

2017 ACCESSORIES & EQUIPMENT

Object Detection and Pedestrian Protection - Bolt EV

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

Application	Specification
	Metric (English)
NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Forward Collision Alert Display Bolt	2.5 N.m (22 lb in)
Front View Driver Information Camera Fastener	2.5 N.m (22 lb in)
Outside Rearview Mirror Housing Lower Cover Screw	0.5 N.m (4 lb in)
Parking Assist Control Module Nut	5 N.m (44 lb in)
Side Object Sensing Alert Module Bolt	2.5 N.m (22 lb in)
Side View Driver Information Camera Screw	0.8 N.m (7 lb in)
Video Processing Module Nut	8 N.m (71 lb in)

SCHEMATIC WIRING DIAGRAMS

OBJECT DETECTION WIRING SCHEMATICS

Rearview Camera (UVC)

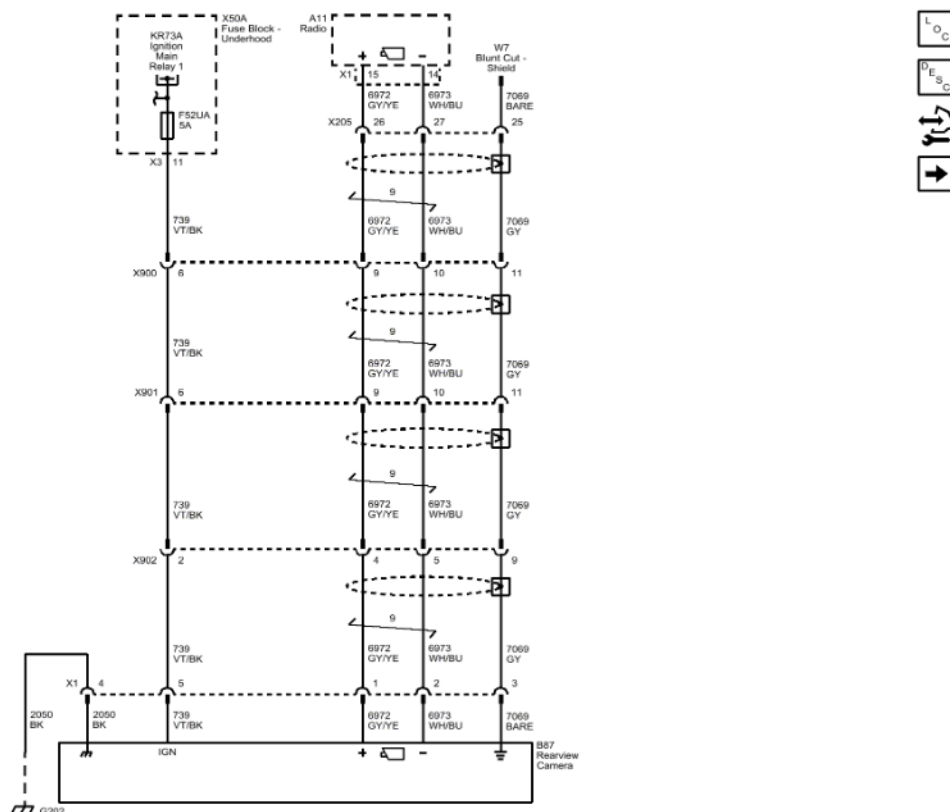


Fig. 1: Rearview Camera (UVC)

Courtesy of GENERAL MOTORS COMPANY

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

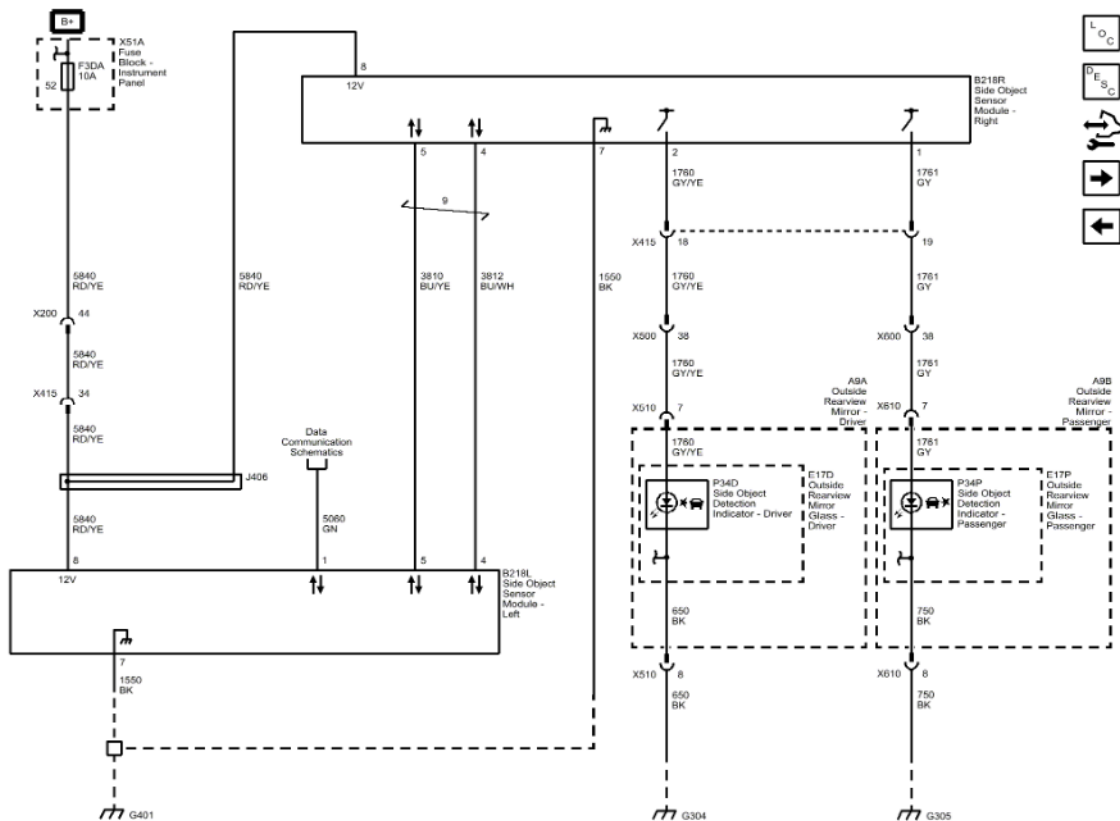


Fig. 2: Rear Cross Traffic Alert (UFG) and Side Object Detection (UKC).
Courtesy of GENERAL MOTORS COMPANY

Lane Keep Assist (UHX) and Forward Collision Alert (UEU) with (EF7/Z49/CW1)

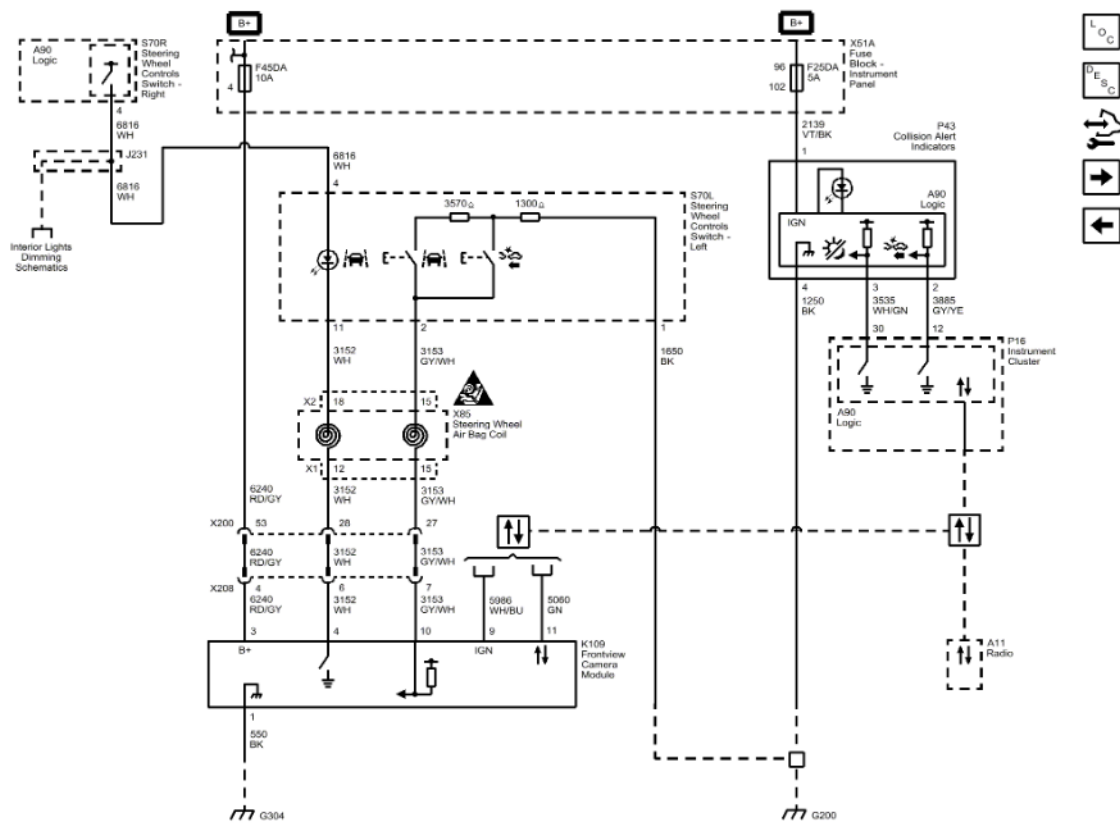


Fig. 3: Lane Keep Assist (UHX) and Forward Collision Alert (UEU) with (EF7/Z49/CW1).
Courtesy of GENERAL MOTORS COMPANY

Lane Keep Assist (UHX) and Forward Collision Alert (UEU) with (MBM)

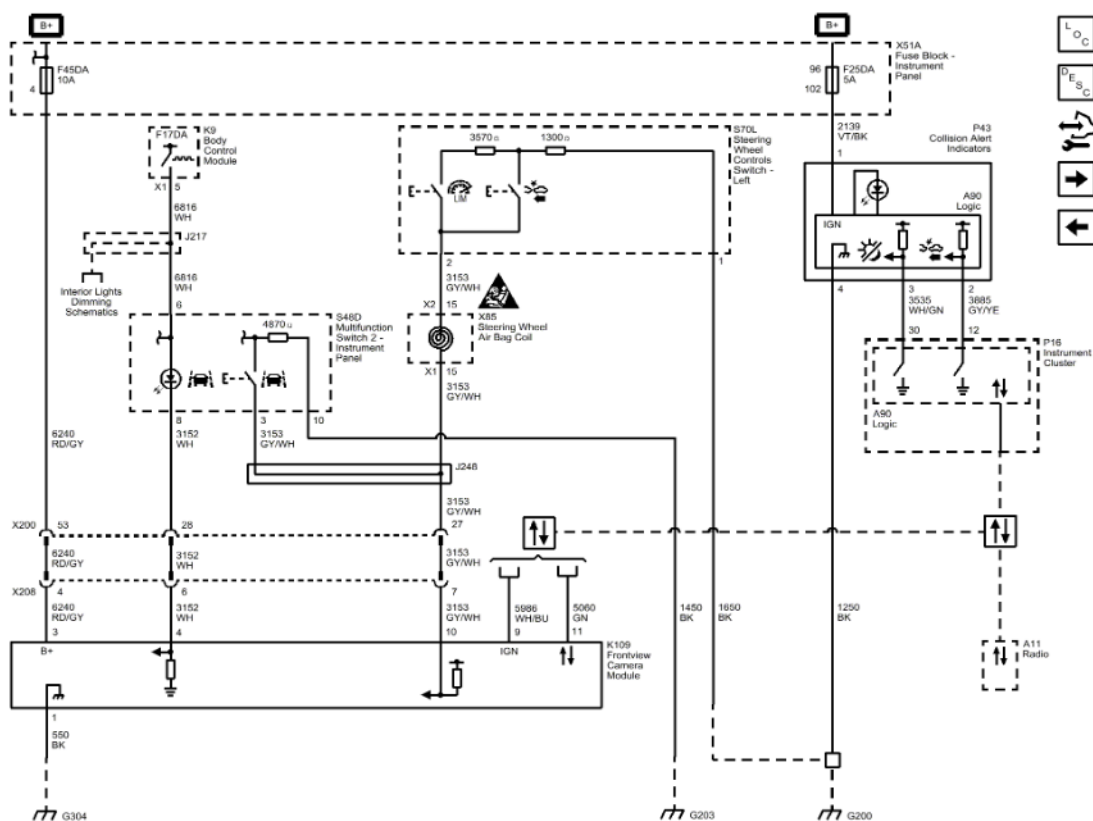


Fig. 4: Lane Keep Assist (UHX) and Forward Collision Alert (UEU) with (MBM)
 Courtesy of GENERAL MOTORS COMPANY

Park Assist - Power, Ground, Serial Data and Control (UD5, UD7 or UFQ)

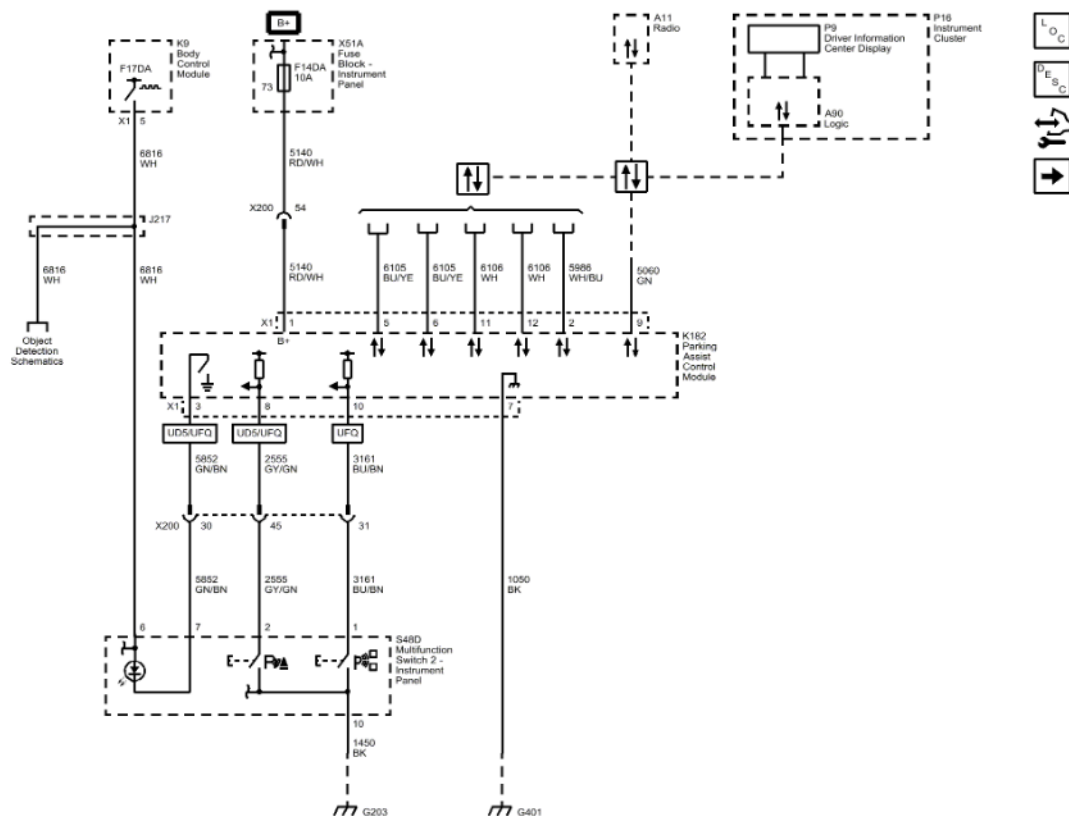


Fig. 5: Park Assist - Power, Ground, Serial Data and Control (UD5, UD7 or UFQ)
 Courtesy of GENERAL MOTORS COMPANY

Park Assist - Rear Sensors (UD5, UD7 and UFQ)

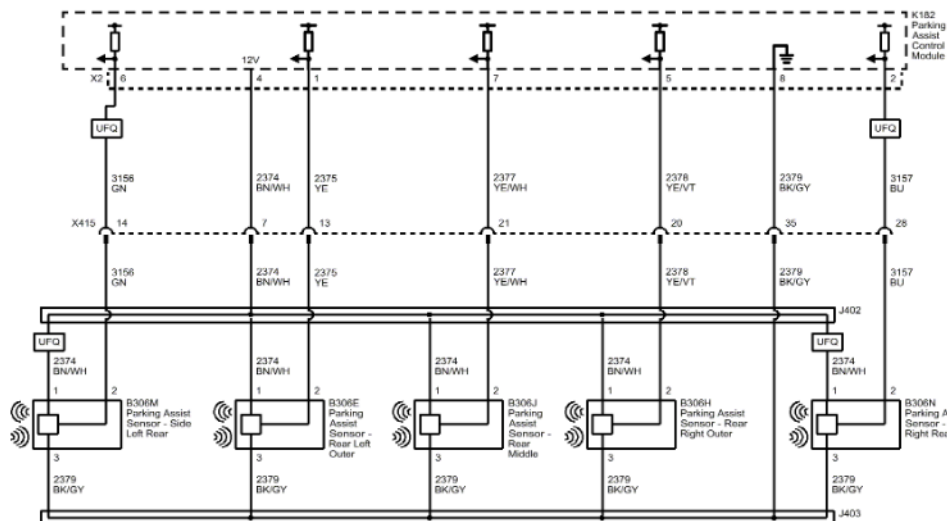


Fig. 6: Park Assist - Rear Sensors (UD5, UD7 and UFQ)
 Courtesy of GENERAL MOTORS COMPANY

Park Assist - Front Sensors (UD5 and UFQ)

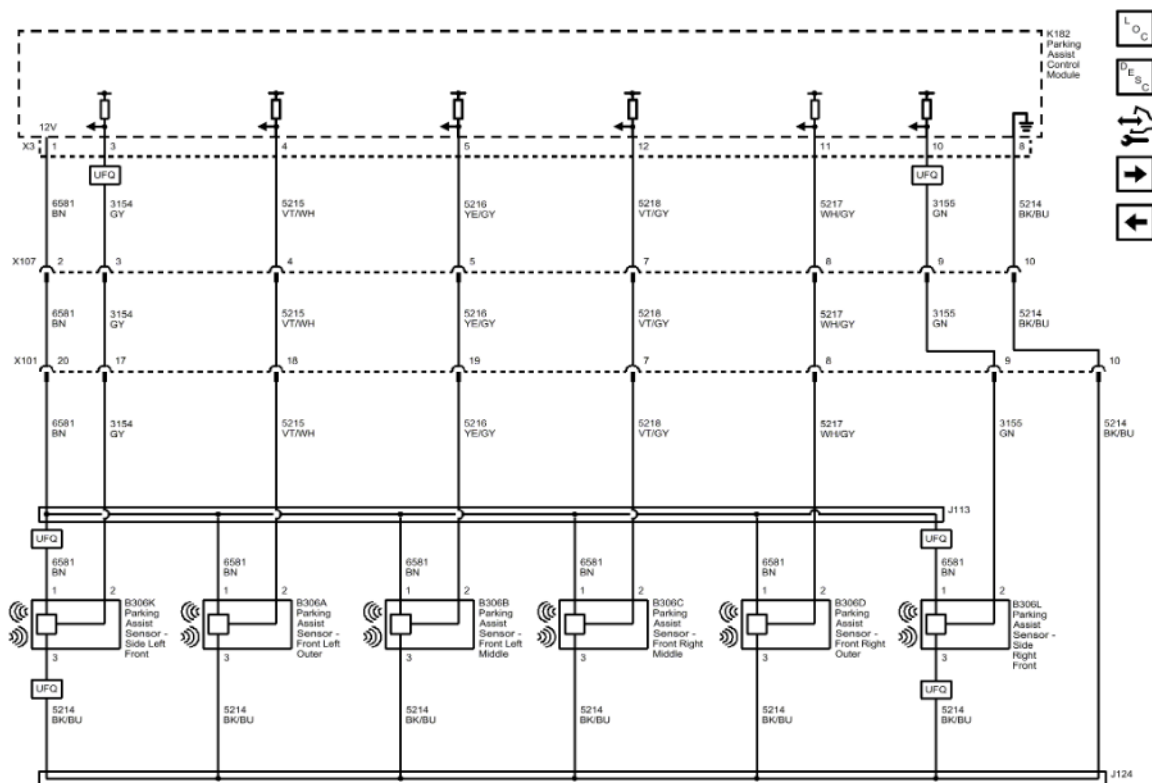
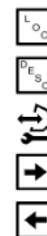
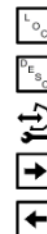


Fig. 7: Park Assist - Front Sensors (UD5 and UFQ)
 Courtesy of GENERAL MOTORS COMPANY



360 Degree Vision - Front and Rear Cameras (UHD)



360 Degree Vision - Side Vision Cameras (UVH)

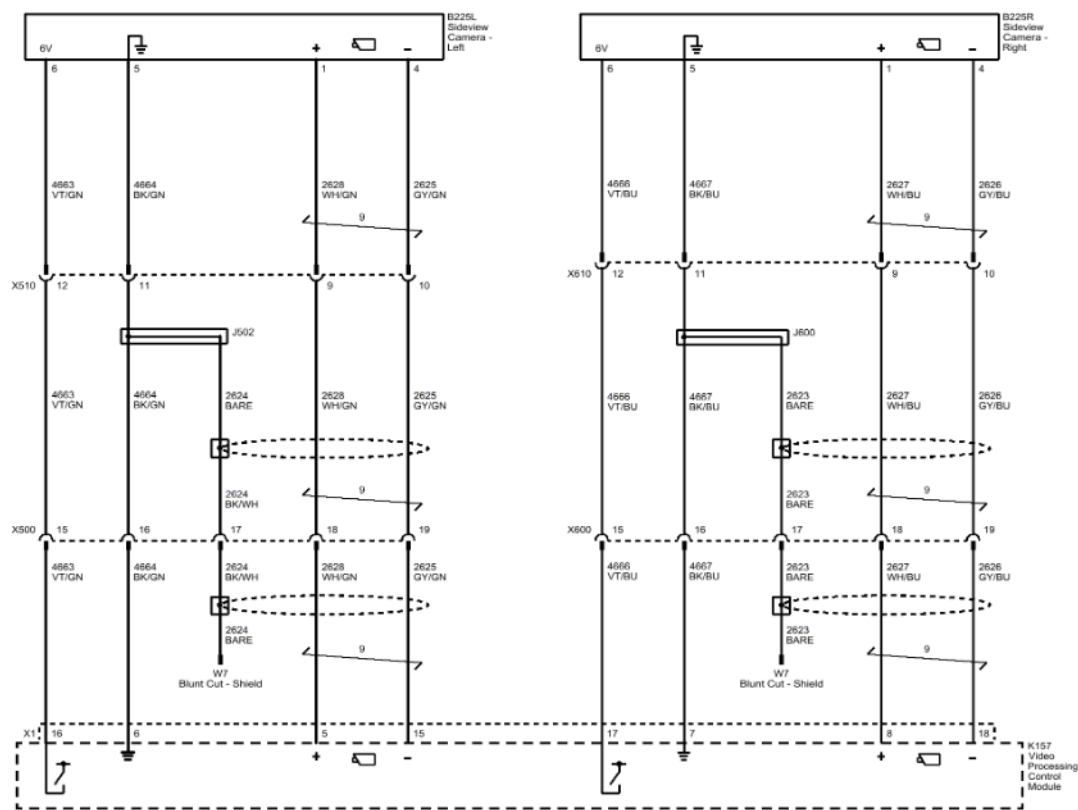


Fig. 10: 360 Degree Vision - Side Vision Cameras (UVH)
 Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B094C: 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 B094C

Right Side Object Detection Control Module

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Indicator Control - Left	B094C 39	1	2	-
Indicator Control - Right	B094C 39	3	4	-
Ground - Left	-	1	-	-
Ground - Right	-	3	-	-
1. Left side blind spot indicator inoperative 2. Left side blind spot indicator always on 3. Right side blind spot indicator inoperative 4. Right side blind spot indicator always on				

Circuit/System Description

The side object sensor module - left communicates on a private communication data bus with the side object sensor module - right. The side object sensor module - left is the master and is responsible for communicating with other control modules on the vehicle, as well as setting DTCs for both side object sensor modules.

