

2017 ACCESSORIES & EQUIPMENT

Object Detection and Pedestrian Protection - Impala

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Forward Range Radar Module Fastener	9 N.m (80 lb in)
Rear Object Alarm Control Module Fastener	4.5 N.m (40 lb in)

SCHEMATIC WIRING DIAGRAMS

OBJECT DETECTION WIRING SCHEMATICS

Rear Park Assist (UD7)

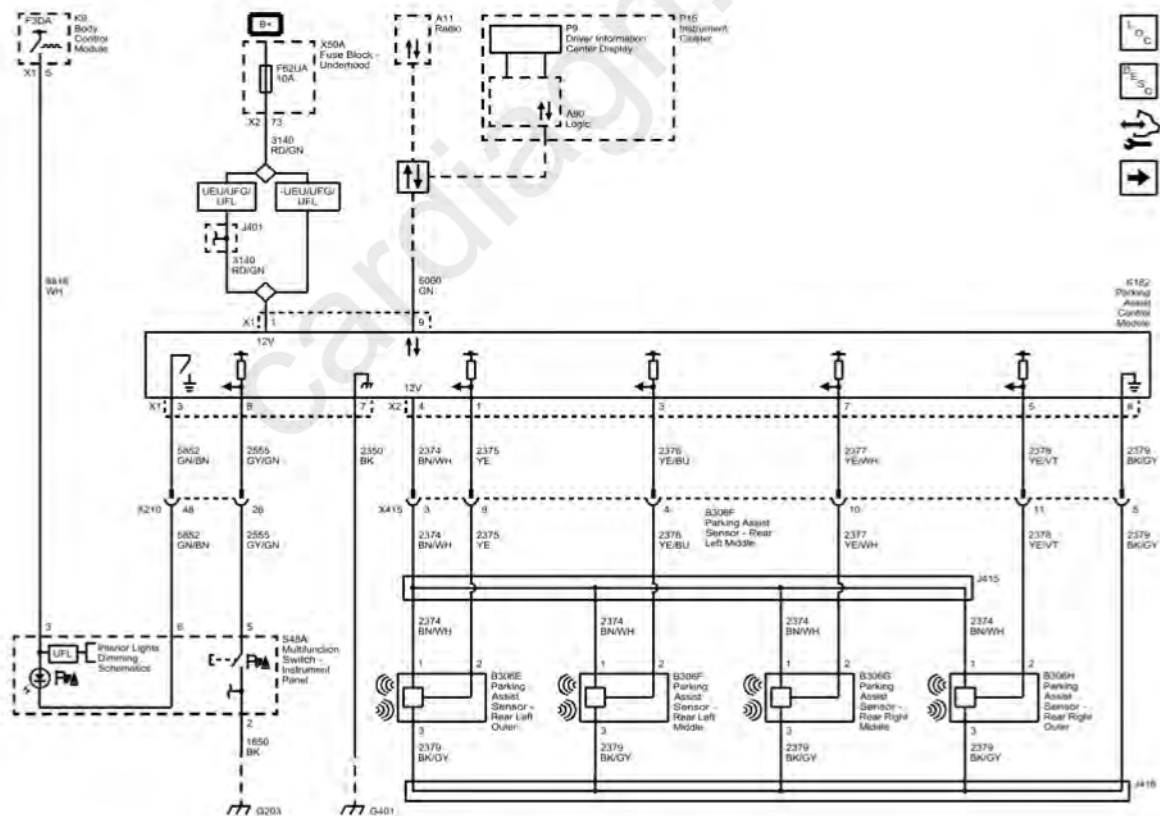


Fig. 1: Rear Park Assist (UD7)

Courtesy of GENERAL MOTORS COMPANY

Rearview Camera (UVC)

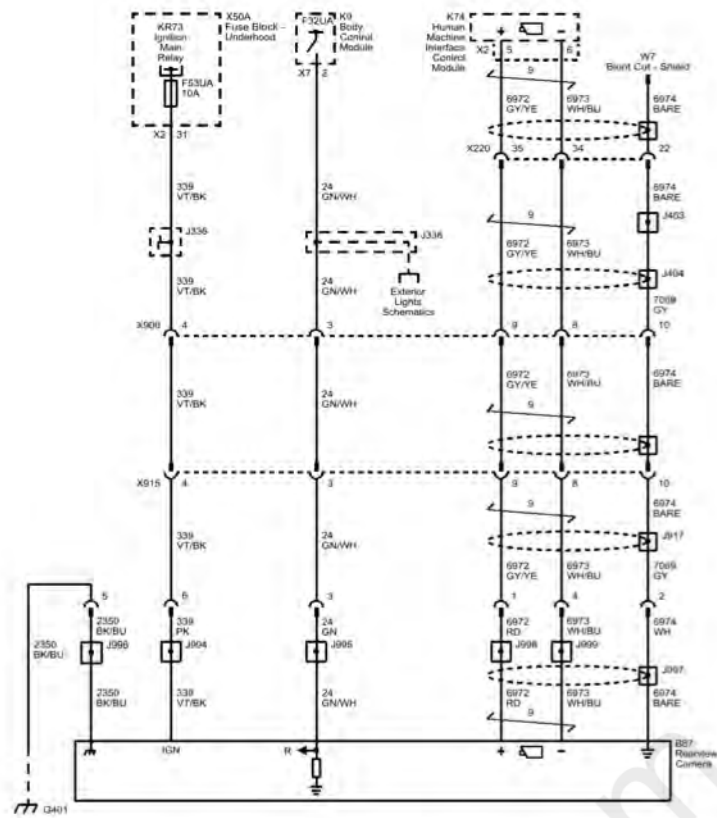


Fig. 2: Rearview Camera (UVC)
Courtesy of GENERAL MOTORS COMPANY

Rear Cross Traffic Alert (UFG) and Side Object Detection (UFT)

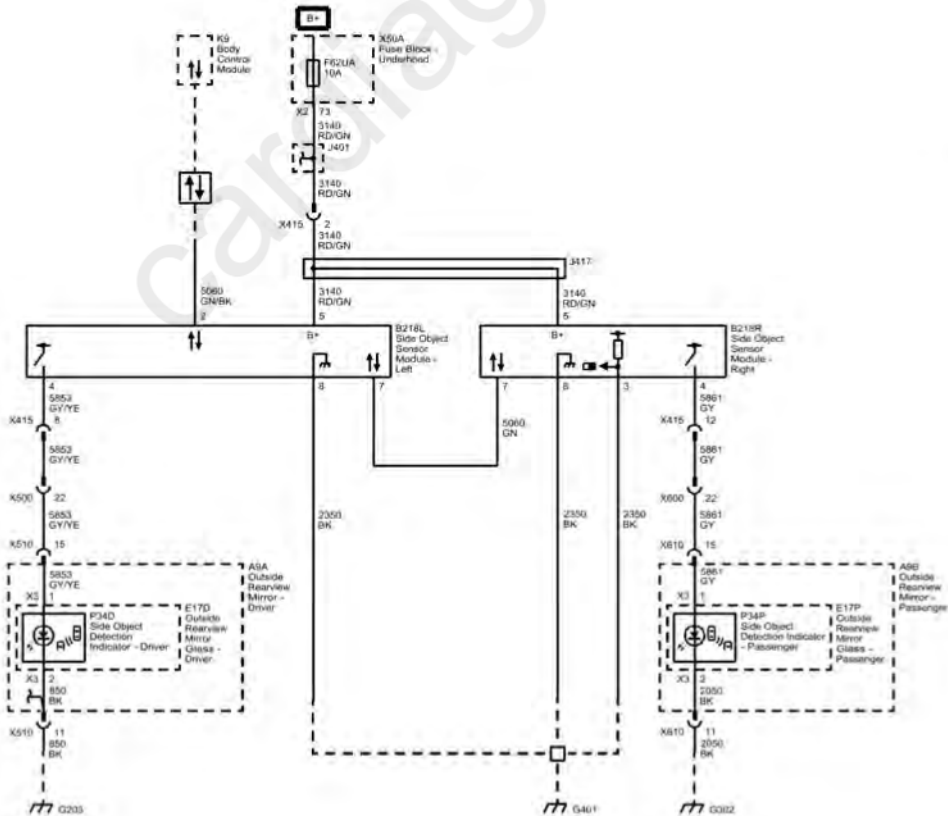


Fig. 3: Rear Cross Traffic Alert (UFG) and Side Object Detection (UFT)
Courtesy of GENERAL MOTORS COMPANY

Lane Departure Warning (UFL) and Forward Collision Alert (UEU)

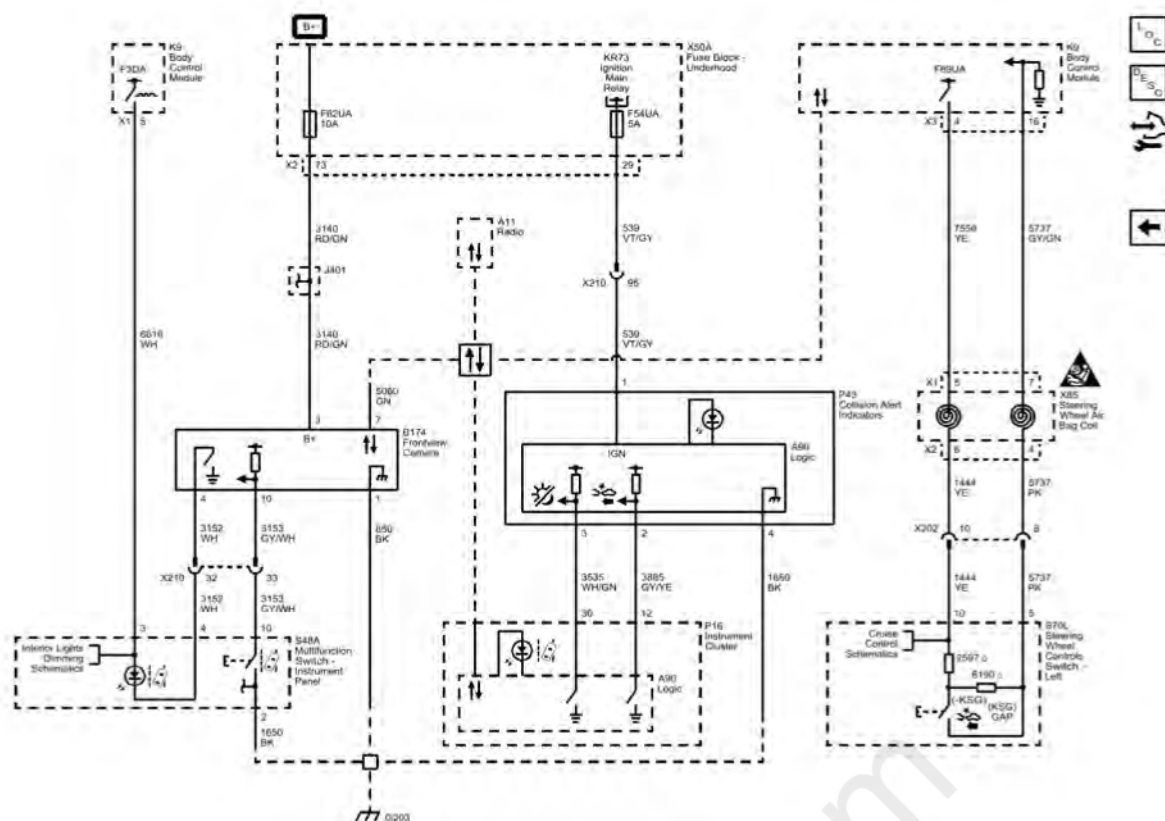


Fig. 4: Lane Departure Warning (UFL) and Forward Collision Alert (UEU)
Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B094B OR B094C: LEFT/RIGHT SIDE OBJECT DETECTION CONTROL MODULE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptor

DTC B094B 00

Left Side Object Detection Control Module - Malfunction

DTC B094B 08

Left Side Object Detection Control Module - Performance - Signal Invalid

DTC B094B 45

Left Side Object Detection Control Module - Variant Not Programmed

DTC B094B 54

Left Side Object Detection Control Module - High Temperature

DTC B094B 58

Left Side Object Detection Control Module - Performance

DTC B094C 00

DTC B094C 08

Right Side Object Detection Control Module - Performance - Signal Invalid

DTC B094C 45

Right Side Object Detection Control Module - Variant Not Programmed

DTC B094C 54

Right Side Object Detection Control Module - High Temperature

DTC B094C 58

Right Side Object Detection Control Module - Performance

Circuit/System Description

The B218L Side Object Sensor Module - Left or B218R Side Object Sensor Module - Right can set this code if the module determines there is a fault due to the reason listed in the symptom byte.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The control module has detected a malfunction.

Action Taken When the DTC Sets

- The Side Blind Zone and Rear Cross Traffic Alert Systems will not function.
- The DIC will display "Service Side Detection System".

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the control module ignition cycle counter reaches the reset threshold of 50, without a repeat of the malfunction.

Diagnostic Aids

If DTC B094B 58 or B094C 58 is set, check for anything that can interfere with the radar signal. Verify area in front of radar is clean of mud, ice, snow, etc. Also verify the fascia panels in front of the radar are damage-free and not obstructed by any add-on accessories such as emblems, etc.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Side Blind Zone Alert 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

1. Ignition ON.
2. Verify that B094B 45 or B094C 45 is not set.
 - **If DTC is set**
 1. Program the appropriate B218 Side Object Sensor Module.
 2. Verify the DTC does not set.
 - If the DTC sets, replace the appropriate B218 Side Object Sensor Module.
 - If the DTC does not set
 - 3. All OK.
3. Verify that B094B 00, B094C 00, B094B 08, B094C 08, B094B 54 or B094C 54 is not set.
 - **If DTC is set**

Replace the appropriate B218 Side Object Sensor Module.
 - **If the DTC is not set**
4. Verify that B094B 58 or B094C 58 is not set.
 - **If DTC is set**

Verify the area in front of the sensor is clean, unobstructed, and damage-free.

 - If not clean, unobstructed, and damage-free, clean or repair as necessary.
 - If clean, unobstructed, and damage-free, replace the appropriate B218 Side Object Sensor Module.
 - **If DTC is not set**
5. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

Refer to [Control Module References](#) for control module replacement, programming and setup

DTC B094D OR B094E: LEFT/RIGHT SIDE OBJECT DETECTION INDICATOR CIRCUIT

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC B094D

Left Side Object Detection Indicator Circuit

DTC B094E

Right Side Object Detection Indicator Circuit

For symptom byte information, refer to [Symptom Byte List](#).

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Left Indicator	B094D 02	B094D 04	B094D 01	-
Ground - Left Indicator	-	B094D 04	-	-
Control - Right Indicator	B094E 02	B094E 04	B094E 01	-
Ground - Right Indicator	-	B094E 04	-	-

Circuit/System Description

The side blind zone alert system sensors are located behind the rear fascia and detect and report objects on either side of the vehicle, within a specified blind zone. The system alerts with a visual indicator placed on each side rear view mirror, to the presence of objects that may not be visible in the inside rearview mirror and outside rearview mirrors. When the system detects a vehicle in the side blind zone while driving forward, independent if passing a vehicle or being passed, an amber warning symbol will light up in the appropriate outside mirror. This indicates that it may be unsafe to change lanes. If the driver then activates the turn signal, the amber warning symbol starts flashing and a chime sounds to give an extra warning not to change lanes. The Side Object Sensor Module provides the voltage to the outside rearview mirror to illuminate the Side Blind Zone alert symbol on the mirror.

Side blind zone alert is active from speeds of 10 km/h (6.2 MPH) up to 140 km/h (87 MPH). Driving faster deactivates the system, indicated by low lighting warning symbols in the mirrors. Driving under this speed again will turn off the warning symbols. If then a vehicle is detected in blind zone, the warning symbols will illuminate normally on the appropriate side. When the vehicle is started, both outside mirror displays will briefly come on to indicate that the system is operating.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

B094D 01

The side object sensor module has detected a short to voltage on the left indicator control circuit.

B094D 02

The side object sensor module has detected a short to ground on the left indicator control circuit.

B094D 04

The side object sensor module has detected an open in the left indicator control circuit.

B094E 01

The side object sensor module has detected a short to voltage on the right indicator control circuit.

B094E 02

The side object sensor module has detected a short to ground on the right indicator control circuit.

B094D 04

The side object sensor module has detected an open in the right indicator control circuit.

Action Taken When the DTC Sets

The side blind zone alert system is inoperative and Service Side Detection System is displayed on the Driver Information Center.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Side Blind Zone Alert 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

1. Ignition OFF, ignition ON.
2. Verify the side blind zone alert system indicators located in the outside rearview mirrors briefly turn ON and then OFF during the system self test.
 - **If both side blind zone alert indicators do not briefly turn ON and OFF**

Refer to Circuit/System Testing
 - **If both side blind zone alert indicators briefly turn ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X2 harness connector at the appropriate A9 Outside Rearview Mirror. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 1 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. 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**
3. Ignition ON, connect a test lamp between the control circuit terminal 2 and the ground circuit terminal 1.
4. Verify the test lamp turns ON and OFF when commanding the Object Detection Alert Indicators ON and OFF with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the harness connector at the appropriate B218 Side Object Sensor Module.

2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the B218 Side Object Sensor Module.
- **If the test lamp is always ON**
 1. Ignition OFF, disconnect the harness connector at the B218 Side Object Sensor Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the B218 Side Object Sensor Module.
- **If the test lamp turns ON and OFF**
5. Test or replace the A9 Outside Rearview Mirror Glass.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- Refer to [Outside Rearview Mirror Glass Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming and setup.

DTC B0958, B0959, B0960, OR B0961: PARKING ASSIST REAR SENSOR CIRCUITS

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC B0958

Parking Assist Rear Sensor Left Corner Circuit

DTC B0959

Parking Assist Rear Sensor Left Middle Circuit

DTC B0960

Parking Assist Rear Sensor Right Middle Circuit

DTC B0961

Parking Assist Rear Sensor Right Corner Circuit

For symptom byte information, refer to [Symptom Byte List](#).

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12 V Reference	B1405 02	B0958 06, B0959 06, B0960 06, B0961 06, B1405 03	B0958 06, B0959 06, B0960 06, B0961 06, B1405 07	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Rear Object Sensor Signal	B0958 06	B0958 06	B0958 01	B0958 08, B0958 21
Left Middle Rear Object Sensor Signal	B0959 06	B0959 06	B0959 01	B0959 08, B0959 21
Right Middle Rear Object Sensor Signal	B0960 06	B0960 06	B0960 01	B0960 08, B0960 21
Right Rear Object Sensor Signal	B0961 06	B0961 06	B0961 01	B0961 08, B0961 21
Low Reference	-	B0958 01, B0959 01, B0960 01, B0961 01	-	-

Circuit/System Description

The object sensors are 3-wire sensors that are used to determine the distance between the vehicle and an object of interest. The parking assist control module supplies 12 V to the object sensors via the 12 V reference circuit and provides ground via the low reference circuit. The parking assist control module triggers the sensors in a sequential loop. After each sensor transmits, the parking assist control module uses the sensor echo received through the signal circuit to calculate the distance and position of an object.

Conditions for Running the DTC

- Ignition ON, engine running.
- The parking assist is activated. The activation takes place through putting the vehicle in reverse.

Conditions for Setting the DTC

B0958 01, B0959 01, B0960 01, or B0961 01

The parking assist control module has detected the voltage at the sensor circuit is shorted to battery or the object sensor is not grounded.

B0958 06, B0959 06, B0960 06, or B0961 06

The parking assist control module has detected the voltage at the sensor circuit is less than 0.5 V or the circuit has an open circuit.

B0958 08, B0959 08, B0960 08, or B0961 08

The parking assist control module has received an invalid signal.

B0958 21, B0959 21, B0960 21, or B0961 21

The object sensor determines no change in the position of an object while the vehicle is in motion.

B0958 3A, B0959 3A, B0960 3A, or B0961 3A

The parking assist control module determines the wrong sensor type is installed.

Action Taken When the DTC Sets

- The parking assist is disabled.
- The driver information center displays SERVICE PARK ASSIST.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

For symptom byte 21 the module only runs diagnostic when the vehicle is driven greater than 40 km/h (25 MPH). Therefore, even with clean sensor with no obstruction (i.e snow or ice melted off) drive the vehicle greater than 40 km/h (25 MPH).

The following is a list of reasons this failure type byte 21 might have set:

- One or more of the sensors may be blocked by snow, mud, ice or debris. This might happen after going through a car wash in cold weather.
- Silicone insulator surrounding sensor maybe missing, cut or twisted.
- Improperly installed sensor, sensor maybe be crooked due to a tight wire harness.
- One or more of the sensors may be scratched or the paint maybe 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 - INDEX

Description and Operation

Parking Assist Description and Operation (with Rear Park Assist, UD7) **Parking Assist Description and Operation (with Front and Rear Park Assist, UD5)**

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

1. Ignition ON.
2. Verify that DTC B1405 is not set.
 - **If the DTC is set**

Refer to **DTC B1405**
 - **If the DTC is not set**
3. Verify that DTC B0958 01, B0959 01, B0960 01, B0961 01, B0958 21, B0959 21, B0960 21 or B0961 21 is not set.
 - **If the DTC is set**
 1. Check the B78 Rear Object Sensor for contamination with snow, mud, dirt, slush, or ice.
 - If contaminated, clean sensor.
 - If there is no contamination
 2. Refer to Circuit/System Testing.
 - **If the DTC is not set**
4. Verify that DTC B0958 3A, B0959 3A, B0960 3A or B0961 3A is not set.
 - **If the DTC is set**

Replace the B78 Rear Object Sensor with the correct sensor type.

