SYSTEM OPERATION AND COMPONENT DESCRIPTION

413-13B Parking Aid - Vehicles With: Parking Aid Camera
Description and Operation

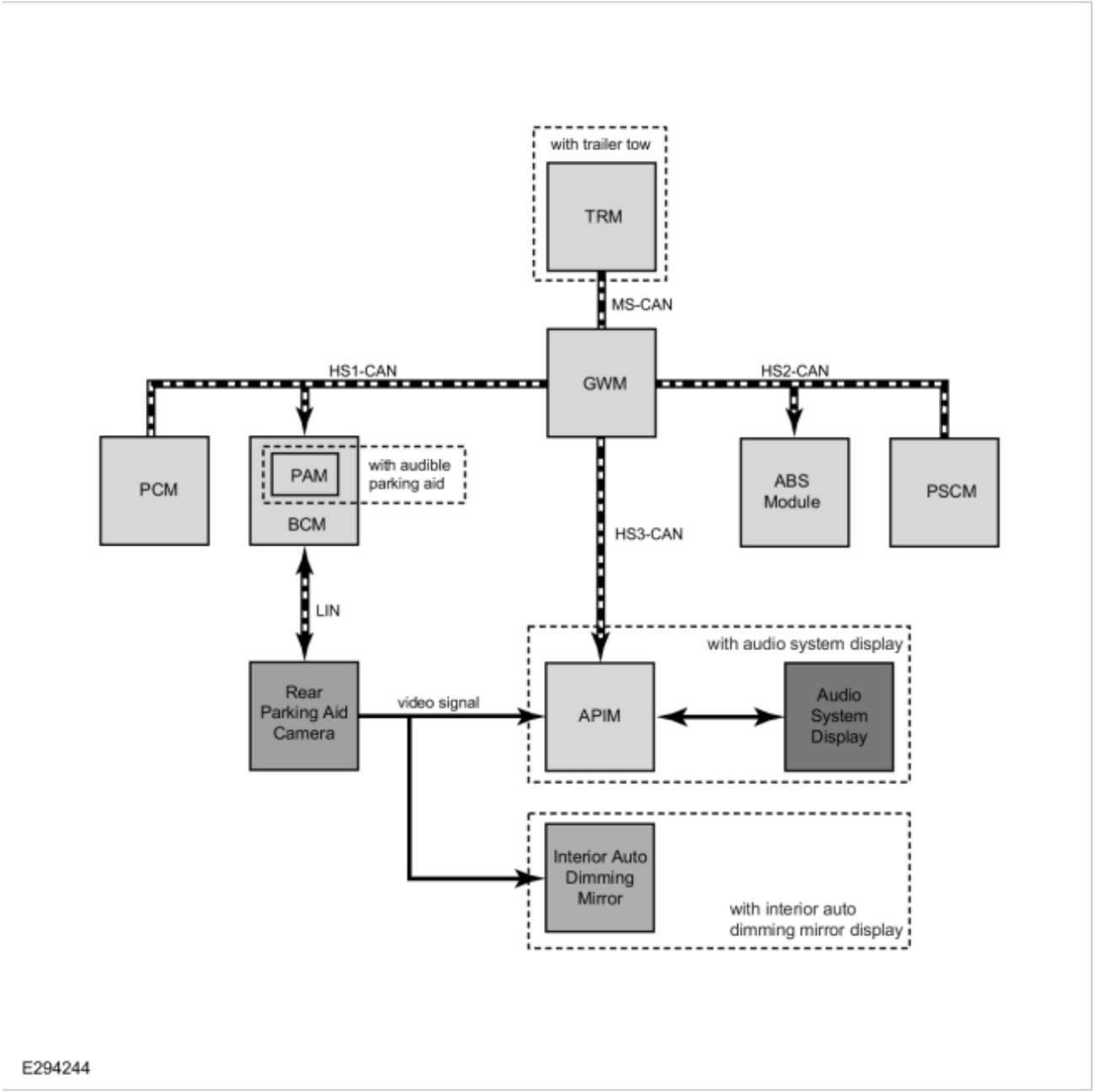
2020 Ranger

Parking Aid - System Operation and Component Description

System Operation

Parking Aid Camera

System Diagram



Network Message Chart

BCM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Camera commands	APIM	Used to command the zoom level on and off based on driver inputs through the audio system display.
Gear lever position	PCM	Used to support the rear parking aid camera standby mode. Turns the camera image output on when reverse gear is selected.