The side object sensor module - right is responsible for illuminating the left and right side blind spot indicators. The indicators are located on each outside rearview mirror glass. The indicators each receive ground at all times and are controlled by side object sensor module - right through a discrete control circuit. When a vehicle is located in the vehicle's blind spot or is in an adjacent lane, approaching the side of the vehicle, the side object sensor module - right will illuminate the indicator by applying voltage to the appropriate control circuit. If the driver turns on a turn signal, indicating an intention to change lanes, the side object sensor module - right will flash the indicator as an additional warning.

Conditions for Running the DTC

Vehicle in Service Mode.

Conditions for Setting the DTC

The side object sensor module - right has detected an internal malfunction or a malfunction with one of the indicator control circuits.

Action Taken When the DTC Sets

- The side object sensor system is disabled.
- A service message may be displayed on the driver information center.

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 40, without a repeat of the malfunction.

Diagnostic Aids

- The side object sensor module - left and side object sensor module - right are different parts and cannot be swapped from side to side.
- This DTC may be stored as a history DTC without affecting the operation of the side object sensor module - right. Do not replace side object sensor module - right based only on DTC B094C being set in history.
- The side object sensor module - right communicates on a private communication data bus with the side object sensor module - left. If programming is needed for module replacement, you must program the side object sensor module - left, which will then program the side object sensor module - right.

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. Vehicle in Service Mode.
2. Verify that both side blind spot indicators turn ON and OFF when commanding the Object Detection Alert Indicators On and Off with a scan tool.
 - **If both indicators do not turn ON and OFF**
Replace the B218R Side Object Sensor Module - Right.
 - **If one indicator does not turn ON and OFF**
Refer to Circuit/System Testing.
 - **If both indicators turn ON and OFF**
3. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the appropriate X510 (Left) or X610 (Right) inline harness connector. It may take up to 2 mins for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 8 and ground.
 - **If 2 Ω or greater**
 1. Vehicle 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 2 Ω**
3. Vehicle in Service Mode.
4. Test for less than 1 V between the control circuit terminal 7 and ground.
 - **If 1 V or greater**
 1. Vehicle OFF, disconnect the harness connector at the B218R Side Object Sensor Module - Right.
 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 2 Ω , replace the B218R Side Object Sensor Module - Right.
 - **If less than 1 V**
5. Command the Object Detection Alert Indicators On with a scan tool.
6. Test for greater than 3 V between the control circuit terminal 7 and ground.
 - **If 3 V or less**
 1. Vehicle OFF, disconnect the harness connector at the B218R Side Object Sensor Module - Right.
 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. Vehicle 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 B218R Side Object Sensor Module - Right.

- If greater than 3 V

7. 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.

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 on the side of the rear fascia and detect and report objects on either side of the vehicle, within a specified blind spot area. The system alerts the presence of objects in the blind spot with a visual indicator on each outside rearview mirror. 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 will begin flashing and an audible alert will sound to give an extra warning not to change lanes.

Each indicator receives a constant ground and is controlled by the Side Object Sensor Module - Left and/or Right by applying voltage to the control circuit. When voltage is applied on the control circuit, the indicator will illuminate.

Conditions for Running the DTC

- Engine running.
- The side blind zone alert system is active.

Conditions for Setting the DTC

B094D 01

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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 disabled.
- A service message may be 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. Vehicle ON.
2. Verify the side blind zone alert indicators located in each outside rearview mirror briefly turn ON and OFF during the system self test immediately after the vehicle is turned ON.
 - **If either indicator does not briefly turn ON and OFF**

Refer to Circuit/System Testing

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- **If both indicators briefly turn ON and OFF**

3. All OK.

Circuit/System Testing

NOTE: Make sure to use a high impedance test lamp like special tool EL-35616-210.

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the appropriate E17 Outside Rearview Mirror Glass. 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 2 and ground.
 - **If 10 Ω or greater**
 1. Vehicle 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. Vehicle ON, connect a test lamp between the control circuit terminal 1 and the ground circuit terminal 2.
4. Verify the test lamp turns ON and OFF when commanding the appropriate Object Detection Indicator On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Vehicle 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. Vehicle OFF, disconnect the harness connector at the B218 Side Object Sensor Module, vehicle 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 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 parking assist control module replacement, programming and setup

DTC B0954, B0955, B0956, OR B0957: PARKING ASSIST FRONT SENSOR 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.

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DTC Descriptors

DTC B0954

Parking Assist Front Sensor Left Corner Circuit

DTC B0955

Parking Assist Front Sensor Left Middle Circuit

DTC B0956

Parking Assist Front Sensor Right Middle Circuit

DTC B0957

Parking Assist Front 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
9 V Reference	B1405 02	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B1405 03	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B1405 07	-
Left Front Object Sensor Signal	B0954 06	B0954 06	B0954 01	B0954 08, B0954 21
Left Middle Front Object Sensor Signal	B0955 06	B0955 06	B0955 01	B0955 08, B0955 21
Right Middle Front Object Sensor Signal	B0956 06	B0956 06	B0956 01	B0956 08, B0956 21
Right Front Object Sensor Signal	B0957 06	B0957 06	B0957 01	B0957 08, B0957 21
Low Reference	-	B0954 01, B0955 01, B0956 01, B0957 01, 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 9 V to the object sensors via the 9 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

- Vehicle ON
- The park assist is activated. The activation takes place through putting in the reverse gear or through operating the park assist switch.

Conditions for Setting the DTC

B0954 01, B0955 01, B0956 01, or B0957 01

The parking assist control module has detected the voltage at the sensor circuit is greater than 11.5 V or the object sensor is not grounded.

B0954 06, B0955 06, B0956 06, or B0957 06

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

B0954 08, B0955 08, B0956 08, or B0957 08

The parking assist control module has received an invalid signal.

B0954 21, B0955 21, B0956 21, or B0957 21

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

B0954 3A, B0955 3A, B0956 3A, or B0957 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.

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, UFQ)

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. Vehicle ON.
2. Verify that DTC B1405 is not set.
 - If the DTC is set

- **If the DTC is not set**

3. Verify that DTC B0954 01, B0955 01, B0956 01, B0957 01 B0954 21, B0955 21, B0956 21 or B0957 21 is not set.

- **If the DTC is set**

1. Verify the B78 Front Object Sensors are not contaminated 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 B0954 3A, B0955 3A, B0956 3A or B0957 3A is not set.

- **If the DTC is set**

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

- **If the DTC is not set**

5. Vehicle ON, 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. Vehicle OFF, scan tool disconnected, disconnect the harness at the appropriate B78 Front Object Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 2 and ground.

- **If 10 Ω or greater**

1. Vehicle OFF, disconnect the harness connector X3 at the K182 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 K182 Parking Assist Control Module.

- **If less than 10 Ω**

3. Vehicle ON.

4. Test for 7.5 - 10.5 V between the 9 V reference circuit terminal 1 and ground.

- **If less than 7.5 V**

1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module.
2. Test for infinite resistance between the 9 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 9 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 K182 Parking Assist Control Module.

- **If greater than 10.5 V**

1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module, Vehicle ON.
2. Test for less than 1 V between the 9 V reference circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K182 Parking Assist Control Module.
 - **If between 7.5 - 10.5 V**
5. Test for 7.5 - 9.5 V between the signal circuit terminal 2 and ground.
- **If less than 7.5 V**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module.
 2. 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
 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 K182 Parking Assist Control Module.
 - **If greater than 9.5 V**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module, Vehicle 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, replace the K182 Parking Assist Control Module.
 - **If between 7.5 - 9.5 V**
6. All OK.

Repair Instructions

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

- Refer to [Advanced Parking Assist Alarm Sensor Replacement \(Front\)](#)[Advanced Parking Assist Alarm Sensor Replacement \(Rear\)](#)
- Refer to [Control Module References](#) for parking assist control module replacement, programming and setup

DTC B095D OR B095E: PARKING ASSIST REAR SENSOR LEFT/RIGHT SIDE 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 B095D

Parking Assist Rear Sensor Left Side Circuit

DTC B095E

Parking Assist Rear Sensor Right Side 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, B1405 03	B095D 06, B095E 06	B1405 07	-
Left Rear Supplemental Object Sensor Signal	B095D 02, B095D 06	B095D 06	B095D 01	B095D 08, B095D 21

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Right Rear Supplemental Object Sensor Signal	B095E 02, B095E 06	B095E 06	B095E 01	B095E 08, B095E 21
Low Reference	-	B095D 01, B095D 06, B095E 01, B095E 06	-	-

Circuit/System Description

The parking assist sensors are 3-wire ultrasonic sensors that are used to determine the distance between the vehicle and an object on the side of the vehicle, in the vehicle's blind spot. The parking assist control module supplies 12 V to the parking assist 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

- Vehicle ON.
- The side blind spot system (if equipped) or parking assist system is activated.

Conditions for Setting the DTC

B095D 01, B095E 01

The parking assist control module has determined the sensor signal voltage is too high.

B095D 06, B095E 06

The parking assist control module has determined the sensor signal voltage is too low.

B095D 08, B095E 08

The parking assist control module has received an invalid signal.

B095D 21, B095E 21

The parking assist control module has determined no change in the position of an object while the vehicle is in motion.

B095D 3A, B095E 3A

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

Action Taken When the DTC Sets

- The side blind spot system (if equipped) is disabled.
- The parking assist system is disabled.
- The driver information center may display a service message.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

For symptom byte 21, the parking assist control module only runs the diagnostic when the vehicle is driven greater than 40 km/h (25 MPH). When diagnosing symptom byte 21, the vehicle must be driven greater than 40 km/h (25 MPH) after a repair to verify the concern has been corrected.

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

- One or more of the sensors may be blocked by snow, mud, ice, or debris. This condition may occur after going through a car wash in cold weather.
- One or more of the sensors may be scratched or the paint may be chipped.
- Excessive paint thickness on a sensor may cause an excessive sensor ring time. When replacing or refinishing a sensor, do not apply an excessive amount of paint or clear coat.
- The silicone insulator (ring) surrounding sensor may be missing, cut, or twisted.
- The sensor may be improperly installed and not fully seated, or the sensor may be misaligned due to a tight wiring harness.

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 \(with Front and Rear Park Assist, UFQ\)](#)

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. Vehicle ON.
2. Verify DTC B1405 is not set.
 - **If the DTC is set**
Refer to [DTC B1405](#)
 - **If the DTC is not set**
3. Verify DTC B095D 01, B095E 01, B095D 21, or B095E 21 is not set.
 - **If any of the DTCs are set**
 1. Verify none of the B306 Parking Assist Sensors - Rear are contaminated with snow, mud, dirt, slush, or ice.
 - If contaminated, clean the B306 Parking Assist Sensors - Rear.
 - If there is no contamination.
 2. Refer to Circuit/System Testing.
 - **If none of the DTCs are set**
4. Verify that DTC B095D 3A or B095E 3A is not set.
 - **If any of the DTCs are set**
Replace the appropriate B306 Parking Assist Sensor - Rear with the correct sensor type.
 - **If none of the DTCs are set**
5. Vehicle ON.

6. Verify the scan tool Parking Assist System Status parameter is Enabled.

- **If the Parking Assist System Status parameter is Disabled**

Refer to Circuit/System Testing.

- **If the Parking Assist System Status parameter is Enabled**

7. All OK.

Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness at the appropriate B306 Parking Assist Sensor. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 15 Ω between the low reference circuit terminal 3 and ground.

- **If 15 Ω or greater**

1. Vehicle OFF, disconnect the X2 harness connector at the K182 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 K182 Parking Assist Control Module.

- **If less than 15 Ω**

3. Vehicle ON.

4. Test for greater than 9.7 V between the 12 V reference circuit terminal 1 and ground.

- **If less than 9.7 V**

1. Vehicle OFF, disconnect the X2 harness connector at the K182 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 9 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 K182 Parking Assist Control Module.

- **If greater than 9.7 V**

5. Test for 4 - 12.0 V between the signal circuit terminal 2 and ground.

- **If less than 4 V**

1. Vehicle OFF, disconnect the X2 harness connector at the K182 Parking Assist Control Module.

2. 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

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 K182 Parking Assist Control Module.

- **If greater than 12 V**

1. Vehicle OFF, disconnect the X2 harness connector at the K182 Parking Assist Control Module, vehicle 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, replace the K182 Parking Assist Control Module.

- **If between 4 - 12.0 V**

6. Test or replace the B306 Parking Assist Sensor.

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

Parking Assist Rear Sensor Left Corner Circuit

DTC B0960

Parking Assist Rear Sensor 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	-	-
Parking Assist Rear Sensor Left Corner Signal	B0958 02, B0958 06	B0958 06	B0958 01	B0958 08, B0958 22
Parking Assist Rear Sensor Middle Signal	B0960 06	B0960 06	B0960 01	B0960 08, B0960 22
Parking Assist Rear Sensor Right Corner Signal	B0961 06	B0961 06	B0961 01	B0961 08, B0961 22
Low Reference	-	B0958 01, B0959 01, B0960 01, B0961 01	-	-

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 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

- Vehicle ON
- The parking assist is activated. The activation takes place through putting in the reverse gear or through operating the park assist switch.

Conditions for Setting the DTC

B0958 01, B0960 01, or B0961 01

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

B0958 02, B0960 02, or B0961 02

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

B0958 04, B0960 04, or B0961 04

The parking assist control module has detected the voltage at the sensor is too high.

B0958 08, B0960 08, or B0961 08

The parking assist control module has received an invalid signal.

B0958 18, B0960 18, or B0961 18

The parking assist control module has detected the voltage at the sensor has a low signal amplitude.

B0958 22, B0960 22, or B0961 22

The parking assist control module determines the sensor has too short of a low time.

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

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

B0958 3B, B0960 3A, or B0961 3B

The parking assist control module determines the sensor failed a self test.

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, UFQ)**

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. Vehicle 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, B0960 01 or B0961 01 is not set.
 - **If the DTC is set**
Check the appropriate B306 Parking Assist Sensor for contamination with mud. If no contamination is diagnosed, refer to Circuit/System Testing.
 - **If the DTC is not set**
4. Verify that DTC B0958 22, B0960 22 or B0961 22 is not set.
 - **If the DTC is set**
Check the appropriate B306 Parking Assist Sensor for contamination with mud, ice or snow. If no contamination is diagnosed, replace the sensor.
 - **If the DTC is not set**
5. Verify that DTC B0958 3A, B0958 3B, B0960 3A B0960 3B B0961 3A or B0961 3B is not set.
 - **If the DTC is set**
Replace the appropriate B306 Parking Assist Sensor with a sensor of the correct sensor type.
 - **If the DTC is not set**
6. Vehicle ON, transmission in REVERSE, 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. Vehicle OFF for 1 min, scan tool must be disconnected for steps 1 and 2 to allow module to power down. Disconnect the harness connector at the affected rear object sensor.
2. Test for less than 10 Ω between the low reference circuit terminal 2 and ground.
 - **If 10 Ω or greater**
 1. Vehicle OFF, disconnect the harness connector X2 at the K182 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 K182 Parking Assist Control Module.
 - **If less than 10 Ω**
3. Vehicle 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. Vehicle OFF, disconnect the harness connector at the K182 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 K182 Parking Assist Control Module.

- **If 9.7 V or greater**

5. Test for 4 - 12 V between the signal circuit terminal 3 and ground.

- **If less than 4 V**

1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module.
2. 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
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 K182 Parking Assist Control Module.

- **If greater than 12 V**

1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module, Vehicle 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, replace the K182 Parking Assist Control Module.

- **If between 4 - 12 V**

6. Vehicle OFF, connect all of the B306 Parking Assist Sensors.

7. Vehicle ON.

8. Verify that DTC B0958, B0960, or B0961 is not set.

- **If the DTC is set**

Replace the appropriate B306 Parking Assist Sensor

- **If the DTC is not set**

9. 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

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DTC B0967

DTC B0968

Parking Assist On/Off Switch 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
Parking Assist Switch Signal	B0967 02, 1	1	1	-
Parking Assist Switch Indicator Illumination	B0968 06, 2	B0968 06, 2	2	-
Parking Assist Switch Indicator Control	B0968 06, 2	B0968 06, 2	B0968 01,	-
Parking Assist Switch Ground	-	1	-	-
1. Parking Assist Switch Malfunction 2. Parking Assist Indicator Malfunction				

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

- Vehicle 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

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Object Detection Schematics

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, UFQ)**

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. Vehicle 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. 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.
 - **If the Parking Assist Switch parameter changes between Active and Inactive**
5. All OK.

Circuit/System Testing

Parking Assist Indicator Malfunction

1. Vehicle OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. It may take up to 2 min for all vehicle systems to power down.
2. Test for 1.6 - 3.6 V between the control circuit terminal 6 and ground.
 - **If less than 1.6 V**
 1. Ignition OFF, disconnect the 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 , refer to **Interior Backlighting Malfunction** .

- **If greater than 3.6 V**
 1. Ignition OFF, disconnect the 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 1.6 - 3.6 V**
- 3. Connect a test lamp between the control circuit terminal 7 and signal circuit terminal 6.
- 4. Verify the test lamp turns On and Off when commanding the Parking Assist Switch On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module, Vehicle 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. 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 K182 Parking Assist Control Module.
 - **If the test lamp is always ON**
 1. Vehicle OFF, disconnect the harness connector at the K182 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 in the circuit.
 - If infinite resistance, replace the K182 Parking Assist Control Module.
 - **If the test lamp turns ON and OFF**
- 5. All OK.

Parking Assist Switch Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - 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 10 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 the scan tool Park Assist Switch parameter is Inactive.
 - **If not Inactive**
 1. Ignition OFF, disconnect the harness connector X1 at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the signal circuit terminal 2 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K182 Parking Assist Control Module.
 - **If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 2 and ground.
6. Verify the scan tool Park Assist Switch parameter is Active.
 - **If not Active**

1. Ignition OFF, disconnect the harness connector X1 at the K182 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. 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 K182 Parking Assist Control Module.
- **If Active**
7. Test or replace the S48D Multifunction Switch 2 - Instrument Panel.

Repair Instructions

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

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

DTC B096B: PARKING ASSIST SWITCH PARALLEL PARKING 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 B096B

Parking Assist Switch Parallel Parking 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
Parallel Park Assist Switch Signal	B096B 02	1	-	-
Parallel Parking Assist Switch Ground	-	1	-	-
1. Parallel Parking Assist Switch Malfunction				

Circuit/System Description

The parallel parking assist can be activated/deactivated by pressing the parallel parking assist switch.

Conditions for Running the DTC

- Vehicle ON
- The parallel parking assist is activated. The activation takes place through pressing the parallel parking assist switch.

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

- The parallel parking assist is disabled.

- An indicator in the driver information center shows the parking assistance is not available.

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, UFQ)

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. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. 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 10 and ground.
 - **If 10 Ω or greater**
 1. Vehicle 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. Vehicle ON.
4. Verify the scan tool Advanced Parking Assist Switch parameter is Inactive.
 - **If not Inactive**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel signal circuit terminal 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K182 Parking Assist Control Module.
 - **If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 1 and ground.
6. Verify the scan tool Advanced Parking Assist Switch parameter is Active.
 - **If not Active**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module, vehicle ON.

2. Test for less than 1 V between the S48D Multifunction Switch 2 - Instrument Panel signal circuit terminal 1 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 K182 Parking Assist Control Module.

- **If Active**

7. Test or replace the S48D Multifunction Switch 2 - Instrument Panel.

Repair Instructions

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

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

DTC B096C OR B096D: PARKING ASSIST SIDE SENSOR LEFT/RIGHT FRONT 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 B096C

Parking Assist Side Sensor Left Front Circuit

DTC B096D

Parking Assist Side Sensor Right Front 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
9 V Reference	B1405 02	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B096C 06, B096D 06, B1405 03	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B096C 06, B096D 06, B1405 07	-
Left Side Object Sensor Signal	B096C 06	B096C 06	B096C 01	B096C 08, B096C 21
Right Side Object Sensor Signal	B096D 06	B096D 06	B096D 01	B096D 08, B096D 21

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Low Reference	-	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B096C 06, B096D 06	-	-

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 9 V to the object sensors via the 9 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

- Vehicle in Service Mode
- The parallel parking assist is activated. The activation takes place through operating the parallel parking assist switch.

Conditions for Setting the DTC

B096C 01 or B096D 01

The parking assist control module has detected the voltage at the sensor circuit is too high.

