ACCESSORIES & EQUIPMENT

Object Detection and Pedestrian Protection - Escalade, Suburban, Tahoe, Yukon

SPECIFICATIONS

FASTENER SPECIFICATIONS

Application	Specification	
	Metric	English
Forward Collision Alert Display Fastener	2.5 N.m	22 lb in
Forward Range Radar Bracket Bolt - Cadillac with AVF	9 N.m	80 lb in
Forward Range Radar Bracket Bolt - Cadillac without AVF	2.5 N.m	22 lb in
Forward Range Radar Module Fastener	85 N.m	63 lb ft
Forward Range Radar Module Nut	9 N.m	80 lb in
Front View Driver Information Camera Fastener	2.5 N.m	22 lb in
Side Object Sensing Alert Module Fastener	2.5 N.m	22 lb in

SCHEMATIC WIRING DIAGRAMS

OBJECT DETECTION WIRING SCHEMATICS

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

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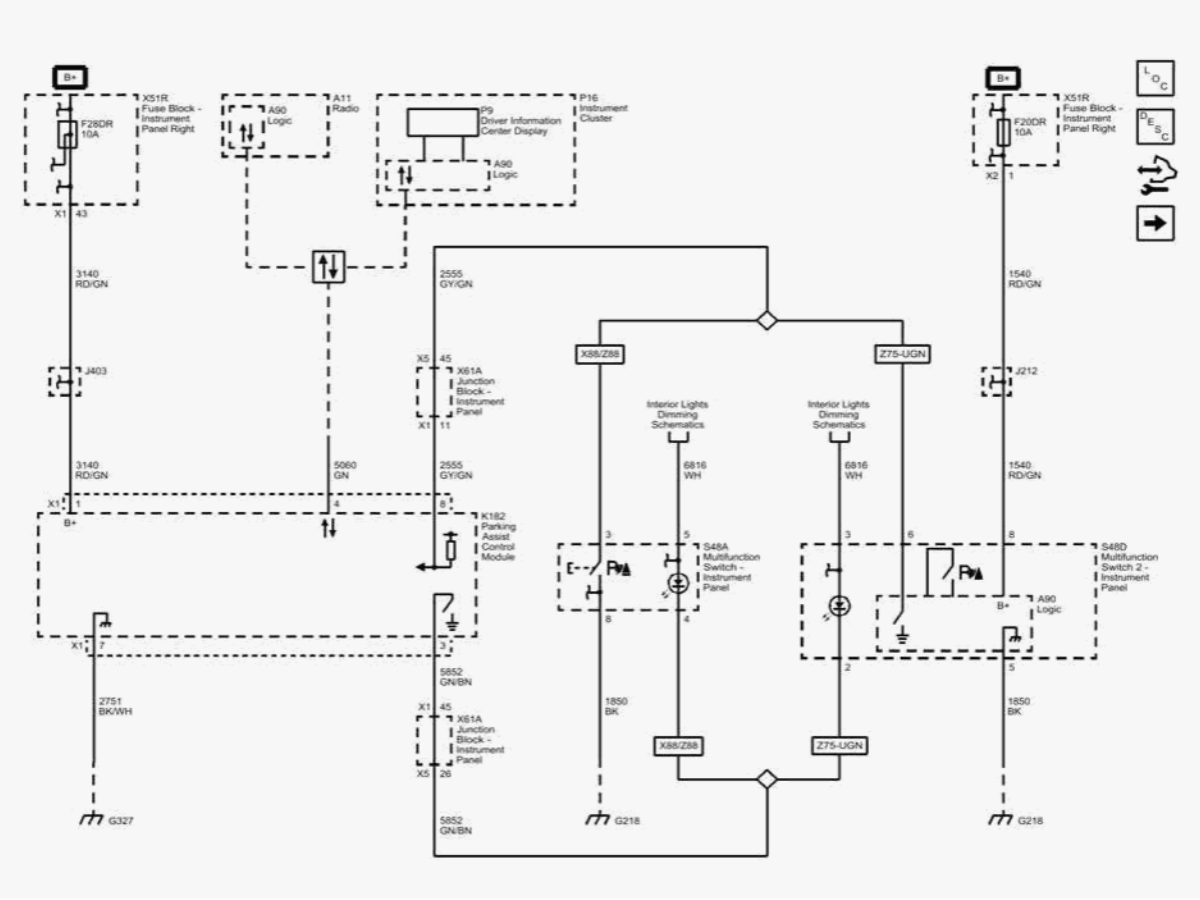


Fig. 1: Park Assist - Power, Ground, and Serial Data (UD5 or UD7)
Courtesy of GENERAL MOTORS COMPANY

Park Assist - Rear Sensors (UD5 or UD7)

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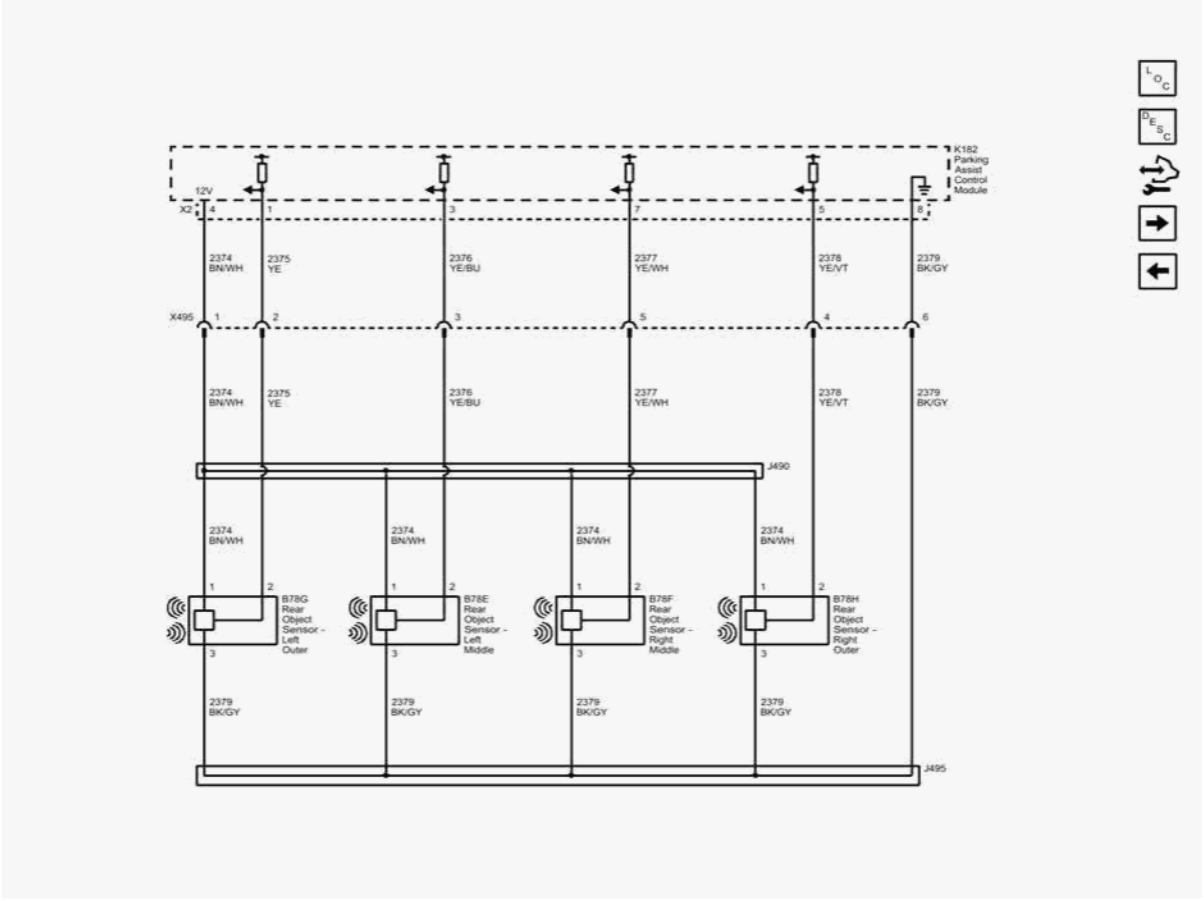