5. Ignition ON, engine running, transmission in REVERSE.
6. Verify the scan tool Parking Assist System Status parameter displays Enabled.
 - **If the Parking Assist System displays Disabled**

Refer to Circuit/System Testing.
 - **If the Parking Assist System displays Enabled**
7. All OK.

Circuit/System Testing

1. Ignition OFF, scan tool disconnected, disconnect the harness at the appropriate B78 Rear Object Sensor. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 3 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the X2 harness connector at the K41R Rear Parking Assist Control Module.
 2. Test for less than 2 Ω in the low reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω replace the K41R Rear Parking Assist Control Module.
 - **If less than 10 Ω**
3. Ignition ON.
4. Test for at least 9.7 V between the 12 V reference circuit terminal 1 and ground.
 - **If less than 9.7 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K41R Rear Parking Assist Control Module.
 2. Test for infinite resistance between the 12 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the 12 V reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K41R Rear Parking Assist Control Module.
 - **If 9.7 V or greater**
5. Ignition OFF, remove appropriate sensor and switch locations with another properly operating sensor. Connect harness connector at both sensors. Ignition ON.
6. Verify the DTC is set for the new location in which the malfunctioning sensor is installed.
 - **If DTC set for the new location**

Replace the malfunctioning sensor.
 - **If DTC set for the original location**
 1. Ignition OFF, disconnect the X2 harness connector at the K41R Rear Parking Assist Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF.
 4. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 5. Test for less than 2 Ω in the circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K41R Rear Parking Assist Control Module.

- **If no DTC set**

7. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Refer to **Rear Parking Assist Alarm Sensor Replacement**
- Refer to **Control Module References** for control module replacement, programming and setup.

DTC B0967 OR B0968: PARKING ASSIST ON/OFF SWITCH CIRCUIT/PARKING ASSIST ON/OFF SWITCH INDICATOR CIRCUIT

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.
- Refer to **Diagnostic Procedure Instructions** to provide an overview of each diagnostic category.

DTC Descriptor

DTC B0967 02

Parking Assist On/Off Switch Circuit Short to Ground

DTC B0968 01

Parking Assist On/Off Switch Indicator Circuit Short to Battery

DTC B0968 06

Parking Assist On/Off Switch Indicator Circuit Low Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Parking Assist Switch Indicator Ignition	B2625 02, B0987 06, 2	B0987 06, 2	-	-
Parking Assist Switch Signal	B0967 02, 1	1	1	-
Parking Assist Switch Indicator Control	3	2	B0968 01	-
Parking Assist Switch Ground	-	1	1	-
1. Parking Assist Switch Malfunction 2. Parking Assist Indicator Malfunction 3. Parking Assist Indicator On all the Time				

Circuit/System Description

The parking assist can be activated/deactivated by pressing the parking assist switch. By engaging the reverse gear the parking assist can also be activated. By subsequently pressing the parking assist switch the parking assist can be disabled again.

The indicator in the parking assist switch shows the status of the parking assist. If the lamp is ON, the parking assist is activated.

Conditions for Running the DTC

- Ignition ON
- The parking assist is activated. The activation takes place by putting in the reverse gear or by pressing the parking assist switch.

Conditions for Setting the DTC

B0967 02

The parking assist control module has detected a short to ground.

B0968 01

The parking assist control module has detected a short to battery.

B0968 06

The parking assist control module has detected a short to ground or open.

Action Taken When the DTC Sets

- The parking assist is disabled.
- The driver information center displays SERVICE PARK ASSIST.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

[Parking Assist Description and Operation \(with Rear Park Assist, UD7\)](#)[Parking Assist Description and Operation \(with Front and Rear Park Assist, UD5\)](#)

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

1. Ignition ON.
2. Verify that DTC B0967 02 is not set.
 - **If the DTC is set**
Refer to Parking Assist Switch Malfunction.
 - **If the DTC is not set**
3. Verify that B0968 01 or B0968 06 is not set.

- **If the DTC is set**

Refer to Parking Assist Switch Indicator Malfunction.

- **If the DTC is not set**

4. Verify parking assist indicator turns on and off when commanding the Parking Assist Switch LED parameter On and Off with a scan tool.

- **If the LED does not turn On and Off**

Refer to Circuit/System Testing - Parking Assist Switch Indicator Malfunction.

- **If the LED turns On and Off**

5. Activate and deactivate the parking assist switch and verify the scan tool Park Assist Switch parameter changes between Active and Inactive.

- **If the Parking Assist Switch parameter does not change between Active and Inactive**

Refer to Circuit/System Testing - Parking Assist Switch Malfunction.

- **If the Parking Assist Switch parameter changes between Active and Inactive**

6. All OK.

Circuit/System Testing

Parking Assist Switch Circuit Malfunction

1. Ignition ON.

2. Verify the scan tool Parking Assist Switch parameter is Inactive.

- **If Active**

1. Ignition OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module.

2. Test for infinite resistance between the signal circuit terminal 8 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K41R Rear Parking Assist Control Module.

- **If Inactive**

3. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.

4. Test for less than 10 Ω between the ground circuit terminal 2 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

2. 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**

5. Install a 3 A fused jumper wire between the signal circuit terminal 5 and ground.

NOTE: If jumper is in place for more than 10 s, DTC B0967 02 will set.

6. Verify the scan tool Parking Assist Switch parameter is Active.

- **If Inactive**

1. Ignition OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module, ignition ON.

2. Test for less than 1 V between the signal circuit terminal 8 and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V

3. Ignition OFF

4. 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 , replace the K41R Rear Parking Assist Control Module.
- **If Active**

7. Test or replace the S48A Multifunction Switch - Instrument Panel.

Parking Assist Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel, Ignition ON.

NOTE: **Verify interior dimming is turned all the way bright.**

2. Test for greater than 11 V between the terminal 3 and ground.

- **If less than 11 V**

Refer to [Interior Backlighting Malfunction](#) .

- **If greater than 11 V**

3. Connect a test lamp between the control circuit terminal 6 and B+.

4. Verify the test lamp turns ON and OFF when Commanding the Park Assist Switch Indicator On and Off with a scan tool.

- **If the test lamp is always OFF**

1. Ignition OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module.

2. Test for less than 1 V between the control circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V

3. Ignition OFF.

4. Test for less than 2 Ω in the control circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K41R Rear Parking Assist Control Module.

- **If the test lamp is always ON**

1. Ignition OFF, disconnect the X1 harness connector at the K41R Rear Parking Assist Control Module.

2. Test for infinite resistance between the control circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K41R Rear Parking Assist Control Module.

- **If the test lamp turns ON and OFF**

5. Test or, replace the S48A Multifunction Switch - Instrument Panel.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair

- Refer to [Instrument Panel Multifunction Switch Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming and setup

DTC B0987: VEHICLE DIRECTION CAMERA INDICATOR CIRCUIT

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC B0987 01

Vehicle Direction Camera Indicator Circuit Short to Battery

DTC B0987 06

Vehicle Direction Camera Indicator Circuit Low Voltage/Open

DTC B0987 0B

Vehicle Direction Camera Indicator Circuit High Current

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Lane Departure Warning Switch Indicator Ignition	B0987 06, 1	B0987 06, 1	-	-
Lane Departure Warning Switch Indicator Control	1	B0987 06, 1	B0987 01, B0987 0B	-
1. Lane Departure Warning Switch Indicator Malfunction				

Circuit/System Description

The lane departure warning is enabled and disabled through the lane departure warning switch. When enabled, the Frontview Camera Module will illuminate the indicator located in the switch. For the exact location of the lane departure warning switch, refer to the Owner's Manual.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

B0987 01

The Frontview Camera Module detects a short to voltage in the control circuit.

B0987 06

The Frontview Camera Module detects a short to ground or an open/high resistance in the control circuit.

B0987 0B

The Active Safety Control Module detects high current in the control circuit.

Action Taken When the DTC Sets

- Lane departure warning and forward collision alert features are disabled
- The driver information center displays "Service Front Camera".

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Description and Operation

Lane Departure Warning 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

1. Ignition ON.
2. Verify DTC B356A is not set.
 - **If the DTC is set**
Refer to **DTC B356A**
 - **If the DTC is not set**
3. Verify the lane departure warning indicator turns ON and OFF while pressing and releasing the lane departure warning switch.
 - **If the indicator does not turn ON and OFF**
Refer to Circuit/System Testing.
 - **If the indicator turns ON and OFF**
4. All OK.

Circuit/System Testing

1. Ignition OFF, and all vehicle systems OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel, ignition ON.

NOTE: **Verify interior lighting dimming is turned all the way up.**

2. Verify a test lamp illuminates between the BCM PWM control circuit terminal 3 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. If the fuse is OK, replace K9 Body Control Module.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. 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, replace the K109 Frontview Camera Module.
 - **If the test lamp illuminates**
3. Connect a test lamp between control circuit terminal 4 and B+.
4. Verify the test lamp turns ON and OFF when commanding the Lane Departure Warning Indicator Status parameter On and Off with a scan tool.

- **If the test lamp is always OFF**

1. Ignition OFF, disconnect the harness connector at the K109 Frontview Camera Module, ignition ON.
2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
3. Ignition OFF.
4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K109 Frontview Camera Module.

- **If the test lamp is always ON**

1. Ignition OFF, disconnect the harness connector at the K109 Frontview Camera Module.
2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K109 Frontview Camera Module.

- **If the test lamp turns ON and OFF**

5. Test or replace the S48A Multifunction Switch - Instrument Panel.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair

- Refer to **Instrument Panel Multifunction Switch Replacement**
- Refer to **Control Module References** for control module replacement, programming, and setup.

DTC B1011: SYSTEM DISABLED INFORMATION STORED MALFUNCTION

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.
- Refer to **Diagnostic Procedure Instructions** to provide an overview of each diagnostic category.

DTC Descriptor

DTC B1011 00

System Disabled Information Stored Malfunction

Circuit/System Description

The frontview camera module permanently monitors the serial data bus for error messages. When a malfunction is detected by the frontview camera module, the system will be disabled and an error message will be stored in the frontview camera module disable history buffer which is used to store information about the front camera features that are disabled.

Conditions for Running the DTC

- Ignition ON
- Frontview camera enabled

Conditions for Setting the DTC

The frontview camera module detects a malfunction.

Action Taken When the DTC Sets

- The frontview camera module is disabled.

- The frontview camera module disable history buffer stores information why the system was disabled.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

The frontview camera module disable history buffers are used to store information about the frontview camera module features that are disabled. The buffers will only update if the disable condition changes.

Example: If the data received from the steering wheel angle sensor is Invalid across many ignition cycles then it will only appear in 1 history buffer and not all history buffers. If this condition is the current reason why the frontview camera module is disabled then it will be set in frontview camera module disable history buffer 1. If a new reason occurs, such as vehicle speed validity is invalid, then the invalid steering wheel angle sensor fault will shift into disable history buffer 2 and vehicle speed validity invalid will be in disable history buffer 1. Since there are only 4 disable history buffers, the invalid steering wheel angle sensor will age out if 4 other disable reasons occur since the last invalid steering wheel angle sensor event occurred. Frontview camera module disable history buffer 1 contains the current reason that one of the frontview camera module features is disabled.

The frontview camera module disable history buffers can display the following values:

- Lane Departure Warning Indicator Malfunction
- Lane Departure Warning Switch Malfunction
- Camera Obstructed
- Accelerator Pedal Position Out of Range
- Driven Wheel Speed Signal Invalid
- Non-Driven Wheel Speed Signal Invalid
- Brake Pedal Moderate Travel Signal Invalid
- Brake Pedal Initial Travel Position Achieved
- Lost Communication with Steering Wheel Angle Sensor Module
- Invalid Data Received From Steering Wheel Angle Sensor Module
- Forward Collision Alert Switch Malfunction
- Clutch Pedal Position (CPP) Sensor Performance
- Clutch Pedal Position (CPP) Sensor Performance
- Transmission Gear Engaged
- Acceleration Sensor Longitudinal Signal
- Invalid Data Received From Yaw Rate Sensor Module
- Power Mode Controlled by Backup Device
- System Power Mode
- Overvoltage
- Undervoltage
- Undefined

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

- [Lane Departure Warning Description and Operation](#)
- [Forward Collision Alert 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

NOTE: Do not replace K109 Frontview Camera Module for this DTC. DTC B1011 is an information DTC.

1. Ignition ON.
2. Verify no other DTC is set except for DTC B1011.
 - **If any other DTCs are set**
Diagnose those first. Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **If no other DTCs are set**
3. Verify the scan tool can communicate with all equipped high speed GMLAN devices.
 - **If the scan tool does not communicate with high speed GMLAN devices**
Refer to [Scan Tool Does Not Communicate with High Speed GMLAN Device](#) .
 - **If the scan tool communicates with all equipped high speed GMLAN devices**

NOTE: When referring to Frontview Camera Disable History, some items such as Non-Driven Wheel Speed Signal Invalid and Driven Wheel Speed Signal Invalid may routinely be stored without B1011 being set. If B1011 has not set, disregard any information stored in the buffers as it is not indicative of a problem.

4. Refer to Diagnostic Aids and Frontview Camera Disable History for what caused B1011 to set. Diagnose the system that set the malfunction.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

Refer to [Control Module References](#) for control module programming and setup

DTC B1015: VEHICLE IDENTIFICATION NUMBER INFORMATION

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptor

DTC B1015

Vehicle Identification Number Information

For symptom byte information, refer to [Symptom Byte List](#).

Circuit/System Description

When the ignition is turned ON, the advanced parking assist control module and the frontview camera module receive the vehicle identification number (VIN) from the body control module (BCM). The modules will compare the VIN received to the VIN stored in memory.

Conditions for Running the DTC

Ignition voltage is between 9 - 16 V.

Conditions for Setting the DTC

The stored VIN does not match the received VIN.

Action Taken When the DTC Sets

- The parking assist system or the lane departure warning system is disabled.
- The driver information center may display a system service message.

Conditions for Clearing the DTC

The stored VIN matches the VIN stored in the body control module.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning 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

1. Ignition ON.
2. Verify that DTC B1015 is not set.
 - **If the DTC is set**
 1. Program the control module that set the DTC.
 2. Verify that DTC B1015 is not set.
 - If the DTC is set, replace the control module that set the DTC.
 - If the DTC is not set
 3. All OK
 - **If the DTC is not set**
3. All OK

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair

Refer to **Control Module References** for control module replacement, programming, and setup.

DTC B101D: ELECTRONIC CONTROL UNIT HARDWARE (DTC SET IN K109 FRONTVIEW CAMERA MODULE)

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.
- Refer to **Diagnostic Procedure Instructions** to provide an overview of each diagnostic category.

DTC Descriptor

DTC B101D

Electronic Control Unit Hardware

DTC B101D 3C

Electronic Control Unit Hardware Performance Internal Communications Failure

For symptom byte information, refer to **Symptom Byte List**

Circuit/System Description

The internal fault detection is handled inside the device. The symptom byte information is for engineering reference only. No external circuit diagnosis is involved.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

B101D

The frontview camera module has detected an internal malfunction

B101D 3C

The frontview camera module has detected a software malfunction

Action Taken When the DTC Sets

- Lane departure warning is disabled
- SERVICE LANE DEPARTURE SYSTEM is displayed on the DIC.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 100 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Parking Assist Description and Operation (with Rear Park Assist, UD7)Parking Assist Description and Operation (with Front and Rear Park Assist, UD5)

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

1. Verify that DTC B101D symptom byte 3C is not set as current.
 - **If DTC B101D symptom byte 3C is set as current**
Reprogram the K109 Frontview Camera Module
 - **If DTC B101D symptom byte 3C is not set as current**
2. Verify that DTC B101D is not set as current.
 - **If DTC B101D is set as current**
Replace the K109 Frontview Camera Module
 - **If DTC B101D is not set as current**
3. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

Refer to [Control Module References](#) for control module replacement, setup, and programming

DTC B127B: REARVIEW CAMERA INPUT SIGNAL CIRCUIT MISSING REFERENCE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

B127B 2B

Rearview Camera Input Signal Circuit Missing Reference

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	1	B127B 2B, 1	-	-
Backup Signal	B127B 2B, 1	B127B 2B, 1	2	-
Camera Module signal +	1	B127B 2B, 1	B127B 2B, 1	-
Camera Module signal -	3	B127B 2B, 1	B127B 2B, 1	-
Ground	-	B127B 2B, 1	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Shield	3	B127B 2B, 1	3	-
1. Rear Vision Camera Malfunction 2. Rear Vision Camera image always displayed 3. Poor Quality Image				

Circuit/System Description

When the transmission is placed into REVERSE, a 12 V signal is sent to the B87 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 K74 Human Interface Control Module 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.

Conditions for Running the DTC

The vehicle must be in reverse with the engine running.

Conditions for Setting the DTC

B127B 2B

Signal from the rearview camera not received by the Human Machine Interface Control Module for 2.5s.

Action Taken When the DTC Sets

- The Human Machine Interface Control Module commands the driver information center to display "Service Rear Vision System".
- The Human Machine Interface Control Module stores the DTC in memory.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 40 malfunction-free ignition cycles have occurred.

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.

Terminal fretting or incorrectly seated connectors can cause a poor image displayed condition. Check the circuit terminals for fretting or incorrectly seated connector. If the condition is intermittent or cannot be duplicated, disconnect the connectors and add Nyogel lubricant 760G. This procedure will correct the high resistance condition due to terminal fretting corrosion.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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

NOTE: If the condition is intermittent or cannot be duplicated, disconnect the connectors and add Nyogel lubricant 760G. This procedure will correct the high resistance condition due to terminal fretting corrosion.

1. Verify that DTC B2545 is not set.
 - **If the DTC is set**
Refer to [DTC B2545](#).
 - **If the DTC is not set**
2. Verify the rearview camera has no debris on the lens and that the bezel and bezel seal are not damaged.
 - **If debris is found on the lens**
Clean the lens. If the lens, bezel, or bezel seal are damaged, replace as necessary.
 - **If no debris on the lens**
3. Ignition ON, transmission in R.
4. Verify the backup lamps are illuminated.
 - **If the backup lamps are not illuminated**
Refer to [Backup Lamps Malfunction](#).
 - **If the backup lamps are illuminated**
5. Engine running, transmission in R.
6. Verify a clear rear vision image is displayed on the P17 Info Display Module.
 - **If a clear image is not displayed**
Refer to Circuit/System Testing.
 - **If a clear image is displayed**
7. All OK.

Circuit/System Testing

NOTE:

- Circuit/System Verification must be performed before Circuit/System Testing.
- Under normal operating conditions the Human Interface Machine Control Module will become very hot. The module should be allowed to cool down prior to removal for any service procedure.

1. Ignition OFF, disconnect the harness connector at the B87 Rearview Camera.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.

2. 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**

3. Ignition ON.

4. 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**

1. Ignition OFF.

2. Test for less than 2 Ω in the ignition circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. Refer to **Power Mode Mismatch**.

• **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF.

2. 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, replace the B87 Rearview Camera.

• **If the test lamp illuminates**

5. Engine running, park brake applied, transmission in R.

6. Test for greater than 11 V between the control circuit terminal 3 and ground.

• **If less than 11 V**

1. Ignition OFF, disconnect the X7 harness connector at the K9 Body Control Module.

2. Test for infinite resistance between the control circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance

3. Test for less than 2 Ω in the control circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K9 Body Control Module.

• **If greater than 11 V**

7. Ignition OFF, disconnect the X2 harness connector at the K74 Human Interface Control Module, ignition ON.

8. Test for less than 1 V between the signal circuit terminal listed below and ground:

- B87 Rearview Camera signal (+) circuit terminal 5
- B87 Rearview Camera signal (-) circuit terminal 6

• **If 1 V or greater**

Repair the short to voltage on the circuit.

• **If less than 1 V**

9. Test for infinite resistance between the signal circuit terminal listed below and ground:

- B87 Rearview Camera signal (+) circuit terminal 5
- B87 Rearview Camera signal (-) circuit terminal 6

• **If less than infinite resistance**

Repair the short to ground on the circuit.

• **If infinite resistance**

10. 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**

11. 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.

- **If less than 2 Ω**

12. Replace the B87 Rearview Camera.

13. Engine running, transmission in R, verify a clear rear vision image is displayed on the P17 Info Display Module.

- **If a clear rear vision image is not displayed**

Replace the K74 Human Interface Control Module.

- **If a clear rear vision image is displayed**

14. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- Refer to [Rearview Driver Information Camera Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming and setup

DTC B1405: CONTROL MODULE VOLTAGE REFERENCE OUTPUT 2 CIRCUIT

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC B1405 02

Control Module Voltage Reference Output 2 Circuit Short to Ground

DTC B1405 03

Control Module Voltage Reference Output 2 Circuit Low Voltage

DTC B1405 07

Control Module Voltage Reference Output 2 Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12 V Reference	B1405 02	B0958 06, B0959 06, B0960 06, B0961 06, B1405 03	B0958 06, B0959 06, B0960 06, B0961 06, B1405 07	-
Parking Assist Sensor Rear Left Outer Sensor Signal	B0958 06	B0958 06	B0958 01	B0958 08, B0958 21
Parking Assist Sensor Rear Left Middle Sensor Signal	B0959 06	B0959 06	B0959 01	B0959 08, B0959 21
Parking Assist Sensor Rear Right Middle Sensor Signal	B0960 06	B0960 06	B0960 01	B0960 08, B0960 21

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Parking Assist Sensor Rear Right Outer Sensor Signal	B0961 06	B0961 06	B0961 01	B0961 08, B0961 21
Parking Assist Sensor Low Reference	-	B0958 06, B0959 06, B0960 06, B0961 06	-	-

Circuit/System Description

The parking assist sensors are 3-wire sensors that are used to determine the distance between the vehicle and an object of interest. The parking assist control module supplies 12 V to the object sensors via the object sensor supply voltage circuit and provides ground via the object sensor low reference circuit. The parking assist control module triggers the sensors in a sequential loop. After each sensor transmits, the parking assist control module uses the sensor echo received through the parking assist sensor signal circuit to calculate the distance and position of an parking assist.