B096C 06 or B096D 06

The parking assist control module has detected the voltage at the sensor circuit is too low.

B096C 08 or B096D 08

The parking assist control module has received an invalid signal.

B096C 21 or B096D 21

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

B096C 3A or B096D 3A

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

Action Taken When the DTC Sets

- The parallel parking assist is disabled.
- An indicator in the driver information center shows the parking assistance is not available.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

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, UFQ)**

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. Vehicle in Service Mode.
2. Verify that DTC B1405 is not present.

- **If the DTC is set**

Refer to **DTC B1405**

- **If the DTC does not set**

3. Verify that DTC B096C 01 or B096D 01 is not present.

- **If the DTC is set**

Check the appropriate sensor for contamination with mud, ice or snow. If no contamination is diagnosed, refer to Circuit/System Testing.

- **If the DTC does not set**

4. Verify that DTC B096C 3A or B096D 3A is not present.

- **If the DTC is set**

Replace the appropriate sensor with a sensor by correct sensor type.

- **If the DTC does not set**

5. Verify that DTC B096C 21 or B096D 21 is not present.

- **If the DTC is set**

Check the appropriate sensor for contamination with mud, ice or snow. If no contamination is diagnosed, replace the appropriate sensor.

- **If the DTC does not set**

6. All OK.

Circuit/System Testing

1. Vehicle OFF for 30 s, disconnect the harness connector at the appropriate B94 Side Object Sensor - Front. It may take up to 2 min 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. Vehicle OFF, disconnect the harness connector at the K182 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 K182 Parking Assist Control Module.
 - **If less than 10 Ω**
3. Vehicle in Service Mode, engine running.
 4. Test for 7.5 - 10.5 V between the 9 V reference circuit terminal 1 and ground.
 - **If less than 7.5 V**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the 9 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 9 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 K182 Parking Assist Control Module.
 - **If greater than 10.5 V**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module, Vehicle in Service Mode.
 2. Test for less than 1 V between the 9 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K182 Parking Assist Control Module.
 - **If between 7.5 - 10.5 V**
 5. Test for 7.5 - 9.5 V between the signal circuit terminal 2 and ground.
 - **If less than 7.5 V**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module.
 2. 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
 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 K182 Parking Assist Control Module.
 - **If greater than 9.5 V**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module, Vehicle in Service Mode.
 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, replace the K182 Parking Assist Control Module
 - **If between 11.5 - 13.5 V**
 6. Test or replace the appropriate B94 Side Object Sensor - Front.

Repair Instructions

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

- Refer to [Advanced Parking Assist Alarm Sensor Replacement \(Front\)](#)/[Advanced Parking Assist Alarm Sensor Replacement \(Rear\)](#)
- 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 Descriptor

DTC B0987 01

Vehicle Direction Camera Indicator Circuit Short to Battery

DTC B0987 06

Vehicle Direction Camera Indicator Circuit Low Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Lane Departure Warning Switch Indicator Ignition	B0987 06	B0987 06	-	-
Lane Departure Warning Switch Indicator Control	B0987 06	B0987 06	B0987 01	-

Circuit/System Description

The lane departure warning is enabled and disabled through a switch located in the left steering wheel controls switch. When enabled, the frontview camera module will illuminate the indicator located in the switch.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The frontview camera module has detected a short to battery or open/high resistance in the control circuit.

Action Taken When the DTC Sets

- Lane departure warning is 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

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**

[Control Module References](#) for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that 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, disconnect the harness connector at the S70L Steering Wheel Controls Switch - Left, ignition ON.

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

2. Test for 6.2 - 12.0 V between the dimming control circuit terminal 4 and ground.
 - **If less than 6.2 V**
 1. Ignition OFF, disconnect the 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 , refer to [Interior Backlighting Malfunction](#).
 - **If greater than 12.0 V**
 1. Ignition OFF, disconnect the 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 - 12.0 V**
3. Connect a test lamp between the control circuit terminal 5 and B+.
4. Verify the test lamp turns ON and OFF when commanding the Lane Departure Warning Indicator 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 S70L Steering Wheel Controls Switch - Left.

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

DTC B1008: CALIBRATION DATA NOT PROGRAMMED

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 B1008

Calibration Data Not Programmed

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

Circuit/System Description

When the ignition is turned ON, the frontview camera module performs a self-test to verify if a critical malfunction exists within the system. During the power-up mode, the frontview camera module checks for a valid calibration data set.

Conditions for Running the DTC

- DTC B1325 is not set
- Ignition voltage is between 9 - 16 volts

Conditions for Setting the DTC

- A valid calibration is not detected upon module power - up.
- The frontview camera module has been replaced and programmed, but not calibrated.

Action Taken When the DTC Sets

- Lane departure and forward collision alert system is disabled.
- The instrument panel cluster to display SERVICE FRONT CAMERA or SERVICE LANE DEPARTURE WARNING message in the driver information center and a chime will sound.
- All functions handled by the frontview camera module are inoperative

Conditions for Clearing

- The DTC will transition to history when the fault is no longer present.

- A history DTC will clear after 50 malfunction - free ignition cycles.

Diagnostic Aids

- This DTC will be set as current while performing calibration, and will remain set as current until calibration can be completed
- The frontview camera will not calibrate if not properly installed or mounted.

Reference Information

Schematic Reference

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: Do not diagnose this DTC if set in history

1. Ignition ON.
2. Verify that DTC B101E 42 is not set.
 - **If DTC is set**

Perform the **Front View Camera Module Programming and Setup** procedure.

- **If the DTC is not set**
3. Perform the **Vehicle Yaw Sensor Learn** procedure.
 4. Verify that DTC B1008 is not set.

- **If DTC is set**
 1. Calibrate the front camera module. Refer to **Front View Camera Module Learn**.
 2. Verify the DTC does not set.
 - If the DTC sets, replace the B174W Frontview Camera - Windshield.
 - If the DTC does not set
 3. All OK.

- **If the DTC is not set**
5. All OK.

Repair Instructions

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

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

DTC B1011: SYSTEM DISABLED INFORMATION STORED

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

System Disabled Information Stored

Circuit/System Description

The front view camera module permanently monitors the serial data bus for error messages. When a malfunction is detected by the front view camera module, the system will be disabled and an error message will be stored in the front view 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
- Front view camera enabled

Conditions for Setting the DTC

The front view camera module detects a malfunction.

Action Taken When the DTC Sets

- The front view camera module is disabled.
- The front view 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 front view camera module disable history buffers are used to store information about the front view 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 front view camera module is disabled then it will be set in front view 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. Front view camera module disable history buffer 1 contains the current reason that one of the front view camera module features is disabled.

The front view 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

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

1. Verify no DTC is set.
 - If a DTC is present, diagnose this first. Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).
2. Verify the scan tool Vehicle Direction Camera System parameter is NORMAL.
 - If not the specified value, refer to [Lane Departure Warning System Malfunction](#), and [Forward Collision Alert System Malfunction](#).
3. Verify the scan tool Vehicle Direction Camera Calibration Status parameter is CALIBRATED.
 - If not the specified value, calibrate the K109 Frontview Camera Module. Refer to [Front View Camera Module Learn](#).

Circuit/System Testing

NOTE: Perform the Circuit/System Verification before proceeding with the [diagn.com](#) Circuit/System Testing.

1. Verify the scan tool Front View Camera Module Disable History displays no current malfunction. Refer to Diagnostic Aids.
 - If a current malfunction is displayed, diagnose the system that sets the malfunction.
2. If no malfunction is displayed in the Front View Camera Module Disable History, refer to [Lane Departure Warning System Malfunction](#), and [Forward Collision Alert System Malfunction](#).

Repair Instructions

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

Refer to [Control Module References](#) for front view camera 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](#)

- [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
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

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

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 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 08

Rearview Camera Input Signal Circuit Malfunction

Diagnostic Fault Information

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

Circuit/System Description

When the vehicle is placed in reverse with the engine running, a video signal is sent from the rearview camera to the Radio. If the Radio does not see a signal from the camera it will set B127B 2B and display "Service Rear Vision System". The rearview camera is powered with ignition voltage and does not have a reverse signal circuit.

Conditions for Running the DTC

The vehicle must be in reverse with the engine running.

Conditions for Setting the DTC

B127B 08

Signal from the rearview camera not received by the Radio for 2.5 s.

Action Taken When the DTC Sets

- The Radio commands the driver information center to display "Service Rear Vision System".
- The Radio 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. Vehicle ON.
2. Verify that DTC B2545 is not set.
 - **If the DTC is set**
Refer to **DTC B2545** .
 - **If the DTC is not set**
3. 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**
4. Vehicle ON, transmission in R.
5. Verify the backup lamps are illuminated.
 - **If the backup lamps are not illuminated**
Refer to **Backup Lamps Malfunction** .
 - **If the backup lamps are illuminated**
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.

- Vehicle OFF, disconnect the harness connector at the B87 Rearview Camera. It may take up to 2 min for all vehicle systems to power down.
- Test for less than 10 Ω between the ground circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 - Vehicle OFF.
 - 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**
- Vehicle ON.
- Verify a test lamp illuminates between the ignition circuit terminal 5 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 - Vehicle OFF.
 - 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**
 - Vehicle OFF.
 - 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**
- Vehicle OFF, disconnect the X1 harness connector at the All Radio, vehicle ON.
- Test for less than 1 V between the signal circuit terminal listed below and ground:
 - B87 Rearview Camera signal (+) circuit terminal 15
 - B87 Rearview Camera signal (-) circuit terminal 14
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **If less than 1 V**
- Test for infinite resistance between the signal circuit terminal listed below and ground:
 - B87 Rearview Camera signal (+) circuit terminal 15
 - B87 Rearview Camera signal (-) circuit terminal 14
 - **If less than infinite resistance**

Repair the short to ground on the circuit.
 - **If infinite resistance**
- 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**

9. 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**

10. Replace the B87 Rearview Camera.

11. Vehicle ON, transmission in R,

12. 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 All Radio.

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

13. 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
9 V Reference	B1405 02	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B1405 03	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B1405 07	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Low Reference	-	B0954 01, B0955 01, B0956 01, B0957 01, 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 9 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 object sensor signal circuit to calculate the distance and position of an object.

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 object sensor supply voltage circuit is shorted to ground.

B1405 03

The parking assist control module has detected the object sensor supply voltage circuit is low.

B1405 07

The parking assist control module has detected the object sensor supply voltage circuit is high.

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 \(with Front and Rear Park Assist, UFQ\)](#)

- [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 and X3 harness connectors at the K41 Front and Rear 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 B78 Rear Object Sensors.
 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 B78 Rear Object Sensor.
 - **If infinite resistance**
3. Test for infinite resistance between the 12 V reference circuit terminal 1 X3 and ground.
 - **If less than infinite resistance**
 1. Ignition OFF, disconnect the harness connector at each of the B78 Front Object Sensors.
 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 B78 Front Object Sensor.
 - **If infinite resistance**
4. Ignition ON.
5. 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 B78 Rear Object Sensors.
 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 B78 Front Object Sensor.
 - **If less than 1 V**
6. Test for less than 1 V between the 12 V reference circuit terminal 1 X3 and ground.
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at each of the B78 Front Object Sensors.
 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 B78 Front Object Sensor.
 - **If less than 1 V**
7. Connect the X2 and X3 harness connector at the K41 Front and Rear Parking Assist Control Module, ignition ON.
8. Verify DTC B1405 is not set.
 - **If DTC B1405 is set**
 1. Ignition OFF, disconnect the harness connector at each of the B78 Object Sensors.
 2. Verify DTC B1405 is not set.
 - If DTC B1405 is set

Replace the K41 Front and Rear 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 B78 Object Sensor, one at a time.
- If DTC B1405 does set

Replace the B78 Object Sensor that was connected immediately before DTC B1405.

- If DTC B1405 does not set.

9. All OK.

- **If DTC B1405 is not set.**

10. 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

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

Vehicle Direction Warning Switch 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
Lane Departure Warning Switch Signal	B356A 02	1	B356A 05	-
Lane Departure Warning Switch Ground	-	1	-	-
1. Lane Departure Warning Malfunction				

Circuit/System Description

The lane departure warning system is controlled by the Frontview Camera - Windshield mounted on the windshield. Lane departure warning is enabled and disabled through a switch located on the steering wheel. When enabled, the Frontview Camera - Windshield or Active Safety Control Module will illuminate the indicator located in the switch.

When the system is operating and can detect the lane markings, the Frontview Camera - Windshield will request via serial data communications that the instrument panel cluster illuminate the green lane departure ready - to - assist indicator. If the Frontview Camera - Windshield detects that the vehicle has crossed a lane marking without the turn signal being used, the module will request that the instrument cluster flash the yellow lane departure warning indicator. An audible warning may also sound three times or the haptic seat (if equipped) may pulse when the yellow Instrument Cluster indicator is

flashing. The driver can select between audible or haptic alerts in the vehicle personalization menu. See the Owner's Manual for more detailed information on vehicle personalization.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

DTC B356A 02

The Frontview Camera Module has detected a short to ground for more than 10 s.

DTC B356A 05

The Frontview Camera Module has detected a short to voltage or an open/high resistance for more than 10 s.

Action Taken When the DTC Sets

- Lane departure warning is disabled.
- Service Lane Departure is displayed on the driver information center.

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.

Diagnostic Aids

Manually pressing the lane departure warning switch for an extended length of time will cause this DTC to set.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Forward Collision Alert Description and Operation

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- **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 changes between Open and Closed while cycling the lane departure warning switch.
 - **If the parameter does not change**

- **If the parameter changes**

3. All OK.

Circuit/System Testing - Without MBM

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S70L Steering Wheel Controls Switch - Left.

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

- **If 10 Ω or greater**

1. Vehicle 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 the scan tool Vehicle Direction Warning Switch Status parameter is Open.

- **If not Open**

1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield.

2. Test for infinite resistance between the S70L Steering Wheel Controls Switch - Left signal circuit terminal 2 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the B174W Frontview Camera - Windshield.

- **If Open**

5. Install a 3 A fused jumper wire between the signal circuit terminal 2 and ground.

6. Verify within 10 s the scan tool Vehicle Direction Warning Switch Status parameter is Closed.

- **If not Closed**

1. Ignition OFF, disconnect harness connector at the B174W Frontview Camera - Windshield. Ignition ON.

2. Test for less than 1 V between the S70L Steering Wheel Controls Switch - Left signal circuit terminal 2 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 B174W Frontview Camera - Windshield.

- **If Closed**

7. Test or replace the S70L Steering Wheel Controls Switch - Left.

Circuit/System Testing - with MBM

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.

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

- **If 10 Ω or greater**

1. Vehicle 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 the scan tool Vehicle Direction Warning Switch Status parameter is Open.

- **If not Open**

1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield.
2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel signal circuit terminal 3 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the B174W Frontview Camera - Windshield.

- **If Open**

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

6. Verify within 10 s the scan tool Vehicle Direction Warning Switch Status parameter is Closed.

- **If not Closed**

1. Ignition OFF, disconnect harness connector at the B174W Frontview Camera - Windshield. Ignition ON.
2. Test for less than 1 V between the S48D Multifunction Switch 2 - Instrument Panel signal circuit terminal 3 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 B174W Frontview Camera - Windshield.

- **If Closed**

7. Test or replace the S48D Multifunction Switch 2 - Instrument Panel.

Repair Instructions

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

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

DTC B390D: FRONTVIEW CAMERA MODULE INCORRECT MOUNTING

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 B390D 66

Frontview Camera Module Incorrect Mounting

Circuit/System Description

The frontview camera module has determined that it is not properly mounted.

Conditions for Running the DTC

Vehicle operating on the road.

Conditions for Setting the DTC

The frontview camera module was unable to see the road ahead.

Action Taken When the DTC Sets

- The frontview camera module is disabled.
- The Active Safety System is disabled.
- Service Driver Assist is displayed on the driver information center and/or heads up display.

Conditions for Clearing the DTC

The frontview camera module is successfully aligned.

Diagnostic Aids

- The frontview camera module needs to be securely mounted. Verify it is secured properly in it's mount.
- The frontview camera module needs to have a clear field of vision to the road ahead. Check for anything that can impair the camera's vision.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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- [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 there are no DTCs set, except for DTC B101E 4B in the B233B Radar Sensor Module - Long Range or K109 Frontview Camera Module.

- **If other DTCs are set**

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

- **If no other DTCs are set**

NOTE: Before conducting alignment, verify that the K109 Frontview Camera Module will not have difficulty seeing the lines on the road. If the view of the K109 Frontview Camera Module is blocked with mud, dirt, snow, ice, or slush, if the windshield is damaged, or if weather limits visibility, such as while driving in fog, rain, or snow conditions, the calibration procedure may not be able to be completed.

3. Perform the calibration procedure. Refer to [Front View Camera Module Learn](#).

4. Verify DTC B390D 66 is not set

- If DTC B390D 66 is set

Replace and calibrate the K109 Frontview Camera Module.

- If DTC B390D 66 is not set

5. All OK.

Repair Instructions

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

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

DTC B390F: FRONTVIEW CAMERA

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 B390F 08

Frontview Camera Performance - Signal Invalid

DTC B390F 66

Frontview Camera Wrong Mounting Position

DTC B390F 4B

Frontview Camera Calibration Not Learned

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
6 V Reference	B390F 08, B399A 02	B390F 08, 1	B399A 01	-
Video Signal +	1, 2	1	1, 2	-
Video Signal -	1, 2	1	1, 2	-
Low Reference	-	B390F 08, 1	-	-
1. Camera inoperative 2. Poor image quality displayed from camera				

Circuit/System Description

The video processing control module performs fault detection on itself and the cameras attached to it.

Conditions for Running the DTC

Ignition voltage is between 9 - 16 V.

Conditions for Setting the DTC

B390F 08

The frontview camera video circuit is open, shorted to voltage, or shorted to ground.

B390F 66

The frontview camera is incorrectly mounted.

B390F 4B

The camera calibration is not learned.

Action Taken When the DTC Sets

- The Video Processing Control Module requests the instrument cluster to display "Service Surround Vision Camera".
- The Video Processing Control Module will disable the Surround Vision Camera 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.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Surround Vision Camera Description and Operation

Electrical Information Reference

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- **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 B390F 4B is not set.
 - **If the DTC is set**
 1. Program the K157 Video Processing Control Module.
 2. Verify DTC B390F 4B is not set after programming.
 - If the DTC sets after programming, replace the B174G Frontview Camera - Grille.
 - If the DTC does not set
 3. All OK.
 - **If both DTCs are not set**
3. Verify DTC B390F 66 is not set.
 - **If the DTC is set**

- **If the DTC is not set**

4. Verify DTC B390F 08 is not set.

- **If DTC is set**

Refer to Circuit/System Testing

- **If DTC is not set**

5. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the B174G Frontview Camera - Grille harness connector. It may take up to 2 min for all vehicle systems to power down.

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

- **If 10 Ω or greater**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing 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 K157 Video Processing Control Module.

- **If less than 10 Ω**

3. Ignition ON.

4. Test for 4.8 - 7.2 V between the 6 V reference circuit terminal 5 and ground.

- **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.

2. Test for infinite resistance between the 6 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 6 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 K157 Video Processing Control Module.

- **If greater than 7.2 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.

2. Test for less than 1 V between the 6 V reference circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K157 Video Processing Control Module.

- **If between 4.8 - 7.2 V**

5. Ignition ON.

6. Test for less than 10 V between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 3

- **If 10 V or greater**

1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing 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, replace the K157 Video Processing Control Module.

- **If less than 10 V**

7. Ignition OFF.

8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 3
- **If less than 100 Ω**

1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.

2. Test for infinite between the signal circuit and ground.

- If less than infinite resistance, repair the short to voltage on the circuit.
- If infinite resistance, replace the K157 Video Processing Control Module.

- **If greater than 100 Ω**

9. Test for less than 2 Ω between the video signal circuit terminals listed below:

- B174G Frontview Camera - Grille video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 1 X1
- B174G Frontview Camera - Grille video signal (-) circuit terminal 3 and the K157 Video Processing Control Module video signal (-) circuit terminal 11 X1
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

10. Ignition OFF, connect the harness connector at the B174G Frontview Camera - Grille.

11. Ignition ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.

12. Verify DTC B390F is not set.

- **If DTC B390F is set**

Replace the B174G Frontview Camera - Grille.

- **If DTC B390F is not set**

13. All OK.

Repair Instructions

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

- Refer to [Front View Camera Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming, and setup.

DTC B395A: REARVIEW CAMERA

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 B395A 08

Rearview Camera Performance - Signal Invalid

DTC B395A 66

Rearview Camera Wrong Mounting Position

DTC B395A 4B

Rearview Camera Calibration Not Learned

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
6 V Reference	B395A 02, B399B 08	B395A 08, 1	B399B 08	-
Video Signal +	1, 2	B395A 08, 1	1, 2	-
Video Signal -	1, 2	1	1, 2	-
Low Reference	-	B395A 08, 1	-	-
1. Camera inoperative 2. Poor image quality displayed from camera				

Circuit/System Description

The video processing control module performs fault detection on itself and the cameras attached to it.

Conditions for Running the DTC

Ignition voltage is between 9 - 16 V.

Conditions for Setting the DTC

B395A 08

The rearview camera video circuit is open, shorted to voltage, or shorted to ground.

B395A 66

The rearview camera is incorrectly mounted.

B395A 4B

The camera calibration is not learned.

Action Taken When the DTC Sets

- The Video Processing Control Module requests the instrument cluster to display "Service Surround Vision Camera".
- The Video Processing Control Module will disable the camera and that cameras portion of the display.