Fig. 2: Park Assist - Rear Sensors (UD5 or UD7)
Courtesy of GENERAL MOTORS COMPANY

Park Assist - Front Sensors (UD5)

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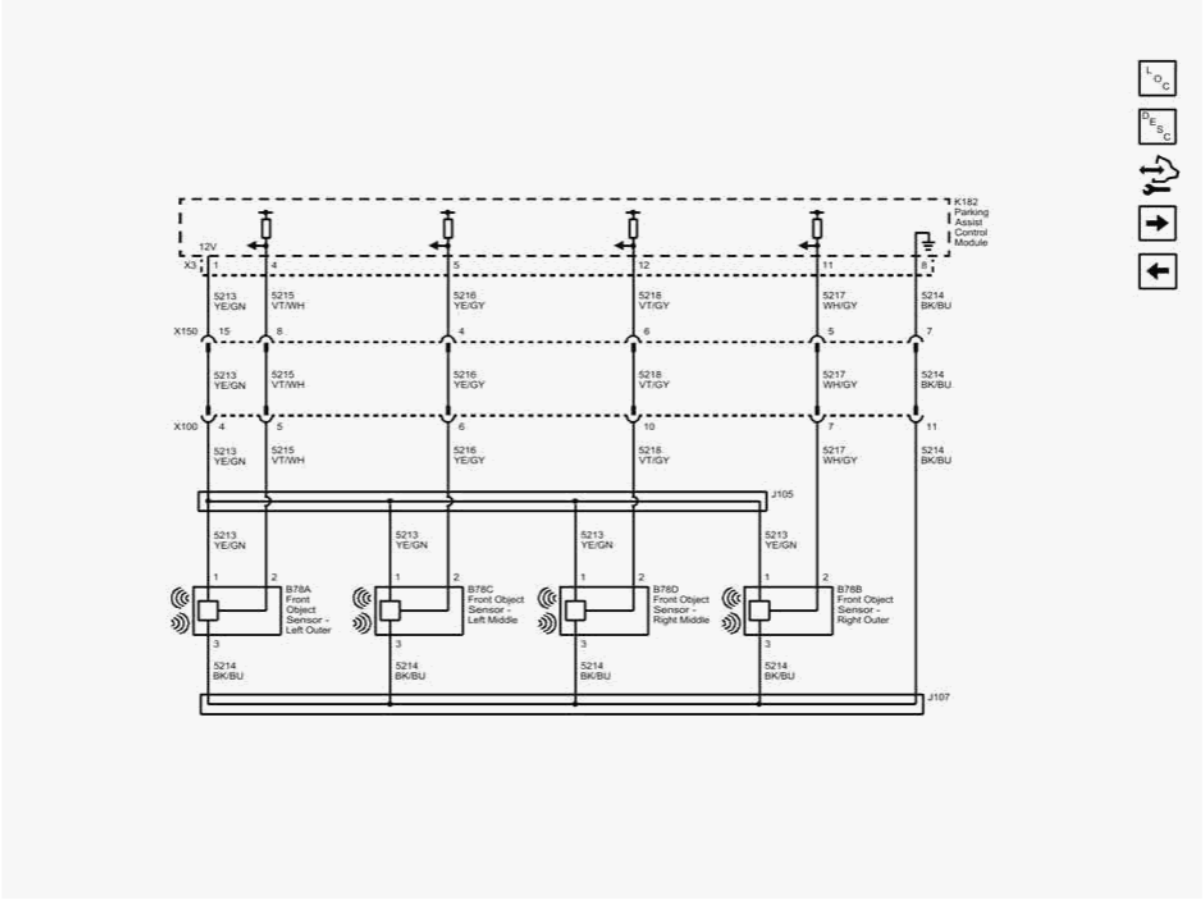


Fig. 3: Park Assist - Front Sensors (UD5)
Courtesy of GENERAL MOTORS COMPANY

Rear Vision Camera (UVC)

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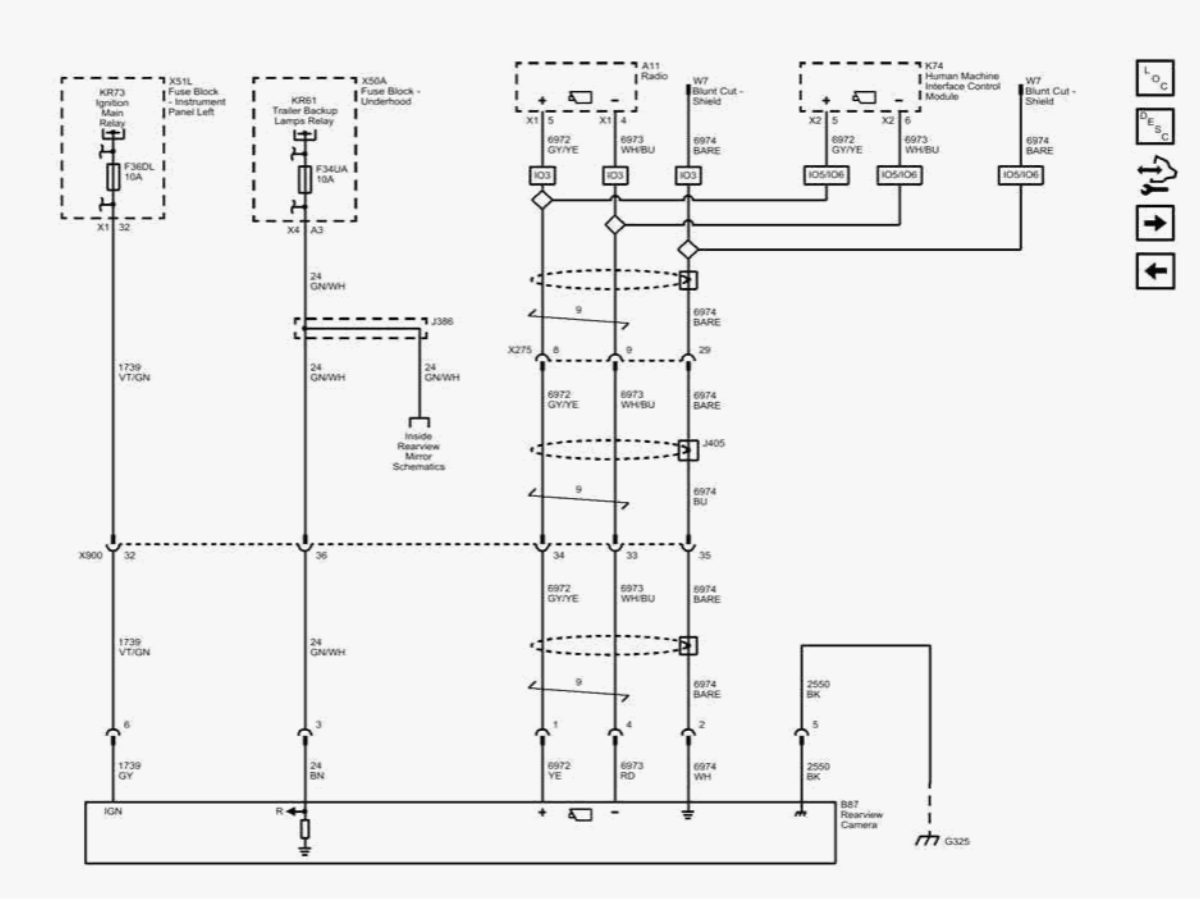


