Component Procedures: Collision Avoidance and Parking Assist Systems

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Parts and Labor (itype_189)

Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Remove & Replace	Parking Aid > Alarm Module, R&R	B	1.6	0.0
Remove & Replace	Parking Aid > Camera, R&R	B	0.5	0.0
Remove & Replace	Parking Aid > Sensor, R&R	B	1.5	0.0

Object Detection Description and Operation (w/ Rear Park Assist) (Article 13215)

The ultrasonic parking assist system is designed to identify and notify the driver of an object in the vehicles path when reversing at speeds of less than 8 km/h (5 MPH). The distance and location of the object is determined by 4 object sensor s located in the rear bumper. The parking assist system will notify the driver using an audible beep signal through the radio rear speaker s.

The parking assist system is made up of the following components:

- Parking assist control module
- Rear object alarm sensor s

Parking Assist Control Module

The parking assist control module provides an 8 V reference and a low reference to the four object alarm sensors. The parking assist control module receives individual signals from each of the four sensors and determines the location and distance of an object based on these inputs. When an object is detected, the parking assist control module will send a data message via CAN-Bus to the radio requesting an audible alert.

Rear Object Alarm Sensors

The object alarm sensors are located in the rear bumper of the vehicle. The sensors are used to determine the distance between an object and the bumper. Each sensor emits an ultrasonic frequency which is reflected off any object located behind the vehicle. These reflections are received by the sensors. The time difference between the emission of the frequency and when the reflection is received is known as sensor echo time, it is used to determine the distance to the object. The sensors report this information to the parking assist control module.

Rear Parking Assist Operation

When the vehicle is first placed into reverse there will be one audible beep through the rear speakers, to indicate that the system is working. If rear speakers are inoperable no audible signals will occur.

When backing up at speed of less than 8 km/h (5 MPH), the system is constantly monitoring for object of interest located behind the vehicle. The rear parking assist system can detect objects greater than 7.6 cm (3 in) wide and 25.4 cm (10 in) tall. The system cannot detect objects below the bumper, underneath the vehicle.

If an object is detected within 2.5 m (8 ft) there will be a audible beep notification out of both rear speakers based upon the distance to the object. As the vehicle gets closer to an object, the time between the beeps become shorter.

If the vehicle stops in a range zone the beeping will stop after 5 s. When the distance between the object and the vehicle changes, beeping will start again.

If the rear parking assist system detects a malfunction the single audible beep will not chime when put into reverse along with a DTC being stored. The object alarm module will send a serial data message to the instrument panel cluster to display the SERVICE PARK ASSIST message on the driver information center .

Parking Assist System Driver Information Center Messages

SERVICE PARK ASSIST

The driver information center displays SERVICE PARK ASSIST when the parking assist control module detects a malfunction in the rear parking assist system and the system is disabled. The driver information center also displays SERVICE PARK ASSIST when a loss of communication occurs with the parking assist control module.

PARK ASSIST OFF

The PARK ASSIST OFF message is displayed in the driver information center when the parking assist system is disabled due to conditions that disable or inhibit the system. The parking assist control module requests the driver information center display PARK ASSIST OFF when it detects that one of the following conditions:

- The rear parking assist system is manually disabled by the vehicle operator through the audio system personalization menu.
- The park brake is applied or not fully released.
- An object is attached to the rear of the vehicle, such as a trailer, bicycle rack, trailer hitch receiver, or tow bar. Also, an object extending beyond a lowered endgate will disable the system.
- The parking assist sensors are covered by snow, mud, dirt or ice.

- The vehicle bumper is damaged.
- Excessive paint thickness on a replacement parking assist sensor.
- The parking assist sensors are disrupted by vibrations, like those caused by a large nearby vehicle or from heavy equipment such as a jackhammer.

Object Detection Description and Operation (w/ Rearview Camera) (Article 13216)

Rear Vision Camera System Operation
The rear vision camera system consists of Rearview Camera, the Human Machine Interface Control Module (if equipped) or Radio , and the Info Display Module.
When the transmission is placed into REVERSE, a 12 volt signal is sent to the rear vision camera by the body control module (BCM). This signal indicates to the camera that the vehicle is in reverse and image display is requested. The rear vision camera receives ignition voltage and a constant ground to power the camera. Video signal + and video signal – circuits carry the video image from the Rearview Camera to the Human Machine Interface Control Module (if equipped) or Radio. The video signal is then sent to the Info Display Module, via an LVDS circuit, to be displayed on the screen. Additionally, the video signal circuits are shielded to prevent any interference which may lead to a loss of video signal resolution and a degraded video image. The shield is provided a ground path by the rear vision camera.
The following conditions may cause a degraded rear vision camera image:
- Ice, snow, or mud has built up on the rear vision camera
- Dark conditions
- Extreme light conditions, such as glare from the sun or the headlights of another vehicle
- Damage to the rear of the vehicle
- Extreme high temperatures or extreme temperature changes
If a malfunction is detected in the system, Service Rear Vision Camera may be displayed on the infotainment display as an indicator to the customer that a problem exists that requires service.