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.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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- [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 B395A 4B is not set.
 - **If the DTC is set**
 1. Program the K157 Video Processing Control Module.
 2. Verify DTC B395A 4B is not set after programming.
 - If the DTC sets after programming, replace the B87 Rearview Camera.
 - If the DTC does not set
 - 3. All OK.
3. Verify DTC B395A 66 is not set.
 - **If the DTC is set**

Remove the B87 Rearview Camera and reinstall
 - **If the DTC is not set**
4. Verify DTC B395A 08 is not set.
 - **If DTC is set**

Refer to Circuit/System Testing
 - **If DTC is not set**
5. Vehicle ON, transmission in R, verify a clear 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**
6. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the B87 Rearview Camera harness connector. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing 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 K157 Video Processing Control Module.
 - **If less than 10 Ω**
3. Ignition ON.
4. Test for 4.8 - 7.2 V between the 6 V reference circuit terminal 5 and ground.
 - **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
2. Test for infinite resistance between the 6 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 6 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 K157 Video Processing Control Module.
- **If greater than 7.2 V**
1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.
2. Test for less than 1 V between the 5 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
- **If between 4.8 - 7.2 V**
5. Ignition ON.
6. Test for less than 10 V between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 3
- **If 10 V or greater**
1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing 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, replace the K157 Video Processing Control Module.
- **If less than 10 V**
7. Ignition OFF.
8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 3
- **If less than 100 Ω**
1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.
2. Test for infinite between the signal circuit and ground.
 - If less than infinite resistance, repair the short to voltage on the circuit.
 - If infinite resistance, replace the K157 Video Processing Control Module.
- **If greater than 100 Ω**
9. Test for less than 2 Ω between the video signal circuit terminals listed below:
 - B87 Rearview Camera video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 4 X1
 - B87 Rearview Camera video signal (+) circuit terminal 3 and the K157 Video Processing Control Module video signal (+) circuit terminal 14 X1
- **If 2 Ω or greater**
- Repair the open/high resistance in the circuit.
- **If less than 2 Ω**
10. Ignition OFF, connect the harness connector at the B87 Rearview Camera.
11. Ignition ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
12. Verify DTC B395A is not set.
- **If DTC B395A is set**

Replace the B87 Rearview Camera.

- If DTC B395A is not set

13. 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 B395B: SIDEVIEW CAMERA - LEFT

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 B395B 08

Sideview Camera - Left Performance - Signal Invalid

DTC B395B 66

Sideview Camera - Left Wrong Mounting Position

DTC B395B 4B

Sideview Camera - Left Calibration Not Learned

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
6 V Reference	B395B 08, B399C 02	B395B 08, 1	B399C 01	-
Video Signal +	1, 2	B395B 08, 1	1, 2	-
Video Signal -	1, 2	1	1, 2	-
Low Reference	-	B395B 08, 1	-	-
1. Camera inoperative 2. Poor image quality displayed from camera				

Circuit/System Description

The video processing control module performs fault detection on itself and the cameras attached to it.

Conditions for Running the DTC

Ignition voltage is between 9 - 16 V.

Conditions for Setting the DTC

B395B 08

The sideview camera - left video circuit is open, shorted to voltage, or shorted to ground.

B395B 66

The sideview camera - left is incorrectly mounted.

B395B 4B

The sideview camera - left is not learned.

Action Taken When the DTC Sets

- The Video Processing Control Module requests the instrument cluster to display "Service Surround Vision Camera".
- The Video Processing Control Module will disable the camera and that cameras portion of the display.

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.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B395B 4B is not set.
 - **If the DTC is set**
 1. Program the K157 Video Processing Control Module.
 2. Verify DTC B395B 4B is not set after programming.
 - If the DTC sets after programming, replace the B225L Sideview Camera - Left.
 - If the DTC does not set
 - 3. All OK.
 - **If the DTC is not set**
3. Verify DTC B395B 66 is not set.
 - **If the DTC is set**

Remove the B225L Sideview Camera - Left and reinstall

- **If the DTC is not set**

4. Verify DTC B395B 08 is not set.

- **If DTC is set**

Refer to Circuit/System Testing

- **If DTC is not set**

5. Vehicle ON, transmission in R, verify a clear 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**

6. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the B225L Sideview Camera - Left harness connector. It may take up to 2 min for all vehicle systems to power down.

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

- **If 10 Ω or greater**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing 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 K157 Video Processing Control Module.

- **If less than 10 Ω**

3. Ignition ON.

4. Test for 4.8 - 7.2 V between the 6 V reference circuit terminal 6 and ground.

- **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.

2. Test for infinite resistance between the 6 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 6 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 K157 Video Processing Control Module.

- **If greater than 7.2 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.

2. Test for less than 1 V between the 6 V reference circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K157 Video Processing Control Module.

- **If between 4.8 - 7.2 V**

5. Ignition ON.

6. Test for less than 10 V between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 4

- **If 10 V or greater**

1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing 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, replace the K157 Video Processing Control Module.

- **If less than 10 V**

7. Ignition OFF.

8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 4

- **If less than 100 Ω**

1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.

2. Test for infinite between the signal circuit and ground.

- If less than infinite resistance, repair the short to voltage on the circuit.
- If infinite resistance, replace the K157 Video Processing Control Module.

- **If greater than 100 Ω**

9. Test for less than 2 Ω between the video signal circuit terminals listed below:

- B225L Sideview Camera - Left video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 5 X1
- B225L Sideview Camera - Left video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 15 X1

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

10. Ignition OFF, connect the harness connector at the B225L Sideview Camera - Left.

11. Ignition ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.

12. Verify DTC B395B is not set.

- **If DTC B395B is set**

Replace the B225L Sideview Camera - Left.

- **If DTC B395B is not set**

13. All OK.

Repair Instructions

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

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

DTC B395C: SIDEVIEW CAMERA - RIGHT

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 B395C 08

Sideview Camera - Right Performance - Signal Invalid

DTC B395C 66

Sideview Camera - Right Wrong Mounting Position

DTC B395C 4B

Sideview Camera - Right Calibration Not Learned

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
6 V Reference	B395C 08, B399D 02	B395C 08, 1	B399D 01	-
Video Signal +	1, 2	B395C 08, 1	1, 2	-
Video Signal -	B395C 08, 1	1	1, 2	-
Low Reference	-	B395C 08, 1	-	-
1. Camera inoperative 2. Poor image quality displayed from camera				

Circuit/System Description

The video processing control module performs fault detection on itself and the cameras attached to it.

Conditions for Running the DTC

Ignition voltage is between 9 - 16 V.

Conditions for Setting the DTC

B395C 08

The sideview camera - right video circuit is open, shorted to voltage, or shorted to ground.

B395C 66

The sideview camera - right is incorrectly mounted.

B395C 4B

The sideview camera - right is not learned.

Action Taken When the DTC Sets

- The Video Processing Control Module requests the instrument cluster to display "Service Surround Vision Camera".
- The Video Processing Control Module will disable the camera and that cameras portion of the display.

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.

Reference Information

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Object Detection Schematics

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- [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 B395C 4B is not set.
 - **If the DTC is set**
 1. Program the K157 Video Processing Control Module.
 2. Verify DTC B395C 4B is not set after programming.
 - If the DTC sets after programming, replace the B225R Sideview Camera - Right.
 - If the DTC does not set
 3. All OK.
 - **If the DTC is not set**
3. Verify DTC B395C 66 is not set.
 - **If the DTC is set**

Remove the B225R Sideview Camera - Right and reinstall
 - **If the DTC is not set**
4. Verify DTC B395C 08 is not set.
 - **If DTC is set**

Refer to Circuit/System Testing
 - **If DTC is not set**
5. Vehicle ON, transmission in R, verify a clear 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**
6. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the B225R Sideview Camera - Right harness connector. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 5 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing 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 K157 Video Processing Control Module.
 - **If less than 10 Ω**

3. Ignition ON.

4. Test for 4.8 - 7.2 V between the 6 V reference circuit terminal 6 and ground.

- **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
2. Test for infinite resistance between the 6 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 6 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 K157 Video Processing Control Module.

- **If greater than 7.2 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.
2. Test for less than 1 V between the 6 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.

- **If between 4.8 - 7.2 V**

5. Ignition ON.

6. Test for less than 10 V between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 4

- **If 10 V or greater**

1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing 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, replace the K157 Video Processing Control Module.

- **If less than 10 V**

7. Ignition OFF.

8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 4

- **If less than 100 Ω**

1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.
2. Test for infinite between the signal circuit and ground.
 - If less than infinite resistance, repair the short to voltage on the circuit.
 - If infinite resistance, replace the K157 Video Processing Control Module.

- **If greater than 100 Ω**

9. Test for less than 2 Ω between the video signal circuit terminals listed below:

- B225R Sideview Camera - Right video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 8 X1
 - B225R Sideview Camera - Right video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 18 X1
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

10. Ignition OFF, connect the harness connector at the B225R Sideview Camera - Right.

11. Ignition ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.

12. Verify DTC B395C is not set.

- **If DTC B395C is set**

Replace the B225R Sideview Camera - Right.

- **If DTC B395C is not set**

13. All OK.

Repair Instructions

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

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

DTC B399A: FRONTVIEW CAMERA SUPPLY CIRCUIT SHORT TO BATTERY/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 Descriptor

DTC B399A 01

Frontview Camera Supply Circuit Short to Battery

DTC B399A 02

Frontview Camera Supply Circuit Short to Ground

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
6 V Reference	B390F 08, B399A 02	B390F 08, 1	B399A 01	-
Video Signal +	1, 2	1	1, 2	-
Video Signal -	1, 2	1	1, 2	-
Low Reference	-	B390F 08, 1	-	-
1. Camera inoperative 2. Poor image quality displayed from camera				

Circuit/System Description

The video processing control module performs fault detection on itself and the cameras attached to it.

Conditions for Running the DTC

Ignition voltage is between 9 - 16 V.

Conditions for Setting the DTC

B399A 01

The frontview camera 6 V reference circuit is shorted to voltage

B399A 02

The frontview camera 6 V reference circuit is shorted to ground

Action Taken When the DTC Sets

- The Video Processing Control Module requests the instrument cluster to display "Service Surround Vision Camera".
- The Video Processing Control Module will disable the camera and that camera's portion of the display.

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.

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- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the B174G Frontview Camera - Grille harness connector. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing 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 K157 Video Processing Control Module.
 - **If less than 10 Ω**
3. Ignition ON.
4. Test for 4.8 - 7.2 V between the 6 V reference circuit terminal 5 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
 2. Test for infinite resistance between the 6 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 6 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 K157 Video Processing Control Module.
 - **If greater than 7.2 V**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.
 2. Test for less than 1 V between the 6 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
 - **If between 4.8 - 7.2 V**
5. Ignition ON.
 6. Test for less than 10 V between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 3
 - **If 10 V or greater**
 1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing 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, replace the K157 Video Processing Control Module.
 - **If less than 10 V**
7. Ignition OFF.
 8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 3
 - **If less than 100 Ω**
 1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.
 2. Test for infinite between the signal circuit and ground.
 - If less than infinite resistance, repair the short to voltage on the circuit.
 - If infinite resistance, replace the K157 Video Processing Control Module.
 - **If greater than 100 Ω**
9. Test for less than 2 Ω between the video signal circuit terminals listed below:
 - B174G Frontview Camera - Grille video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 1 X1
 - B174G Frontview Camera - Grille video signal (+) circuit terminal 3 and the K157 Video Processing Control Module video signal (+) circuit terminal 11 X1
 - **If 2 Ω or greater**

Repair the open/high resistance in the circuit.
 - **If less than 2 Ω**
10. Ignition OFF, connect the harness connector at the B174G Frontview Camera - Grille.
 11. Ignition ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
 12. Verify DTC B399A is not set.
 - **If DTC B399A is set**

Replace the B174G Frontview Camera - Grille.
 - **If DTC B399A is not set**
 13. All OK.

Repair Instructions

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

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

DTC B399B: REARVIEW CAMERA SUPPLY CIRCUIT SHORT TO BATTERY/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 Descriptor

DTC B399B 01

Rearview Camera Supply Circuit Short to Battery

DTC B399B 02

Rearview Camera Supply Circuit Short to Ground

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
6 V Reference	B395A 02, B399B 08	B395A 08, 1	B399B 08	-
Video Signal +	1, 2	B395A 08, 1	1, 2	-
Video Signal -	1, 2	1	1, 2	-
Low Reference	-	B395A 08, 1	-	-
1. Camera inoperative 2. Poor image quality displayed from camera				

Circuit/System Description

The video processing control module performs fault detection on itself and the cameras attached to it.

Conditions for Running the DTC

Ignition voltage is between 9 - 16 V.

Conditions for Setting the DTC

B399B 01

The rearview camera 6 V reference circuit is shorted to voltage

B399B 02

The rearview camera 6 V reference circuit is shorted to ground

Action Taken When the DTC Sets

- The Video Processing Control Module requests the instrument cluster to display "Service Surround Vision Camera".
- The Video Processing Control Module will disable the camera and that cameras portion of the display.

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.

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- **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 B87 Rearview Camera harness connector. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 4 and ground.

- **If 10 Ω or greater**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing 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 K157 Video Processing Control Module.

- **If less than 10 Ω**

3. Ignition ON.

4. Test for 4.8 - 7.2 V between the 6 V reference circuit terminal 5 and ground.

- **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
2. Test for infinite resistance between the 6 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 6 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 K157 Video Processing Control Module.

- **If greater than 7.2 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.

2. Test for less than 1 V between the 6 V reference circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K157 Video Processing Control Module.

- **If between 4.8 - 7.2 V**

5. Ignition ON.

6. Test for less than 10 V between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 3

- **If 10 V or greater**

1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing 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, replace the K157 Video Processing Control Module.

- **If less than 10 V**

7. Ignition OFF.

8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 3

- **If less than 100 Ω**

1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.

2. Test for infinite between the signal circuit and ground.

- If less than infinite resistance, repair the short to voltage on the circuit.
- If infinite resistance, replace the K157 Video Processing Control Module.

- **If greater than 100 Ω**

9. Test for less than 2 Ω between the video signal circuit terminals listed below:

- B87 Rearview Camera video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 4 X1
- B87 Rearview Camera video signal (+) circuit terminal 3 and the K157 Video Processing Control Module video signal (+) circuit terminal 14 X1
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

10. Ignition OFF, connect the harness connector at the B87 Rearview Camera.

11. Ignition ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.

12. Verify DTC B399B is not set.

- **If DTC B399B is set**

Replace the B87 Rearview Camera.

- **If DTC B399B is not set**

13. 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.

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DTC B399C: SIDEVIEW CAMERA - LEFT SUPPLY CIRCUIT SHORT TO BATTERY/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 Descriptor

DTC B399C 01

Sideview Camera - Left Supply Circuit Short to Battery

DTC B399C 02

Sideview Camera - Left Supply Circuit Short to Ground

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
6 V Reference	B395B 08, B399C 02	B395B 08, 1	B399C 01	-
Video Signal +	1, 2	B395B 08, 1	1, 2	-
Video Signal -	1, 2	1	1, 2	-
Low Reference	-	B395B 08, 1	-	-
1. Camera inoperative 2. Poor image quality displayed from camera				

Circuit/System Description

The video processing control module performs fault detection on itself and the cameras attached to it.

Conditions for Running the DTC

Ignition voltage is between 9 - 16 V.

Conditions for Setting the DTC

B399C 01

The sideview camera - left 6 V reference circuit is shorted to voltage

B399C 02

The sideview camera - left 6 V reference circuit is shorted to ground

Action Taken When the DTC Sets

- The Video Processing Control Module requests the instrument cluster to display "Service Surround Vision Camera".
- The Video Processing Control Module will disable the camera and that cameras portion of the display.

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.

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[Object Detection Schematics](#)

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- [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 B225L Sideview Camera - Left harness connector. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 5 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing 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 K157 Video Processing Control Module.
 - **If less than 10 Ω**
3. Ignition ON.
4. Test for 4.8 - 7.2 V between the 6 V reference circuit terminal 6 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
 2. Test for infinite resistance between the 6 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 6 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 K157 Video Processing Control Module.
 - **If greater than 7.2 V**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.
 2. Test for less than 1 V between the 6 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
 - **If between 4.8 - 7.2 V**
5. Ignition ON.
6. Test for less than 10 V between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1

- Vision Signal - signal circuit terminal 4

- **If 10 V or greater**

1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing 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, replace the K157 Video Processing Control Module.

- **If less than 10 V**

7. Ignition OFF.

8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 4

- **If less than 100 Ω**

1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.
2. Test for infinite between the signal circuit and ground.
 - If less than infinite resistance, repair the short to voltage on the circuit.
 - If infinite resistance, replace the K157 Video Processing Control Module.

- **If greater than 100 Ω**

9. Test for less than 2 Ω between the video signal circuit terminals listed below:

- B225L Sideview Camera - Left video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 5 X1
- B225L Sideview Camera - Left video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 15 X1

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

10. Ignition OFF, connect the harness connector at the B225L Sideview Camera - Left.
11. Ignition ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
12. Verify DTC B399C is not set.

- **If DTC B399C is set**

Replace the B225L Sideview Camera - Left.

- **If DTC B399C is not set**

13. All OK.

Repair Instructions

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

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

DTC B399D: SIDEVIEW CAMERA - RIGHT SUPPLY CIRCUIT SHORT TO BATTERY/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 Descriptor

DTC B399D 01

Sideview Camera - Right Supply Circuit Short to Battery

DTC B399D 02

Sideview Camera - Right Supply Circuit Short to Ground

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
6 V Reference	B395C 08, B399D 02	B395C 08, 1	B399D 01	-
Video Signal +	1, 2	B395C 08, 1	1, 2	-
Video Signal -	B395C 08, 1	1	1, 2	-
Low Reference	-	B395C 08, 1	-	-
1. Camera inoperative 2. Poor image quality displayed from camera				

Circuit/System Description

The video processing control module performs fault detection on itself and the cameras attached to it.

Conditions for Running the DTC

Ignition voltage is between 9 - 16 V.

Conditions for Setting the DTC

B399D 01

The sideview camera - right 6 V reference circuit is shorted to voltage

B399D 02

The sideview camera - right 6 V reference circuit is shorted to ground

Action Taken When the DTC Sets

- The Video Processing Control Module requests the instrument cluster to display "Service Surround Vision Camera".
- The Video Processing Control Module will disable the camera and that cameras portion of the display.

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.

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Schematic Reference

Object Detection Schematics

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- [Wiring Repairs](#)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the B225R Sideview Camera - Right harness connector. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 5 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing 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 K157 Video Processing Control Module.
 - **If less than 10 Ω**
3. Ignition ON.
4. Test for 4.8 - 7.2 V between the 6 V reference circuit terminal 6 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
 2. Test for infinite resistance between the 6 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 6 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 K157 Video Processing Control Module.
 - **If greater than 7.2 V**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.
 2. Test for less than 1 V between the 6 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
 - **If between 4.8 - 7.2 V**
5. Ignition ON.
6. Test for less than 10 V between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 4
 - **If 10 V or greater**
 1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing 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, replace the K157 Video Processing Control Module.

- **If less than 10 V**

7. Ignition OFF.

8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 4

- **If less than 100 Ω**

1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.

2. Test for infinite between the signal circuit and ground.

- If less than infinite resistance, repair the short to voltage on the circuit.
- If infinite resistance, replace the K157 Video Processing Control Module.

- **If greater than 100 Ω**

9. Test for less than 2 Ω between the video signal circuit terminals listed below:

- B225R Sideview Camera - Right video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 8 X1
- B225R Sideview Camera - Right video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 18 X1
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

10. Ignition OFF, connect the harness connector at the B225R Sideview Camera - Right.

11. Ignition ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.

12. Verify DTC B399D is not set.

- **If DTC B399D is set**

Replace the B225R Sideview Camera - Right.

- **If DTC B399D is not set**

13. All OK.

Repair Instructions

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

- Refer to [Side View Driver Information Camera 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 lists.

1. In order to verify that all of the following conditions are fulfilled before using the symptom lists perform the Diagnostic System Check: [Diagnostic System Check - Vehicle](#)

- No DTCs Stored
- The control modules can communicate via the serial data link.

2. Review the system description and 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 Departure Warning Description and Operation](#)
- [Lane Keep Assist Description and Operation](#)
- [Parking Assist Description and Operation \(with Rear Park Assist, UD7\)](#) [Parking Assist Description and Operation \(with Front and Rear Park Assist, UFQ\)](#)
- [Rear Vision Camera Description and Operation](#)
- [Side Blind Zone Alert Description and Operation](#)
- [Surround Vision Camera 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.

Intermittent

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

Symptom List

For more information see:

- [Forward Collision Alert System Malfunction](#)
- [Parking Assist System Malfunction](#)
- [Parallel Parking Assist System Malfunction](#)
- [Rear Vision Camera System Malfunction](#)
- [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.

DTC Descriptor

DTC B0987 01

Vehicle Direction Camera Indicator Circuit Short to Battery

DTC B0987 06

Vehicle Direction Camera Indicator Circuit Low Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Lane Departure Warning Switch Indicator Ignition	B0987 06	B0987 06	-	-
Lane Departure Warning Switch Indicator Control	B0987 06	B0987 06	B0987 01	-

Circuit/System Description

The lane departure warning is enabled and disabled through a switch located in the left steering wheel controls switch. When enabled, the frontview camera module will illuminate the indicator located in the switch.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The frontview camera module has detected a short to battery or open/high resistance in the control circuit.

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Action Taken When the DTC Sets

- Lane departure warning is 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

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 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, disconnect the harness connector at the S70L Steering Wheel Controls Switch - Left, ignition ON.

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

2. Test for 6.2 - 12.0 V between the dimming control circuit terminal 4 and ground.
 - **If less than 6.2 V**
 1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module. cardiagn.com
 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 , refer to [Interior Backlighting Malfunction](#).
 - **If greater than 12.0 V**
 1. Ignition OFF, disconnect the 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 - 12.0 V**
 3. Connect a test lamp between the control circuit terminal 5 and B+.
 4. Verify the test lamp turns ON and OFF when commanding the Lane Departure Warning Indicator 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 S70L Steering Wheel Controls Switch - Left.

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 [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.

DTC Descriptor

DTC B0967

Parking Assist On/Off Switch Circuit

DTC B0968

Parking Assist On/Off Switch 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
Parking Assist Switch Signal	B0967 02, 1	1	1	-
Parking Assist Switch Indicator Illumination	B0968 06, 2	B0968 06, 2	2	-
Parking Assist Switch Indicator Control	B0968 06, 2	B0968 06, 2	B0968 01,	-
Parking Assist Switch Ground	-	1	-	-
1. Parking Assist Switch Malfunction 2. Parking Assist Indicator Malfunction				

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

- Vehicle 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

Description and Operation

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

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. Vehicle 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. 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.
 - **If the Parking Assist Switch parameter changes between Active and Inactive**
5. All OK.