Fig. 4: Rear Vision Camera (UVC)
Courtesy of GENERAL MOTORS COMPANY

Side Blind Zone Alert (UKC)

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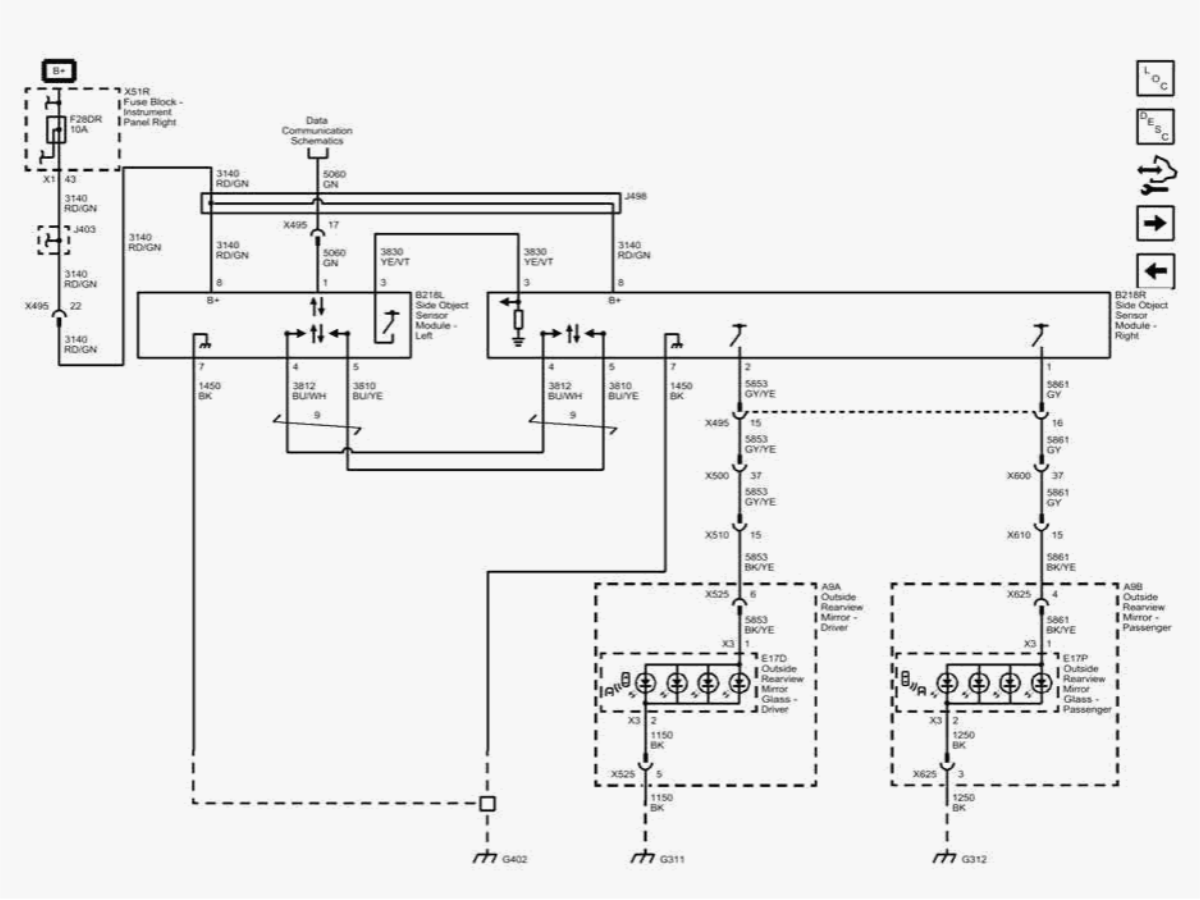


Fig. 5: Side Blind Zone Alert (UKC)
Courtesy of GENERAL MOTORS COMPANY

Lane Departure Warning and Keep Assist (UEU, UFL or UHX) (1 of 2)

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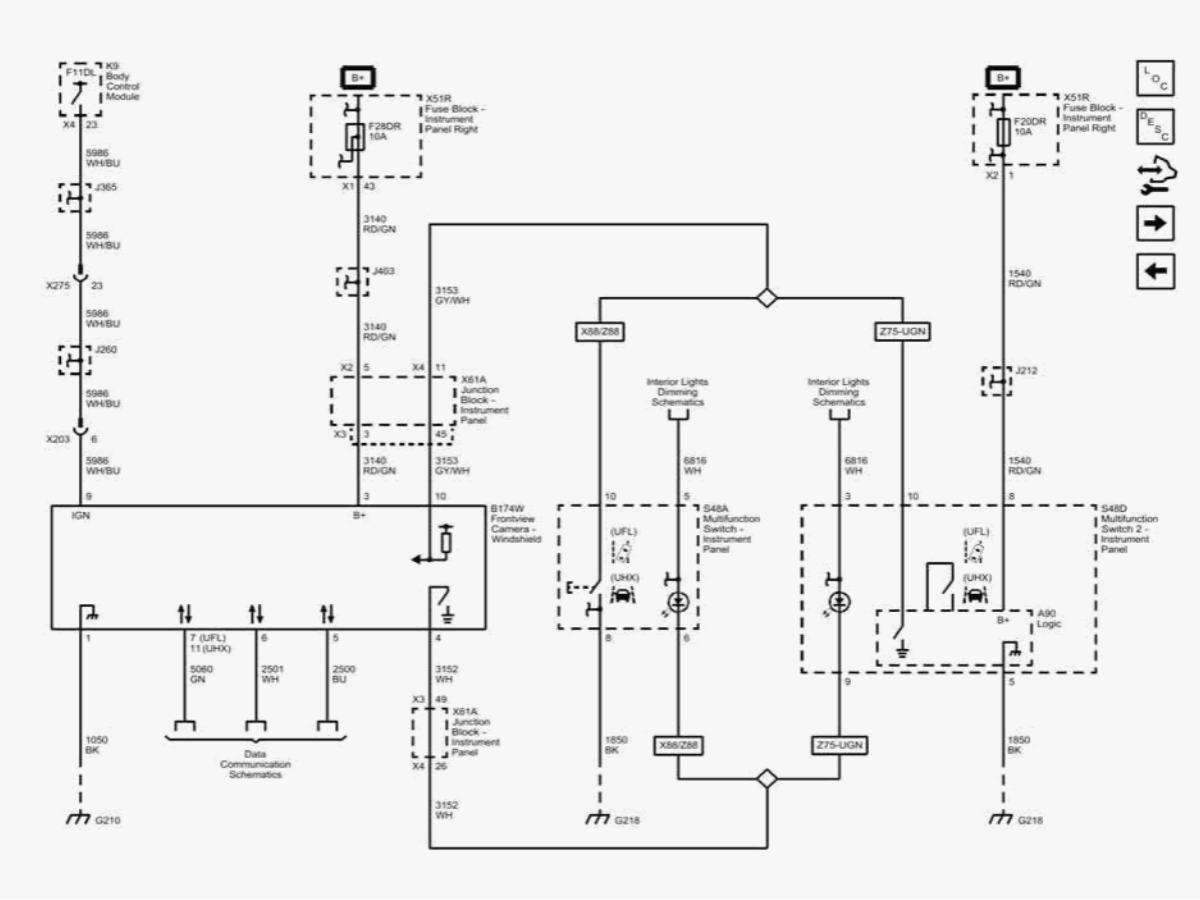