Object Detection Schematics (Article 13230)

Figure 1: UD7
Figure 2: Object Detection Schematics Rear View Camera

Parking Assistant Circuit (Article 11237)

Parking Assistant Circuit
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Rear View Camera Circuit (Article 11211)

Rear View Camera Circuit
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Object Detection - Fastener Specifications (Article 13231)

Application Specification
Metric English
Rear Object Alarm Indicator Screws 7 Nm 62 lb in
Rear Object Alarm Module Nuts 6 Nm 53 lb in

All New Technical Service Bulletins (itype_432)

Tsbs
- During Start Up Amber Forward Collision Alert Icon Illuminated and/or Startup Message Forward Collision Automatic Braking Off Illuminated on Driver Information Center (DIC) (25-NA-341, 2025/12/05)

All Technical Service Bulletins (itype_100)

Tsbs
- Diagnostic Tip: Rear View Camera Brightness Control Options (PIC5611H, 2023/01/04)
- Collision Avoidance - Blind Spot Detection Stops Working (16-NA-069, 2016/03/03)
- During Start Up Amber Forward Collision Alert Icon Illuminated and/or Startup Message Forward Collision Automatic Braking Off Illuminated on Driver Information Center (DIC) (25-NA-341, 2025/12/05)

Customer Interest Bulletins (itype_109)

Tsbs

- Collision Avoidance - Blind Spot Detection Stops Working (16-NA-069, 2016/03/03)

Object Alarm Module Programming and Setup (Article 10747)

The following service procedures require either a programming or a setup event performed for a complete repair.

Parking Assist Control Module Replacement

If the parking assist control module needs to be replaced, the following procedures must be performed:

- Connect a scan tool to the vehicle and access SPS. Refer to Service Programming System (SPS)
- Perform the SPS function Parking Assist Control Module Programming and follow the on-screen instructions.
- Perform the SPS function Parking Assist Control Module Configuration & Setup and follow the on-screen instructions.
- Clear DTCs after completing the programming procedure.

Parking Assist Control Module Reprogramming

Do not reprogram the parking assist control module, unless directed by a service procedure, or a service bulletin.

Object Alarm Module Scan Tool Information (Article 10789)

Parameter System State Expected Value Description

Operating Conditions: Ignition ON/Engine OFF/Parking Assist ON

Advanced Park Assist Switch Advanced parking assist switch released Inactive The scan tool displays Inactive or Active depending on the advanced parking assist switch state.

Advanced parking assist switch pressed Active

Battery Voltage — 11–14 V The scan tool displays V. This is the current battery voltage.

Calculated Transmission Range Transmission in reverse Reverse The scan tool displays Park, Reverse, Neutral, Drive or Unknown depending on the state of the commanded gear.

Obstacle Detected — No The scan tool displays Yes or No. Yes is displayed if there is an object within the measuring range of the object sensor s.

Park Assist Chime — Varies The scan tool displays On or Off. On is displayed if there is an object within the measuring range of the object sensors.

Park Assist Disable History 1 — Varies The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.

Park Assist Disable History 2 — Varies The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.

Park Assist Disable History 3 — Varies The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.

Park Assist Disable History 4 — Varies The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.

Park Assist Disable History 5 — Varies The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.

Park Assist Disable History 6 — Varies The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.

Park Assist Disable History 7 — Varies The scan tool displays None, Manual Disable, Park Brake Applied, Trailer or Other Attached Object, Excessive Speed in Reverse, No or Invalid Sensor Signals, Sensor Disturbance, Sensors Dirty, Sound Signal Return Time Not Plausible. This is the state of the park assist disable history.

Park Assist Sensor — On The scan tool displays On or Off.