Circuit/System Testing

Parking Assist Indicator Malfunction

1. Vehicle OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. It may take up to 2 min for all vehicle systems to power down.
2. Test for 1.6 - 3.6 V between the control circuit terminal 6 and ground.
 - **If less than 1.6 V**
 1. Ignition OFF, disconnect the 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 , refer to [Interior Backlighting Malfunction](#) .
 - **If greater than 3.6 V**

1. Ignition OFF, disconnect the 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 1.6 - 3.6 V**
3. Connect a test lamp between the control circuit terminal 7 and signal circuit terminal 6.
4. Verify the test lamp turns On and Off when commanding the Parking Assist Switch On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module, Vehicle 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. 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 K182 Parking Assist Control Module.
 - **If the test lamp is always ON**
 1. Vehicle OFF, disconnect the harness connector at the K182 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 in the circuit.
 - If infinite resistance, replace the K182 Parking Assist Control Module.
 - **If the test lamp turns ON and OFF**
5. All OK.

Parking Assist Switch Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - 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 10 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 the scan tool Park Assist Switch parameter is Inactive.
 - **If not Inactive**
 1. Ignition OFF, disconnect the harness connector X1 at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the signal circuit terminal 2 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K182 Parking Assist Control Module.
 - **If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 2 and ground.
6. Verify the scan tool Park Assist Switch parameter is Active.
 - **If not Active**

1. Ignition OFF, disconnect the harness connector X1 at the K182 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. 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 K182 Parking Assist Control Module.
- **If Active**
7. Test or replace the S48D Multifunction Switch 2 - Instrument Panel.

Repair Instructions

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

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

PARALLEL 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.

DTC Descriptor

DTC B096B

Parking Assist Switch Parallel Parking 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
Parallel Park Assist Switch Signal	B096B 02	1	-	-
Parallel Parking Assist Switch Ground	-	1	-	-
1. Parallel Parking Assist Switch Malfunction				

Circuit/System Description

The parallel parking assist can be activated/deactivated by pressing the parallel parking assist switch.

Conditions for Running the DTC

- Vehicle ON
- The parallel parking assist is activated. The activation takes place through pressing the parallel parking assist switch.

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

- The parallel parking assist is disabled.

- An indicator in the driver information center shows the parking assistance is not available.

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, UFQ)

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. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. 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 10 and ground.
 - **If 10 Ω or greater**
 1. Vehicle 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. Vehicle ON.
4. Verify the scan tool Advanced Parking Assist Switch parameter is Inactive.
 - **If not Inactive**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel signal circuit terminal 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K182 Parking Assist Control Module.
 - **If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 1 and ground.
6. Verify the scan tool Advanced Parking Assist Switch parameter is Active.
 - **If not Active**
 1. Vehicle OFF, disconnect the harness connector at the K182 Parking Assist Control Module, vehicle ON.

2. Test for less than 1 V between the S48D Multifunction Switch 2 - Instrument Panel signal circuit terminal 1 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 K182 Parking Assist Control Module.
- **If Active**
7. Test or replace the S48D Multifunction Switch 2 - Instrument Panel.

Repair Instructions

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

- Refer to [Instrument Panel Center Accessory Function 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 driver 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 of 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

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. Vehicle 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**

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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. Vehicle OFF and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down. Disconnect the harness connector at the Side Object Sensor - Left.

2. Test for less than 10 Ω between ground circuit terminal 8 and ground.

- **If 10 Ω or greater**

1. Vehicle 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. Vehicle 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. Vehicle 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 Side Object Sensor - Left.

- **If the test lamp illuminates**

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

5. Test for less than 2 Ω in each of the serial data circuits end to end between the control module harness connector 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 Side Object Sensor - Left.

Right Side Object Sensor Malfunction

1. Vehicle OFF and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down. Disconnect the harness connector at the Side Object Sensor - Right.
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. Vehicle 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. Vehicle 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. Vehicle 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 Side Object Sensor - Right.
 - **If the test lamp illuminates**
4. Vehicle OFF and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down.
5. Test for less than 2 Ω in each of the serial data circuits end to end between the control module harness connector 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 Side Object Sensor - Right.

Repair Instructions

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

Refer to [Control Module References](#) 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 08

Rearview Camera Input Signal Circuit Malfunction

Diagnostic Fault Information

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

Circuit/System Description

When the vehicle is placed in reverse with the engine running, a video signal is sent from the rearview camera to the Radio. If the Radio does not see a signal from the camera it will set B127B 2B and display "Service Rear Vision System". The rearview camera is powered with ignition voltage and does not have a reverse signal circuit.

Conditions for Running the DTC

The vehicle must be in reverse with the engine running.

Conditions for Setting the DTC

B127B 08

Signal from the rearview camera not received by the Radio for 2.5 s.

Action Taken When the DTC Sets

- The Radio commands the driver information center to display "Service Rear Vision System".
- The Radio 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

- [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. Vehicle ON.
2. Verify that DTC B2545 is not set.
 - **If the DTC is set**
Refer to [DTC B2545](#) .
 - **If the DTC is not set**
3. 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**
4. Vehicle ON, transmission in R.
5. Verify the backup lamps are illuminated.
 - **If the backup lamps are not illuminated**
Refer to [Backup Lamps Malfunction](#) .
 - **If the backup lamps are illuminated**
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.

1. Vehicle OFF, disconnect the harness connector at the B87 Rearview Camera. 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. Vehicle 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. Vehicle ON.
 4. Verify a test lamp illuminates between the ignition circuit terminal 5 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Vehicle 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. Vehicle 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. Vehicle OFF, disconnect the X1 harness connector at the All Radio, vehicle ON.
 6. Test for less than 1 V between the signal circuit terminal listed below and ground:
 - B87 Rearview Camera signal (+) circuit terminal 15
 - B87 Rearview Camera signal (-) circuit terminal 14
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **If less than 1 V**
 7. Test for infinite resistance between the signal circuit terminal listed below and ground:
 - B87 Rearview Camera signal (+) circuit terminal 15
 - B87 Rearview Camera signal (-) circuit terminal 14
 - **If less than infinite resistance**
Repair the short to ground on the circuit.
 - **If infinite resistance**
 8. 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**
 9. 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**
 10. Replace the B87 Rearview Camera.
 11. Vehicle ON, transmission in R,
 12. 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 All Radio.
 - **If a clear rear vision image is displayed**
 13. 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.

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 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

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. Vehicle 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. Vehicle OFF, vehicle 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**

- **If both indicators turn ON and OFF**

6. All OK.

Circuit/System Testing

Left Side Object Sensor Malfunction

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

DTC Descriptors

DTC B356A

Vehicle Direction Warning Switch 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
Lane Departure Warning Switch Signal	B356A 02	1	B356A 05	-
Lane Departure Warning Switch Ground	-	1	-	-
1. Lane Departure Warning Malfunction				

Circuit/System Description

The lane departure warning system is controlled by the Frontview Camera - Windshield mounted on the windshield. Lane departure warning is enabled and disabled through a switch located on the steering wheel. When enabled, the Frontview Camera - Windshield or Active Safety Control Module will illuminate the indicator located in the switch.

When the system is operating and can detect the lane markings, the Frontview Camera - Windshield will request via serial data communications that the instrument panel cluster illuminate the green lane departure ready - to - assist indicator. If the Frontview Camera - Windshield detects that the vehicle has crossed a lane marking without the turn signal being used, the module will request that the instrument cluster flash the yellow lane departure warning indicator. An audible warning may also sound three times or the haptic seat (if equipped) may pulse when the yellow Instrument Cluster indicator is flashing. The driver can select between audible or haptic alerts in the vehicle personalization menu. See the Owner's Manual for more detailed information on vehicle personalization.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

DTC B356A 02

The Frontview Camera Module has detected a short to ground for more than 10 s.

DTC B356A 05

The Frontview Camera Module has detected a short to voltage or an open/high resistance for more than 10 s.

Action Taken When the DTC Sets

- Lane departure warning is disabled.
- Service Lane Departure is displayed on the driver information center.

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.

Diagnostic Aids

Manually pressing the lane departure warning switch for an extended length of time will cause this DTC to set.

Reference Information

Schematic Reference

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

1. Ignition ON.
2. Verify the scan tool Lane Departure Warning Switch Status parameter changes between Open and Closed while cycling the lane departure warning switch.
 - **If the parameter does not change**

Refer to Circuit/System Testing.
 - **If the parameter changes**
3. All OK.

Circuit/System Testing - Without MBM

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S70L Steering Wheel Controls Switch - Left.

2. Test for less than 10 Ω between the ground circuit terminal 1 and ground.
 - **If 10 Ω or greater**
 1. Vehicle 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 the scan tool Vehicle Direction Warning Switch Status parameter is Open.
 - **If not Open**
 1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield.
 2. Test for infinite resistance between the S70L Steering Wheel Controls Switch - Left signal circuit terminal 2 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the B174W Frontview Camera - Windshield.
 - **If Open**
5. Install a 3 A fused jumper wire between the signal circuit terminal 2 and ground.
6. Verify within 10 s the scan tool Vehicle Direction Warning Switch Status parameter is Closed.
 - **If not Closed**
 1. Ignition OFF, disconnect harness connector at the B174W Frontview Camera - Windshield. Ignition ON.
 2. Test for less than 1 V between the S70L Steering Wheel Controls Switch - Left signal circuit terminal 2 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 B174W Frontview Camera - Windshield.
 - **If Closed**
7. Test or replace the S70L Steering Wheel Controls Switch - Left.

Circuit/System Testing - with MBM

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
2. Test for less than 10 Ω between the ground circuit terminal 10 and ground.
 - **If 10 Ω or greater**
 1. Vehicle 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 the scan tool Vehicle Direction Warning Switch Status parameter is Open.
 - **If not Open**
 1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield.
 2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel signal circuit terminal 3 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.

- If infinite resistance, replace the B174W Frontview Camera - Windshield.

- **If Open**

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

6. Verify within 10 s the scan tool Vehicle Direction Warning Switch Status parameter is Closed.

- **If not Closed**

1. Ignition OFF, disconnect harness connector at the B174W Frontview Camera - Windshield. Ignition ON.

2. Test for less than 1 V between the S48D Multifunction Switch 2 - Instrument Panel signal circuit terminal 3 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 B174W Frontview Camera - Windshield.

- **If Closed**

7. Test or replace the S48D Multifunction Switch 2 - Instrument Panel.

Repair Instructions

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

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

REPAIR INSTRUCTIONS

FORWARD COLLISION ALERT DISPLAY REPLACEMENT

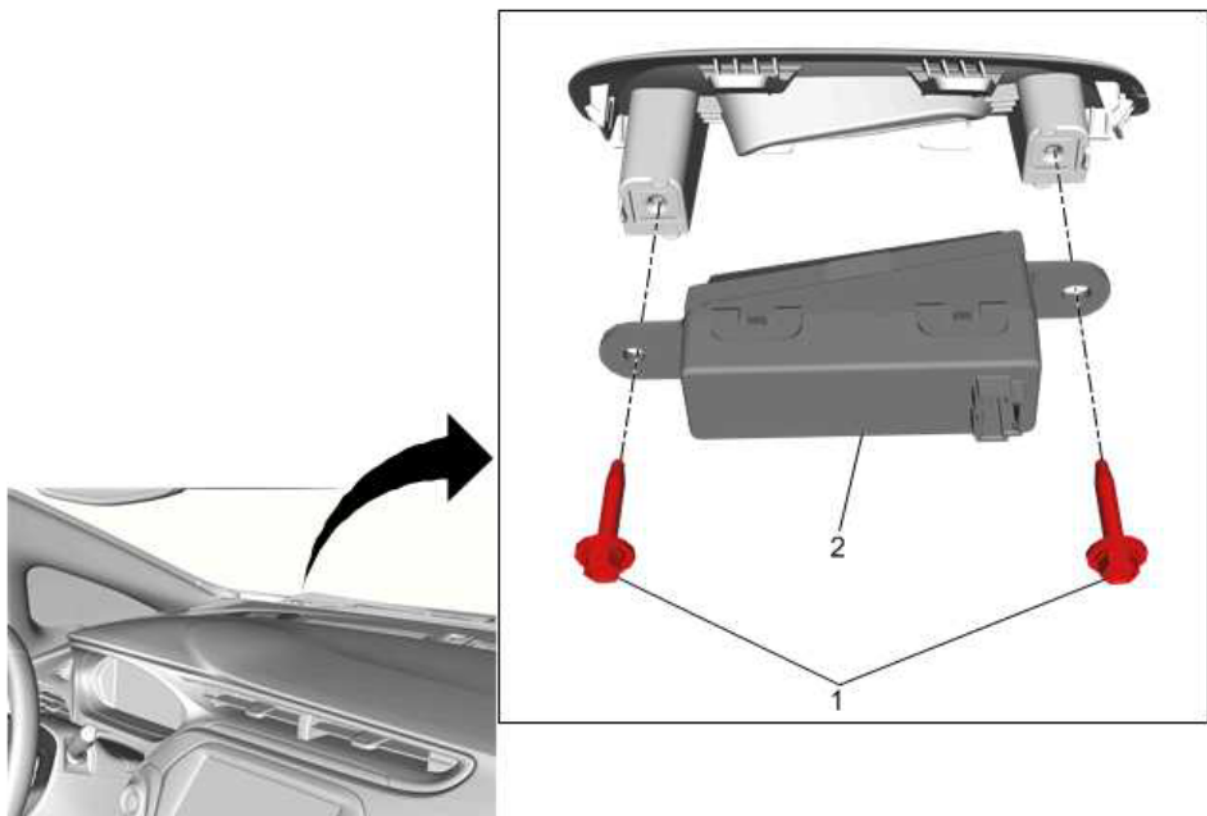


Fig. 11: Forward Collision Alert Display

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name	cardiagn.com

Callout	Component Name
Preliminary Procedure Remove Forward Collision Alert Display Bezel. Refer to Forward Collision Alert Display Bezel Replacement	
1	Forward Collision Alert Display Bolt (Qty: 2) CAUTION: Refer to Fastener Caution Tighten 2.5 N.m (22 lb in)
2	Forward Collision Alert Display Procedure Disconnect the electrical connector.

PARKING ASSIST CONTROL MODULE REPLACEMENT

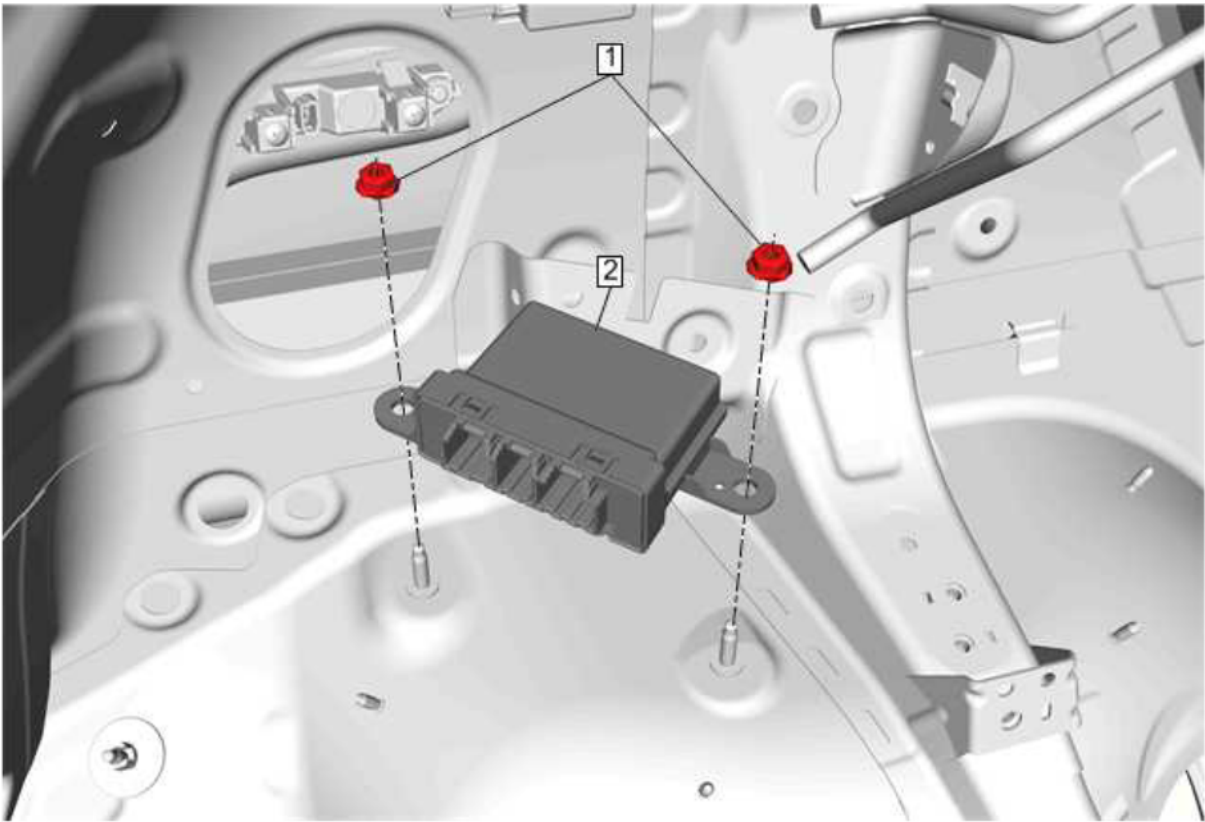


Fig. 12: Parking Assist Control Module
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Quarter Lower Rear Trim Panel - Left Side. Refer to Quarter Lower Rear Trim Panel Replacement	
1	Parking Assist Control Module Nut (Qty: 2) CAUTION: Refer to Fastener Caution Tighten 5 N.m (44 lb in)

Callout	Component Name
2	Parking Assist Control Module Procedure 1. Disconnect the electrical connector. 2. Perform the necessary programming and setup procedure. Refer to Control Module References

ADVANCED PARKING ASSIST ALARM SENSOR REPLACEMENT (FRONT)

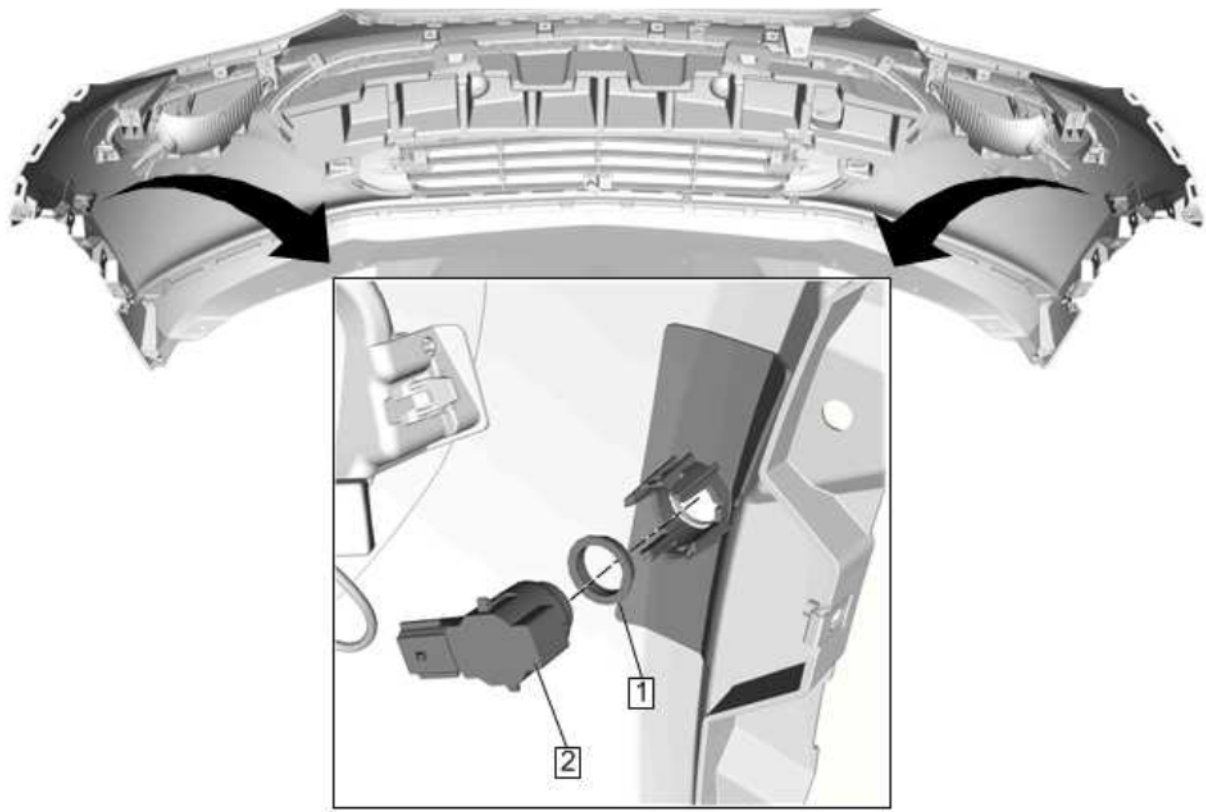


Fig. 13: Advanced Parking Assist Alarm Sensor (Front)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Front Bumper Fascia. Refer to Front Bumper Fascia Replacement (North America) Front Bumper Fascia Replacement (Europe, Korea)	
1	Advance Parking Assist Alarm Sensor Ring
2	Advance Parking Assist Alarm Sensor CAUTION: When painting the park assist sensors, DO NOT exceed a paint thickness of 80-120 micrometer. The overall thickness of the paint coat on the park assist sensors should be between 80-120 micrometer. If this paint thickness is exceeded, it may result in poor functioning of the parking assist sensors. Procedure 1. Disconnect the electrical connector. 2. Lift the locking tabs on the housing and remove the parking assist alarm sensor.