Broadcast Message	Originating Module	Message Purpose
Parking aid sensor data	PAM	Used to generate the visual highlights in the zone where an object is detected by the rear parking aid system.
Steering angle	ABS Module	Used to generate the intended vehicle path for the active guideline feature.
Trailer lamp connected	TRM	Disables the guidelines and visual park aid alert when a trailer is electrically connected to the vehicle (if equipped with trailer tow).
Vehicle speed	PCM	Used to support the rear parking aid camera standby mode. Turns the camera image output off when vehicle speed is 10 mph (16 km/h) or greater and turns the camera image output on when the vehicle speed is 5 mph (8 km/h) or less.

ABS Module Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Steering wheel angle sensor data	PSCM	The ABS module uses the steering angle sensor data to generate the steering angle message that is sent to the BCM to support the active guideline feature.

APIM Network Input Messages

Broadcast Message	Originating Module	Message Purpose
Camera status	BCM	Used to display the current status for active guidelines and visual park aid alert.
Gear lever position	PCM	Used to enable the video display when reverse gear is selected.

Broadcast Message	Originating Module	Message Purpose
Parking aid sensor data	PAM	Used to generate the visual highlights in the zone where an object is detected by the rear parking aid system.
Vehicle speed	PCM	When the video delay feature is turned on, this message is used to turn the rear camera display off after the vehicle speed exceeds a preset threshold.

Vehicles Equipped With Audio System Display

NOTE: *The tailgate must remain closed for correct operation of the parking aid camera system.*

The rear parking aid camera image is displayed by the audio system display when reverse gear is selected. To determine the selector lever position and enable the camera display, the PCM sends the gear position message to the GWM on the HS-CAN1 . The GWM then sends the message to the APIM via the HS-CAN3 .

The camera is on any time it receives voltage (when the ignition is ON), but a video signal is only generated under certain conditions. When reverse gear is selected, the camera continuously generates a video signal. When any gear except reverse is selected, the camera turns the video signal off when the vehicle speed reaches 10 mph (16 km/h), and turns the video signal on when vehicle speed falls below 5 mph (8 km/h). If the camera is not configured properly, some features may be inoperative. The camera sends the video signal on shielded twisted pair wires to the APIM , which displays the image on the audio system display.

The following parking aid camera system features are driver selectable:

- Visual park aid alert — assists the driver to visually see the object causing the parking aid system to sound.
- Manual zoom — allows the driver to manually zoom the image.
- Video delay — allows the driver to see the image behind the vehicle after the vehicle is shifted out of reverse into any gear other than park.

The following camera system features are not driver selectable:

- Fixed guidelines — assists the driver with aligning the vehicle with an object.
- Active guidelines — displays the intended path of the vehicle based upon steering wheel input.

The audio system display settings menu is used to turn the visual park aid alert and video delay on and off. The visual park aid alert and video delay features are generated within the APIM .

To turn the manual zoom feature on and off, the driver uses an on screen button located on the audio system display while in reverse. The driver generated commands originate at the audio system display, which is hardwired to the APIM . The APIM sends the driver generated commands over the HS-CAN3 to the GWM . The GWM then sends the commands to the BCM on the HS-CAN1 . The BCM sends the zoom command to the rear parking aid camera via the LIN circuit. The zoom is generated by the rear parking aid camera.

The fixed and active guidelines are generated by the rear parking aid camera and are not selectable by the driver.

Vehicles Equipped With An Interior Auto-Dimming Mirror Display

NOTE: *The tailgate must remain closed for correct operation of the parking aid camera system.*

The parking aid camera image is displayed in the interior auto-dimming mirror glass when the transmission is placed in reverse. The interior auto-dimming mirror video display turns on when the interior auto-dimming mirror receives voltage from the reversing lamp circuit. The camera generates a video signal any time it receives voltage, regardless of the current configuration. If the parking aid camera is not configured properly, some features may be inoperative. The camera is supplied voltage by the DCDC when the ignition is on. When the camera is on, the image signal is sent from the parking aid camera on shielded twisted pair wires to the interior auto-dimming mirror.

Vehicles equipped with the interior auto-dimming mirror display do not have any features that can be configured by the driver. The system displays fixed guidelines that cannot be turned off.