Fig. 6: Lane Departure Warning and Keep Assist (UEU, UFL or UHX) (1 of 2)
Courtesy of GENERAL MOTORS COMPANY

Lane Departure Warning and Keep Assist (UEU, UFL or UHX) (2 of 2)

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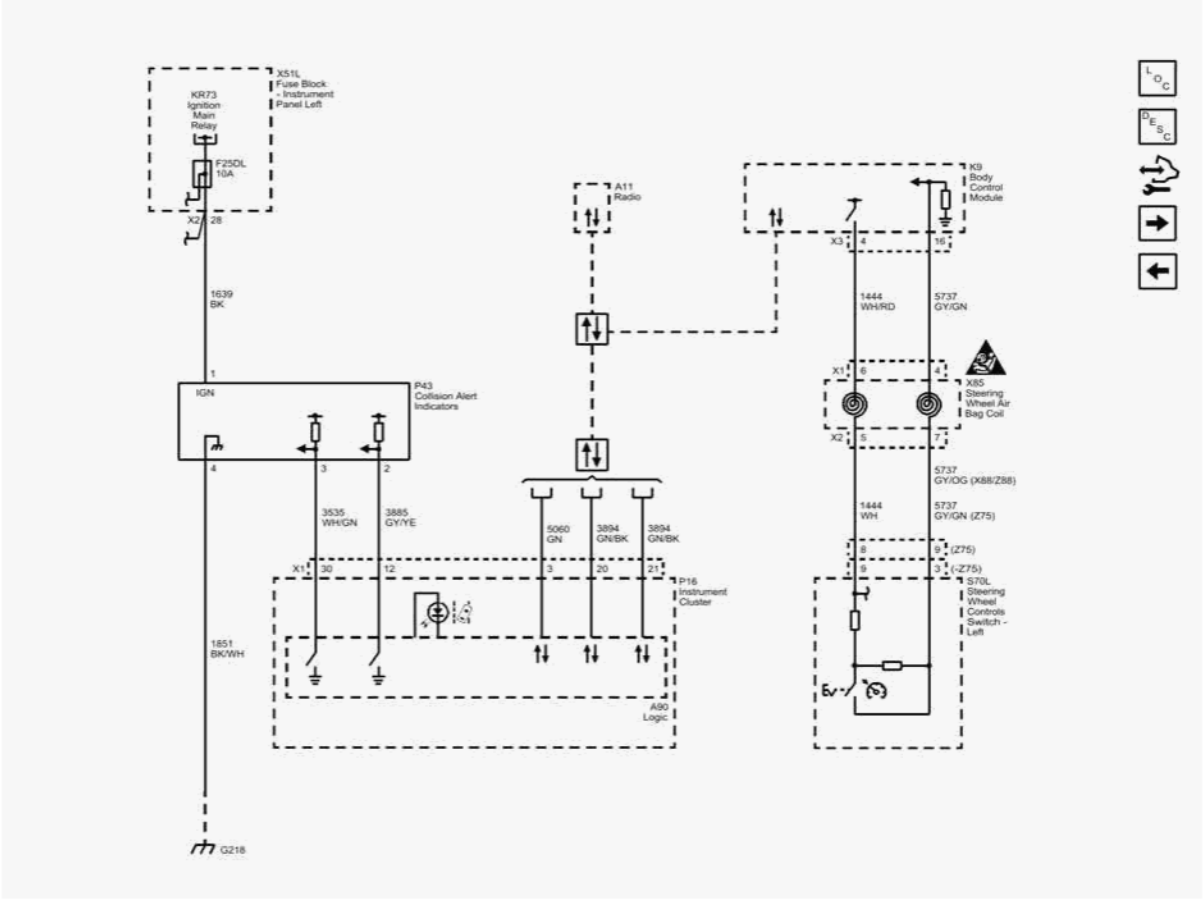


Fig. 7: Lane Departure Warning and Keep Assist (UEU, UFL or UHX) (2 of 2)
Courtesy of GENERAL MOTORS COMPANY

Comprehensive Safety - Power, Ground, Serial Data, and Multifunction Switch (UGN+Z75)

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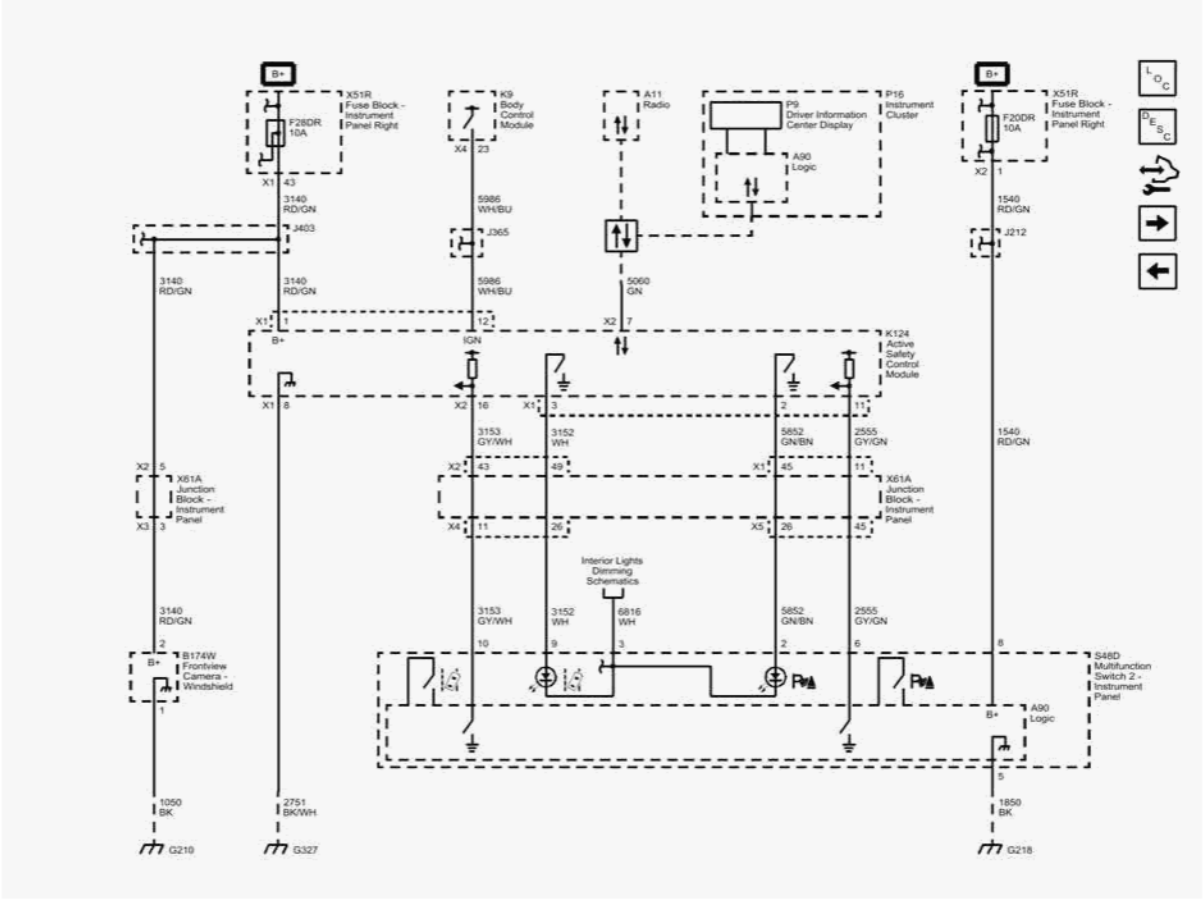