ADVANCED PARKING ASSIST ALARM SENSOR REPLACEMENT (REAR)

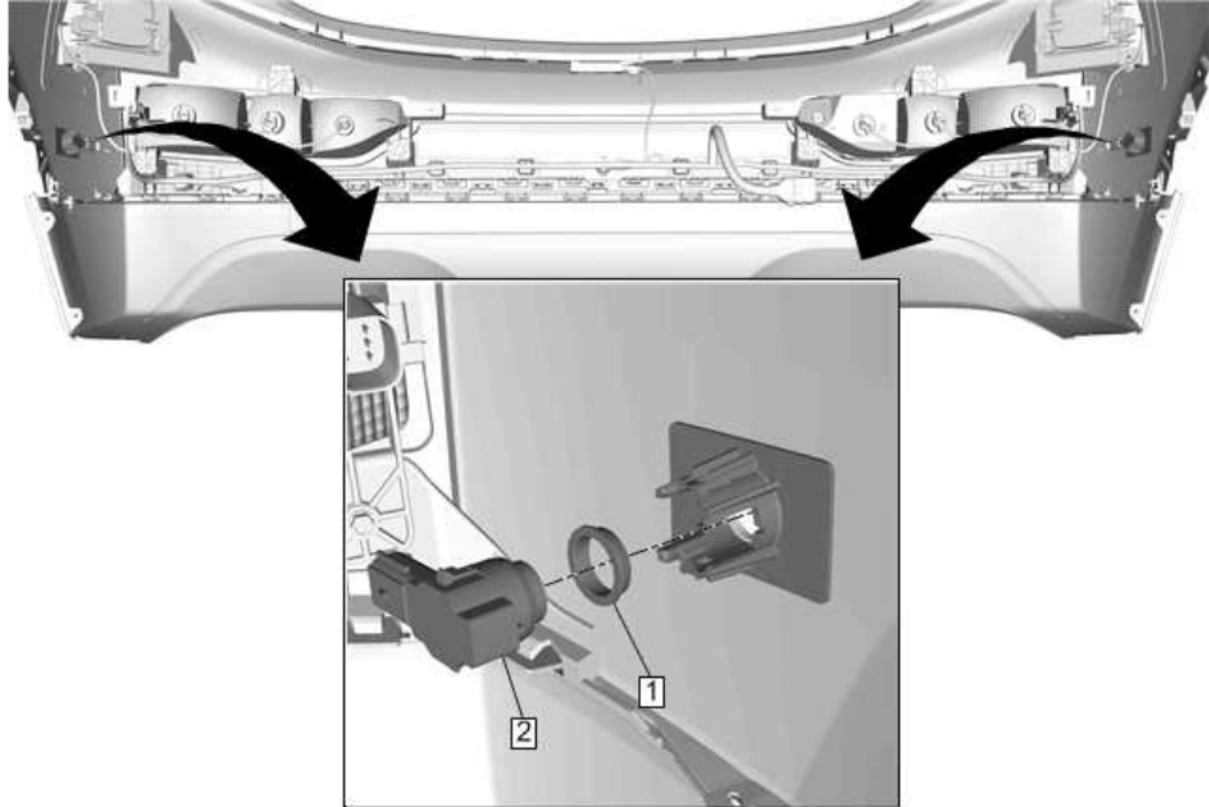


Fig. 14: Advanced Parking Assist Alarm Sensor (Rear)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove Rear Bumper Fascia. Refer to Rear Bumper Fascia Replacement	
1	Advance Parking Assist Alarm Sensor Ring
2	Advance Parking Assist Alarm Sensor CAUTION: When painting the park assist sensors, DO NOT exceed a paint thickness of 80-120 micrometer. The overall thickness of the paint coat on the park assist sensors should be between 80-120 micrometer. If this paint thickness is exceeded, it may result in poor functioning of the parking assist sensors. Procedure 1. Disconnect the electrical connector. 2. Lift the locking tabs on the housing and remove the parking assist alarm sensor.

FRONT PARKING ASSIST ALARM SENSOR REPLACEMENT

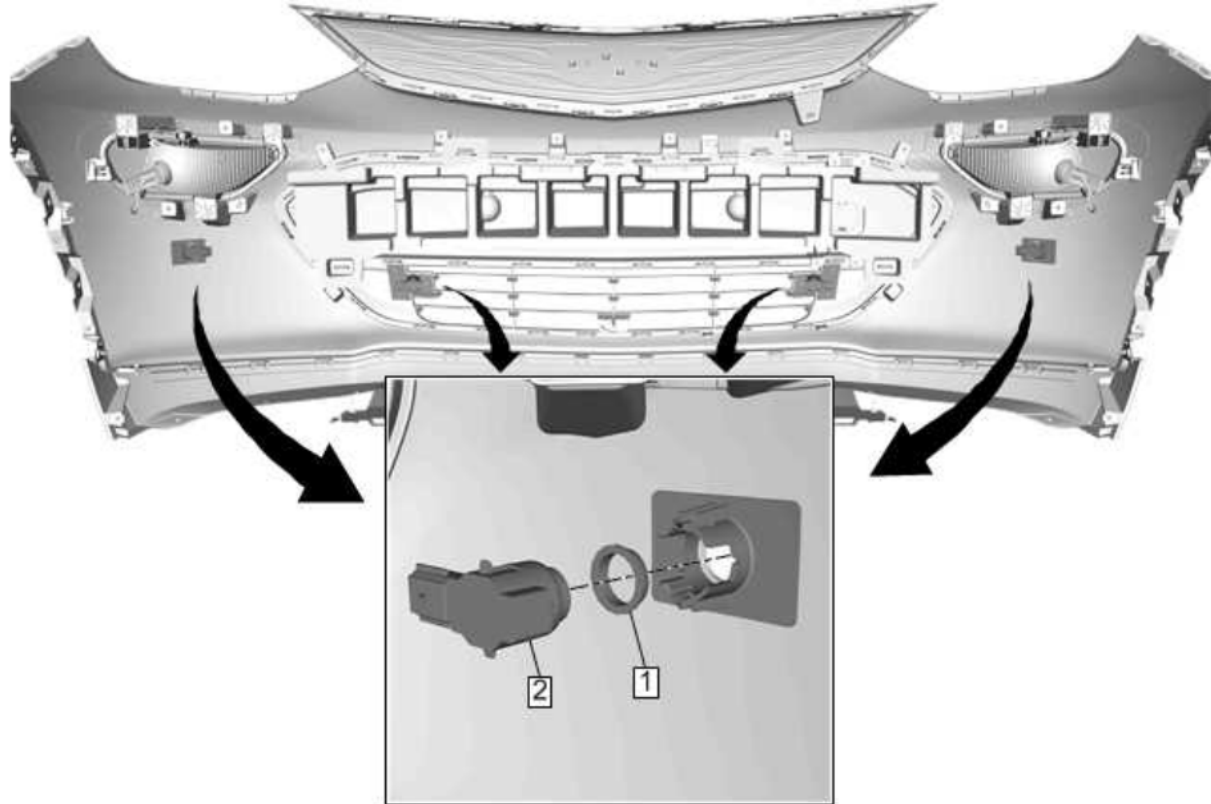


Fig. 15: Front Parking Assist Alarm Sensor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Front Bumper Fascia. Refer to Front Bumper Fascia Replacement (North America) Front Bumper Fascia Replacement (Europe, Korea)	
1	Front Parking Assist Alarm Sensor Ring
2	Front Parking Assist Alarm Sensor CAUTION: When painting the park assist sensors, DO NOT exceed a paint thickness of 80-120 micrometer. The overall thickness of the paint coat on the park assist sensors should be between 80-120 micrometer. If this paint thickness is exceeded, it may result in poor functioning of the parking assist sensors. Procedure 1. Disconnect the electrical connector. 2. Lift the locking tabs on the housing and remove the parking assist alarm sensor.

SIDE OBJECT SENSING ALERT MODULE REPLACEMENT

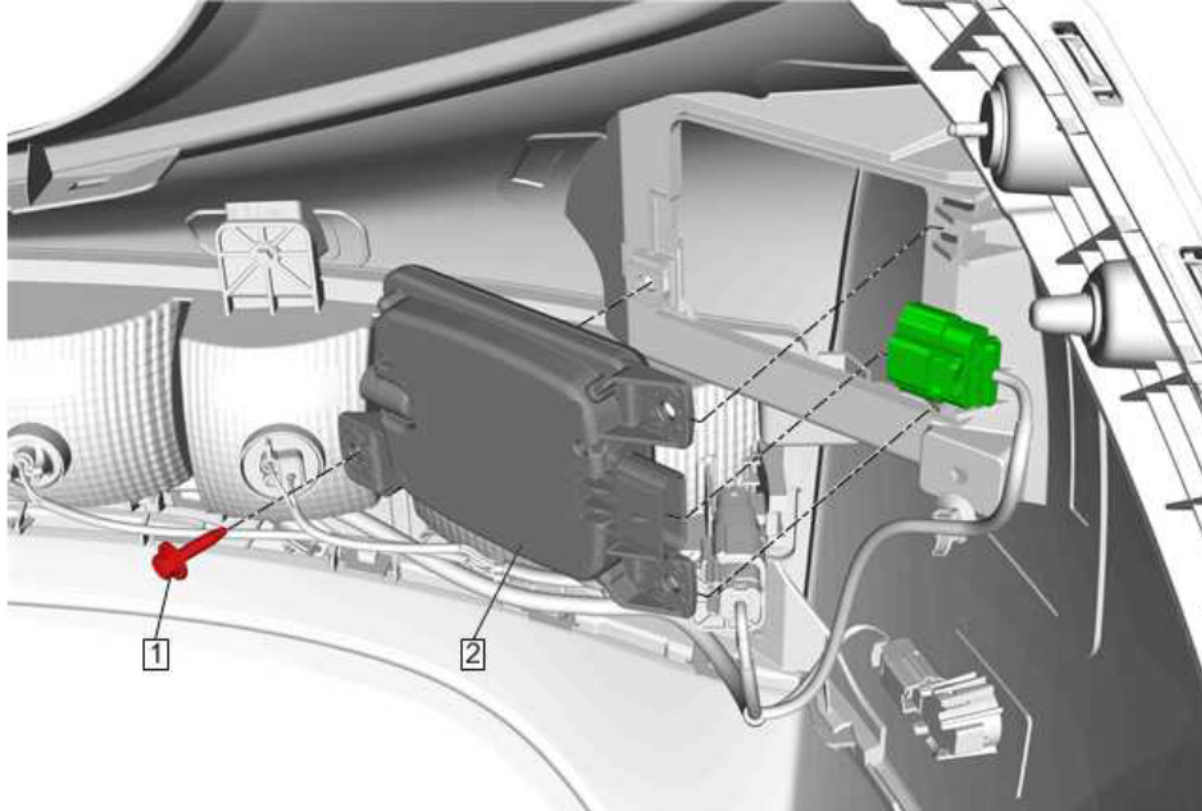


Fig. 16: Side Object Sensing Alert Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Rear Bumper Fascia Replacement	
1	Side Object Sensing Alert Module Bolt CAUTION: Refer to Fastener Caution Tighten 2.5 N.m (22 lb in)
2	Side Object Sensing Alert Module Procedure 1. Disconnect the electrical connector. 2. Perform the necessary programming and setup procedure. Refer to Control Module References

REAR PARKING ASSIST ALARM SENSOR REPLACEMENT

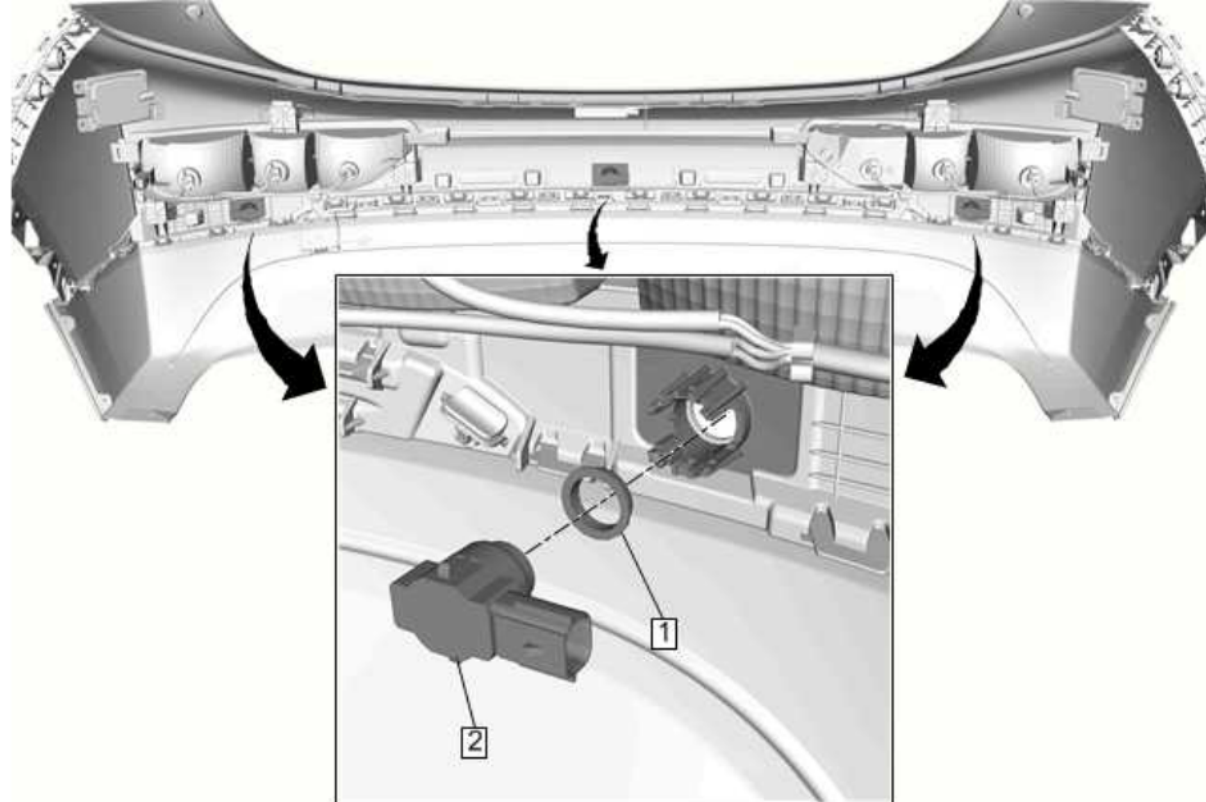


Fig. 17: Rear Parking Assist Alarm Sensor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove Rear Bumper Fascia. Refer to Rear Bumper Fascia Replacement	
1	Rear Parking Assist Alarm Sensor Ring
2	Rear Parking Assist Alarm Sensor CAUTION: When painting the park assist sensors, DO NOT exceed a paint thickness of 80-120 micrometer. The overall thickness of the paint coat on the park assist sensors should be between 80-120 micrometer. If this paint thickness is exceeded, it may result in poor functioning of the parking assist sensors. Procedure 1. Disconnect the electrical connector. 2. Lift the locking tabs on the housing and remove the parking assist alarm sensor.

MULTIFUNCTION RELAY MODULE BRACKET REPLACEMENT (WITH FRONT VIEW CAMERA)

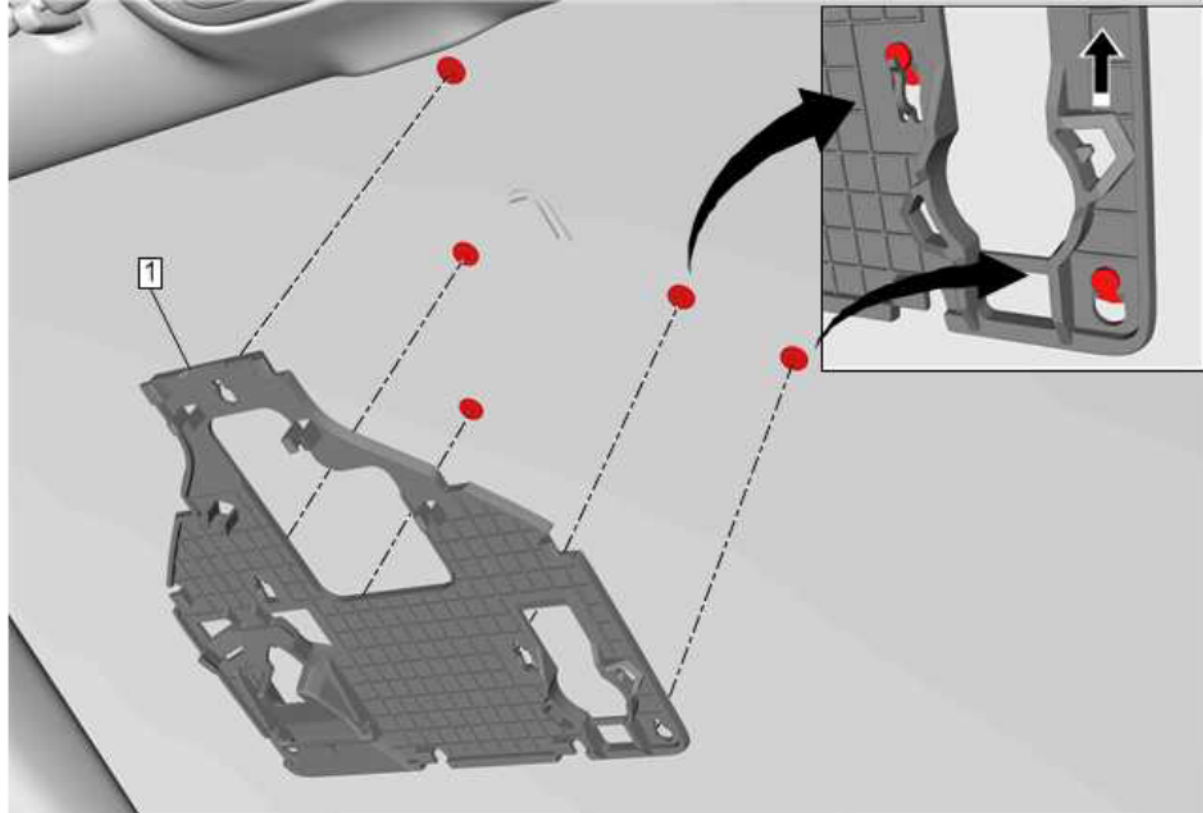


Fig. 18: Multifunction Relay Module Bracket (With Front View Camera)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Remove Front View Camera. Refer to Front View Camera Replacement 2. Remove Inside Air Moisture and Windshield Temperature Sensor (With Front View Camera). Refer to Inside Air Moisture and Windshield Temperature Sensor Replacement (With Front View Camera) 3. Remove Inside Rearview Mirror. Refer to Inside Rearview Mirror Replacement	
1	Multifunction Relay Module Bracket Procedure Slide the bracket upward to disengage tabs, gently pull from windshield.

MULTIFUNCTION RELAY MODULE BRACKET REPLACEMENT (WITHOUT FRONT VIEW CAMERA)

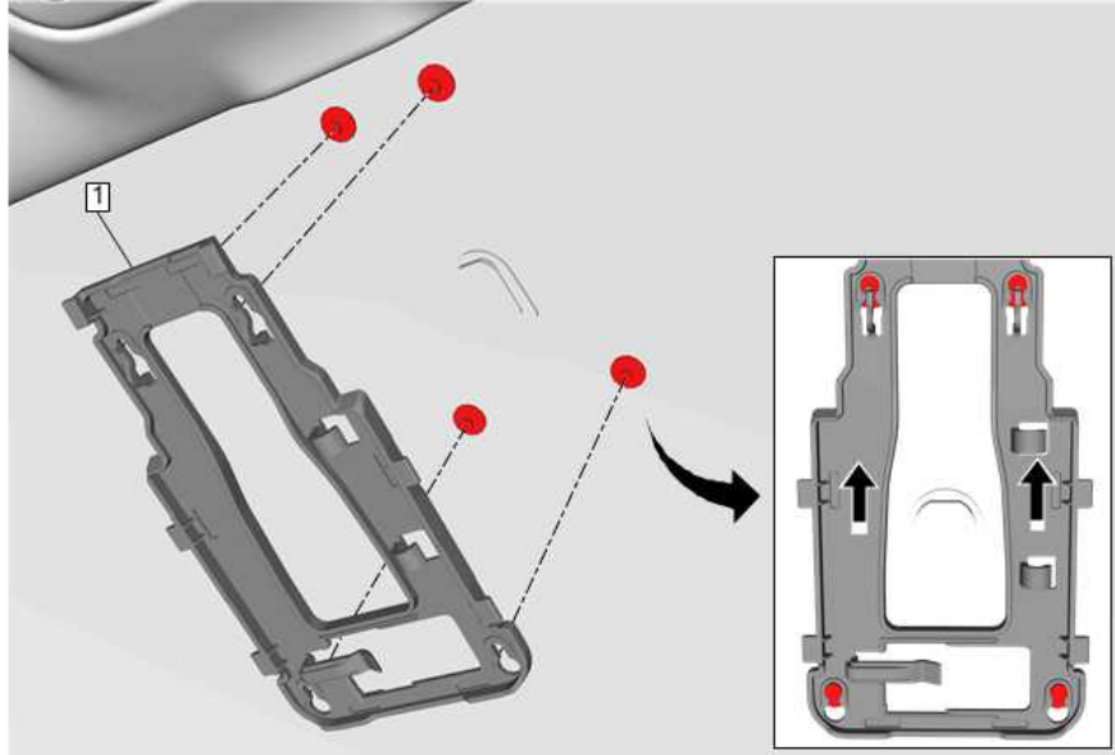


Fig. 19: Multifunction Relay Module Bracket (Without Front View Camera)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Remove Inside Air Moisture and Windshield Temperature Sensor (Without Front View Camera). Refer to Inside Air Moisture and Windshield Temperature Sensor Replacement (Without Front View Camera) 2. Remove Inside Rearview Mirror. Refer to Inside Rearview Mirror Replacement	
1	Multifunction Relay Module Bracket Procedure 1. Unclip wiring as necessary. 2. Slide the bracket upward to disengage tabs, gently pull from windshield. NOTE: Releasing the bracket is restricted by headliner. The bracket must be forced into the headliner and then released.

