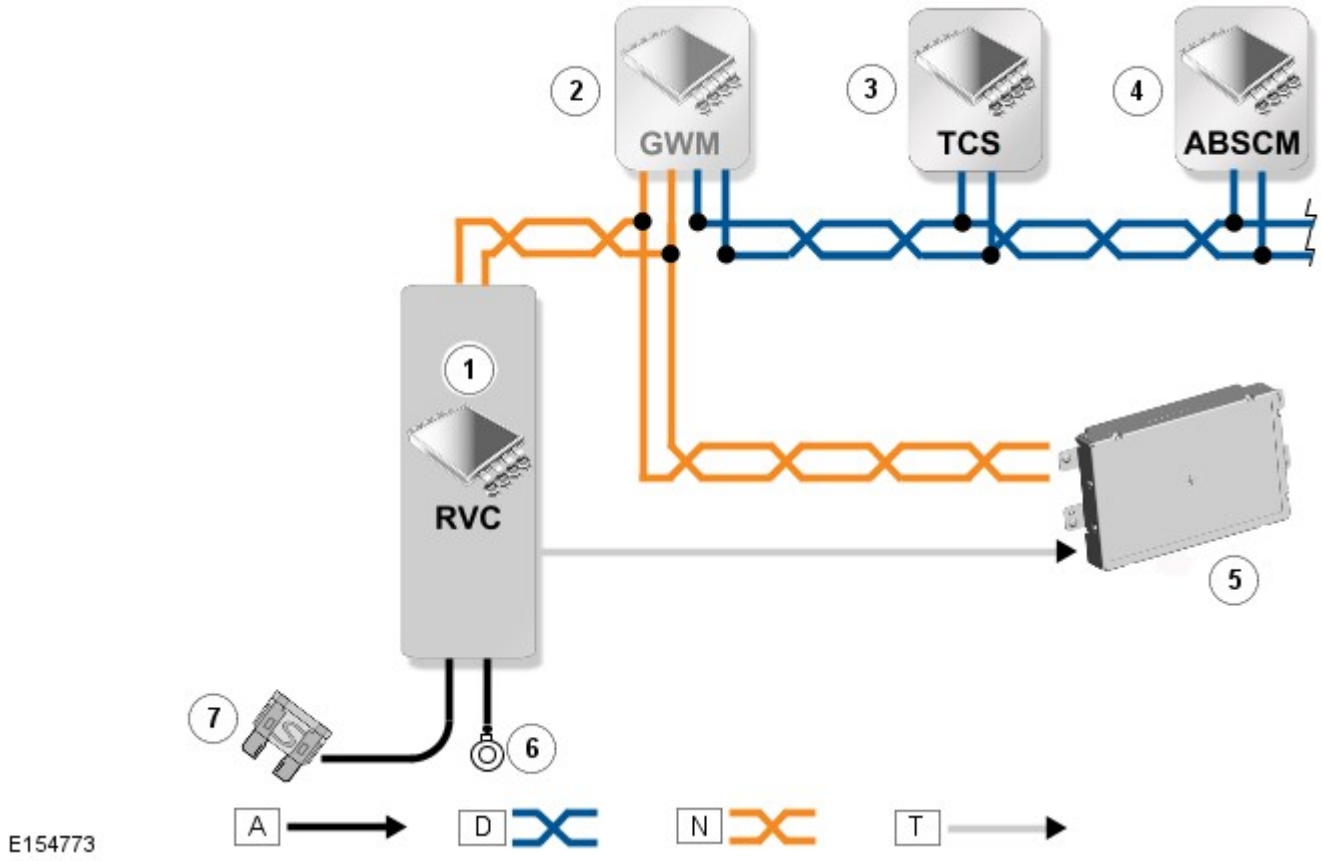
Input/Output Diagram - Parking Aid



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

Item	Description
1	Parking aid control module
2	Transmission control switch
3	Anti-lock brake system control module
4	Integrated audio module
5	Touch screen
6	Gateway module
7	Parking aid switch
8	Front parking aid sensors
9	Rear parking aid sensors
10	Ground
11	Power feed
12	Rear parking aid sensors
13	Front parking aid sensors
14	Parking aid switch

Input/Output Diagram - Rear View Camera



A = Hardwired connection; D = High speed CAN bus; N = Medium speed CAN bus; T = Co-axial cable.

Item	Description
1	Rear view camera
2	Gateway module
3	Transmission control switch
4	Anti-lock brake system control module
5	Touch screen
6	Ground
7	Power feed