Fig. 8: Comprehensive Safety - Power, Ground, Serial Data, and Multifunction Switch (UGN+Z75)
Courtesy of GENERAL MOTORS COMPANY

Comprehensive Safety - Camera and Front Long Range Radar (UGN+Z75)

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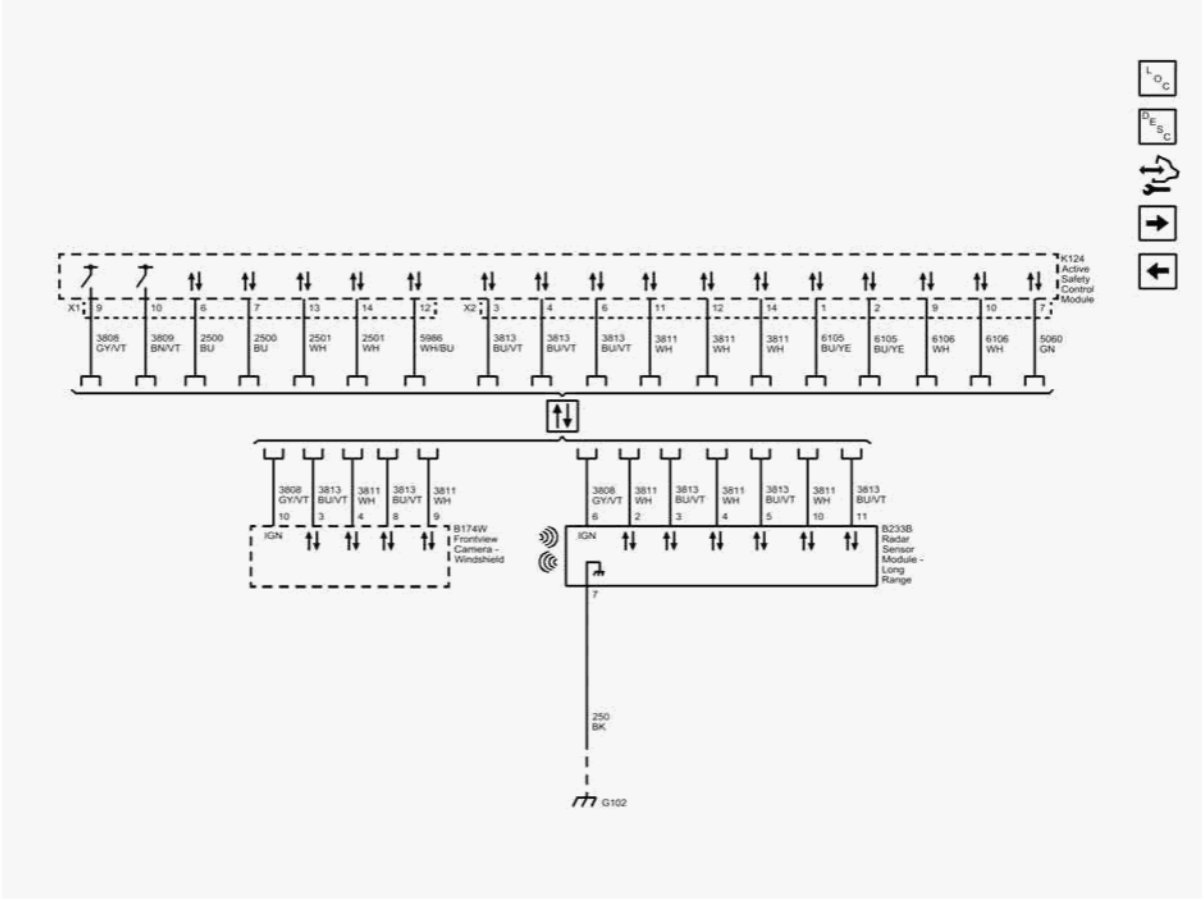


Fig. 9: Comprehensive Safety - Camera and Front Long Range Radar (UGN+Z75)
Courtesy of GENERAL MOTORS COMPANY

Comprehensive Safety - Front Short Range Radar (UVZ)

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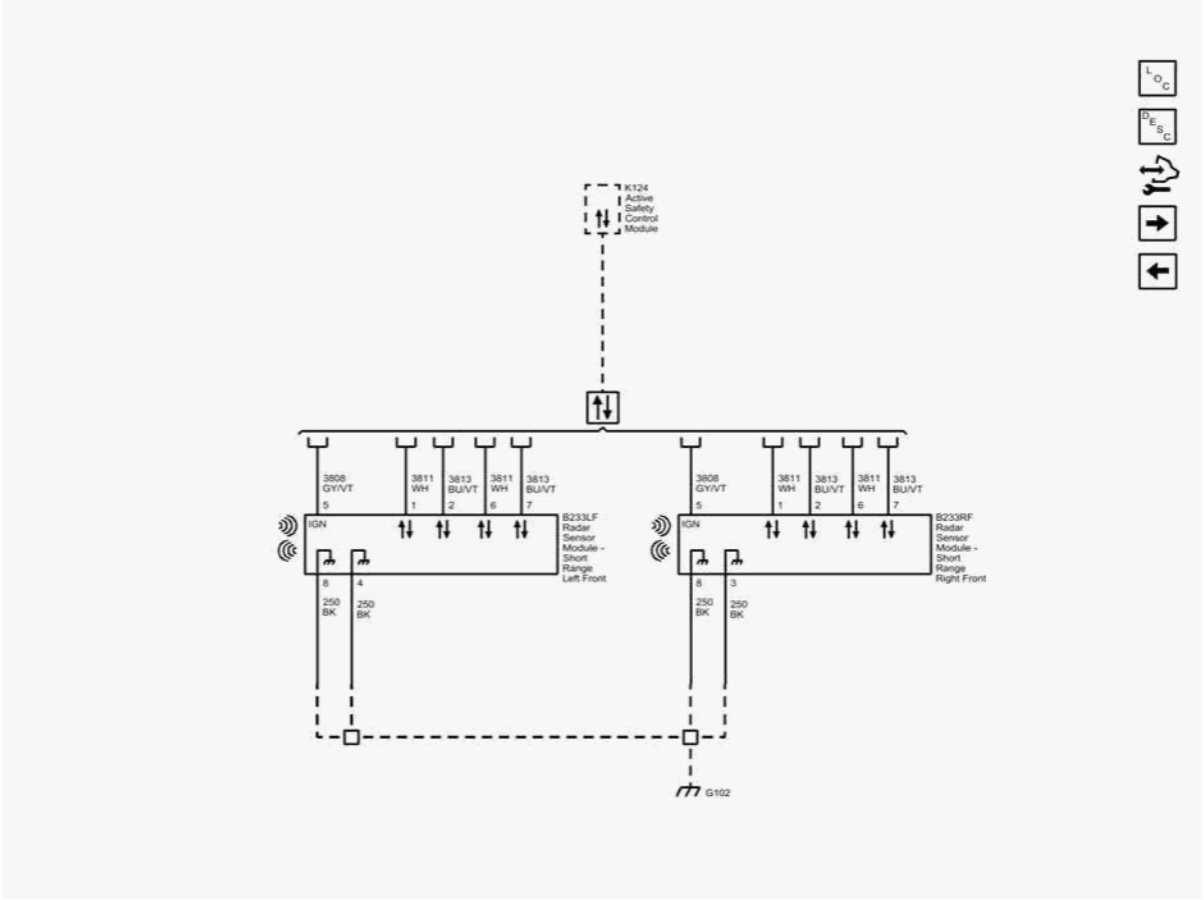