SIDE VIEW DRIVER INFORMATION CAMERA REPLACEMENT

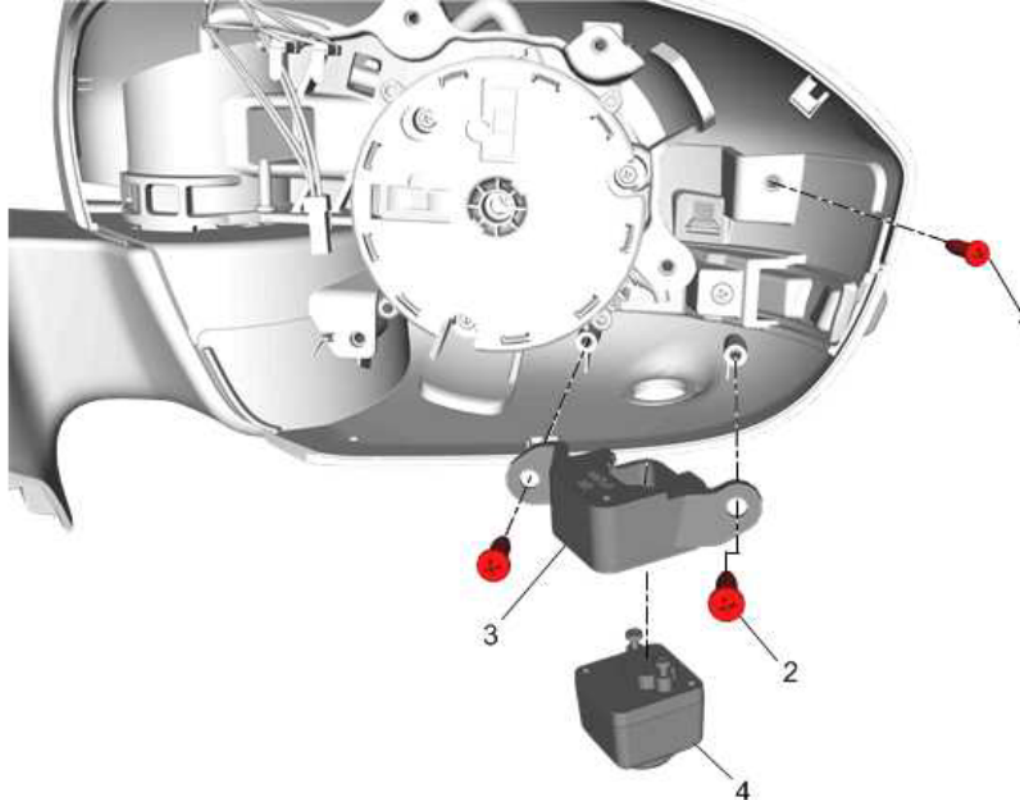


Fig. 20: Side View Driver Information Camera
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Outside Rearview Mirror Housing Bezel. Refer to Outside Rearview Mirror Housing Bezel Replacement	
1	Outside Rearview Mirror Housing Lower Cover Screw CAUTION: Refer to Fastener Caution Tighten 0.5 N.m (4 lb in)
2	Side View Driver Information Camera Screw (Qty: 2) Tighten 0.8 N.m (7 lb in)
3	Side View Driver Information Camera Bracket Procedure Slide off once camera is removed.
4	Side View Driver Information Camera Procedure 1. Separate the outside rearview mirror housing lower cover from upper cover. 2. Unclip and disconnect the electrical connector.

FRONT VIEW CAMERA REPLACEMENT

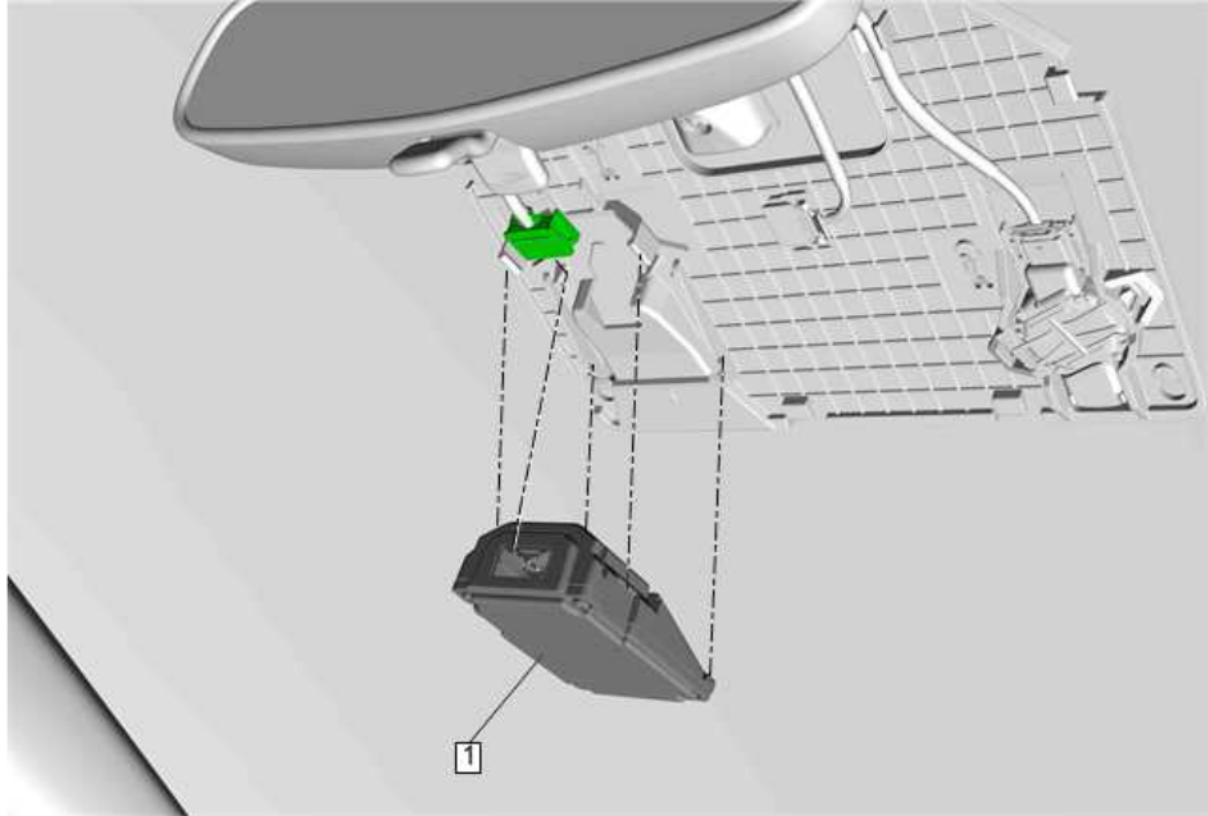


Fig. 21: Front View Camera

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Windshield Multifunction Sensor Mount Bracket Cover (with Front View Camera). Refer to Windshield Multifunction Sensor Mount Bracket Cover Replacement (with Front View Camera)	
1	Front View Camera Procedure 1. Gently release the retaining tabs on bracket. 2. Disconnect the electrical connector. 3. Perform all necessary programming and setup procedures for the control module. Refer to Control Module References

FRONT VIEW DRIVER INFORMATION CAMERA REPLACEMENT

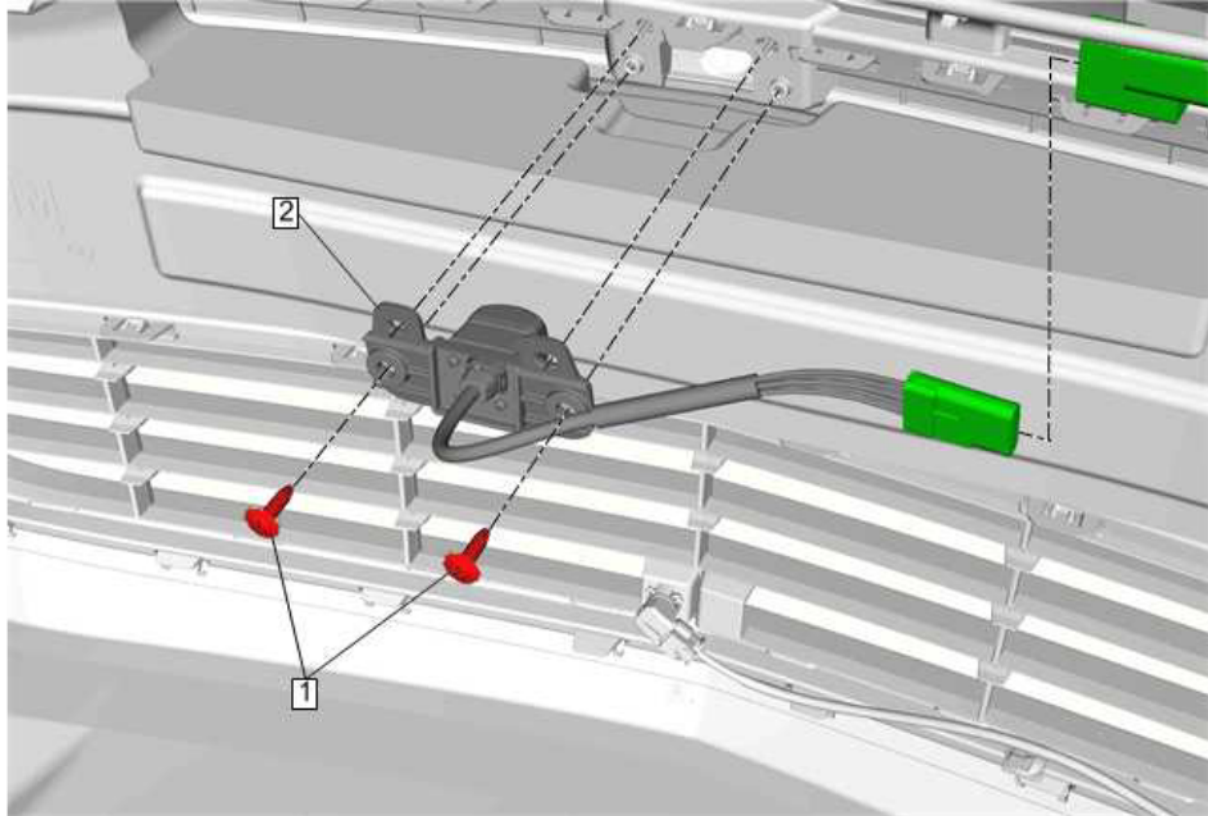


Fig. 22: Front View Driver Information Camera

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Front Bumper Fascia. Refer to Front Bumper Fascia Replacement (North America) Front Bumper Fascia Replacement (Europe, Korea)	
1	Front View Driver Information Camera Fastener (Qty: 2) CAUTION: Refer to Fastener Caution Tighten 2.5 N.m (22 lb in)
2	Front View Driver Information Camera Procedure Disconnect the electrical connector.

REARVIEW DRIVER INFORMATION CAMERA REPLACEMENT

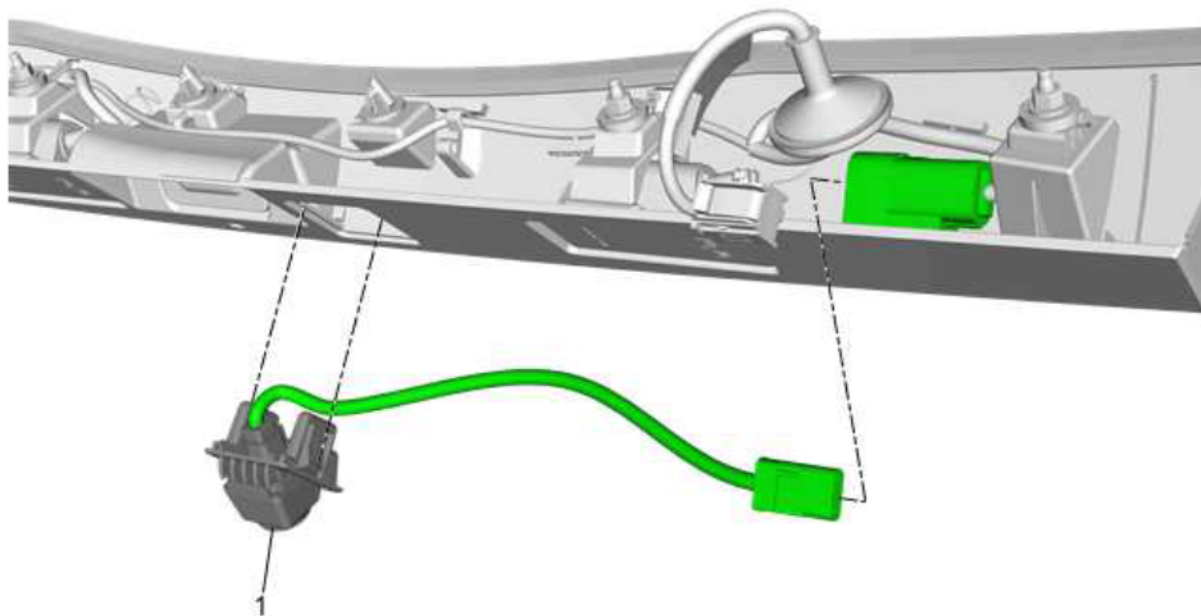


Fig. 23: Rearview Driver Information Camera
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove Rear Closure Center Applique. Refer to Rear Closure Center Applique Replacement	
1	Rearview Driver Information Camera Procedure Disconnect the electrical connector.

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 frontview 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, the K109 Frontview Camera Module will attempt to complete the service point calibration for 20 minutes after initialized. If the service point calibration does not complete within 20 minutes key-off the vehicle and the service point calibration will automatically restart on the next ignition cycle. This process shall work across ignition cycles and shall not be required to be re-initialized at start up. If the Lane Departure Warning or Lane Keep Assist Switch is pressed during calibration, the indicator will flash momentarily and then stay out - this is normal operation.

During this time the Lane Departure Warning or Lane Keep Assist amber indicator will illuminate.

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

NOTE:

If the front view camera module calibration is not completed during the current ignition cycle, it will restart in next ignition cycle. "Service Front Camera" will be displayed until successful calibration and DTC B10084B may be active.

When Lane Departure Warning is on, the indicator is green if Lane Departure Warning is available to warn of a lane departure. If the vehicle crosses a detected lane marking without using the turn signal in that direction, the indicator changes to amber and flashes. To verify if the system is working the indicator on the switch should remain illuminated once pressed, and when up to speeds greater than 35 mph (56 km/h), the lane departure indicator will illuminate on the instrument cluster.

The power mode be in ACCY for the calibration process to become enabled by using the scan tool. GDS2 will display a "loss of com" error message when the procedure is attempted in any power mode other than ACCY.

- 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. **Place vehicle in ACCY Power Mode**
4. Install scan tool
5. Navigate to the module diagnostics menu
6. Select Frontview Camera Module
7. Select Configuration/Reset Functions menu Item
8. Select the Frontview Camera Learn procedure and follow the directions displayed on the screen.
9. 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

The ideal calibration condition is driving on a 2 lane divided highway with markings on both sides of the lane. One or more of the following conditions may increase the length of time required to complete the self-calibration procedure: :

- Camera not properly installed. Verify it is snapped into tabs and is secure. Refer to [Front View Camera Replacement](#).
- 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

No Calibration

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

- Camera not properly installed. Verify it is snapped into tabs and is secure. Refer to [Front View Camera Replacement](#).
- 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

PARKING ASSIST SENSOR LEARN CALIBRATION

Calibration

The calibration process for the Parking Assist system is necessary when a parking assist sensor has been replaced or improperly learned.

To calibrate the Parking Assist sensors:

NOTE: Parking Assist Sensors should be at or near room temperature

1. Select **Parking Assist Sensor Learn** in the scan tool
2. Operate the vehicle in the following conditions until the calibration is complete:
 - Nothing is within 50 cm of the parking assist sensors
 - Ensure the parking assist sensors are clean
3. Vehicle OFF, scan tool disconnected, all doors closed, all accessories OFF, open and close driver door. It may take up to 2 min for all vehicle systems to power down.
4. Verify Parking Assist system is operating correctly and there are no DTCs set.

No Calibration

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

- Dirty or contaminated obstruction on the parking assist sensor
- Objects are within 50 cm of the parking assist sensors

Repair Instructions

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

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

VIDEO PROCESSING MODULE REPLACEMENT

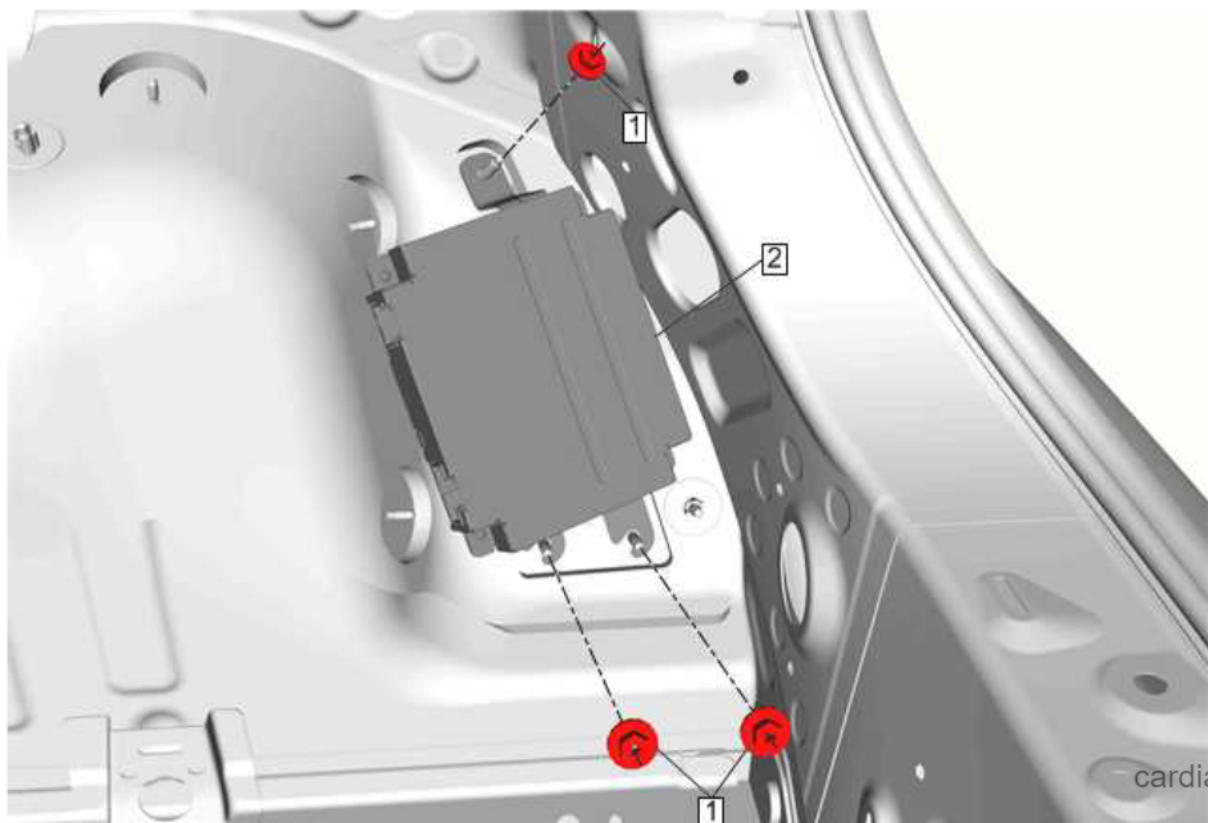


Fig. 24: Video Processing Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Quarter Lower Rear Trim Panel - Right Side. Refer to Quarter Lower Rear Trim Panel Replacement	
1	Video Processing Module Nut (Qty: 3) CAUTION: Refer to Fastener Caution Tighten 8 N.m (71 lb in)
2	Video Processing Module Procedure 1. Disconnect the electrical connector. 2. Perform the necessary programming and setup procedure. Refer to Control Module References

VIDEO PROCESSING CONTROL MODULE CALIBRATION

NOTE: Image will be slightly distorted at all times, the camera(s) lens is a fish-eye lens meant to capture as much as possible.

The calibration procedure is to have the Video Processing Control Module learn the new cameras and their positions. The calibration does not start automatically or if manual initialization is desired, calibration can be initiated by selecting Video Processing Control Module Camera Learn in the scantool.

Radio Display Prompt Example

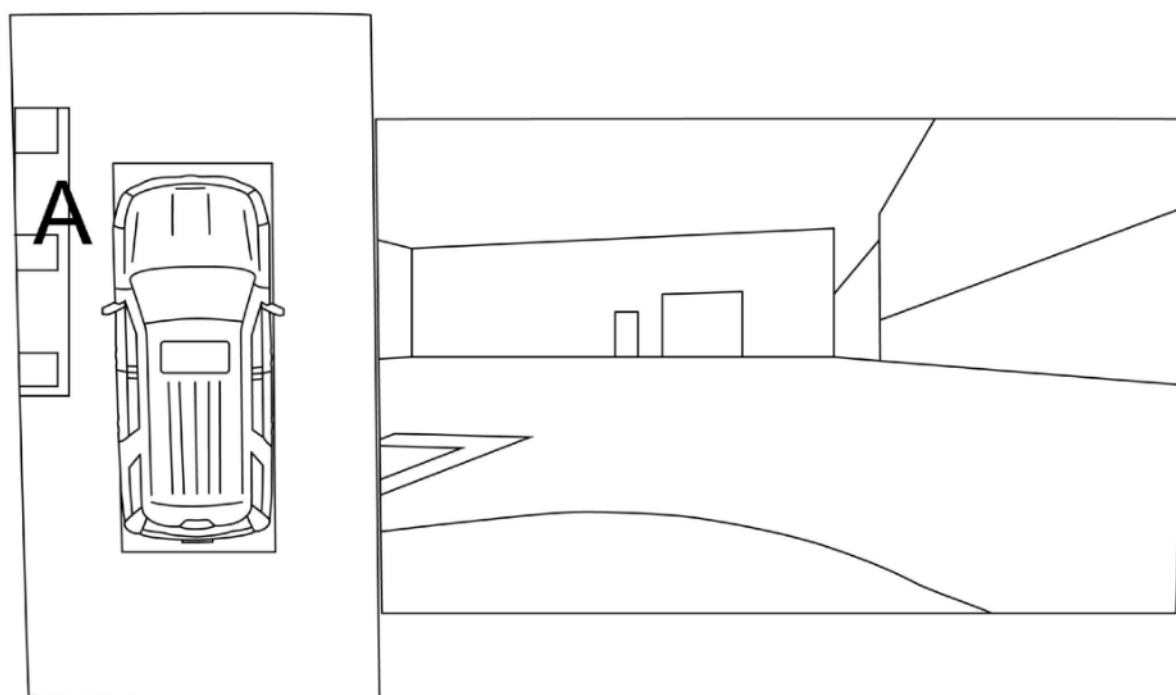


Fig. 25: Radio Display Prompt Example
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Only ONE EL-51372 Camera Calibration Mat is required for calibration.

The left side of the screen will display where the **EL-51372** Camera Calibration Mat should be located for each step. The right side of the display is the view from the camera that is being learned during that step.