Park Assist Sensor Reference Voltage — 7.3–9.1 V The scan tool displays V. This is the amount of voltage being

sent to the object sensors.
Park Assist Switch Parking assist switch released Inactive The scan tool displays Inactive or Active depending on the parking assist switch state.
Parking assist switch pressed Active
Park Assist Switch LED Parking assist ON On The scan tool displays On or Off. This is the state of the parking assist switch indicator.
Parking assist OFF Off
Park Assist System Status — Enable The scan tool displays Disable, Enable, Inhibited or Failed. This is the state of the parking assist system.
Power Mode — Run The scan tool displays Off, Accessory, Run or Crank. This is the state of the ignition switch.
Output Control Description
Clear Disable History Data The object alarm module clears the park assist disable history when commanded from the scan tool.
Park Assist Switch LED The object alarm module illuminates the parking assist switch indicator when commanded from the scan tool.
Advance Park Assist LED The object alarm module illuminates the advanced parking assist switch indicator when commanded from the scan tool.

Symptoms - Object Detection (Article 13225)

- Perform the Diagnostic System Check - Vehicle before using the Symptom Tables in order to verify that all of the following are true:
- There are no DTCs set.
- The control modules can communicate via the serial data link.
- Review the system operation in order to familiarize yourself with the system functions. Refer to Object Detection Description and Operation .

Visual/Physical Inspection
- Inspect for aftermarket devices which may affect the operation of the system. Refer to Checking Aftermarket Accessories .
- Inspect the easily accessible or visible system components for obvious damage or conditions which may cause the symptom.
- This system can use various sensors that need to be clean in order to function properly. Make sure to check the following sensors for obstructions:
- Parking assist sensors located in the rear bumper cover
- Rear vision camera lens

Intermittent
Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to Testing for Intermittent Conditions and Poor Connections .
Symptom List
- Parking Assist System Malfunction
- Rear Vision Camera System Malfunction

Parking Assist System Malfunction (Article 13223)

Diagnostic Instructions
- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

Circuit/System Description
The ultrasonic parking assist system is designed to identify and notify the driver of an object in the vehicle's path when reversing at speeds of less than 8 km/h (5 MPH). The distance and location of the object is determined by four object sensor s located in the rear bumper. The parking assist system will notify the driver using an audible signal through the radio .
Diagnostic Aids
When the “Park Assist Off”, “Park Asst Blocked See Owners Manual”, or “Park Assist Blocked See Owners Manual” message is displayed in the DIC the disable reason is stored in the Park Assist Disable History.
The scan tool Park Assist Disable History parameters are a list of the seven previous reasons the parking assist system was disabled. These parameters may help in the diagnosis of an intermittent concern or a customer concern which is the result of normal system operation. The following is a brief description of potential causes which may aid in diagnosis:

- Manual Disable - The parking assist system has been disabled by the vehicle operator through the audio system personalization menu.
- Hitch/Object Attached - The parking assist control module is detecting an object that is attached to the vehicle. Common items such as a hitch receiver, trailer, or a bicycle rack may cause this concern. Additionally, damage to the rear of the vehicle or a misaligned sensor may cause this concern. If the vehicle is damaged in a manner that causes the sensor to detect the bumper itself, the parking assist control module will interpret this as an attached object and disable the system. Carefully inspect the bumper, bumper mounting surface, and sensor retainers before continuing with normal diagnosis. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 MPH).
- Reverse Overspeed - The vehicle is travelling too fast in reverse at speeds of greater than 8 km/h (5 MPH).
- Inhibit - The parking assist control module has lost or received invalid GMLAN signal(s).
- Sensor Disturbance - An outside interference is causing sensor movement. Such interference may be caused by a heavy pounding, like that of a nearby jackhammer, or large changes in pressure, such as a large truck's air brakes.
- Sensor Ring Time - If the sensor fails its own diagnostic initialization the parking assist control module will set this error. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 MPH). The following is a list of reasons this cause may have set:
- One or more of the sensors may be blocked by snow, mud, ice, or other debris. This might happen after going through a car wash in cold weather.
- Silicone insulator surrounding sensor may be missing, cut, or twisted.
- Improperly installed sensor, sensor may be crooked due to a tight wire harness.
- One or more of the sensors may be scratched or the paint may be chipped.
- Excessive paint thickness on a sensor may cause an excessive sensor ring time. When replacing or refinishing a sensor, do not apply an excessive amount of paint or clear coat.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Object Detection Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

Manual Transmission

- Ignition ON, transmission in REVERSE, verify the engine control module (ECM) scan tool Reverse Position Switch parameter is On.
- If not the specified value, refer to Backup Lamps Malfunction .
- Verify the scan tool Parking Assist System Status parameter displays Enable.
- If not the specified values, refer to Diagnostic Aids and the scan tool Park Assist Disable History parameters to determine the cause of the inhibit.
- If all tests normal, replace the K41R Rear Parking Assist Control Module.