Fig. 10: Comprehensive Safety - Front Short Range Radar (UVZ)
Courtesy of GENERAL MOTORS COMPANY

Comprehensive Safety - Rear Radar (UVZ)

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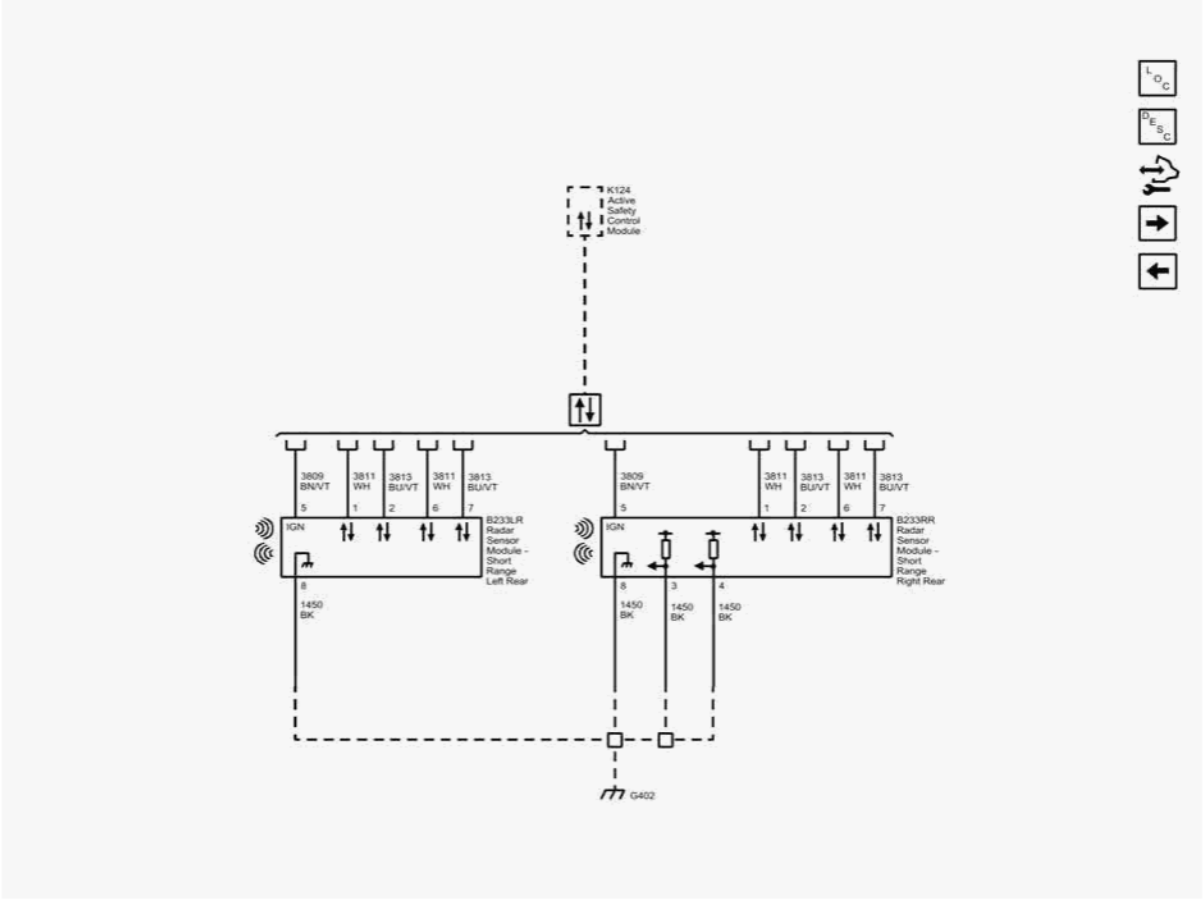


Fig. 11: Comprehensive Safety - Rear Radar (UVZ)
Courtesy of GENERAL MOTORS COMPANY

Seat Haptic Motors (Z75 with UGN)

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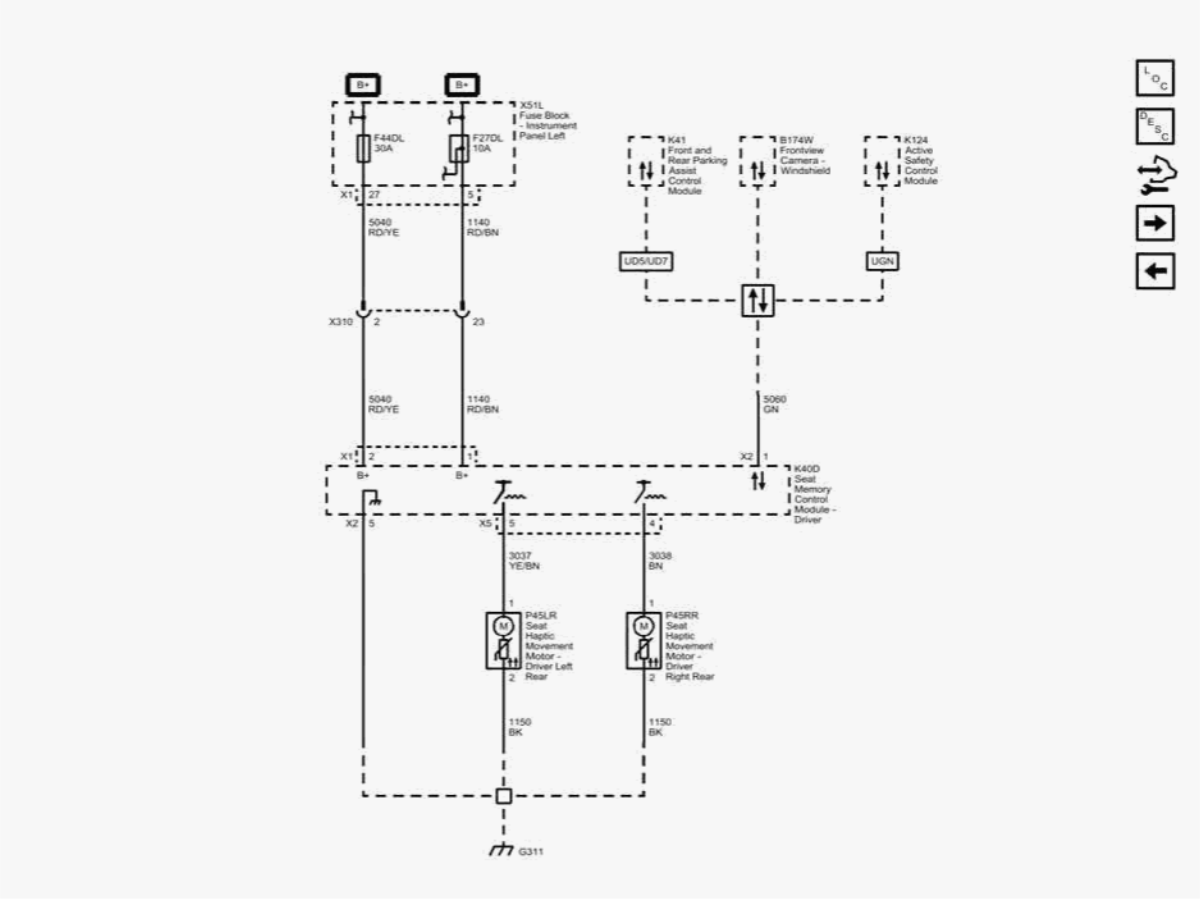