Conditions for Running the DTC

- Ignition ON
- Transmission in REVERSE

Conditions for Setting the DTC

B1405 02

The parking assist control module has detected the parking assist sensor supply voltage circuit is shorted to ground.

B1405 03

The parking assist control module has detected the parking assist sensor supply voltage circuit is less than 7.2 V.

B1405 07

The parking assist control module has detected the parking assist sensor supply voltage circuit is greater than 12 V.

Action Taken When the DTC Sets

- The parking assist is disabled.
- The driver information center displays SERVICE PARK ASSIST.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Description and Operation

Parking Assist Description and Operation (with Rear Park Assist, UD7)**Parking Assist Description and Operation (with Front and Rear Park Assist, UD5)**

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

1. Ignition OFF, disconnect the X2 harness connector at the K182 Parking Assist Control Module.
2. Test for infinite resistance between the 12 V reference circuit terminal 4 X2 and ground.
 - **If less than infinite resistance**
 1. Ignition OFF, disconnect the harness connector at each of the B306 Parking Assist Sensor.
 2. Test for infinite resistance between the 12 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If less than 2 Ω , replace the appropriate B306 Rear Object Sensor.
 - **If infinite resistance**
3. Ignition ON.
4. Test for less than 1 V between the 12 V reference circuit terminal 4 X2 and ground.
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at each of the B306 Parking Assist Sensor - Rear.
 2. Test for less than 1 V between the 12 V reference circuit and ground.
 - If greater than 1 V, repair the short to voltage on the circuit.
 - If less than 1 V, replace the appropriate B306 Front Object Sensor.
 - **If less than 1 V**
5. Connect the X2 harness connector at the K182 Parking Assist Control Module, ignition ON.
6. Verify DTC B1405 is not set.
 - **If DTC B1405 is set**
 1. Ignition OFF, disconnect the harness connector at each B306 Parking Assist Sensor - Rear.
 2. Verify DTC B1405 is not set.
 - If DTC B1405 is set

Replace the K182 Parking Assist Control Module.
 - If DTC B1405 is not set.
 - 3. Verify the DTC B1405 does not set while connecting the harness connector at each B306 Parking Assist Sensor - Rear, one at a time.
 - If DTC B1405 does set

Replace the B306 Parking Assist Sensor - Rear that was connected immediately before DTC B1405.
 - If DTC B1405 does not set.
7. All OK.
8. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- Refer to [Rear Parking Assist Alarm Sensor Replacement](#)

- Refer to [Control Module References](#) for control module replacement, programming and setup

DTC B356A: VEHICLE DIRECTION WARNING SWITCH CIRCUIT SHORT TO GROUND

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC B356A 02

Vehicle Direction Warning Switch Circuit Short to Ground

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Switch Signal	B356A 02	1	1	-
Switch Ground	-	1	1	-
1. Lane departure cannot be enabled or disabled, forward collision alert timing sensitivity not adjustable.				

Circuit/System Description

The Vehicle Direction Warning Switch DTC detects a short to ground in the lane departure warning switch circuit. The lane departure warning feature is enabled and disabled through the lane departure switch located in the instrument panel. When enabled, the frontview camera module will illuminate the indicator located in the switch. When the lane departure switch is pressed the switch provides a path to ground for the signal circuit at the frontview camera module. DTC B356A will set if the circuit is grounded for more than 8 s. This DTC can also be set by holding down the lane departure switch for more than 8 s.

Conditions for Running the DTC

Ignition ON

Conditions for Setting the DTC

The frontview camera module has detected a short to ground for more than 8 s.

Action Taken When the DTC Sets

- Lane departure and forward collision warning features are disabled.
- Service Front Camera is displayed on the driver information center.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Description and Operation

Lane Departure Warning 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

1. Ignition ON.
2. Verify the scan tool Lane Departure Warning Switch Status parameter while pressing and releasing the lane departure warning switch. The parameter should change between Open and Closed.

- **If the parameter does not change**

Refer to Circuit/System Testing.

- **If the parameter changes**

3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 2 and ground.

- **If 10 Ω or greater**

1. 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**

3. Ignition ON.

4. Verify the scan tool Lane Departure Warning Switch Status parameter is Open.

- **If not Open**

1. Ignition OFF, disconnect the harness connector at the K109 Frontview Camera Module.
2. Test for infinite resistance between the signal circuit terminal 4 at the S48A Multifunction Switch - Instrument Panel and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K109 Frontview Camera Module.

- **If Open**

5. Reconnect the harness at S48A Multifunction Switch - Instrument Panel. Ignition ON.
6. Verify the scan tool Lane Departure Warning Switch Status parameter while pressing and releasing the vehicle direction warning switch. The parameter should change between Open and Closed.

- **If the parameter does not change**

Test or replace the S48A Multifunction Switch - Instrument Panel.

- **If the parameter changes**

7. All OK.

Component Test

Static Test

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.
2. Test for infinite resistance between the control circuit terminal 10 and ground circuit terminal 2.
 - **If less than infinite resistance**

Replace the S48A Multifunction Switch - Instrument Panel.
 - **If infinite resistance**
3. Test for less than 10 Ω between the control circuit terminal 10 and ground circuit terminal 2 while pressing the lane departure warning switch.
 - **If 10 Ω or greater**

Replace the S48A Multifunction Switch - Instrument Panel.
 - **If less than 10 Ω**
4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- Refer to [Instrument Panel Multifunction Switch Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming and setup.

DTC P15F6: FRONT OBJECT DETECTION CONTROL MODULE TORQUE REQUEST SIGNAL MESSAGE COUNTER INCORRECT

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P15F6

Front Object Detection Control Module Torque Request Signal Message Counter Incorrect

Circuit/System Description

The Frontview Camera Module communicates with the Engine Control Module (ECM), requesting engine speed or torque reduction as necessary.

Conditions for Running the DTC

Engine running.

Conditions for Setting the DTC

The ECM detects that the engine speed and torque modification messages from the Frontview Camera Module are either corrupted or intermittently missing.

Action Taken When the DTC Sets

- The Frontview Camera Module sends a serial data message to display the appropriate indicator message
- The Frontview Camera Module features are unavailable.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The engine control module clears the history DTC when a current DTC is not detected in 40 consecutive drive cycles.

Diagnostic Aid

This is an informational DTC set by the engine control module. It is set to provide an indication that the Frontview Camera Module will not be able to perform as intended. Diagnose any other DTCs first. During normal diagnostic and/or repair verification technicians may find that a "Service Driver Assist System" message may be displayed by the Frontview Camera Module. Do not replace the Frontview Camera Module for this condition.

If the Service Driver Assist System message is displayed with no DTCs set, perform the following steps:

1. Remove the key from the ignition, open and close the driver's door to turn off retained accessory power, and wait 60 s.
2. Ignition ON, if the Service Driver Assist message is still present, operate the vehicle at speeds greater than 15 km/h (10 mph) to complete the self test. The Frontview Camera Module should request the message to turn off.
3. If the telltales remain on with no DTCs set after the drive cycle, disconnect the battery for at least 60 s, then reconnect the battery.
4. Operate the vehicle at speeds greater than 40 km/h (25 mph), the Frontview Camera Module should request all indicators to turn off.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning 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

NOTE:

- DTC P15F6 is an informational DTC.
- Diagnose all other K20 Engine Control Module DTCs prior to DTC P15F6.

1. Verify there are no other DTCs set in the K20 Engine Control Module and that there are no communication DTCs set in the vehicle.
 - If any DTCs are set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If no DTCs are set**
- 2. Clear DTCs and operate the vehicle in the conditions that the customer experienced.
- 3. Verify DTC P15F6 does not set.
 - **If the DTC sets**

Replace K109 Frontview Camera Module
 - **If the DTC does not set**
- 4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

Refer to [Control Module References](#) for control module replacement, programming, and setup.

SYMPTOMS - OBJECT DETECTION

NOTE: The following steps must be completed before using the symptom tables:

1. 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 module can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to:
 - [Cross Traffic Alert Description and Operation](#)
 - [Forward Collision Alert Description and Operation](#)
 - [Lane Keep Assist Description and Operation](#)
 - [Lane Departure Warning Description and Operation](#)
 - [Parking Assist Description and Operation \(with Rear Park Assist, UD7\)](#)[Parking Assist Description and Operation \(with Front and Rear Park Assist, UD5\)](#)
 - [Rear Vision Camera Description and Operation](#)
 - [Side Blind Zone Alert 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

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to [Testing for Intermittent Conditions and Poor Connections](#).

Symptom List

- Refer to [Forward Collision Alert System Malfunction](#)
- Refer to [Lane Departure Warning System Malfunction](#)
- Refer to [Parking Assist System Malfunction](#)
- Refer to [Rear Vision Camera System Malfunction](#)
- Refer to [Rear Cross Traffic Alert System Malfunction](#)

- Refer to [Side Blind Zone Alert System Malfunction](#)

FORWARD COLLISION ALERT SYSTEM MALFUNCTION

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Forward Collision Alert Indicators Ignition	1	1	-	-
Forward Collision Alert Switch Signal	P0580, P0592	P0592	P0593	-
Forward Collision Alert Switch Dimming Control	P155A	P0580	-	-
Forward Collision Alert Indicators Control	2	1	1	-
Forward Collision Alert Indicators Ground	-	1	-	-
1. Forward Collision Alert Indicators inoperable 2. Forward Collision Alert Indicators on all the time				

Circuit/System Description

The forward collision alert system is controlled by the frontview camera module mounted on the windshield. The system is designed to detect vehicles directly ahead, within a distance of approximately 60 meters (197 ft). The forward collision alert system operates at speeds above 40 km/h (25 mph). When the system detects a vehicle in the path ahead, the green vehicle ahead alert indicator in the driver information center is illuminated. When approaching another vehicle too rapidly, the collision alert symbol will flash and the radio will beep or the haptic seat will pulse, depending on user configuration. The red collision alert display will stay continuously illuminated if the vehicle ahead remains much too close. These actions are requested by the frontview camera module via serial data. The forward collision alert switch is part of the left steering wheel controls and is used to adjust the timing sensitivity of the front collision alert system.

Diagnostic Aids

Certain factors will affect the operation of the forward collision alert system. Forward collision alert is intended to detect vehicles. It is not intended to warn the driver of any objects that are not detected as a vehicle such as pedestrians, animals, signs, guard rails, bridges, construction barrels or other stationary or slow moving objects. In few cases the camera may inadvertently detect a vehicle that is not in the path ahead, or the system may occasionally provide unrealistic alerts. This could occur with a turning vehicle ahead, guard rails, traffic signs, or other stationary objects. This is normal operation, the vehicle does not need service. When the system is operating properly, the green vehicle ahead alert indicator will illuminate on the vehicle direction display when the system detects a vehicle in the path ahead. This indicates that all of the required operating conditions are met. The green vehicle ahead alert indicator will not appear when the system is having difficulty seeing other vehicles on the road. This can occur if the front view camera is blocked with mud, dirt, snow, ice, slush, if the windshield is damaged, or when weather limits visibility, such as while driving in fog, rain, or snow conditions. This is normal operation, the vehicle does not need service.

Additionally, the Front View Camera Disable History can give useful hints about what affected the operation of the forward collision alert system. For the Front View Camera Disable History, refer to [DTC B1011](#).

Reference Information

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Forward Collision Alert 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

NOTE: Refer to Diagnostic Aids before performing Circuit/System Verification.

1. Ignition ON.
2. Verify the scan tool Forward Collision Alert Function Status parameter is not Malfunction.
 - **If the parameter is Malfunction**
Refer to Circuit/System Testing - Frontview Camera Module Malfunction
 - **If parameter is not Malfunction**
3. Verify the forward collision alert indicators turn on and off when commanding the instrument cluster all indicators On and Off with a scan tool.
 - **If the indicators do not illuminate**
Refer to Circuit/System Testing - Forward Collision Alert Indicator Malfunction
 - **If the indicators illuminate**
4. Verify the driver information center forward collision alert distance indicator toggles between far, medium, near and off.
 - **If the setting does not change**
Refer to Circuit/System Testing - Forward Collision Alert Switch Malfunction.
 - **If the setting changes**
5. Verify the area of the K109 Frontview Camera Module is not contaminated.
 - **If contaminated**
Clean the windshield
 - **If not contaminated**
6. All OK.

Circuit/System Testing

NOTE: Perform the Circuit/System Verification before proceeding with Circuit/System Testing.

Frontview Camera Module Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K109 Frontview Camera Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 1 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. 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**
3. Verify a test lamp illuminates between the B+ circuit terminal 3 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K109 Frontview Camera Module.
 - **If the test lamp illuminates**
4. Replace the K109 Frontview Camera Module.

Forward Collision Alert Indicator Malfunction

1. Ignition OFF, and all vehicle systems OFF, disconnect the harness connector at the P43 Collision Alert Indicators. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. 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**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 1 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Power Mode Mismatch](#).
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. 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, replace the P43 Collision Alert Indicators.
 - **If the test lamp illuminates**
5. Connect a test lamp between the control circuit terminal 2 and the ignition circuit terminal 1.

6. Verify the test lamp turns ON and OFF when commanding the Instrument Cluster All Indicators On and Off with a scan tool.
- **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the P16 Instrument Cluster.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the P16 Instrument Cluster.
 - **If the test lamp turns ON and OFF**
7. Test or replace the P43 Collision Alert Indicators.

Forward Collision Alert Switch Malfunction

1. Ignition OFF, disconnect the X3 harness connector at the K9 Body Control Module, ignition ON.
2. Test for less than 1 V between the signal circuit terminals listed below and ground:
 - Terminal 4
 - Terminal 16
 - **If 1 V or greater**

Repair the short to voltage on the signal circuit.
 - **If less than 1 V**
3. Ignition OFF.
4. Test for infinite resistance between the signal circuit terminals listed below and ground:
 - Terminal 4
 - Terminal 16
 - **If less than infinite resistance**

Repair the short to ground on the signal circuit.
 - **If infinite resistance**
5. Test for 7.0k - 10.5k Ω between signal circuit terminals 4 and signal circuit terminal 16.
 - **If greater than 10.5k Ω**
 1. Disconnect the harness connector at the S70L Steering Wheel Controls Switch - Left.
 2. Test for less than 5 Ω between the circuit terminals listed below:
 - S70L Steering Wheel Controls Switch - Left terminal 10 and K9 Body Control Module terminal 4.
 - S70L Steering Wheel Controls Switch - Left terminal 5 and K9 Body Control Module terminal 16.
 - If greater than 5 Ω , repair the open/high resistance in the circuit.
 - If less than 5 Ω , test or replace the S70L Steering Wheel Controls Switch - Left.
 - **If less than 7.0k Ω**
 1. Disconnect the harness connector at the S70L Steering Wheel Controls Switch - Left.
 2. Verify infinite resistance between signal circuit terminals 4 and signal circuit terminal 16

- If less than infinite resistance, repair short in circuit.
 - If infinite resistance, test or replace the S70L Steering Wheel Controls Switch - Left.
 - **If between 7.0k - 10.5k Ω**
6. Test for 2.1k - 3.2k Ω between signal circuit terminals 4 and signal circuit terminal 16 while pressing forward collision alert switch.
- **If not between 2.1k - 3.2k Ω**
- Test or replace the S70L Steering Wheel Controls Switch - Left.
- **If between 2.1k - 3.2k Ω**
7. Replace the K9 Body Control Module.

Component Testing

Forward Collision Alert Switch

1. Ignition OFF, disconnect the harness connector at the S70L Steering Wheel Controls Switch - Left.
2. Test for 7.0k - 10.5k Ω between the control terminal 10 and the signal circuit terminal 5.
 - **If not between 7.0k - 10.5k Ω**

Replace the S70L Steering Wheel Controls Switch - Left.

 - **If between 7.0k - 10.5k Ω**
3. Test for 2.1k - 3.1k Ω between the control terminal 10 and the signal circuit terminal 5 while pressing the switch.
 - **If not between 2.1k - 3.1k Ω**

Replace the S70L Steering Wheel Controls Switch - Left.

 - **If between 2.1k - 3.1k Ω**
4. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Refer to **Cruise Control Switch Replacement** - Steering Wheel Controls Switch - Left replacement.
- Refer to **Forward Collision Alert Display Replacement**
- Refer to **Control Module References** for control module replacement, programming and setup.

PARKING ASSIST SYSTEM MALFUNCTION

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.
- Refer to **Diagnostic Procedure Instructions** to provide an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Parking Assist Switch Indicator Ignition	B2625 02, B0987 06, 2	B0987 06, 2	-	-
Parking Assist Switch Signal	B0967 02, 1	1	1	-
Parking Assist Switch Indicator Control	3	2	B0968 01	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Parking Assist Switch Ground	-	1	1	-
1. Parking Assist Switch Malfunction 2. Parking Assist Indicator Malfunction 3. Parking Assist Indicator On all the Time				

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 moving reverse at speeds of less than 8 km/h (5 MPH). The distance and location of the object is determined by 4 object sensors, located in the rear bumper. The parking assist system will notify the driver using an audible signal through the radio.

Diagnostic Aids

For Symptom Byte 21 the module only run diagnostic when the vehicle is driven greater than 40 km/h (25 MPH). Therefore, even with clean sensor with no obstruction (i.e. snow or ice melted off) drive the vehicle greater than 40 km/h (25 MPH).

The following is a list of reasons this failure type byte 21 might 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 maybe missing, cut, or twisted.
- Improperly installed sensor, sensor maybe be crooked due to a tight wire harness.
- One or more of the sensors may be scratched or the paint maybe 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 - INDEX

Description and Operation

Parking Assist Description and Operation (with Rear Park Assist, UD7)Parking Assist Description and Operation (with Front and Rear Park Assist, UD5)

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

1. Ignition ON.
2. Verify the park assist system is enabled through the parking assist switch.

- **If the park assist system is manually disabled, enable the system.**

Refer to the vehicle owners manual for instructions on enabling the system.

- **If the park assist system does not manually change**

3. Verify the scan tool Park Assist Switch parameter while pressing and releasing the parking assist switch. The parameter should change between Active and Inactive.

- **If the parameter does not change between Active and Inactive**

Refer to Parking Assist Switch Circuit Malfunction.

- **If the parameter changes between Active and Inactive**

4. Command the Park Assist Switch LED output control On and Off with the scan tool. The parking assist switch indicator should turn On and Off when changing between the commanded states.

- **If the indicator does not turn ON and OFF**

Refer to Parking Assist Switch Indicator Circuit Malfunction.

- **If the indicator does turn ON and OFF**

5. Transmission in reverse, verify the Calculated Transmission Range parameter is Reverse.

- **If the parameter is not Active**

Refer to [Backup Lamps Malfunction](#) .

- **If the parameter is Active**

6. Transmission in REVERSE, verify the scan tool Park Assist System Status parameter displays Enable.

- **If the parameter is not Enabled**

Refer to Diagnostic Aids to determine the cause of the inhibit.

- **If the parameter is Enabled**

7. All OK.

Circuit/System Testing

Parking Assist Switch Circuit Malfunction

1. Ignition ON.

2. Verify the scan tool Parking Assist Switch parameter is Inactive.

- **If Active**

1. Ignition OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module.

2. Test for infinite resistance between the signal circuit terminal 8 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K41R Rear Parking Assist Control Module.

- **If Inactive**

3. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.

4. Test for less than 10 Ω between the ground circuit terminal 2 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

2. 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**

5. Install a 3 A fused jumper wire between the signal circuit terminal 5 and ground.

NOTE: If jumper is in place for more than 10 s, DTC B0967 02 will set.

6. Verify the scan tool Parking Assist Switch parameter is Active.

- **If Inactive**

1. Ignition OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module, ignition ON.

2. Test for less than 1 V between the signal circuit terminal 8 and ground.

- If 1 V or greater, repair the short to voltage on the circuit.

- If less than 1 V

3. Ignition OFF

4. 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 , replace the K41R Rear Parking Assist Control Module.

- **If Active**

7. Test or replace the S48A Multifunction Switch - Instrument Panel.

Parking Assist Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel, Ignition ON.

NOTE: Verify interior dimming is turned all the way bright.

2. Test for greater than 11 V between the terminal 3 and ground.

- **If less than 11 V**

Refer to [Interior Backlighting Malfunction](#).

- **If greater than 11 V**

3. Connect a test lamp between the control circuit terminal 6 and B+.

4. Verify the test lamp turns ON and OFF when Commanding the Park Assist Switch Indicator On and Off with a scan tool.

- **If the test lamp is always OFF**

1. Ignition OFF, disconnect the harness connector at the K41R Rear Parking Assist Control Module.

2. Test for less than 1 V between the control circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.

- If less than 1 V

3. Ignition OFF.

4. Test for less than 2 Ω in the control circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.

- If less than 2 Ω , replace the K41R Rear Parking Assist Control Module.

- **If the test lamp is always ON**

1. Ignition OFF, disconnect the X1 harness connector at the K41R Rear Parking Assist Control Module.

2. Test for infinite resistance between the control circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.

- If infinite resistance, replace the K41R Rear Parking Assist Control Module.