Automatic Transmission

- Ignition ON, transmission in REVERSE, verify the scan tool Parking Assist System Status parameter displays Enable.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for rear parking assist control module replacement, programming and setup

Rear Vision Camera System Malfunction (Article 13224)

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

Circuit/System Description

When the transmission is placed into REVERSE, a 12 V signal is sent to the rearview camera indicating that camera operation is requested. Ignition voltage and ground are supplied to the rearview camera. The rearview camera sends video information to the radio through a video signal + and a video signal – circuit. A grounded shielding also wraps the video signal circuits to reduce electronic interference which may degrade the video signal and cause a distorted or otherwise degraded image.

Diagnostic Aids

A poor video image can be caused by ice, snow, and mud buildup on the lens of the rearview camera. Also, extreme lighting conditions can affect performance, such as operating in the dark or with bright sunlight shining on the camera. Extreme high or low temperatures can also affect the image quality. An open in the shield of the video signal circuit can also cause a distorted screen.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Rear Vision Camera Description and Operation

Electrical Information Reference

- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

- Ignition ON.
- Verify that DTC B2545 is not set.
- If the DTC is set Refer to DTC B2545 .
- If the DTC is not set
- Verify the rearview camera there is no debris on the lens and that the bezel or bezel seal is not damaged.
- If debris are found on the lens Clean the lens using water and a soft cloth. If the lens, bezel, or bezel seal are damaged, replace as necessary.
- If no debris on the lens
- Engine running, parking brake applied, transmission in R.
- Verify the backup lamps are On.
- If the backup lamps are not ON Refer to Backup Lamps Malfunction .
- If the backup lamps are ON
- Verify a clear rear vision image is displayed on the radio.
- If a clear image is not displayed Refer to Circuit/System Testing.
- If a clear image is displayed
- All OK.

Circuit/System Testing

- Ignition OFF, disconnect the harness connector at the B87 Rearview Camera.
- Test for less than 10 Ω between the ground circuit terminal 5 and ground.
- If 10 Ω or greater Test for less than 2 Ω in the ground circuit end to end.
- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω, repair the open/high resistance in the ground connection.
- If less than 10 Ω
- Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
- If the test lamp does not illuminate and the circuit fuse is good
- Ignition OFF.
- Test for less than 2 Ω in the ignition circuit end to end.
- If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse.
- If the test lamp does not illuminate and the circuit fuse is open
- Test for infinite resistance between the ignition circuit and ground.
- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, test or replace the KR74 Ignition Run Relay.
- If the test lamp illuminates
- Engine running, park brake applied, transmission in REVERSE.
- Test for greater than 11 V between the control circuit terminal 3 and ground.

- If less than 11 V
- Ignition OFF, disconnect the X7 harness connector at the K9 Body Control Module.
- Test for infinite resistance between the control circuit and ground.
- If infinite resistance
- Test for less than 2 Ω in the control circuit end to end.
- If less than 2 Ω, replace the K9 Body Control Module.
- If greater than 11 V
- Ignition OFF, disconnect the X4 harness connector at the A11 Radio, ignition ON.
- Test for less than 1 V between the signal circuit terminal listed below and ground:
- Signal (+) circuit terminal 1 at the B87 Rearview Camera.
- Signal (–) circuit terminal 4 at the B87 Rearview Camera.
- If 1 V or greater Repair the short to voltage on the circuit.
- If less than 1 V
- Test for infinite resistance between the signal circuit terminal listed below and ground:
- If less than infinite resistance Repair the short to ground on the circuit.
- Test for less than 2 Ω in the signal (+) circuit end to end.
- If 2 Ω or greater Repair the open/high resistance in the circuit.
- If less than 2 Ω
- Test for less than 2 Ω in the signal (–) circuit end to end.
- If 2 Ω or greater Test the signal circuit for an open/high resistance.
- Replace the B87 Rearview Camera.
- Engine running, parking brake applied, transmission in REVERSE, verify a clear rear vision image is displayed on the A11 Radio.
- If a clear rear vision image is not displayed on the A11 Radio Replace the A11 Radio.
- If a clear rear vision image displayed on the A11 Radio
- All Ok.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair.

- Rearview Camera Image Display Module Replacement
- Control Module References for control module replacement, programming and setup