Fig. 12: Seat Haptic Motors (Z75 with UGN)
Courtesy of GENERAL MOTORS COMPANY

360 Degree Vision - Power, Ground, and Serial Data (UVH)

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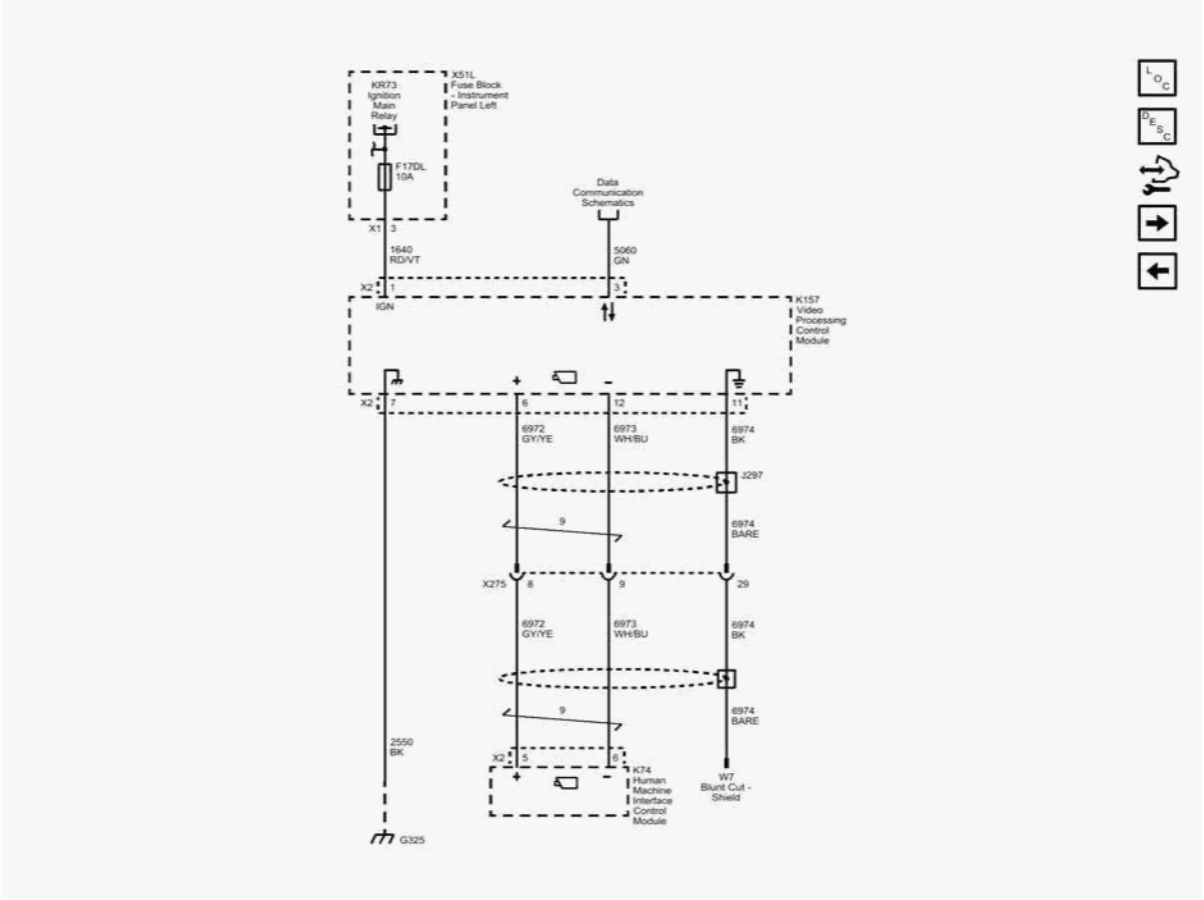


Fig. 13: 360 Degree Vision - Power, Ground, and Serial Data (UVH)
Courtesy of GENERAL MOTORS COMPANY

360 Degree Vision - Front and Rear Cameras (UVH)

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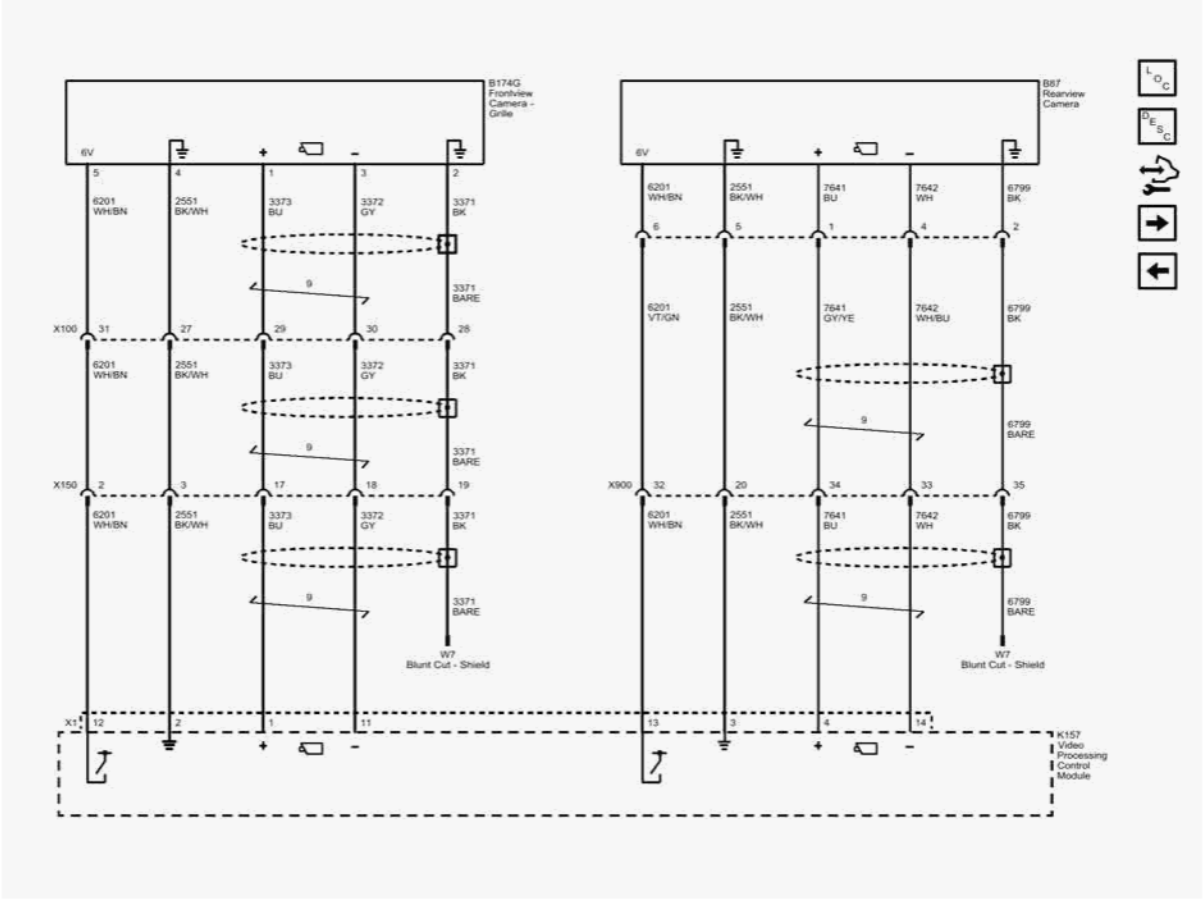