- **If the test lamp turns ON and OFF**

5. Test or, replace the S48A Multifunction Switch - Instrument Panel.

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- Refer to [Instrument Panel Multifunction Switch Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming, and setup

REAR CROSS TRAFFIC ALERT SYSTEM MALFUNCTION

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Side Object Sensor - Left Ground	-	U0232	-	-
Side Object Sensor - Left B+	-	U0232	-	-
Side Object Sensor - Left Communication (terminal 7)	1	U0232	1	-
Side Object Sensor - Left Communication (terminal 2)	1	U0233	1	Ã,Â
Side Object Sensor - Right Ground (terminal 8)	-	U0233	1	-
Side Object Sensor - Right Ground (terminal 3)	-	U0233	1	Ã,Â
Side Object Sensor - Right B+	1	U0233	-	-
Side Object Sensor - Right Communication	1	U0232	1	-
1. Rear Cross Traffic Alert System Malfunction				

Circuit/System Description

The side object sensor modules are located on each side of the vehicle behind the rear fascia and are not directly visible from outside the vehicle. The sensors use radar to determine the presence of objects nearby. When an object is detected in the rear cross traffic zone, the module will send out a signal through serial data communication to turn on the visual icons on the rear vision camera screen and also audio chime notification for the appropriate side. Each sensor is supplied B+ and ground. The right sensor receives an additional ground. Both sensors communicate independently on the serial data line. The serial data enters the left sensor in a pass-thru configuration, that connects to the right sensor. The scan tool is able to individually communicate with each sensor.

Diagnostic Aids

- The rear cross traffic alert system uses the same side blind zone sensors so a malfunction may affect either or both systems.
- The conditions for disabling the rear cross traffic alert system are captured by DTCs. The drivers information center will display Service Side Detection System if one of the sensors has failed.
- The rear cross traffic system can be disabled if any off the following occur:
 - The driver has selected the Off mode through vehicle personalization menus. The selected mode is retained over ignition cycles. A driver information center message stating that the Rear Cross Traffic System Alert Off shall be displayed.
 - There is a loss of serial data communication with a sensor or between modules.
 - A blockage condition exists (i.e. mud/snow buildup in front of the sensor). A driver information message stating that the side detection system is temporarily unavailable will be displayed. The rear cross traffic system transitions back to the normal operating state when the blockage is removed. Bumper sticks, fascia damage, labels, and heavy rain storms may

also cause this condition. The blockage determination is performed with the vehicle in a drive gear.

- The rear cross traffic alert system will read the GPS latitude and longitude on the serial data bus and calculate if the vehicle is within a Radio Astronomy zone. These zones are located in Europe and Japan and require the sensors to be turned off. The "Side Detection System Unavailable" message will be displayed to the driver when this occurs.
- Because the sensors are identical, they may be swapped from one side of the vehicle to the other in an attempt to isolate a concern. Sensors should NOT be swapped from one vehicle to another.
- The rear cross traffic alert system is designed to ignore stationary objects; however, the system may occasionally detect pedestrians, shopping carts, or other objects. This is normal system operation and does not require service.
- The rear cross traffic alert system may indicate an object if a trailer is attached to the vehicle, or a bicycle or object is extending out to either side of the vehicle. The system may also temporarily disable the system and display the "Side Detection System Unavailable" message.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cross Traffic Alert 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

1. Ignition ON.
2. Verify the scan tool can communicate with the right side object sensor.
 - **If the scan tool can not communicate with the right side object sensor**
Refer to Circuit/System Testing - Right Side Object Sensor Malfunction.
 - **If the scan tool can communicate with the right side object sensor**
3. Verify the scan tool can communicate with the left side object sensor.
 - **If the scan tool can not communicate with the left side object sensor**
Refer to Circuit/System Testing - Left Side Object Sensor Malfunction.
 - **If the scan tool can communicate with the left side object sensor**
4. Verify that the rear cross traffic indicators alerts turn ON and then turn OFF when commanding the Object Detection Alert Indicators ON and OFF with a scan tool.
 - **If alert indicators do not turn ON and OFF**
 1. Verify the system is enabled.
 - If disabled, refer to diagnostic aids for cause of disable.

- If enabled, test or replace the radio.

- **If indicators turn ON and OFF**

5. All OK.

Circuit/System Testing

Left Side Object Sensor Malfunction

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the B218L Side Object Sensor Module - Left. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between ground circuit terminal 8 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. 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**
3. Verify a test lamp illuminates between the B+ circuit terminal 5 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition Off.
 2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for greater than 500 Ω between the B+ circuit and ground.
 - If less than 500 Ω , repair the short to ground on the circuit.
 - If greater than 500 Ω , replace the B218L Side Object Sensor Module - Left.
 - **If the test lamp illuminates**
4. Ignition OFF and all vehicle systems OFF. Disconnect the It may take up to 2 minutes for all vehicle systems to power down.
5. Test for less than 2 Ω between the serial data circuit terminal 2 and the DLC terminal 1.
 - **If 2 Ω or greater**

Repair the open/high resistance in the circuit.
 - **If less than 2 Ω**
6. Replace B218L Side Object Sensor Module - Left.

Right Side Object Sensor Malfunction

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the B218R Side Object Sensor Module - Right. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the following ground circuit terminals and ground.
 - Terminal 3
 - Terminal 8
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. 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**
3. Verify a test lamp illuminates between the B+ circuit terminal 5 and ground.

- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition Off.

2. Test for less than 2 Ω in the B+ circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF.

2. Test for greater than 500 Ω between the B+ circuit and ground.

- If less than 500 Ω , repair the short to ground on the circuit.
- If greater than 500 Ω , replace the B218R Side Object Sensor Module - Right.

- **If the test lamp illuminates**

4. Ignition OFF and all vehicle systems OFF. It may take up to 2 min for all vehicle systems to power down.

5. Test for less than 2 Ω between the serial data circuit terminal 7 and the DLC terminal 1.

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

6. Replace B218R Side Object Sensor Module - Right.

Side Object Indicator Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector for the appropriate A9 Outside Rearview Mirror. It may take up to 2 min for all vehicle systems to power down.

- X505 - Driver Door Harness to Outside Rearview Mirror
- X605 - Passenger Door Harness to Outside Rearview Mirror

2. Test for less than 10 Ω between the ground circuit terminal 1 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

2. 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**

3. Ignition ON, connect a test lamp between the control circuit terminal 9 and the ground circuit terminal 1.

4. Verify the test lamp turns ON and OFF when commanding the Object Detection Alert Indicators ON and OFF with a scan tool.

- **If the test lamp is always OFF**

1. Ignition OFF, disconnect the harness connector at the appropriate B218 Side Object Sensor Module.

2. Test for infinite resistance between the control circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance

3. Test for less than 2 Ω in the control circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the B218 Side Object Sensor Module.

- **If the test lamp is always ON**

1. Ignition OFF, disconnect the harness connector at the B218 Side Object Sensor Module, ignition ON.

2. Test for less than 1 V between the control circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.

- If less than 1 V, replace the B218 Side Object Sensor Module.

- **If the test lamp turns ON and OFF**

5. Test or replace the appropriate E17 Outside Rearview Mirror Glass.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- Refer to **Outside Rearview Mirror Glass Replacement**
- Refer to **Control Module References** for control module replacement, programming and setup

REAR VISION CAMERA SYSTEM MALFUNCTION

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.
- Refer to **Diagnostic Procedure Instructions** to provide an overview of each diagnostic category.

DTC Descriptors

B127B 2B

Rearview Camera Input Signal Circuit Missing Reference

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	1	B127B 2B, 1	-	-
Backup Signal	B127B 2B, 1	B127B 2B, 1	2	-
Camera Module signal +	1	B127B 2B, 1	B127B 2B, 1	-
Camera Module signal -	3	B127B 2B, 1	B127B 2B, 1	-
Ground	-	B127B 2B, 1	-	-
Shield	3	B127B 2B, 1	3	-
1. Rear Vision Camera Malfunction 2. Rear Vision Camera image always displayed 3. Poor Quality Image				

Circuit/System Description

When the transmission is placed into REVERSE, a 12 V signal is sent to the B87 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 K74 Human Interface Control Module 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.

Conditions for Running the DTC

The vehicle must be in reverse with the engine running.

Conditions for Setting the DTC

B127B 2B

Signal from the rearview camera not received by the Human Machine Interface Control Module for 2.5s.

Action Taken When the DTC Sets

- The Human Machine Interface Control Module commands the driver information center to display "Service Rear Vision System".

- The Human Machine Interface Control Module stores the DTC in memory.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 40 malfunction-free ignition cycles have occurred.

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.

Terminal fretting or incorrectly seated connectors can cause a poor image displayed condition. Check the circuit terminals for fretting or incorrectly seated connector. If the condition is intermittent or cannot be duplicated, disconnect the connectors and add Nyogel lubricant 760G. This procedure will correct the high resistance condition due to terminal fretting corrosion.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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

NOTE: If the condition is intermittent or cannot be duplicated, disconnect the connectors and add Nyogel lubricant 760G. This procedure will correct the high resistance condition due to terminal fretting corrosion.

1. Verify that DTC B2545 is not set.
 - **If the DTC is set**
Refer to [DTC B2545](#).
 - **If the DTC is not set**
2. Verify the rearview camera has no debris on the lens and that the bezel and bezel seal are not damaged.
 - **If debris is found on the lens**
Clean the lens. If the lens, bezel, or bezel seal are damaged, replace as necessary.
 - **If no debris on the lens**

3. Ignition ON, transmission in R.

4. Verify the backup lamps are illuminated.

- **If the backup lamps are not illuminated**

Refer to [Backup Lamps Malfunction](#) .

- **If the backup lamps are illuminated**

5. Engine running, transmission in R.

6. Verify a clear rear vision image is displayed on the P17 Info Display Module.

- **If a clear image is not displayed**

Refer to Circuit/System Testing.

- **If a clear image is displayed**

7. All OK.

Circuit/System Testing

NOTE:

- **Circuit/System Verification must be performed before Circuit/System Testing.**
- **Under normal operating conditions the Human Interface Machine Control Module will become very hot. The module should be allowed to cool down prior to removal for any service procedure.**

1. Ignition OFF, disconnect the harness connector at the B87 Rearview Camera.

2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

2. 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**

3. Ignition ON.

4. 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**

1. Ignition OFF.

2. Test for less than 2 Ω in the ignition circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. Refer to [Power Mode Mismatch](#) .

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF.

2. 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, replace the B87 Rearview Camera.

- **If the test lamp illuminates**

5. Engine running, park brake applied, transmission in R.

6. Test for greater than 11 V between the control circuit terminal 3 and ground.

- **If less than 11 V**

1. Ignition OFF, disconnect the X7 harness connector at the K9 Body Control Module.

2. Test for infinite resistance between the control circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the control circuit end to end.
- If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
- **If greater than 11 V**
7. Ignition OFF, disconnect the X2 harness connector at the K74 Human Interface Control Module, ignition ON.
8. Test for less than 1 V between the signal circuit terminal listed below and ground:
- B87 Rearview Camera signal (+) circuit terminal 5
 - B87 Rearview Camera signal (-) circuit terminal 6
 - **If 1 V or greater**
- Repair the short to voltage on the circuit.
- **If less than 1 V**
9. Test for infinite resistance between the signal circuit terminal listed below and ground:
- B87 Rearview Camera signal (+) circuit terminal 5
 - B87 Rearview Camera signal (-) circuit terminal 6
 - **If less than infinite resistance**
- Repair the short to ground on the circuit.
- **If infinite resistance**
10. 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**
11. 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.
- **If less than 2 Ω**
12. Replace the B87 Rearview Camera.
13. Engine running, transmission in R, verify a clear rear vision image is displayed on the P17 Info Display Module.
- **If a clear rear vision image is not displayed**
- Replace the K74 Human Interface Control Module.
- **If a clear rear vision image is displayed**
14. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- Refer to [Rearview Driver Information Camera Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming and setup

SIDE BLIND ZONE ALERT SYSTEM MALFUNCTION

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

Circuit/System Description

The side blind zone alert system detects and reports objects on either side of the vehicle, within a specified blind spot zone. The system alerts with a visual indicator placed on each side rear view mirror, to the presence of objects that may not be visible in the inside rearview mirror and outside rearview mirrors. Although this system is intended to help drivers avoid lane change crashes, it does not replace driver vision and therefore should be considered a lane change aid. Even with the side blind zone system, the driver must check carefully for objects outside of the reporting zone (e.g., a fast approaching vehicle) before changing lanes. In the event that the system senses a malfunction through its diagnostic routines, the system will be disabled and the driver will be visually notified.

When the system detects a vehicle in the side blind zone while driving forward, independent if passing a vehicle or being passed, an amber warning symbol will light up in the appropriate outside mirror. This indicates that it may be unsafe to change lanes. If the driver then activates the turn signal, the amber warning symbol starts flashing as an extra warning not to change lanes.

Side blind zone alert is active when the vehicle is out of park or the parking brake is off on manual transmission vehicles and from speeds of 10 km/h (6.2 MPH) up to 140 km/h (87 MPH). Driving faster deactivates the system, indicated by dimly lighting the warning symbols in the mirrors. Driving under this speed again will turn off the warning symbols. If then a vehicle is detected in the blind zone, the warning symbols will turn on normally on the appropriate side. When the vehicle is started, both outside mirror displays will briefly come on to indicate that the system is operating.

Diagnostic Aids

- The conditions for disabling the side blind zone alert system are captured by DTCs. The drivers information center will display Service Side Detection System if one of the sensors has failed.
- The side blind zone system can be disabled if any off the following occur:
 - The driver has selected the Off mode through vehicle personalization menus. The selected mode is retained over ignition cycles. A driver information center message stating that the side blind zone system is off shall be displayed and the outside mirror indicators will be OFF.
 - There is a loss of serial data communication with a sensor or between modules.
 - A blockage condition exists (i.e. mud/snow buildup in front of the sensor). A driver information message stating that the side detection system is temporarily unavailable will be displayed. The rear cross traffic system transitions back to the normal operating state when the blockage is removed. Bumper sticks, fascia damage, labels, and heavy rain storms may also cause this condition. The blockage determination is performed with the vehicle in a drive gear.
 - The side blind zone alert system will read the GPS latitude and longitude on the serial data bus and calculate if the vehicle is within a Radio Astronomy zone. These zones are located in Europe and Japan and require the sensors to be turned off. The "Side Detection System Unavailable" message will be displayed to the driver when this occurs.
- Because the sensors are identical, they may be swapped from one side of the vehicle to the other in an attempt to isolate a concern. Sensors should NOT be swapped from one vehicle to another.
- The side blind zone system is designed to ignore stationary objects; however, the system may occasionally detect guard rails, signs, trees, shrubs, or other stationary objects as an object in the blind zone. This is normal system operation and does not require service.
- The side blind zone system may indicate an object in the blind zone if a trailer is attached to the vehicle, or a bicycle or object is extending out to either side of the vehicle. The system may also temporarily disable the system and display the "Side Detection System Unavailable" message.

Reference Information

Schematic Reference

Object Detection Schematics

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Side Blind Zone Alert 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

1. Ignition ON.
2. Verify the scan tool can communicate with the left side object sensor.
 - **If the scan tool can not communicate with the left side object sensor**
Refer to Circuit/System Testing - Left Side Object Sensor Malfunction.
 - **If the scan tool can communicate with the left side object sensor**
3. Verify the scan tool can communicate with the right side object sensor.
 - **If the scan tool can not communicate with the right side object sensor**
Refer to Circuit/System Testing - Right Side Object Sensor Malfunction.
 - **If the scan tool can communicate with the right side object sensor**
4. Ignition OFF, ignition ON.
5. Verify that the side blind zone alert system indicator located in the appropriate outside rearview mirror turns ON and OFF when commanding the appropriate Object Detection Alert Indicator On and Off with a scan tool.
 - **If one or both indicators do not turn ON and OFF**
Refer to Circuit/System Testing - Side Object Indicator Malfunction.
 - **If both indicators turn ON and OFF**
6. All OK.

Circuit/System Testing

Left Side Object Sensor Malfunction

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the B218L Side Object Sensor Module - Left. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between ground circuit terminal 8 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. 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**
3. Verify a test lamp illuminates between the B+ circuit terminal 5 and ground.

- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition Off.

2. Test for less than 2 Ω in the B+ circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF.

2. Test for infinite resistance between the B+ circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the B218L Side Object Sensor Module - Left.

- **If the test lamp illuminates**

4. Ignition OFF and all vehicle systems OFF. Disconnect the It may take up to 2 minutes for all vehicle systems to power down.

5. Test for less than 2 Ω between the serial data circuit terminal 2 and the DLC terminal 1.

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

6. Replace B218L Side Object Sensor Module - Left.

Right Side Object Sensor Malfunction

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the B218R Side Object Sensor Module - Right. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 10 Ω between the following ground circuit terminals and ground.

- Terminal 3
- Terminal 8

- **If 10 Ω or greater**

1. Ignition OFF.

2. 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**

3. Verify a test lamp illuminates between the B+ circuit terminal 5 and ground.

- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition Off.

2. Test for less than 2 Ω in the B+ circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF.

2. Test for infinite resistance between the B+ circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the B218R Side Object Sensor Module - Right.

- **If the test lamp illuminates**

4. Ignition OFF and all vehicle systems OFF. It may take up to 2 min for all vehicle systems to power down.

5. Test for less than 2 Ω between the serial data circuit terminal 7 and the DLC terminal 1.

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- If less than 2 Ω

6. Replace B218R Side Object Sensor Module - Right.

Side Object Indicator Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector for the appropriate A9 Outside Rearview Mirror. It may take up to 2 min for all vehicle systems to power down.
 - X510 - Driver Door Harness to Outside Rearview Mirror
 - X610 - Passenger Door Harness to Outside Rearview Mirror
2. Test for less than 10 Ω between the ground circuit terminal 11 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. 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**
3. Ignition ON, connect a test lamp between the control circuit terminal 15 and the ground circuit terminal 11.
4. Verify the test lamp turns ON and OFF when commanding the Object Detection Alert Indicators ON and OFF with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the harness connector at the appropriate B218 Side Object Sensor Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the B218 Side Object Sensor Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the harness connector at the B218 Side Object Sensor Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the B218 Side Object Sensor Module.
 - **If the test lamp turns ON and OFF**
5. Test or replace the appropriate E17 Outside Rearview Mirror Glass.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- Refer to [Outside Rearview Mirror Glass Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming and setup.

LANE DEPARTURE WARNING SYSTEM MALFUNCTION

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Lane Departure Warning Switch Ignition	-	2	-	-
Lane Departure Warning Switch Signal	B356A 02	1	B356A 05	-
Lane Departure Warning Switch Indicator Control	-	B0987 06, 1	B0987 01, B0987 0B	-
Lane Departure Warning Switch Ground	-	1	B0987 0B	-
1. Lane Departure Warning Switch Inoperative. 2. Lane Departure Warning Switch Indicator Inoperative.				

Circuit/System Description

The lane departure warning system is enabled and disabled through the lane departure switch. When enabled, the lane departure warning indicator will illuminate.

The switch and indicator are connected to the Frontview Camera Module. The Frontview Camera module supplies a reference voltage to the lane departure switch. When the switch is pressed, the signal circuit is grounded. When enabled, the Frontview Camera Module will illuminate the indicator located in the switch when lane departure warning system is enabled.

When the system is operating and can detect the lane markings, the Frontview Camera Module will request via serial data communications that the instrument cluster illuminate the green lane departure warning symbol. If the Frontview Camera Module detects that the vehicle unintentionally crosses a lane marking without the turn signal being used, the module will request the instrument cluster to flash the amber lane departure warning indicator. An audible warning will also sound three times when the amber lane departure warning indicator in the instrument cluster is flashing.

Diagnostic Aids

Certain factors will affect the operation of the lane departure warning system. When the system is operating properly, the green lane departure warning indicator will illuminate on the instrument cluster. This indicates that all of the required operating conditions to permit lane departure warning have been met. The green lane departure warning indicator will not appear when the system is having difficulty seeing the lines on the road or if the view of the front view camera is blocked with mud, dirt, snow, ice, or slush, if the windshield is damaged, or when weather limits visibility, such as while driving in fog, rain, or snow conditions. This is normal operation, the vehicle does not need service. Additionally, lane departure warnings may occasionally occur in a properly operating vehicle due to tar marks, shadows, cracks in the road, or other road imperfections. This is normal system operation and the vehicle does not require service. The driver information center may also display Lane Departure System Unavailable due to the temporary conditions listed above.

The driver information center may also display LANE DEPARTURE WARNING SYSTEM UNAVAILABLE when the front camera module and bracket assembly is not properly installed. It may be helpful to verify the correct installation of the front camera and bracket assembly. Calibrate the front camera module after repair. Refer to [Front View Camera Module Learn](#)

Additionally, the Front View Camera Disable History can give useful hints about what affected the operation of the lane departure warning system. For the Front View Camera Disable History, refer to [DTC B1011](#).

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Lane Departure Warning 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

NOTE: Refer to Diagnostic Aids before performing Circuit/System Verification.

1. Ignition ON.
2. Verify the K43 Power Steering Control Module (if equipped) and the K17 Electronic Brake Control Module do not have any DTCs set.
 - **If any DTC is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **If the DTC is not set**
3. Verify that DTC B356A is not set.
 - **If the DTC is set**
Refer to [DTC B356A](#).
 - **If the DTC is not set**
4. Verify that DTC B0987 is not set.
 - **If the DTC is set**
Refer to [DTC B0987](#).
 - **If the DTC is not set**
5. Verify that DTC B1011 is not set.
 - **If the DTC is set**
Refer to [DTC B1011](#).
 - **If the DTC is not set**
6. Verify the scan tool Frontview Camera Disable History 1 parameter does not have a current Malfunction
 - **If the parameter is Malfunction**
Refer to Diagnostic Aids.
 - **If the parameter is Normal**
7. Verify the scan tool Frontview Camera System Status parameter is Normal.
 - **If the parameter is Undefined or Malfunction**
Refer to Diagnostic Aids.
 - **If the parameter is Normal**

8. Verify the scan tool Lane Departure Warning Switch Status parameter changes between Open and Closed while pressing and releasing the lane departure warning switch.

- **If the parameter does not change between Open and Closed**

Refer to Lane Departure Warning Switch Malfunction in Circuit/System Testing.