LIN Communication

The BCM and the rear parking aid camera communicate via a LIN circuit which is a dedicated single wire communication network.

The messages sent from the BCM to the camera are:

- Camera configuration data
- Display manual zoom request
- Guideline on/off request
- Trailer connection status (if equipped with trailer tow)
- Steering angle
- Standby enable/disable request

The messages sent from the camera to the BCM are:

- Camera status
- Display zoom status
- Camera part number data
- Guideline status

Visual Park Aid Alert

NOTE: *The on-screen alert color transitions may not match changes in the audible parking aid alert tone frequency.*

The visual park aid alert feature displays a visual highlight in the zone where an object has been detected by the rea parking aid system. This feature utilizes the parking aid sensor data from the PAM to generate the visual highlights on the video image. When reverse gear is selected and an object is detected by a rear parking aid sensor, the parkinç aid sensor data message from the PAM is used by the APIM to generate the alert.

If the visual park aid alert feature is enabled, the feature is still operational even if the rear parking aid system has been disabled by the driver.

Fixed Guidelines

NOTE: *The color-coded lines cannot indicate accurate or consistent distances between the rear of the vehicle and objects shown in the video image. This normal condition is due to variances in vehicle ride height, including, but not limited to, vehicle loading.*

The video camera fixed guidelines feature displays guidelines on top of the video image to assist the driver with alignment of the vehicle. A dashed line on the displayed image represents the center of the vehicle and 3 color-coded lines (red, yellow, green) identify different zones between the rear of the vehicle and objects.

The guidelines are not shown when reverse is not selected (video delay active).

If the vehicle is equipped with a TRM , the fixed guidelines are not shown when a trailer is electrically connected to the vehicle.

Active Guidelines

NOTE: *If the battery has been disconnected or discharged, or a module is disconnected or replaced, the active guidelines may be inoperative until the vehicle is driven on a flat and smooth road at 32 km/h (20 mph) or more, with hands placed loosely on the steering wheel and minimal steering correction for approximately 30 seconds.*

If the guidelines remain inoperative, it may be necessary to disconnect the battery for 5 minutes with the driver's door open, then drive the vehicle for 5 miles in normal city driving before performing the procedure described above. The active guidelines feature displays dynamic guidelines that correspond to the projected path of vehicle travel, based on the current steering angle. Several modules are involved in generating the steering angle data used to support the active guidelines. The PSCM monitors the steering angle sensor and sends the steering wheel angle sensor data to the ABS module via the HS-CAN2 . The ABS module uses this message from the PSCM to generate the steering angle message that is sent to the GWM on the HS-CAN2 . The GWM then sends the message to the BCM via the HS-CAN1 . The BCM sends the steering angle data to the rear parking aid camera via the LIN circuit. The camera uses this data to generate the active guidelines over the video image.

If the steering wheel is in the straight-ahead position, the active guidelines are not shown.

The guidelines are not shown when reverse is not selected (video delay active).

If the vehicle is equipped with a TRM , the active guidelines are not shown when a trailer is electrically connected to the vehicle.

Manual Zoom

The manual zoom feature is generated by the rear parking aid camera and has one level of zoom. If the manual zoom feature is on and the vehicle is shifted out of reverse gear, the manual zoom feature is disabled and must be re-enabled the next time reverse gear is selected. When the driver turns the zoom on or off at the audio system display, the zoom command is sent through HS-CAN3 to the GWM then over HS-CAN1 to the BCM . The BCM then sends the manual zoom request message to the rear parking aid camera via the LIN circuit. The camera then turns the zoom on or off.

Video Delay

When the video delay is turned on, the display keeps the rear video display enabled after the transmission is shifted out of reverse gear, into any gear other than park, until the vehicle speed reaches 8 km/h (5 mph). With the delay off (default), the image displays until the transmission is shifted out of reverse gear.

Component Description

Rear Camera

The rear parking aid camera is located on the tailgate. The rear camera communicates with the BCM through a LIN circuit. The camera must be configured using a diagnostic scan tool after replacement in order for all features to operate properly.

BCM

The BCM serves as a gateway between the rear parking aid camera and other modules on the HS-CAN1 . It communicates with the rear camera via the LIN and stores Diagnostic Trouble Codes (DTCs) for the camera and the LIN in the event of a concern.