Mat Position Reference

- Position A is the left front
- Position B is the right front
- Position C is the left rear
- Position D is the right rear

Diagnostic Aids

- If any one of the cameras is replaced on the Surround Vision Camera System, the displayed image may not be correctly stitched due to a change in the location or orientation of the camera. The only way to correct an incorrectly stitched image is to perform the calibration procedure.
- Tires must be inflated properly
- Vehicle must be on a level surface
- Mirrors must be folded out
- It is a good practice to wipe camera lens' clean prior to alignment
- Interfering objects or glare from overhead lighting will fail an alignment
- All points of access to the inside of the vehicle **Must** be closed, including hood.
- **Finalize** is the very last step, this saves all the data from the alignment

Calibration

NOTE: Diagnostic Aids **MUST** be followed prior to Calibration

This is the calibration process for the Surround Vision Camera system. When the Video Processing Control Module is replaced, calibration must be performed. If the following occurs, calibration is recommended but not required:

- If a camera is replaced
- If mirrors or fascias are replaced, removed, or physically adjusted

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

- Clean camera lenses.
- Follow the on screen instructions with regards to EL-51372 camera mat placement
- Vehicle must be ignition ON or Vehicle ON

NOTE:

- **Camera Calibration Mat location is very critical for the cameras to learn. If the image displayed is heavily distorted, the mat position was not correct. For correct mat location, refer to the box EL-51372 came in. Place the mat 50 cm from the vehicle when performing calibration or camera learn. For Fore/Aft alignment, place the mat so the distance from the closest edge of the center square, to the bumper, is 70 cm.**
- **Camera Calibration Mat must be as flat as possible. Wrinkles in the matt will cause a distorted view for the camera.**
- **When an exclamation (!) is seen on the radio display, camera learn was not completed or there was an error. To clear this, press Retry**
- **At any point where the Calibration is stuck and radio display does not show any camera images, clicking Cancel from the**

scan tool learn screen will resolve the issue and will return to previous learn position

- If at any point in the calibration procedure the alignment process is interrupted, clicking Retry from the scan tool learn screen will cancel the current learn process and can be procedure can be restarted
- **DO NOT Click Finalize prior to step 7**

1. Using the scan tool, select the desired camera to calibrate, or all cameras if necessary.
2. Click Initiate on the scan tool learn screen. This starts the calibration process.
3. The radio display will show the desired EL-51372 camera calibration mat position.

NOTE: **Mat must be flat on the floor**

4. Place the EL-51372 camera mat in the position shown on the display. Use the box EL-51372 came as a ruler to align the mat with the vehicle correctly.

NOTE: **In an event of an error, click the Retry button to reset the image and try a new capture. DO NOT Click Finalize until step 7**

5. Once the mat is correctly positioned, Click **Capture** on the scan tool learn screen. This captures the image.
 - If a red "X" is displayed, correct the EL-51372 camera mat position
 - If a green checkmark is displayed, the image was accepted.
6. Leave the EL-51372 camera mat in that position until the camera display prompts for it to be moved to the next position, or if calibration is complete.
7. Once the last camera image has been capture, click Finalize on the scan tool learn screen. This completes the learn.

Sequence of Camera Alignment

Left Camera Alignment Learn:

1. Captures an image at Position C
2. Captures an image at Position A

Right Camera Alignment Learn:

1. Captures an image at Position D
2. Captures an image at Position B

Front Camera Alignment Learn:

1. Captures an image at Position A
2. Captures an image at Position B

Rear Camera Alignment Learn:

1. Captures an image at Position D
2. Captures an image at Position C

All Cameras Alignment Learn:

1. Captures an image at Position A
2. Captures an image at Position B
3. Captures an image at Position C
4. Captures an image at Position D

Error Code	Cause	Possible Repair
0101 Front Camera 0103 Front Camera 0201 Right Camera 0203 Right Camera 0301 Rear Camera 0303 Rear Camera 0401 Left Camera 0403 Left Camera	Lighting Issue, Obstructed View of Target, Target Position out of Range, Poor Camera installation	Correct Lighting, Reposition Target, Verify Camera correctly installed and clean.
0102 Front 0202 Right 0302 Rear 0402 Left	Lighting Issue, Obstructed View of Target, Target Position out of Range	Correct Lighting, Reposition Target, Verify Camera is clean.
0104 Front 0204 Right 0304 Rear 0404 Left	Camera Position incorrect	Correct camera position
0120 Front 0220 Right 0320 Rear 0420 Left	NTSC error detected	Verify camera electrical connection
FFF0 Passenger Door FFF1 Left Rear Door FFF2 Right Rear Door FFF3 Driver Door FFF4 Trunk FFF5 Hood FFF6 Liftglass	Hood, Door, Liftgate, Trunk or other part of car OPEN	Close all doors, Hood, Liftgate, and Trunk

VIDEO DISPLAY INSIDE REARVIEW MIRROR CAMERA REPLACEMENT

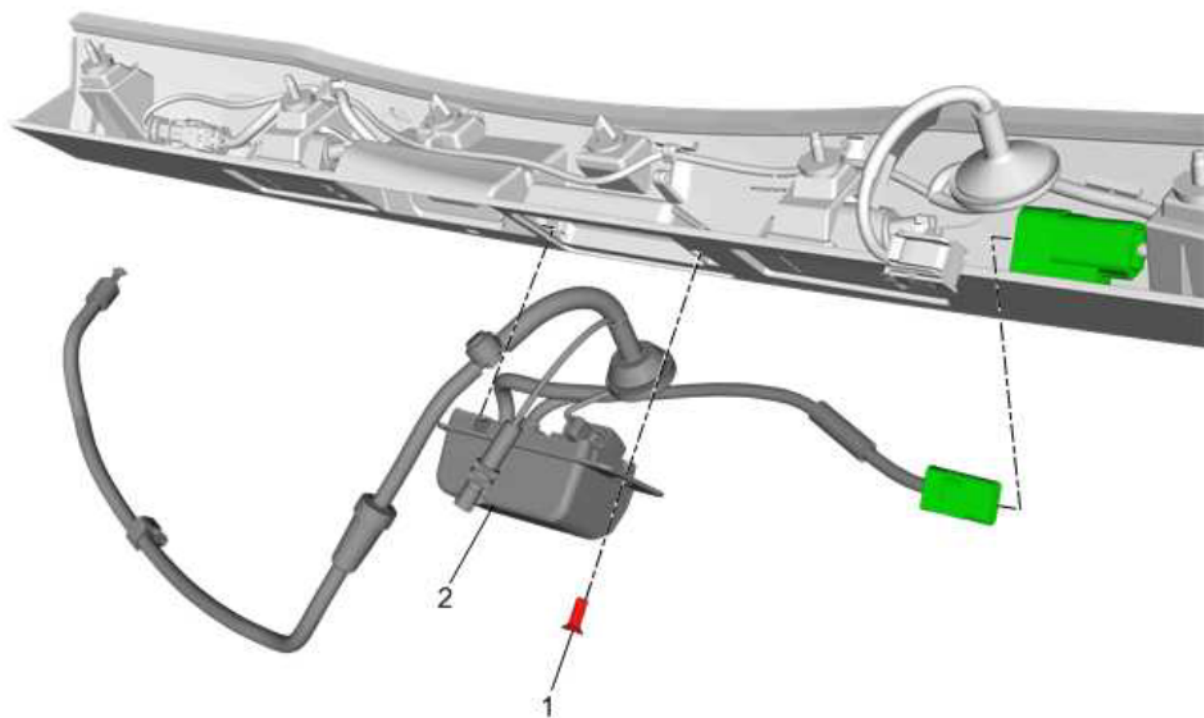


Fig. 26: Video Display Inside Rearview Mirror Camera

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove Rear Closure Center Applique. Refer to Rear Closure Center Applique Replacement	

Callout	Component Name
1	Video Display Inside Rearview Mirror Camera Screw CAUTION: Refer to Fastener Caution
2	Video Display Inside Rearview Mirror Camera Procedure Unclip and Disconnect the electrical connector.

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.

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, UFQ)

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 are 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

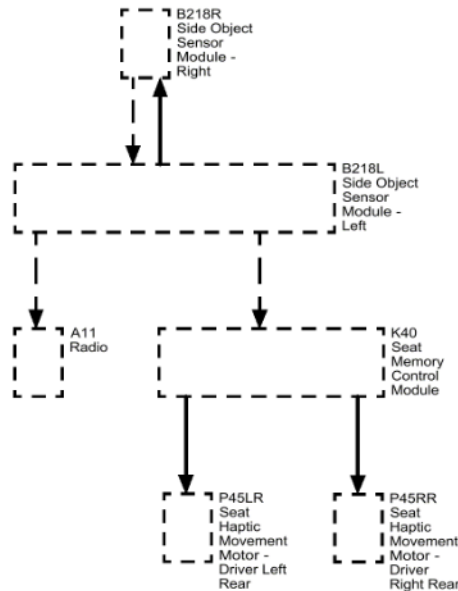


Fig. 27: Rear Cross Traffic Alert Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

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

The rear cross traffic alert system is a feature that utilized two side object sensor modules to provide enhanced customer convenience while backing up by sensing and providing warnings to the driver on impending rear cross traffic. The rear cross traffic alert system is designed to detect and track moving objects as small as a 125cc motorcycle with rider 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 warning, if equipped and enabled, to the presence of moving 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.

Rear Cross Traffic Alert System Components

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

- Left side object sensor module
- Right side object sensor module
- Visual Display Icons located on the infotainment display screen
- Audio system chime
- Haptic safety seat (if equipped)

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 moving objects nearby. The left side object sensor is the master that communicates on serial data. There is a

private communication network between the left and right sensors. The scan tool is able to communicate only with the left sensor.

When a moving object is detected in the left rear cross traffic zone while the engine is running and the transmission in reverse, the side object sensor module sends a serial data message to the human interface module and memory seat module to provide alerts. Each sensor is supplied B+ and ground.

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 rearview camera display, that are used to alert the driver on rear cross traffic from each side of the host vehicle respectively. In addition to visual indicators, the audio system will beep (if enabled) and the haptic safety seat will vibrate (if equipped and enabled). Refer to owner's manual for vehicle customization.

Audio or Haptic Notification

The alert output type can be driver selected to either audio or haptic. The chime location will be left rear for left rear cross traffic alert and right rear for right rear cross traffic alert. The haptic seat system response will be to generate 3 repetitions of haptic vibration in the left rear area of the seat for left cross traffic alert and right rear area of the seat for right cross traffic alert. If there is a problem with the haptic seats, the audio chime will be substituted.

Rear Cross Traffic Alert Operation

The rear cross traffic alert system is designed to detect moving 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.

If the vehicle is towing a trailer or has an object such as a bicycle rack attached to the rear of the vehicle, the rear cross traffic alert system may not function properly.

Foul weather may affect the operation of the rear cross traffic alert 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.

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 side object sensors are also used for side blind zone alert and/or lane change alert, these feature will also be inoperative. Check vehicle for DTCs to determine the cause of this notification.

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SIDE DETECTION SYSTEM TEMPORARILY UNAVAILABLE

This message indicates that the system has been temporarily disabled because the sensors are blocked or can otherwise not accurately detect vehicles or objects. Verify there is no damage to rear fascia or there are any bumper stickers that may interfere with the radar signals. Ask the customer if any of the following circumstances that present when the system became unavailable: mud, dirt, snow, ice, or slush build-up on the rear fascia, heavy rainfall, or excessive road spray.

SIDE BLIND ZONE ALERT DESCRIPTION AND OPERATION

The side blind zone alert system is a lane-changing aid that assists drivers with avoiding crashes that occur with vehicles in the side blind zone (or spot) areas. When the vehicle is moving forward, the left or right side mirror display will illuminate if a vehicle is detected in the blind zone. If the turn signal is activated and a vehicle is also detected on the same side, the display will flash as an extra warning not to change lanes. The side blind zone alert monitors the blind spot area along side the vehicle, approximately 3.5 m (11 ft) from the side of the vehicle, extending 5 m (16 ft) behind the mid-point of the vehicle.

The lane change alert system is a lane-changing aid that assists drivers with avoiding lane change crashes that occur with vehicles rapidly approaching the side blind zone (or spot) areas from behind. The lane change alert warning display will illuminate in the corresponding outside rearview mirror and will flash as an extra warning not to change lanes if the turn signal is on. The lane change alert system monitors the lane area along side the vehicle, approximately 3.5 m (11 ft) from the side of the vehicle, extending up 70 m (230 ft) beyond the rear bumper.

While in reverse, the rear cross traffic alert system displays a triangle with a left or right pointing arrow on the info display module to warn of traffic coming from the left or right. This system detects objects coming from up to 20 m (65 ft) from the left or right side of the vehicle. When an object is detected, either three beeps sound from the left or right or three safety alert seat pulses occur on the left or right side, depending on the direction of the detected vehicle.

Side Blind Zone Alert System Components

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

- Side object sensor module - left
- Side object sensor module - right
- Driver outside rearview mirror
- Passenger outside rearview mirror
- Infotainment system
- Safety alert seat

Side Object Sensor Module

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. The side object sensor module - left is the master that communicates on vehicle serial data bus. There is a private serial data bus between the left and right sensors. The scan tool is able to communicate only with the left sensor. The sensors are unique and not interchangeable from side to side.

The side object sensor module - right controls both side blind zone indicators located on the left and right outside rearview mirrors. Each indicators receives ground at all times. When an object has been detected in the vehicle's blind spot or a vehicle is fast approaching from the rear, the side object sensor module - right will apply voltage to the appropriate indicator, illuminating it. If the turn signal is on, indicating the driver intends to change lanes, side object sensor module - right will flash the appropriate indicator as an additional means of alert.

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 and night conditions. The side object sensor module - right controls both side blind zone indicators.

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Infotainment System

The infotainment system controls the audible alerts for the rear cross traffic alert system. If cross traffic is present, the side object sensor module - left will command the infotainment system issue an audible alert to the driver. The audible alert will sound from the side of the vehicle where traffic is approaching from.

The infotainment system also includes the info display module. When in R, any cross traffic warnings will be overlaid over the rear vision camera image on the info display module.

Safety Alert Seat

The memory seat module controls the haptic alert provided by the seats. If cross traffic is present, the side object sensor module - left will command the safety alert seat issue a haptic alert to the driver on the side of the seat where traffic is approaching from.

Side Blind Zone Alert Operation

When the vehicle is started, both side blind zone indicators located on the left and right outside rearview mirrors will briefly illuminate to indicate that the system is operating. The system is designed to detect objects in an area approximately between 0.5 m (1.5 ft) and 2 m (6 ft) off the ground. The side blind zone alert monitors the blind spot area along side the vehicle, approximately 3.5 m (11 ft) from the side of the vehicle, extending 5 m (16 ft) behind the mid-point of the vehicle. 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, an amber warning symbol will illuminate on the appropriate outside mirror. This indicates that it may be unsafe to change lanes. If the driver 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.

Lane Change Alert Operation

The lane change alert system shall detect and report objects in the driver's blind zone, or approaching on either side of the vehicle, within a specified lane change 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 lane change alert system, the driver must check carefully for objects outside of the reporting zone 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 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. Lane change alert is active when the vehicle is out of park or the parking brake is off on manual transmission vehicles. When the system detects a vehicle in the side blind zone or approaching in the lane change alert 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.

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 70 m (230 ft) behind the vehicle at a height between 0.5 m (1.5 ft) and 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.

If the vehicle is towing a trailer or has an object such as a bicycle rack attached to the rear of the vehicle, the lane change alert system may not function properly and the indicators may illuminate intermittently or remain illuminated all the time. The driver information center may display "SIDE DETECTION SYSTEM UNAVAILABLE".

Foul weather may affect the operation of the lane change alert 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. The warning symbols will vary brightness based on the ambient light conditions.

Rear Cross Traffic Alert Operation

The rear cross traffic alert system is designed to detect moving objects approaching the side of the vehicle while backing up. 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 km/h (6 mph) or less and is designed to detect objects moving at speeds up to 36 km/h (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 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.

If the vehicle is towing a trailer or has an object such as a bicycle rack attached to the rear of the vehicle, the rear cross traffic alert system may not function properly.

Foul weather may affect the operation of the rear cross traffic alert 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.

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.

LANE CHANGE 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.

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. When the message is displayed, the indicators will remain illuminated at all times, notifying the driver that the side blind zone and lane change alert should not be relied upon when changing lanes and the rear cross traffic alert 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 be 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.

SURROUND VISION CAMERA DESCRIPTION AND OPERATION

WARNING: The Surround Vision cameras have blind spots and will not display all objects near the corners of the vehicle. Folding side mirrors that are out of position will not display surround view correctly. Always check around the vehicle when parking or backing.

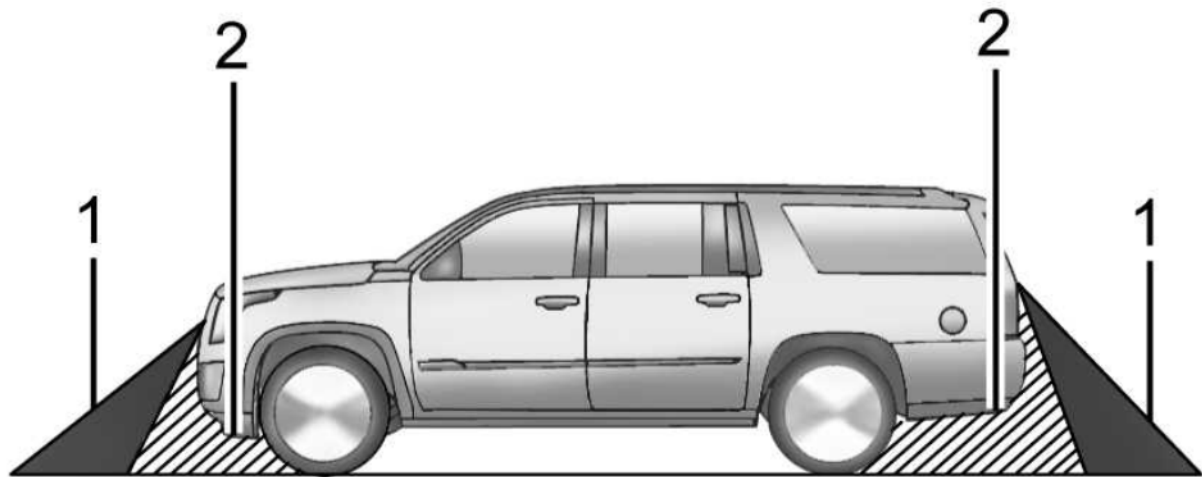


Fig. 28: Surround Vision Camera View And Area
Courtesy of GENERAL MOTORS COMPANY

1. View Displayed by the Surround Vision Camera
2. Area Not Shown

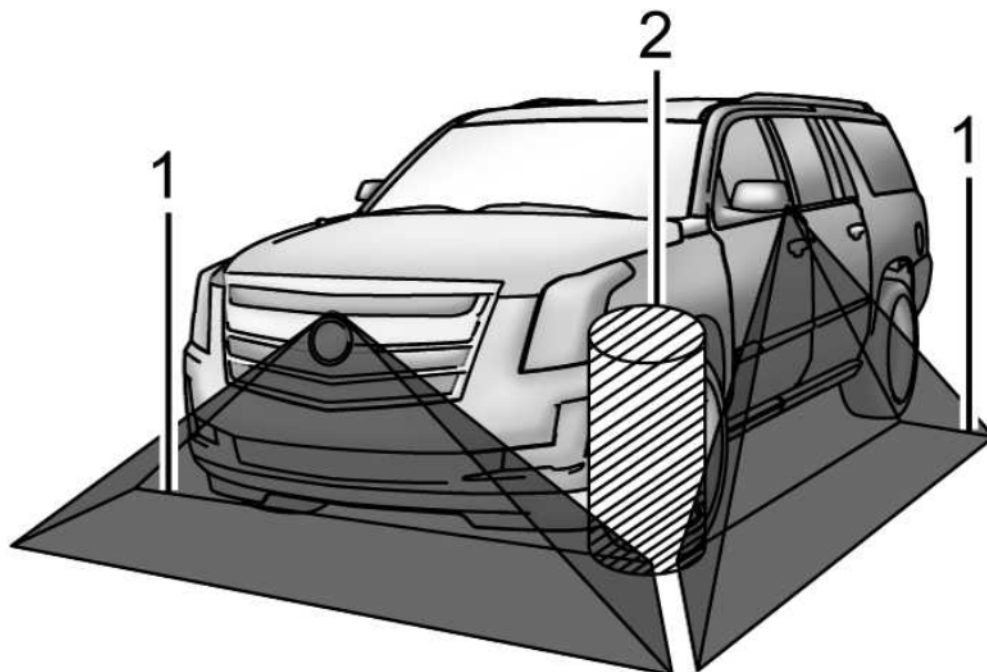


Fig. 29: Surround Vision Camera View And Area
Courtesy of GENERAL MOTORS COMPANY

1. View Displayed by the Surround Vision Camera
2. Area Not Shown

The surround vision camera system consists of the following components:

- B87 Rearview Camera
- B174G Frontview Camera - Grille

- K157 Video Processing Control Module
- A11 Radio **OR** K74 Human Machine Interface Module
- B225L Sideview Camera - Left
- B225R Sideview Camera - Right

When the vehicle is traveling at speeds slower than 6 mph (10 kph) the video processing control module will power up the cameras and send a video signal to the radio or human machine interface module.

The following conditions may cause a degraded surround 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

Surround Vision displays an overhead view of the area surrounding the vehicle, along with the front or rear camera views in the center stack. The front camera is in the grille or near the front emblem, the side cameras are on the bottom of the outside rearview mirrors, and the rear vision camera is above the license plate.

Features of the Surround Vision System

- Rear camera (B87 Rearview Camera) view alongside overhead view is displayed in reverse
- Front camera (B174G Frontview Camera - Grille) view alongside overhead view is displayed after shifting out of reverse to Neutral or Drive
- Will display front view when front park assist object is within trigger range calibration value (30 cm (12 in) in a forward gear
- Image is removed from display when vehicle speed exceeds speed calibration (10 kph/6 mph) or button press/screen touch

System Operation

The video processing control module sends voltage and a constant ground to power the cameras. Video signal + and video signal - circuits carry the video image from the cameras to the video processing control module for processing. The video processing control module will then send the processed image output to infotainment system by Video signal + and video signal - circuits. Additionally, all the video signal circuits are twisted and shielded to prevent any interference which may lead to a loss of video signal resolution and cause a degraded video image. These circuits must not be spliced/removed from shielding or will cause image degradation.

The video processing control module receives CAN information from Rear Park Assist object detection module and Steering Wheel angle from body control module during Reverse. A warning triangle may display during the 360 surround view screen if Rear Parking Assist has detected an object during a reverse. This triangle changes from amber to red and increases in size the closer the object. Also a dynamic guideline is displayed in Reverse to show the projected path of the vehicle.