- **If the parameter changes between Open and Closed**

9. Verify the scan tool Lane Departure Warning Switch indicator turns on and off while pressing and releasing the lane departure warning switch.

- **If the indicator does not turn on and off**

Refer to Lane Departure Warning Switch Indicator Malfunction in Circuit/System Testing.

- **If the indicator turns on and off**

10. Verify the area of the K109 Frontview Camera Module for contamination.

- **If it needs to be cleaned**

Clean the windshield.

- **If it does not need to be cleaned**

11. All OK.

Circuit/System Testing

Lane Departure Warning Switch Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel. It may take up to 2 minutes for all vehicle systems to power down.

2. Test for less than 10 Ω between the ground circuit terminal 2 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

2. 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 ground circuit.
- If less than 2 Ω , repair the open/high resistance in the ground connection.

- **If less than 10 Ω**

3. Ignition ON.

4. Verify the scan tool Lane Departure Warning Switch parameter is Off.

- **If not Off**

1. Ignition OFF, disconnect the harness connector at the K109 Frontview Camera Module.

2. Test for infinite resistance between the S48A Multifunction Switch - Instrument Panel signal circuit terminal 10 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K109 Frontview Camera Module.

- **If Off**

5. Install a 3 A fused jumper wire between the signal circuit terminal 10 and ground.

NOTE: The next step must be completed within 8 s. If not tested within 8 s, the parameter will change back to Open and DTC B356A will set.

6. Verify the scan tool Lane Departure Warning Switch parameter is Closed.

- **If not On**

1. Ignition OFF, disconnect the harness connector at the K109 Frontview Camera Module, ignition ON.

2. Test for less than 1 V between the signal circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.

- If less than 1 V
3. 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 , replace the K109 Frontview Camera Module.
 - **If On**
7. Test or replace the S48A Multifunction Switch - Instrument Panel.

Lane Departure Warning Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel, ignition ON.

NOTE: **Verify interior lighting dimming is turned all the way up.**

2. Test for 6.2 - 10.9 V between the dimming control circuit terminal 3 and ground.
 - **If less than 6.2 V**
 1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Interior Backlighting Malfunction](#).
 - **If greater than 10.9 V**
 1. Ignition OFF, disconnect the X1 harness connector at the K9 Body Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, refer to [Interior Backlighting Malfunction](#).
 - **If between 6.2 - 10.9 V**
3. Connect a test lamp between the control circuit terminal 4 and B+.
4. Verify the test lamp turns ON and OFF when Commanding the Lane Departure Warning Indicator ON and OFF with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the harness connector at the K109 Frontview Camera Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the S48A Multifunction Switch - Instrument Panel.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the harness connector at the K109 Frontview Camera Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K109 Frontview Camera Module.
 - **If the test lamp turns ON and OFF**
5. Test or replace the S48A Multifunction Switch - Instrument Panel.

Static Test

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.
2. Test for infinite resistance between the control circuit terminal 10 and ground circuit terminal 2.
 - **If less than infinite resistance**

Replace the S48A Multifunction Switch - Instrument Panel.
 - **If infinite resistance**
3. Test for less than 10 Ω between the control circuit terminal 10 and ground circuit terminal 2 while pressing the lane departure warning switch.
 - **If 10 Ω or greater**

Replace the S48A Multifunction Switch - Instrument Panel.
 - **If less than 10 Ω**
4. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- Refer to [Instrument Panel Multifunction Switch Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming and setup.

REPAIR INSTRUCTIONS

FORWARD RANGE RADAR MODULE REPLACEMENT

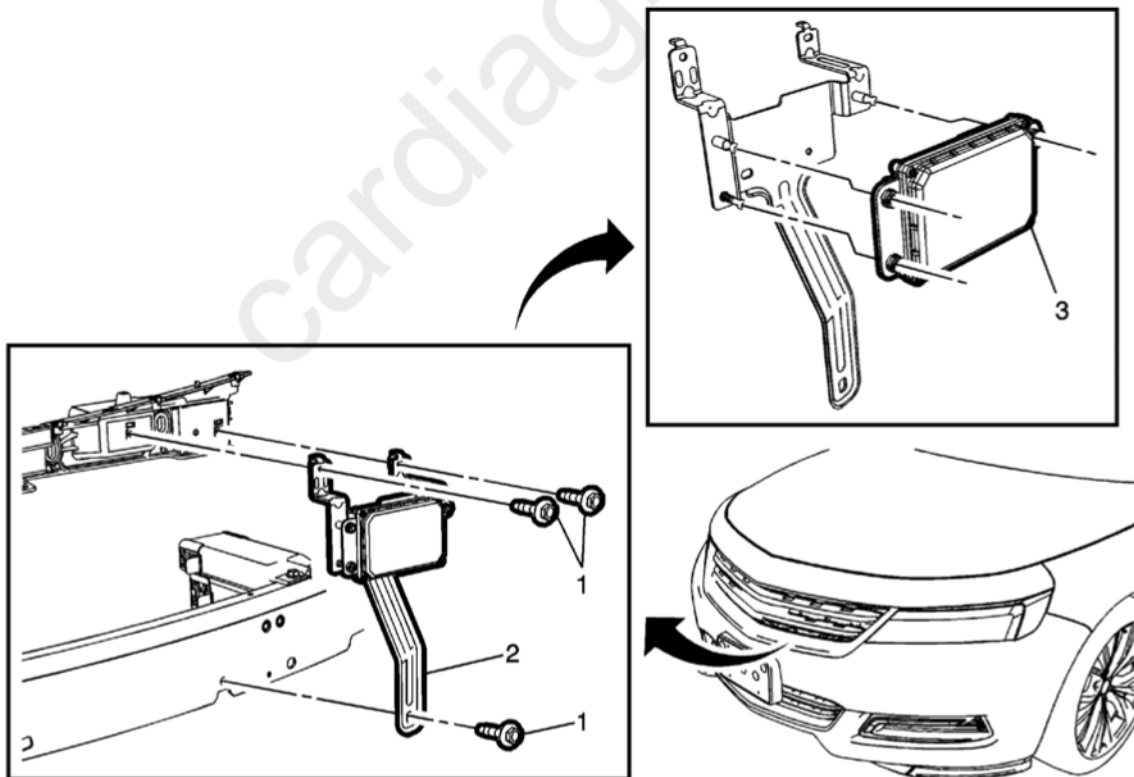


Fig. 5: Forward Range Radar Module

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove the front bumper fascia. Refer to Front Bumper Fascia Replacement .	

Callout	Component Name
1	Forward Range Radar Module Fastener (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
2	Forward Range Radar Module Bracket
3	Forward Range Radar Module Procedure 1. Disconnect the electrical connector. 2. Remove the module beginning with the lower ball socket. 3. Carefully lift the module away from bracket using the appropriate tool. 4. For programming and set up, refer to Control Module References .

FORWARD RANGE RADAR MODULE ALIGNMENT

CAUTION: Always use care when handling the forward range radar module and bracket. Improper handling can cause damage to the module or bracket and affect the functionality of the system.

1. Inspect the forward range radar module for damage. Refer to [Forward Range Radar Module Inspection](#).
2. The alignment of the forward range radar module is performed under the following vehicle conditions:
 - With an empty vehicle:
 - There shall not be any person in the vehicle
 - Specific equipment can remain in the vehicle
 - Luggage must not exceed 5 kg (11 lb)
 - The vehicle must stand on a flat surface. The level of the ground must not vary by more than +/-7 mm/m. This corresponds to 0.4 degrees, using a water bubble level.
 - Vehicle tires must have specified air pressure.

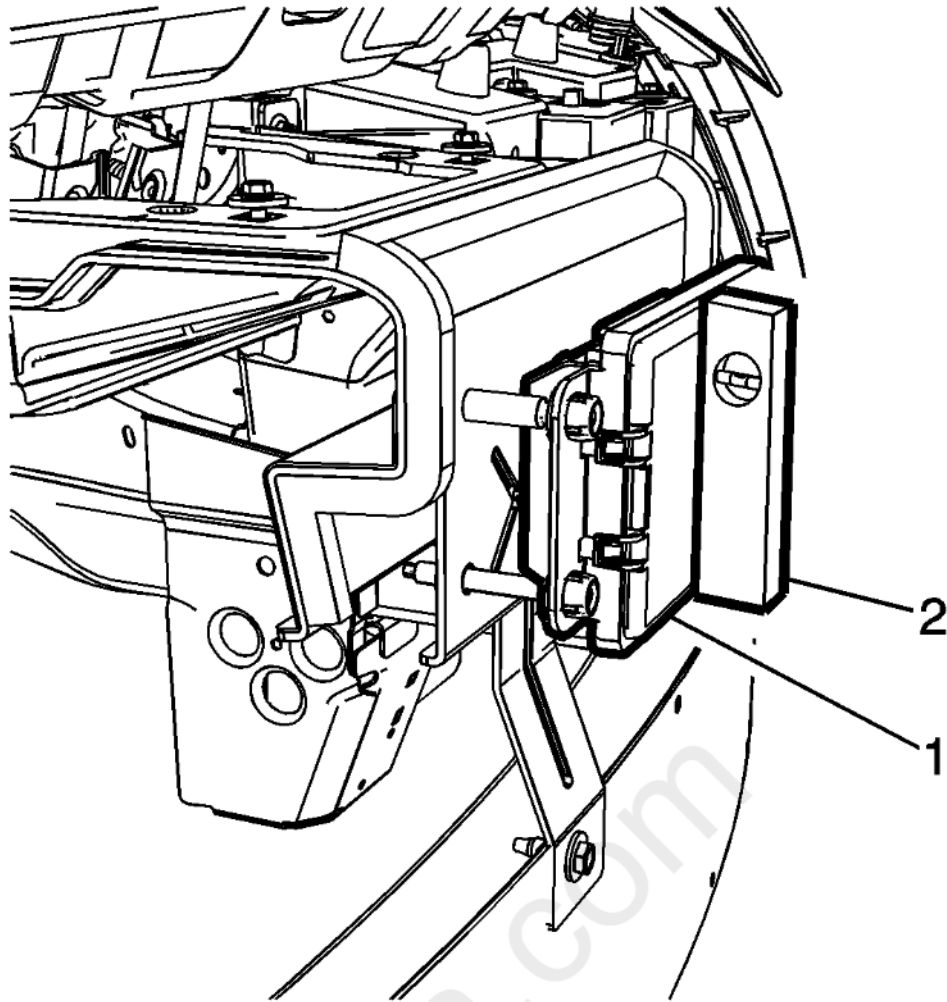


Fig. 6: Bubble Level

Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not press the water bubble level too tight against the face of the module.

3. Use a water bubble level (2) to align the forward range radar module vertically as shown in the graphic.

NOTE: The water bubble level must have an accuracy of ± 0.5 degrees (9 mm/m).

NOTE: The vertical position of forward range radar module is 90 degrees.

4. Turn the screw (1) until the water bubble level has a value of 90 degrees.

FORWARD RANGE RADAR MODULE INSPECTION

1. Remove the front bumper fascia. Refer to [Front Bumper Fascia Replacement](#) .

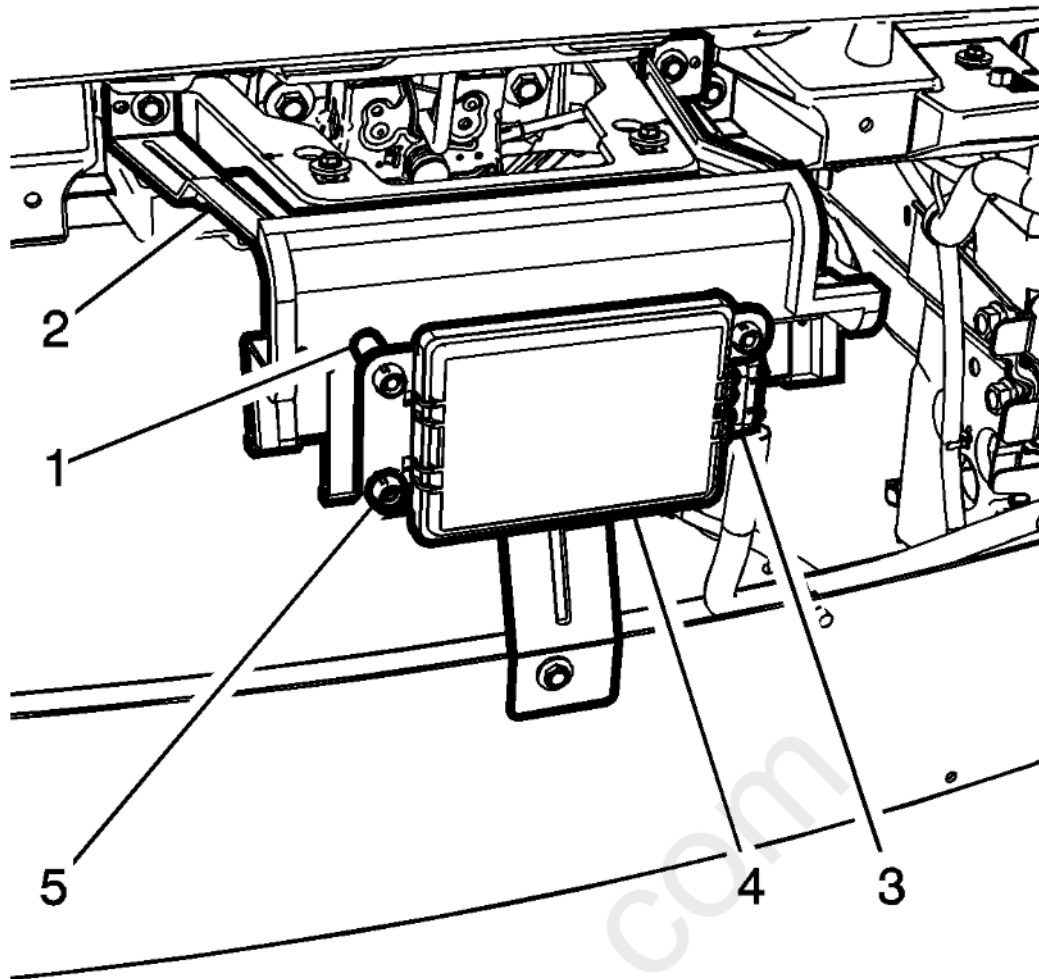


Fig. 7: Forward Range Radar Module

Courtesy of GENERAL MOTORS COMPANY

2. CONTROL MODULE DTC CHECK - Using a scan tool, perform the Vehicle DTC Information function - Verify there are no current control module DTCs set. If any DTC is set, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
3. Inspect the forward range radar module (4) for vertical alignment. Refer to [Forward Range Radar Module Alignment](#).
4. Check the 3 ball sockets (5) for fixed seating. If the ball sockets are damaged replace the ball sockets.
5. Inspect all studs (1) for proper seat. If damaged, replace the bracket. Refer to [Forward Range Radar Module Replacement](#).
6. Inspect the forward range radar module bracket (2) for paint cracks and deformations. Do NOT repair any cracks or misalignments. If damaged, replace the bracket. Refer to [Forward Range Radar Module Replacement](#).
7. Inspect the wiring harness plug (3) and the terminal of the forward range radar module for any damage.

FORWARD COLLISION ALERT DISPLAY REPLACEMENT

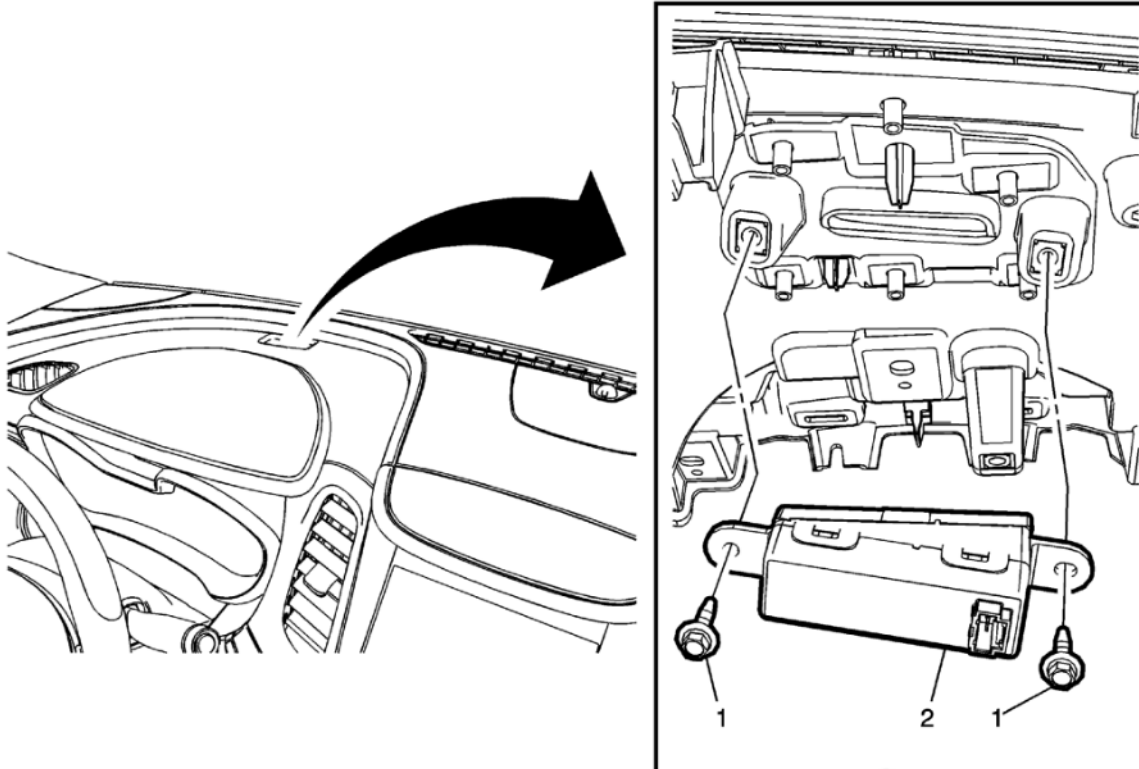


Fig. 8: Forward Collision Alert Display
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement .	
1	Forward Collision Alert Display (Qty: 2) CAUTION: Refer to Fastener Caution .
2	Forward Collision Alert Display Procedure Disconnect the electrical connector.

PARKING ASSIST CONTROL MODULE REPLACEMENT

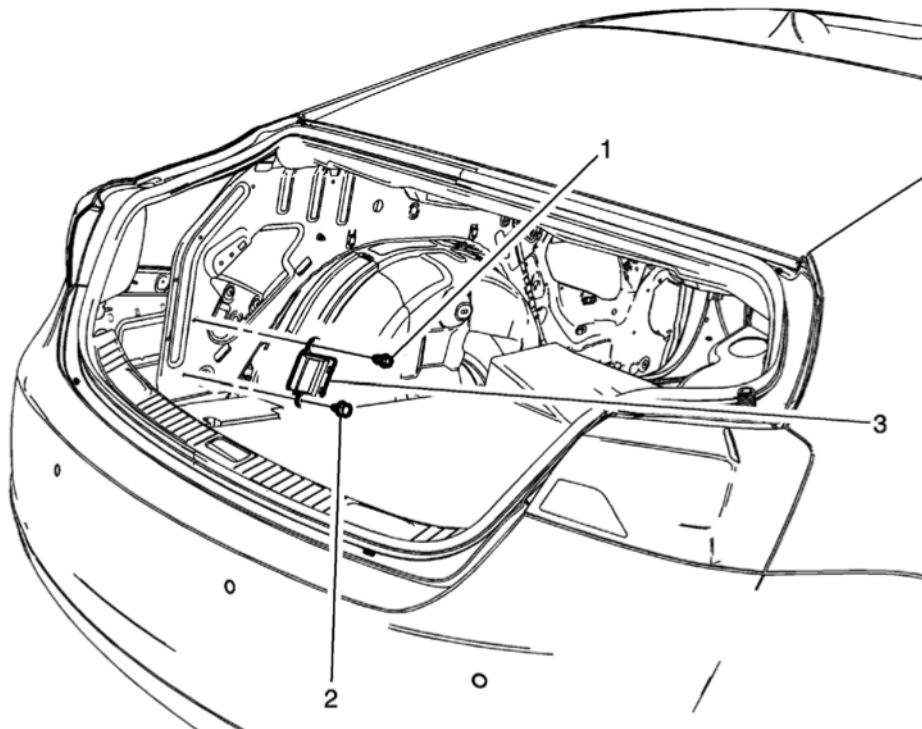


Fig. 9: Rear Object Alarm Control Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Reposition the rear compartment side trim panel enough to gain access to the module. Refer to Rear Compartment Side Trim Replacement - Left Side .	
1	Rear Object Alarm Control Module Fastener CAUTION: Refer to Fastener Caution . Tighten 4.5 N.m (40 lb in)
2	Rear Object Alarm Control Module Retainer
3	Rear Object Alarm Control Module Procedure 1. Disconnect the electrical connectors. 2. For programming and set up, refer to Control Module References .

FRONT OBJECT ALARM SENSOR WIRING HARNESS REPLACEMENT

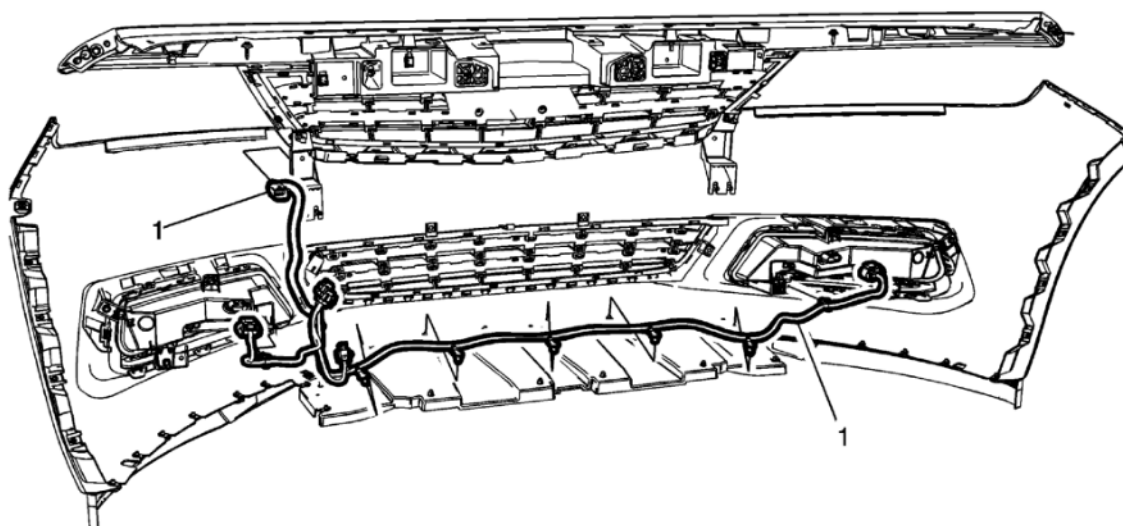


Fig. 10: Front Object Alarm Sensor Wiring Harness

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures Remove the front bumper fascia. Refer to Front Bumper Fascia Replacement .	
1	Front Object Alarm Sensor Wiring Harness Procedure 1. Disconnect the front object alarm sensor wiring harness electrical connectors from the front object sensors. 2. Disconnect the front object alarm sensor wiring harness electrical connectors from the front fascia wiring harness. 3. Using a suitable tool, disconnect the front object alarm sensor wiring harness from the front fascia.

SIDE OBJECT SENSING ALERT MODULE REPLACEMENT

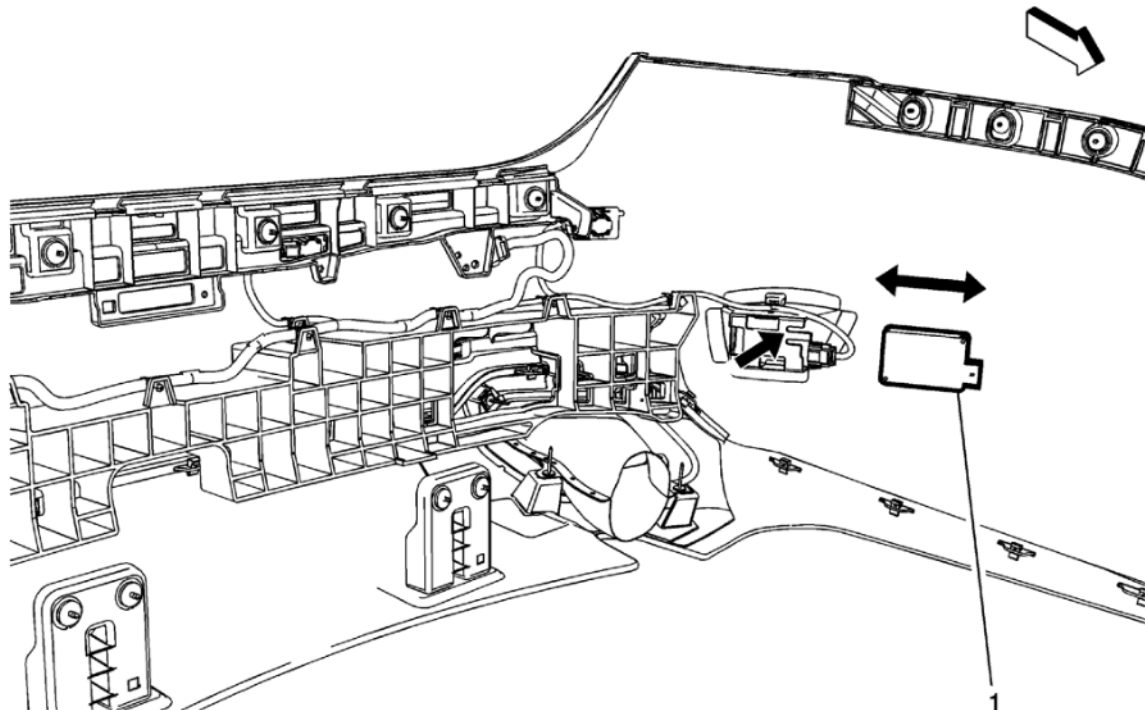


Fig. 11: Side Object Sensing Alert Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle 2. Only remove the rear wheelhouse liner fasteners that attach the liner to the rear fascia. Refer to Rear Wheelhouse Liner Replacement	
1	Side Object Sensor Module Procedure 1. Disconnect the electrical connector. 2. Depress the retainer tab (arrow) and slide the module out of the retaining bracket. 3. For programming and set up, refer to Side Object Sensor Module Programming and Setup

REAR OBJECT SENSOR WIRING HARNESS REPLACEMENT

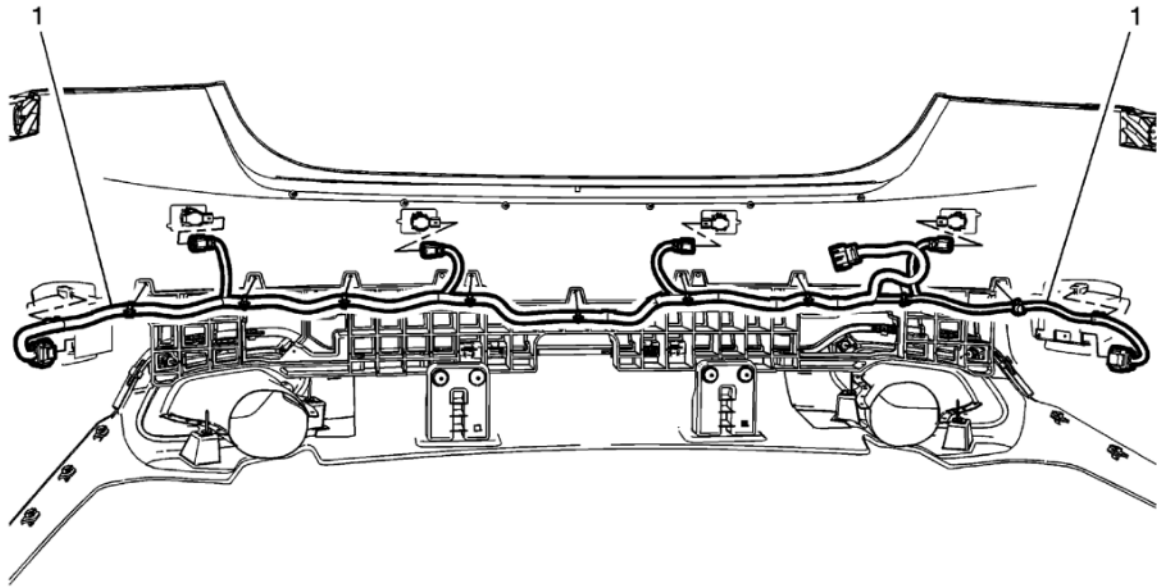


Fig. 12: Rear Object Sensor Wiring Harness
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures Remove the rear bumper fascia. Refer to Rear Bumper Fascia Replacement .	
1	Rear Object Sensor Wiring Harness Procedure 1. Disconnect the rear object sensor wiring harness electrical connectors from the rear object sensors. 2. Disconnect the rear object sensor wiring harness electrical connectors from the rear module. 3. Using a suitable tool, disconnect the rear object sensor wiring harness from the rear fascia.

REAR PARKING ASSIST ALARM SENSOR REPLACEMENT

Removal Procedure

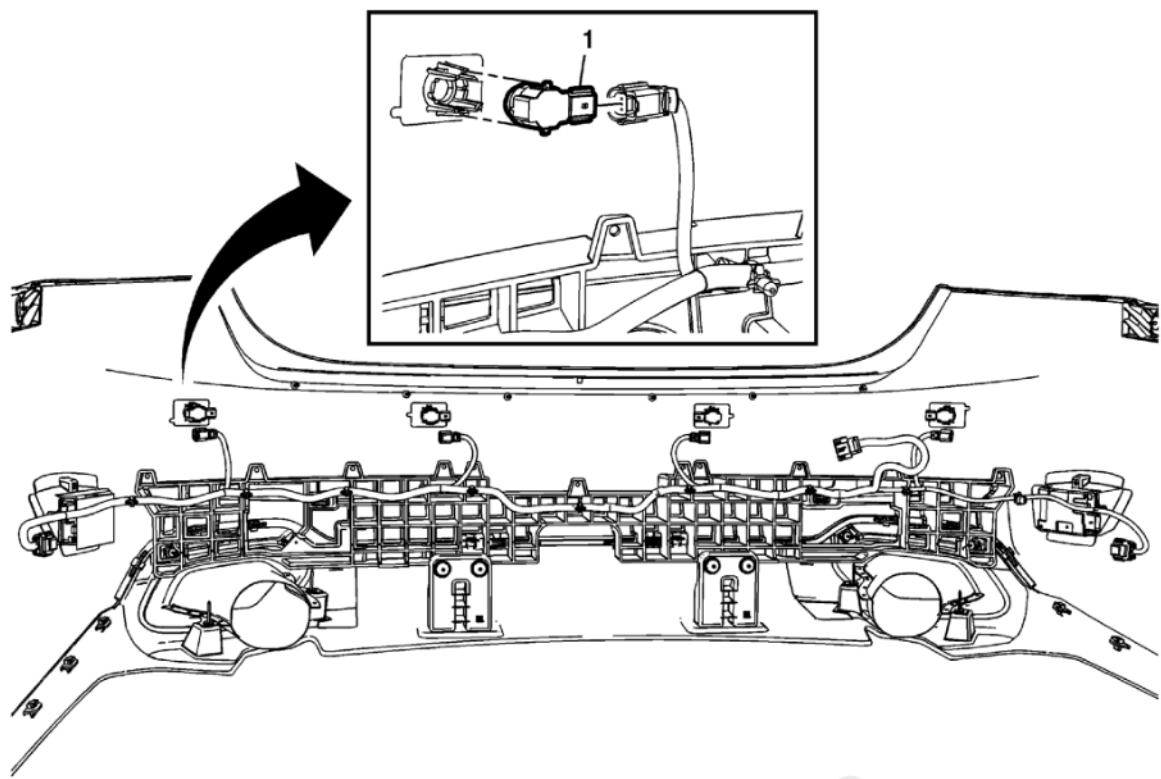


Fig. 13: Rear Parking Assist Alarm/Rear Object Sensor

Courtesy of GENERAL MOTORS COMPANY

1. Remove rear bumper fascia. Refer to [Rear Bumper Fascia Replacement](#) .
2. Disconnect electrical from the rear object sensor.

NOTE: The rear object sensor is a one piece design. Do NOT twist the sensor cap to try and remove the painted cap. Replacement sensor requires painting to match fascia/bumper body color.

3. Lift the locking tabs on the housing and remove the rear object sensor.

Installation Procedure

NOTE: Do not refinish previously painted sensors. Excess paint build up will cause the sensor to be inoperative.

1. Paint the rear object sensor.
2. Ensure the paint does not exceed 6 mils. Use a paint thickness gauge suitable for non-ferrous metals.

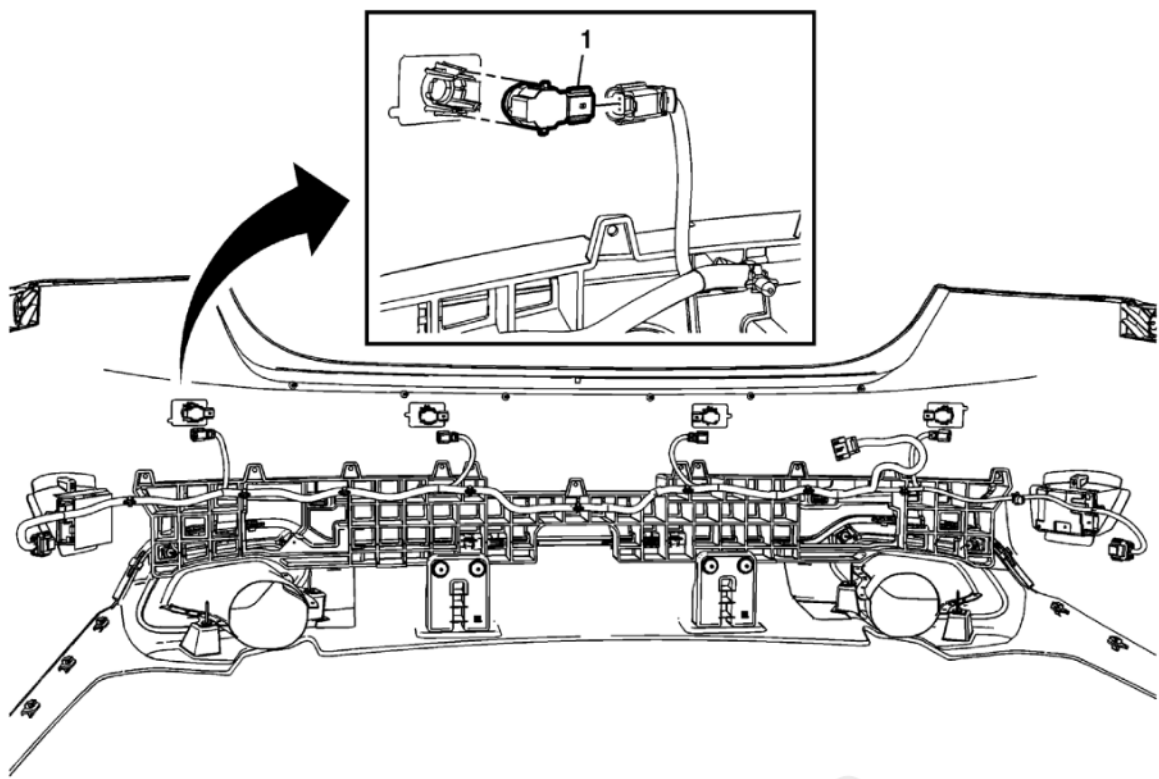


Fig. 14: Rear Parking Assist Alarm/Rear Object Sensor
Courtesy of GENERAL MOTORS COMPANY

NOTE: Ensure the silicone decoupling ring is installed on the sensor to avoid sensor failure.

3. Insert the sensor into the housing.
4. Connect the electrical connector to the rear object sensor.
5. Install the rear bumper fascia. Refer to [Rear Bumper Fascia Replacement](#) .

REAR PARKING ASSIST ALARM SENSOR BRACKET REPLACEMENT

1. Remove the rear fascia. Refer to [Rear Bumper Fascia Replacement](#) .

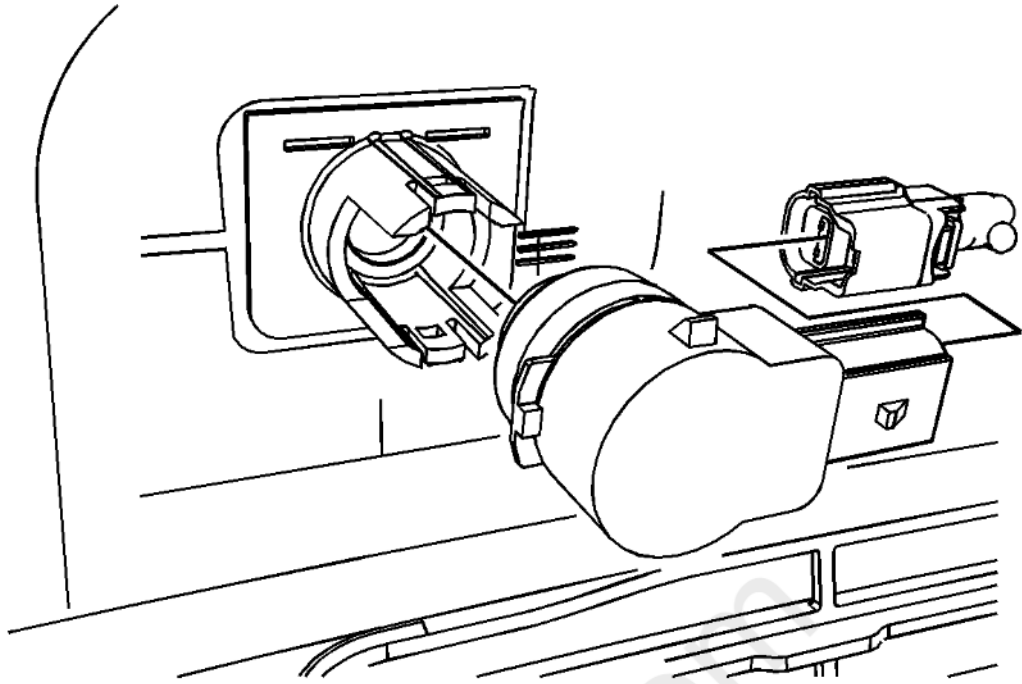


Fig. 15: Rear Object Sensor And Housing
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the sensor harness.
3. Remove the sensor from the sensor bracket.

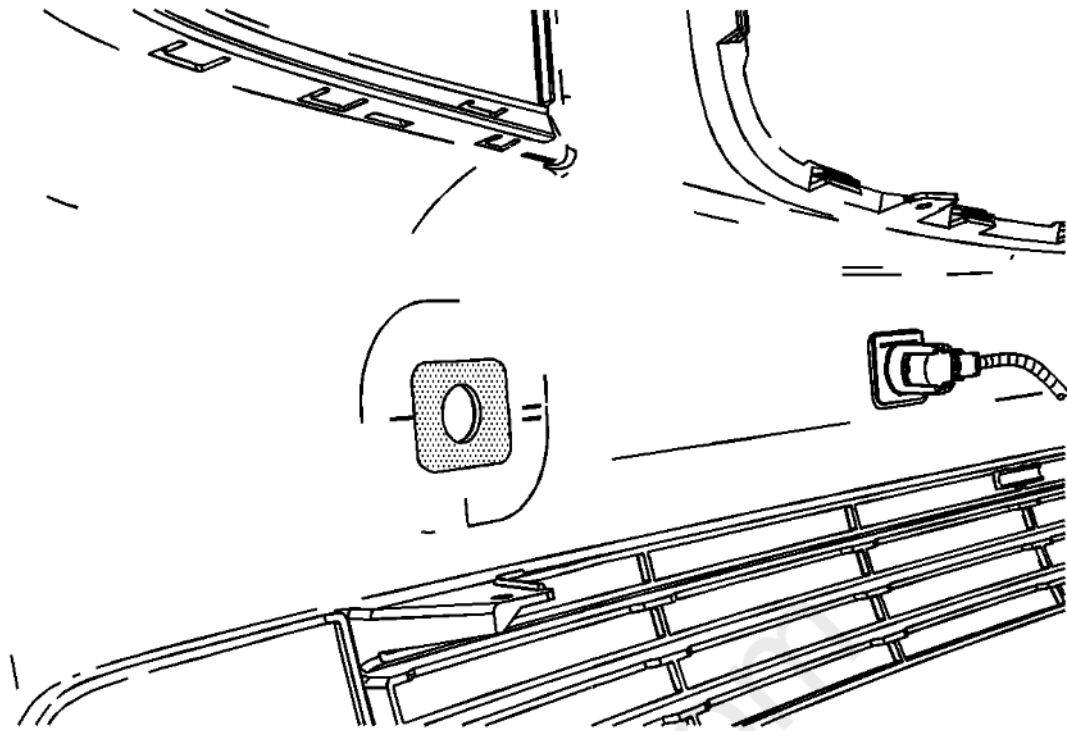


Fig. 16: Sonic Weld Plastic Residue

Courtesy of GENERAL MOTORS COMPANY

IMPORTANT: Do Not grind off alignment tabs.

4. Sand/grind sonic weld plastic residue from the fascia.

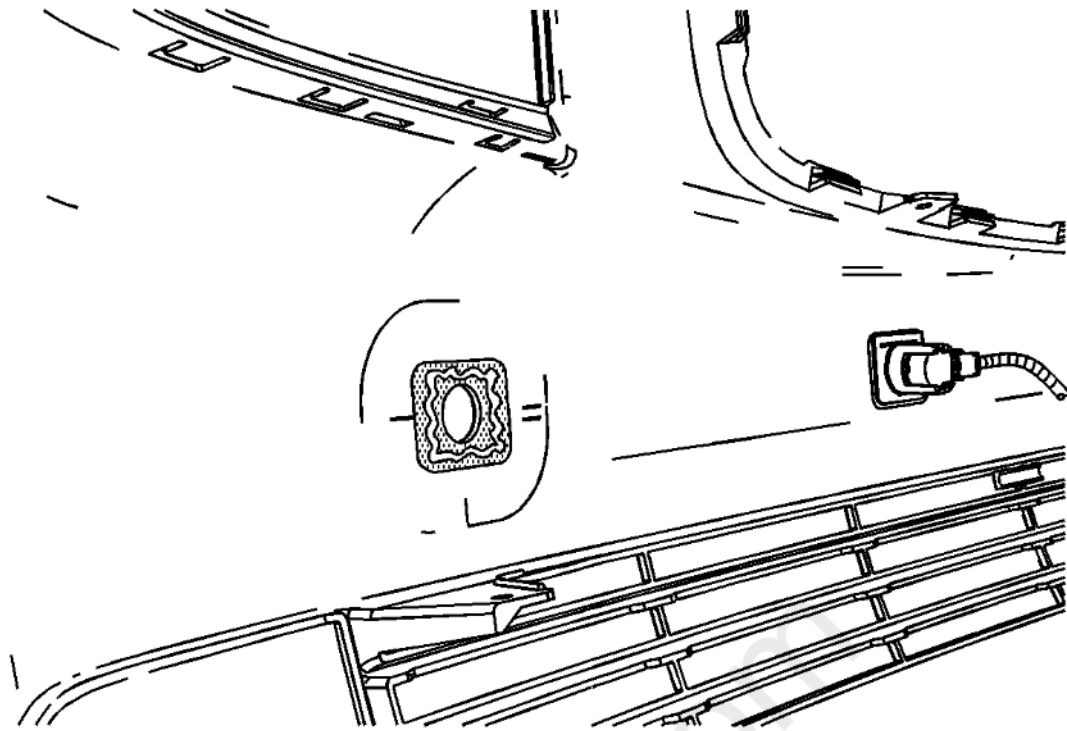


Fig. 17: Structural Adhesive Epoxy On Fascia

Courtesy of GENERAL MOTORS COMPANY

5. Apply structural adhesive epoxy, Lord Fusor™ 127EZ or equivalent, to fascia at mating surface.

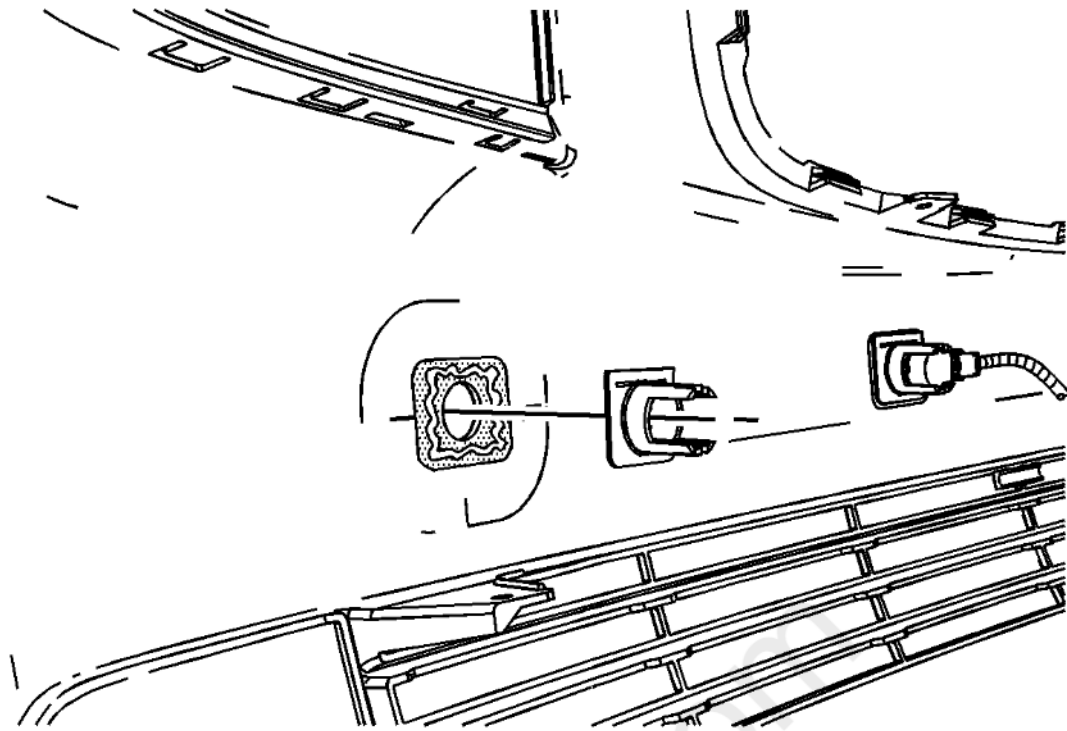


Fig. 18: Sensor Housing And Tabs

Courtesy of GENERAL MOTORS COMPANY

6. Using the alignment tabs, install the sensor bracket to the fascia.
7. Allow adhesive to cure according to manufacturer's directions.

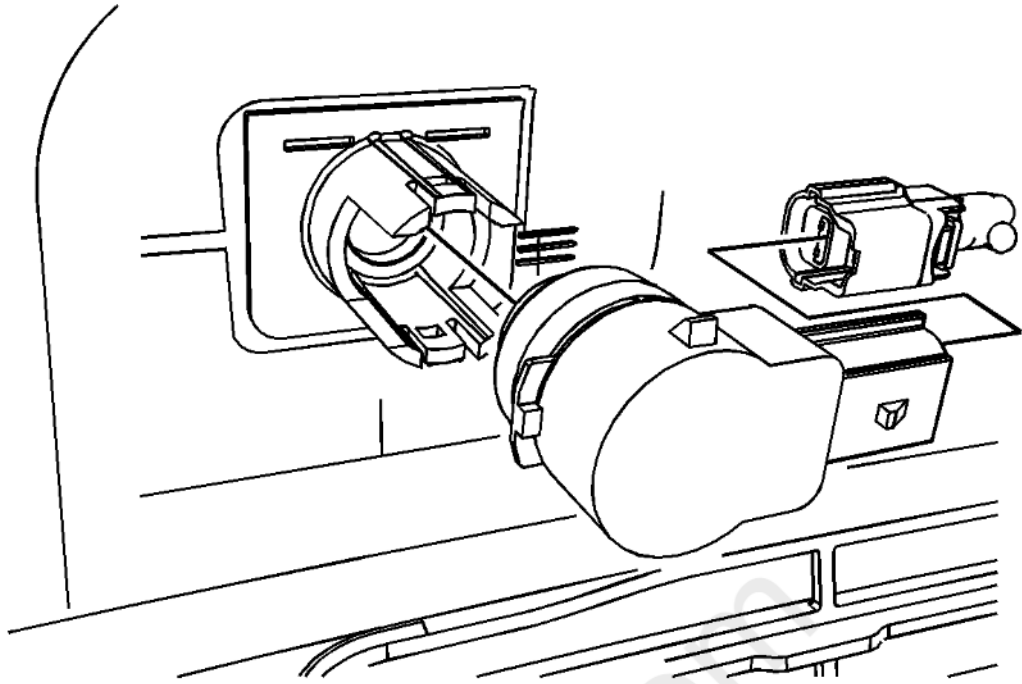


Fig. 19: Rear Object Sensor And Housing
Courtesy of GENERAL MOTORS COMPANY

8. Install the sensor to the sensor bracket.
9. Connect the electrical harness.
10. Install the rear fascia. Refer to [Rear Bumper Fascia Replacement](#) .

FRONT VIEW CAMERA REPLACEMENT

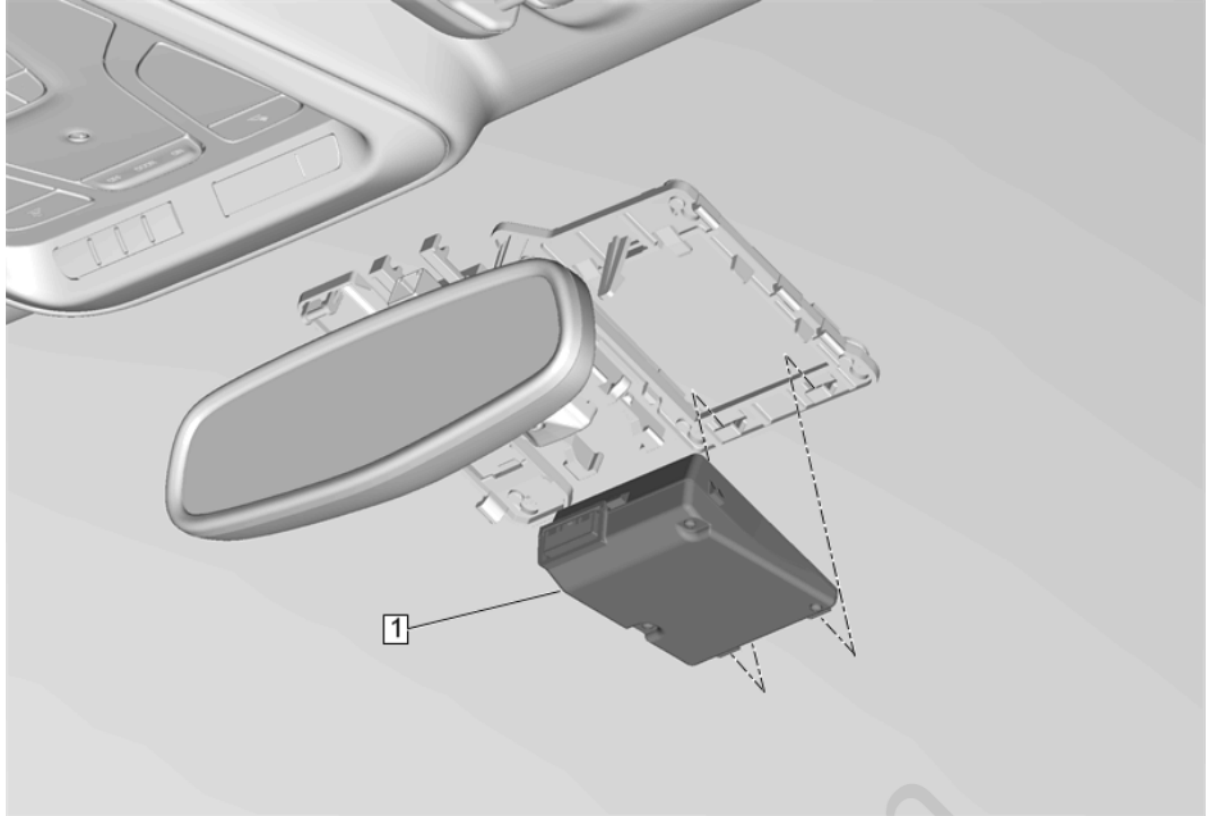


Fig. 20: Front View Camera

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Inside Rearview Mirror Wiring Harness Lower Cover. Refer to Inside Rearview Mirror Wiring Harness Lower Cover Replacement	
1	Front View Camera Procedure 1. Using a suitable plastic tool, insert the tool between the edge of the front view camera retainers, turn the tool to release the retainers and the camera and rotate downward. 2. Disconnect the electrical connector. 3. Refer to Control Module References for programming and set up information, if required.

REARVIEW DRIVER INFORMATION CAMERA REPLACEMENT

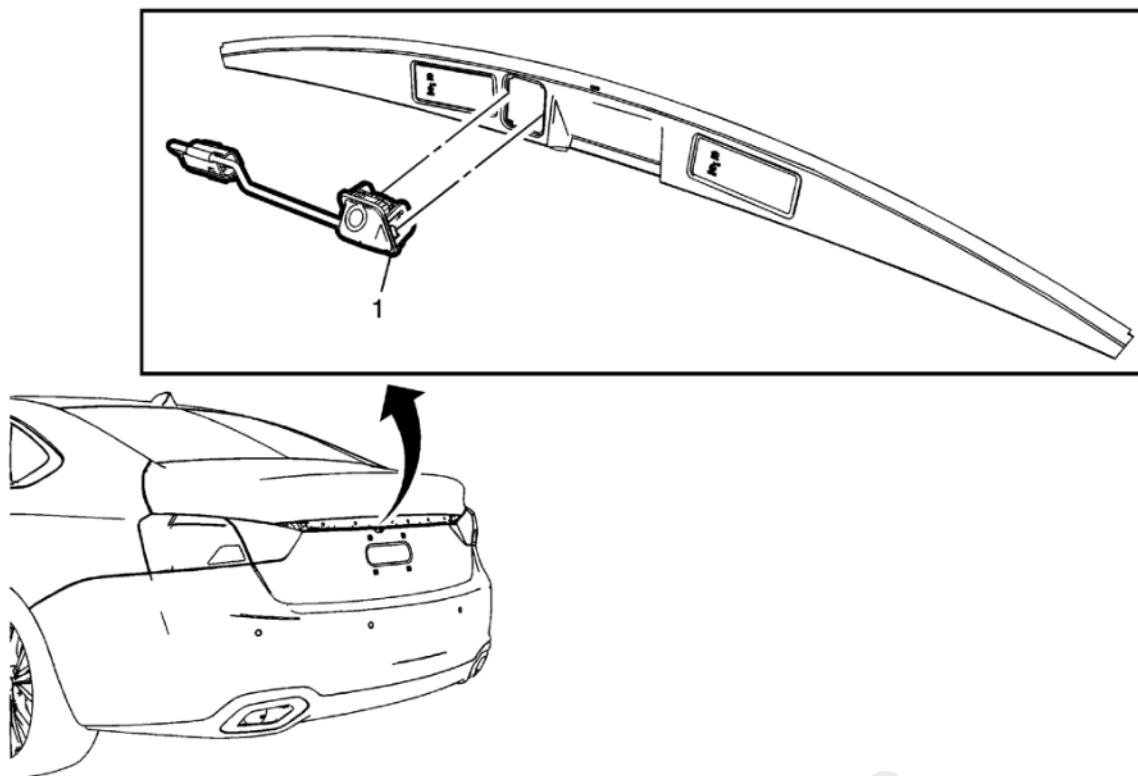


Fig. 21: Rearview Driver Information Camera
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove the rear closure center applique. Refer to Rear Closure Center Applique Replacement .	
1	Rearview Camera Procedure 1. Disconnect the electrical connector. 2. Depress the clip fingers and push outward to remove the rearview camera from the applique.

FRONT VIEW CAMERA MODULE LEARN

Calibration

For North American SPS users, **Calibration will NOT start automatically** and will need to be initiated with GDS2. For European SPS users, **Calibration will start automatically** and will not need to be initiated with GDS2.

The calibration process for the front view camera system is necessary when a front view camera module is replaced by a new one. This process is required when only replacing the windshield and the front view camera module has been mounted again properly. This process shall be completed within 3 - 5 minutes when the correct driving conditions are met. If conditions are not met correct, the front view camera module shall continuously run the service point calibration until successfully completed. This process shall work across ignition cycles and shall not be required to be re-initialized at start up. If the Lane Departure Warning Switch is pressed during calibration, the indicator will flash momentarily and then stay out - this is normal operation.

To calibrate the front camera, operate the vehicle in the following conditions until the calibration is complete:

- Clean windshield.
- Avoid lane changes.
- Maintain vehicle speeds between 56 - 90 km/h (35 - 56 MPH).

- Ensure the road contains visible references (well defined lane markings, curbs, etc.).

Calibration Procedure (Required for North American SPS users)

1. Apply the parking brake.
2. Place the transmission in Park (if applicable)
3. Install scan tool
4. Navigate to the module diagnostics menu
5. Select Frontview Camera Module
6. Select Configuration/Reset Functions menu Item
7. Select the Frontview Camera Learn procedure and follow the directions displayed on the screen.
8. Drive the vehicle to complete calibration.

Once the procedure is complete, the amber indicator will turn off. Shortly after the green ready to assist light should turn on as long as all conditions are met for normal operation. The system is then ready to assist.

If Slow to Calibrate

One or more of the following conditions may increase the length of time required to complete the self-calibration procedure:

- Heavy traffic
- Stop and go traffic
- Mountain roads
- Curves in roadway
- Poor contrast lane markings
- Botts' Dots type lane markings
- Operating the vehicle speed is greater than 90 km/h (56 MPH)
- Driving through snow or fog, or driving directly into the sun
- Camera not properly installed. Verify it is snapped into tabs and is secure. Refer to [**Front View Camera Replacement**](#).

No Calibration

Conditions that will prevent completion of the self-calibration procedure:

- Dirty windshield glass or obstruction on windshield
- Operating the vehicle with speed less than 56 km/h (35 MPH)
- No visible lane markings
- Severe weather where lane markings cannot be seen
- Camera not properly installed. Verify it is snapped into tabs and is secure. Refer to [**Front View Camera Replacement**](#).

DESCRIPTION AND OPERATION

PARKING ASSIST DESCRIPTION AND OPERATION (WITH REAR PARK ASSIST, UD7)

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 sensors located in the rear bumper. The parking assist system will notify the driver using an audible beep signal through the radio rear speakers.

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

- Parking assist control module
- Rear object alarm sensors

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.

PARKING ASSIST DESCRIPTION AND OPERATION (WITH FRONT AND REAR PARK ASSIST, UD5)

The parking assist system is designed to identify and notify the driver of an object in the vehicle path when moving forward or reversing at speeds of less than 8 km/h (5 MPH). The distance and location of the object is determined by 8 object sensors: 4 located in the rear bumper and 4 located in the front bumper. The parking assist system will notify the driver using an audible beep signal through the radio.

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

- Advanced parking assist control module
- Front object alarm sensors
- Rear object alarm sensors
- Parking assist switch
- Parking assist switch indicator

Advanced Parking Assist Control Module

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

Object Alarm Sensors

The object alarm sensors are located in the front and rear bumpers 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 in front of or 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 advanced parking assist control module.

Parking Assist Switch

The parking assist can be activated and deactivated by pressing the parking assist switch. By engaging the reverse gear the parking assist can also be activated. By subsequently pressing the parking assist switch the parking assist can be disabled again.

Parking Assist Switch Indicator

The indicator in the parking assist switch shows the status of the parking assist. If the lamp is ON, the parking assist is activated.

Parking Assist Operation

When an object is within the measuring range of the sensor, the ultrasonic pulse is reflected and is received by the sending or a neighboring sensor. The sensor converts this signal into a voltage signal and sends this signal to the parking assist control module. The advanced parking assist control module evaluates the received sensor signals. As soon as an object is within the measuring range, the advanced parking assist control module sends a message via CAN-Bus to the radio in order to give out the acoustic distance signal.

The 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, one of the following will occur:

- The measuring range of the front object alarm sensors is between 30 - 120 cm (11.8 - 47.2 in). From a distance of 120 cm (47.2 in), the acoustic signal is active. The frequency of the beep sound

increases with decreasing distance. From a distance less than 30 cm (11.8 in), the sound becomes continuous.

- The measuring range of the rear object alarm sensors is between 30 - 250 cm (11.8 - 98.4 in). From a distance of 250 cm (98.4 in), the acoustic signal is active. The frequency of the beep sound increases with decreasing distance. From a distance less than 30 cm (11.8 in), the sound becomes continuous.

The parking assist can be activated and deactivated by pressing the parking assist switch. When REVERSE gear is selected, park assist automatically is engaged for both front and rear sensors. When the vehicle is put into DRIVE from REVERSE the front assist sensors will be active up to speeds of 8 km/h (5 MPH) to assist with parking maneuvers. Once the vehicle is above 8 km/h (5 MPH) the front sensors are disabled and will not be re-enabled until either REVERSE gear is selected or the parking assist switch is pressed to activate the system. Once the parking assist switch is pressed during a key cycle the front sensors become active at speeds under 8 km/h (5 MPH). If the park assist switch is pressed again in the same key cycle the message "Park Assist Off" will be displayed in the driver information center if the vehicle speed is under 8 km/h (5 MPH) and front sensors detect an object within 120 cm (47.2 in). The LED indicator on the parking assist switch provides the ON/OFF state of the system. If the indicator is ON, the system is active and ready to assist.

The advanced parking assist control module carries out a self test and monitors the sensors for electrical and mechanical faults. Monitored is the power supply of each sensor and the sensor signals, which need to alter when the vehicle moves. If this is not the case, the sensor is acoustically blocked or faulty. Mud, ice and snow may cause obstruction of the function of the sensors. Besides that the advanced parking assist control module checks whether the correct type of sensor is installed. If any of these tests fails, a DTC with corresponding symptom is set, the parking assist is deactivated and the parking assist indicator in the instrument panel cluster is activated.

Parking Assist System Driver Information Center Messages

SERVICE PARK ASSIST

The driver information center displays SERVICE PARK ASSIST when the advanced parking assist control module detects a malfunction in the 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 advanced 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 advanced parking assist control module requests the driver information center display PARK ASSIST OFF when it detects that one of the following conditions:

- The parking assist system is manually disabled using the parking assist switch.
- 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 tailgate will disable the system.
- The parking assist sensors are covered by snow, mud, dirt, slush, 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.

LANE DEPARTURE WARNING DESCRIPTION AND OPERATION

The lane departure warning system is a convenience feature of the front view camera that issues a warning when the system detects that the vehicle has unintentionally crossed a lane marking. The front view camera is located behind the windshield, looking out at the road ahead and detecting any lane markings. When the vehicle unintentionally leaves a detected lane, a visual and audible alert is given to the driver.

The lane departure warning system is made up of the following components:

- Front view camera module
- Lane departure warning switch
- Instrument cluster/Vehicle Direction Display
- Radio

Front View Camera Module

The camera detects visual queues such as lane markings. When it is determined that the vehicle has unintentionally moved outside of the lane, a visual and audible warning is given to the driver. The front view camera module receives an input from the lane departure warning switch and controls the lane departure warning switch indicator output. The front view camera module also communicates via serial data with the instrument cluster and radio to request visual and audible alerts.

Lane Departure Warning Switch

The lane departure warning switch provides an input to the front view camera module to turn the lane departure warning system ON and OFF. The front view camera module provides a signal voltage to the normally open momentary switch. When the switch is pressed, the signal circuit is pulled to ground, indicating to the front view camera module that the system has been requested to turn ON or OFF. The lane departure warning switch also contains the lane departure warning switch indicator, which is controlled by the front view camera module to indicate the ON and OFF status of the lane departure warning system. When the system has been enabled by the lane departure warning switch, the front view camera module applies ground to the switch indicator and illuminates the LED. The location of the lane departure warning switch can vary with different vehicles. For the exact location please refer to the user's manual.

Instrument Cluster

The vehicle direction display contains green and amber lane departure warning indicators. These indicate to the driver the current status of the lane departure warning system and are controlled via serial data by the front view camera module. When the vehicle speed is above 56 km/h (35 MPH) and the system has detected the required lane markings and is ready to assist, the green indicator will be illuminated on the vehicle direction display. If the vehicle has unintentionally left the lane, the amber indicator will flash.

Radio

The radio controls the audible alert for the lane departure warning. If the vehicle has unintentionally left the lane, the radio will command three beeps as an audible alert to the driver.

Lane Departure Warning Operation

System operation can be describe by the following modes:

- Off State: The system has been turned off by the driver, using the lane departure warning switch. The lane departure warning indicator will not be illuminated.
- Not Ready To Assist: The system is enabled and the lane departure warning indicator is illuminated, but not ready to assist when any of the following conditions is true:
 - Vehicle speed is less than 56 km/h (35 MPH). The system is designed to function at speeds greater than 56 km/h (35 MPH).
 - The system cannot detect lane markings. This may be because there are no lane markings, as on a country road or that the lane markings cannot be determined due to snow, rain, or other driving conditions.
 - The windshield area in front of the camera or the camera lens is blocked by fog, dirt, damage to the windshield or other elements that may prevent the camera from detecting lane markings.
- Ready To Assist: The system is enabled and ready to warn of the unintentional lane crossing. The system is ready to assist when the green lane departure warning indicator is illuminated on the vehicle direction display.

Lane Crossing Alerts

- When one of the following conditions are met, the system will not give alerts:
 - The correct turn signal is activated. An activated turn signal is interpreted as an intentional lane crossing.
 - The operator makes an intentional steering maneuver.
 - The operator makes an intentional accelerating maneuver.
 - The operator makes an intentional braking maneuver.
- Lane crossing alert consists of the following:
 - Three chimes are activated through the radio.
 - The amber lane departure warning indicator will flash.

Lane Departure Warning System Driver Information Center Messages

The front view camera module can command the driver information center to display the various messages to alert the driver of a system concern or status information. For detailed information about the possible messages please refer to the user's manual.

LANE KEEP ASSIST DESCRIPTION AND OPERATION

NOTE:

- **The Lane Keep Assist system DOES NOT continuously steer the vehicle**
- **The Lane Keep Assist system replaces Lane Departure Warning System**
- **Lane Departure Warning will have more alerts than Lane Keep Assist (visual, audible, and haptic warning)**

The system assists driver to keep vehicle in-lane by providing a steering push back to the vehicle when an unintended lane departure is detected. See the user's manual for more detailed information on vehicle personalization.

The lane keep assist system is made up of the following components:

- Front view camera module
- Lane Keep Assist switch/control indicator
- Instrument cluster/Vehicle Direction Display
- Radio
- Safety Alert Seat (if equipped)
- Yaw rate sensor
- Electric power steering

Front View Camera Module

The camera detects visual queues such as lane markings. When it is determined that the vehicle has unintentionally moved outside of the lane, visual, and audible or haptic warning is given to the driver. The front view camera module receives an input from the lane keep assist switch and controls the lane keep assist switch indicator output. The front view camera module also communicates via serial data with the instrument cluster, radio, and memory seat module to request visual, and audible or haptic alerts.

Lane Keep Assist Switch

The lane keep assist switch provides an input to the front view camera module to turn the lane keep assist system ON and OFF. The front view camera module provides a signal voltage to the normally open momentary switch. When the switch is pressed, the signal circuit is pulled to ground, indicating to the front view camera module that the system has been requested to turn ON or OFF. The lane keep assist switch also contains the lane keep assist switch indicator, which is controlled by the front view camera module to indicate the ON and OFF status of the lane keep assist system. When the system has been enabled by the lane keep assist switch, the front view camera module applies ground to the switch

indicator and illuminates the LED. The location of the lane keep assist switch can vary with different vehicles. For the exact location please refer to the user's manual.

Instrument Cluster

The vehicle direction display contains green and amber lane keep assist indicators. These indicate to the driver the current status of the lane keep assist system and are controlled via serial data by the front view camera module. When the vehicle speed is above 56 km/h (35 MPH) and the system has detected the required lane markings and is ready to assist, the green indicator will be illuminated on the vehicle direction display. If the vehicle has unintentionally left the lane, the amber indicator will flash.

Radio

The radio controls the audible alert for the lane keep assist. If the vehicle has unintentionally left the lane, the radio will command three beeps as an audible alert to the driver.

Safety Alert Seat (if equipped)

The memory seat module controls the haptic alert provided by the seats. If the vehicle has unintentionally left the lane, and the Electric Power Steering determines the corrective action requires an above threshold amount of effort, the memory seat module will command three pulses to the left or right side of the seat, depending on the lane departure direction.

Yaw Rate Sensor

The steering intervention is based on the forward looking sensor outputs, such as lateral offset of the vehicle, relative yaw angle and time to line crossing. Over that, other vehicle dynamics signals are needed, e.g. velocity, steering angle, yaw rate for the purpose of a driver suppression.

Electric Power Steering

The electric power steering uses a torque sensor to detect driver inputs and relays that information to the frontview camera module. The electric power steering is used to provide steering push back.

Lane Keep Assist Operation

There is two stages of warning/intervention for the driver: The first stage is the steering push back, if the lane keep assist system detects that the vehicle will cross the lane marking despite it is intervening, a second stage warning shall be issued. The second stage warning is a chime or a haptic seat vibration, **if equipped** with haptic seats. If a haptic seat vibration is used as stage 2 warning, the vibration shall take place on the side of the seat, where the lane departure happened.

System operation can be described by the following modes:

- Off State: The system has been turned off by the driver using the lane keep assist switch. The lane keep assist indicator will not be illuminated.
- Not Ready To Assist: The system is enabled and the lane keep assist indicator is illuminated, but not ready to assist when any of the following conditions is true:
 - Vehicle speed is less than 37 MPH (60 km/h). The system is designed to function at speeds greater than 37 MPH (60 km/h).
 - The system cannot detect lane markings. This may be because there are no lane markings, as on a country road or that the lane markings cannot be determined due to snow, rain, or other driving conditions.
 - The windshield area in front of the camera or the camera lens is blocked by fog, dirt, damage to the windshield or other elements that may prevent the camera from detecting lane markings.
- Ready To Assist: The system is enabled and ready to warn of the unintentional lane crossing. The system is ready to assist when the green lane keep assist indicator is illuminated on the vehicle direction display.

Lane Crossing Alerts

- When one of the following conditions are met, the system will not give alerts:
 - The correct turn signal is activated. An activated turn signal is interpreted as an intentional lane crossing.
 - The operator makes an intentional steering maneuver.
 - The operator makes an intentional accelerating maneuver.
 - The operator makes an intentional braking maneuver.
- Lane crossing alert consists of the following:
 - The amber lane keep assist indicator will flash.
 - "push-back" steering torque input (or nudge) from Electric Power Steering to help prevent a lane departure
 - Three chimes are activated through the radio.
 - or **if equipped** , three pulses to the left or right side of the seat.

Lane Keep Assist System Driver Information Center Messages

The front view camera module can command the driver information center to display the various messages to alert the driver of a system concern or status information. For detailed information about the possible messages please refer to the user's manual.

CROSS TRAFFIC ALERT DESCRIPTION AND OPERATION

The rear cross traffic alert system is designed to provide enhanced customer visibility while backing up by providing warnings to the driver on impending rear cross traffic. The rear cross traffic alert system is designed to detect and track objects of interest within a specified coverage zone behind the vehicle. The system is designed to alert the driver, with a visual display and either an audible sound or a haptic w, to the presence of objects of interest that may cause a collision with the host vehicle. Although the system is intended to assist drivers in backing up, it does not replace driver's vision. The driver is responsible to check carefully for objects outside of the coverage zone (e.g., a fast approaching vehicle) for a safe backing maneuver. In the event that the system senses a malfunction through its diagnostic functions, the system will be disabled and the driver will be visually notified.

Rear Cross Traffic Alert System Components

The side blind zone alert system is made up of the following components:

- Left side object sensor module (also used for side blind zone alert)
- Right side object sensor module (also used for side blind zone alert)
- Visual Display Icons located on the rear vision display screen
- Audio System chime or Haptic Seat notification

Side Object Sensor Modules

The side object sensor modules are located on each side of the vehicle behind the rear fascia and are not directly visible from outside the vehicle. The sensors use radar to determine the presence of objects nearby. When an object is detected in the rear cross traffic zone, the module will send out a signal through serial data communication to turn on the visual icons and also audio chime notification. Each sensor is supplied B+ and ground. The right sensor receives an additional ground. Both sensors communicate independently on the serial data line. The serial data enters the left sensor in a pass-thru configuration, that connects to the right sensor. The scan tool is able to individually communicate with each sensor.

Display Icons

The rear cross traffic alert system visual alert display consists of two visual icons, one on each side of the display screen of the rear vision camera, that are used to alert the driver on rear cross traffic from each side of the host vehicle respectively.

Rear Cross Traffic Alert Operation

The rear cross traffic alert system is designed to detect objects of interest as small as a 125cc motorcycle with rider. The detection zone extends approximately 30 m (99 ft) from the rear corner of the car and covers an area from behind the vehicle to 125 degrees towards the front at a height of 0.45 m (1.5 ft) to 2 m (6.5 ft) above ground. The system operates when vehicle speed is 10 kph (6 mph) or less and is designed to detect objects moving at speeds up to 36 kph (22 mph).

When the vehicle is backing up, the side object sensors receive energy that is reflected from external objects and determine if the objects are objects of interest or not. The system may at times detect pedestrians, shopping carts, or similar moving objects. This is normal and should not be considered as a false alert or problem with the system. The rear cross traffic alert system will estimate vehicle travel trajectory and use the information in conjunction with object travel trajectory information to determine if there is a potential collision between the vehicle and the object of interest. The rear cross traffic alert function will only alert on objects of interest that pose a potential collision with the host vehicle. The system is not designed to provide an alert to objects that have no potential collision with vehicle. In addition, the system will not alert to stationary objects such as signs, parked cars, etc.

Rear Cross Traffic Alert Driver Information Center Messages

REAR CROSS TRAFFIC ALERT OFF

This message indicates that the system has been disabled through the driver information center. Refer to the vehicle owners manual for instructions on how to set personalization options on the driver information center.

SERVICE SIDE DETECTION SYSTEM

This message indicates that the system requires service. Since the sensors are also used for side blind zone alert, this feature will also be inoperative.

SIDE DETECTION SYSTEM UNAVAILABLE

This message indicates that the system has been temporarily disabled because the sensor is blocked or can otherwise not accurately detect vehicles or objects. Such instances may be mud, dirt, snow, ice, or slush build-up on the rear fascia, heavy rainfall, excessive road spray, fascia damage or stickers.

The rear cross traffic alert system will read the GPS latitude and longitude on the serial data bus and calculate if the vehicle is within a Radio Astronomy zone. These zones are located in Europe and Japan and require the sensors to be turned off. The "Side Detection System Unavailable" message will be displayed to the driver when this occurs.

SIDE BLIND ZONE ALERT DESCRIPTION AND OPERATION

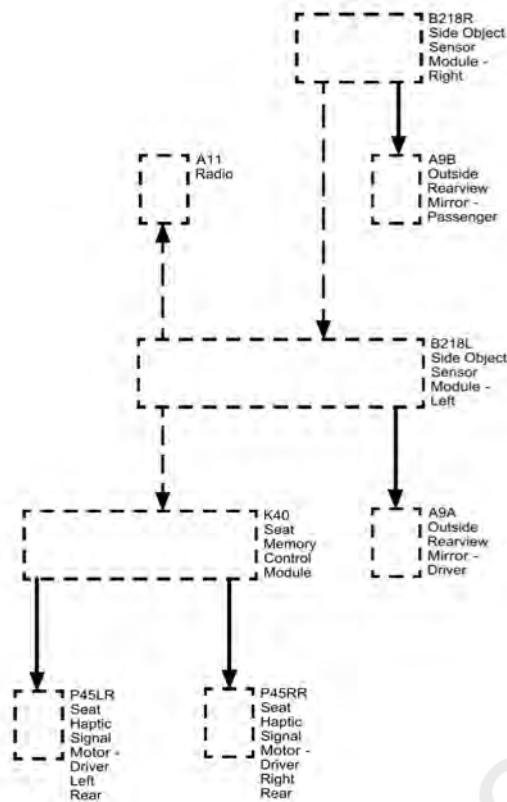


Fig. 22: Side Blind Zone Alert Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
B218R	B218R Side Object Sensor Module - Right
A9B	A9B Outside Rearview Mirror - Passenger
A11	A11 Radio
B218L	B218L Side Object Sensor Module - Left
A9A	A9A Outside Rearview Mirror - Driver
K40	K40 Seat Memory Control Module
P45LR	Seat Haptic Movement Motor - Driver Left Rear
P45RR	Seat Haptic Movement Motor - Driver Right Rear

NOTE: Not all items in block diagram may apply to specific vehicle. Refer to schematics for specific vehicle wiring diagrams.

Description and Operation

The side blind zone alert system shall detect and report "objects of interest" on either side of the vehicle, within a specified "blind spot" zone. The system is designed to alert the driver, with a visual display placed on the side view mirror, to the presence of objects of interest that may not be visible in the inside rearview mirror and outside rear view mirrors. Although this system is intended to help drivers avoid lane change crashes, it does not replace driver vision and therefore should be considered a lane change aid. Even with the side blind zone alert system, the driver must check carefully for objects outside of the reporting zone (e.g., a fast approaching vehicle) before changing lanes. In the event that the system senses a malfunction through its diagnostic routines, the system will be disabled and the driver will be visually notified.

When the system detects a vehicle in the side blind zone while driving forward, an amber warning symbol will light up in the appropriate outside mirror. This indicates that it may be unsafe to change lanes. If the driver then activates the turn signal, the amber warning symbol starts flashing as an extra warning not to change lanes.

Side blind zone alert is active when the vehicle is out of park or the parking brake is off on manual transmission vehicles and at speeds up to approximately 140 km/h (87 MPH). If a vehicle is detected in the blind zone, the warning symbols will turn illuminate on the appropriate side. When the vehicle is started, both outside mirror displays will briefly come on to indicate that the system is operating. The warning symbols will vary brightness based on the ambient light conditions.

Side Blind Zone Alert System Components

The side blind zone alert system is made up of the following components:

- Left side object sensor module (also used for rear cross traffic alert)
- Right side object sensor module (also used for rear cross traffic alert)
- Driver outside rearview mirror
- Passenger outside rearview mirror

Side Object Sensor Modules

The side object sensor modules are located on each side of the vehicle behind the rear fascia and are not directly visible from outside the vehicle. The sensors use radar to determine the presence of objects nearby. When an object is detected in the side blind zone, the side object sensor module supplies voltage to illuminate the visual indicator on the appropriate side rear view mirror. Each sensor is supplied B+ and ground. The right sensor receives an additional ground. Both sensors communicate independently on the serial data line. The serial data enters the left sensor in a pass-thru configuration, that connects to the right sensor. The scan tool is able to individually communicate with each sensor.

Outside Rearview Mirrors

The outside rearview mirrors contain an icon that is backlit with high intensity, amber-colored LED's located on the mirror surface. The display brightness adapts to day/night conditions. The side blind zone alert indicator icon in the left or right outside rearview mirror is illuminated if the left or right side object sensor module detects a vehicle in the side blind zone to inform the driver that there is a vehicle driving in the blind spot zone.

Side Blind Zone Alert Operation

When the vehicle is started, both outside mirror displays will briefly come on to indicate that the system is operating. The system is designed to detect objects of interest as small as a 125cc motorcycle with rider. The detection zone starts at the outside rearview mirror and extends out to 3.5 m (11 ft) at the back corner of the vehicle and 3 m (10 ft) behind the vehicle at a height of 0.5 m (1.5 ft) to 2.0 m (6 ft) above the ground. The system may light up an indicator due to guardrails, signs, trees, shrubs, and other non-moving objects. This is normal system operation; the vehicle does not need service.

When the system detects a vehicle in the side blind zone while driving forward, independent if passing a vehicle or being passed, an amber warning symbol will light up in the appropriate outside mirror. This indicates that it may be unsafe to change lanes. If the driver then activates the turn signal, the amber warning symbol starts flashing as an extra warning not to change lanes.

Foul weather may affect the operation of the side blind zone system. Occasional missed alerts can occur under normal circumstances and will increase in wet conditions. The number of missed alerts will increase with increased rainfall or road spray. Heavy rainfall, as well as mud, dirt, snow, ice, or slush build-up on the rear fascia, can completely disable the system.

If the vehicle is towing a trailer or has an object such as a bicycle rack attached to the rear of the vehicle, the side blind zone system may not function properly and the indicators may illuminate intermittently or remain illuminated all the time.

Side Blind Zone Alert Driver Information Center Messages

SIDE BLIND ZONE ALERT OFF

This message indicates that the system has been disabled through the driver information center. Refer to the vehicle owners manual for instructions on how to set personalization options on the driver information center.

SERVICE SIDE DETECTION SYSTEM

This message indicates that the system requires service. When the message is displayed, the indicators will remain illuminated at all times, notifying the driver that the side blind zone system should not be relied upon when changing lanes. Since the sensors are also used for rear cross traffic alert, this feature will also be inoperative.

SIDE DETECTION SYSTEM UNAVAILABLE

This message indicates that the system has been temporarily disabled because the sensor is blocked or can otherwise not accurately detect vehicles or objects. Such instances may be mud, dirt, snow, ice, or slush build-up on the rear fascia, heavy rainfall, excessive road spray, fascia damage or stickers.

The rear cross traffic alert system will read the GPS latitude and longitude on the serial data bus and calculate if the vehicle is within a Radio Astronomy zone. These zones are located in Europe and Japan and require the sensors to be turned off. The "Side Detection System Unavailable" message will be displayed to the driver when this occurs.

FORWARD COLLISION ALERT DESCRIPTION AND OPERATION

The forward collision alert system is a convenience feature of the frontview camera module that issues a warning to the driver when a potential collision risk exists. The frontview camera module is located behind the windshield, looking toward the roadway ahead and detecting vehicles within a distance of approximately 60 meters (197 ft). The forward collision alert system is always active and operates at speeds above 40 kph (25 mph).

When the frontview camera module detects a vehicle in the path ahead, the green vehicle ahead indicator in the vehicle direction display is illuminated. When following a vehicle ahead too closely, the amber collision alert indicator will illuminate and stay on until the following distance is increased. The green vehicle ahead indicator will then be illuminated again. When approaching another vehicle too rapidly, the collision alert symbol will flash in the vehicle direction display and an audible alert sounds. The forward collision alert sensitivity can be adjusted using the forward collision alert switch in the left steering wheel controls.

Front Automatic Braking (if equipped)

When the system detects a vehicle ahead in your path that is traveling in the same direction that you may be about to crash into, it can provide a boost to braking or automatically brake the vehicle. This can help avoid or lessen the severity of crashes when driving in a forward gear. Depending on the situation, the vehicle may automatically brake moderately or hard. This front automatic braking can only occur if a vehicle is detected.

The system works when driving in a forward gear between 5 mph (8 km/h) and 37 mph (60 km/h). It can detect vehicles up to approximately 197 ft (60 m).

Forward collision does not provide a warning to help avoid a crash unless it detects a vehicle. Forward collision alert may not detect a vehicle ahead if the frontview camera module is blocked by dirt, snow, or ice, or if the windshield is damaged. It may also not detect a vehicle on winding or hilly roads, or in conditions that can limit visibility such as fog, rain, or snow, or if the headlamps or windshield are not cleaned or in proper condition. Ensure the windshield, headlamps, and frontview camera module are clean and in good repair. In some cases the forward collision alert system may provide unnecessary alerts for turning vehicles, vehicles in other lanes, objects that are not vehicles, or shadows. These alerts are normal operation and the vehicle does not need service.

The forward collision alert system is made up of the following components:

- Frontview camera module

- Forward collision alert switch
- Instrument cluster/Vehicle direction display
- Infotainment system

Frontview Camera Module

The frontview camera module detects vehicles in front of the host vehicle. The frontview camera module communicates via serial data to the instrument cluster to illuminate the appropriate indicators in the vehicle direction display. The frontview camera module also communicates via serial data with the driver information center to display messages and the radio to request audible alerts.

Forward Collision Alert Switch

The forward collision alert switch provides an input to the frontview camera module to select between four alert timing sensitivity settings. These setting will change the sensitivity for both the following too closely and forward collision alert indicators. In addition to the sensitivity setting, the alert distance will change based upon vehicle speed. The frontview camera module provides a signal voltage to the normally open switch. When the switch is pressed, the signal circuit is pulled to ground through a resistor, indicating to the frontview camera module that the system has been requested to change the alert timing sensitivity. The first button press shows the current alert timing setting on the driver information center. With every button press, the alert timing sensitivity is changed. The current alert timing setting will be maintained until it is changed. The preset alert timing setting is displayed in the top line of the driver information center. The position of the forward collision alert switch can vary with different vehicles. For the exact position please refer to the owner's manual.

Instrument Cluster

The vehicle direction display contains the indicators for the collision alert system and are controlled by the instrument cluster via serial data messages from the frontview camera module. The green vehicle ahead indicator indicates to the driver that the frontview camera module system has detected a vehicle in the driving path ahead. The amber collision alert indicator will illuminated continuously if the system determines that the vehicle ahead is too close. When approaching another vehicle too rapidly, the red collision alert symbol will flash.

Infotainment System

The infotainment system controls the audible alert for the forward collision alert system and is activated via serial data from the frontview camera module. If the host vehicle is approaching another vehicle too rapidly, the infotainment system will command an audible alert to the driver.

Forward Collision Alert System Driver Information Center Messages

The frontview camera module can command the driver information center to display the various messages to alert the driver of a system concern or status information. For detailed information about the possible messages please refer to the owner's manual.

- FORWARD COLLISION ALERT OFF
- SERVICE FRONT CAMERA

REAR VISION CAMERA DESCRIPTION AND OPERATION

Rear Vision Camera System Operation

The rear vision camera system consists of a video camera/module located at the rear of the vehicle and the infotainment display.

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 rear vision camera to the infotainment display. 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.

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