Fig. 14: 360 Degree Vision - Front and Rear Cameras (UVH)
Courtesy of GENERAL MOTORS COMPANY

360 Degree Vision - Side Vision Cameras (UVH)

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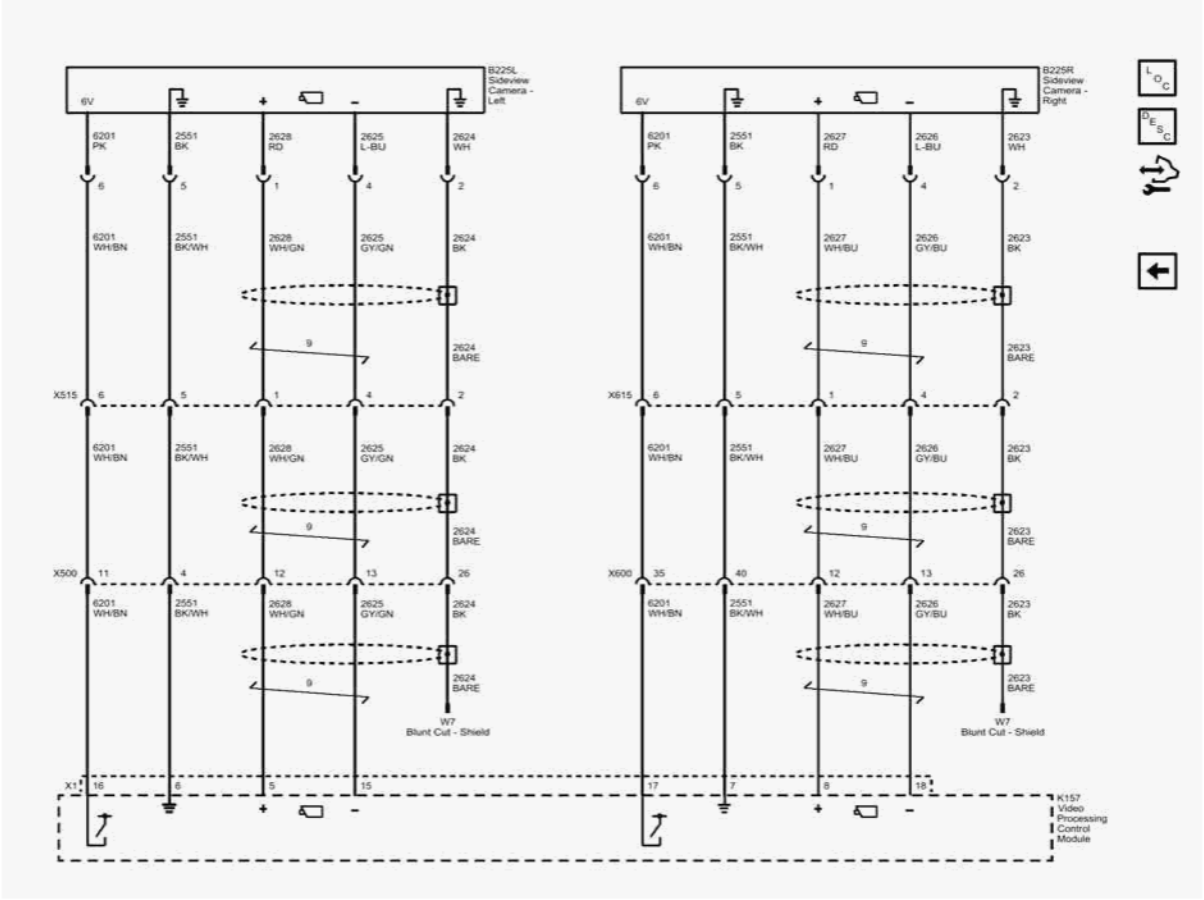


Fig. 15: 360 Degree Vision - Side Vision Cameras (UVH)
Courtesy of GENERAL MOTORS COMPANY

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.

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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 though 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

Ignition ON.

Conditions for Setting the DTC

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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**

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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 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. Ignition OFF and all vehicle systems OFF, disconnect the X3 harness connector at the appropriate A9 Outside Rearview Mirror. 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 2 and ground.
    - **If 2 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 2 Ω**

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3. Ignition ON.
4. Test for less than 1 V between the control circuit terminal 1 and ground.
    - **If 1 V or greater**
    1. Ignition 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 1 and ground.
    - **If 3 V or less**
    1. Ignition 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. 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 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 (DR4)** **Outside Rearview Mirror Glass Replacement (DL3, DL8)**
- Refer to **Control Module References** for side object sensor module replacement, programming, and setup.

DTC B0954, B0955, B0956, OR B0957: PARKING ASSIST FRONT SENSORS

Diagnostic Instructions

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- 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 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
12 V Reference	B1405 02	B0954 04, B0955 04, B0956 04, B0957 04, B0958 04, B0959 04, B0960 04, B0961 04	-	-
Left Front Object Sensor Signal	B0954 02	B0954 04	B0954 01	B0954 08, B0954 22
Left Middle Front Object Sensor Signal	B0955 02	B0955 04	B0955 01	B0955 08, B0955 22
Right Middle Front Object Sensor Signal	B0956 02	B0956 04	B0956 01	B0956 08, B0956 22
Right Front Object Sensor Signal	B0957 02	B0957 04	B0957 01	B0957 08, B0957 22
Low Reference	-	B0954 01, B0955 01, B0956 01, B0957 01,	-	-

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
		B0958 01, B0959 01, B0960 01, B0961 01		

Circuit/System Description

The object sensors are 3-wire ultrasonic sensors that are used to determine the distance between the vehicle and an object. The front and rear 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 front and rear parking assist control module triggers the sensors in a sequential loop. After each sensor transmits, the front and rear parking assist control module uses the sensor echo received through the signal circuit to calculate the distance and position of an object.

Conditions for Running the DTC

- Ignition ON
- Parking assist is activated.

Conditions for Setting the DTC

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

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

B0954 02, B0955 02, B0956 02, or B0957 02

The front and rear parking assist control module has determined the sensor signal circuit is shorted to ground.

B0954 04, B0955 04, B0956 04, or B0957 04

The front and rear parking assist control module has determined the sensor signal circuit is open.

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

The front and rear parking assist control module has received an invalid signal.

B0954 18, B0955 18, B0956 18, or B0957 18

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

B0954 22, B0955 22, B0956 22, or B0957 22

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

B0954 3B, B0955 3B, B0956 3B, or B0957 3B

The front and rear parking assist control module determines the sensor self test has not successfully completed.

Action Taken When the DTC Sets

- The parking assist 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

Parking Assist Description and Operation (with UD7)Parking Assist Description and Operation (with UD5)

Electrical Information Reference

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

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- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

     Refer to **DTC B1405 (with UD5)DTC B1405 (with UD7)**

   - **If the DTC is not set**
3. Verify that DTC B0954 01, B0955 01, B0956 01, B0957 01 B0954 22, B0955 22, B0956 22 or B0957 22 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 the B78 Front Object Sensors.
      - 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 appropriate B78 Front Object Sensor with the correct sensor type.

   - **If the DTC is not set**
5. Ignition ON, transmission in R.
6. Verify the scan tool Parking Assist System Status parameter is Enabled.
   - **If the parameter is Disabled**

     Refer to Circuit/System Testing.

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- **If the parameter is Enabled**

7. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, 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 3 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF, disconnect the X3 harness connector at the K41 Front and Rear Parking Assist Control Module.
    2. Test for less than 2 Ω in the low reference circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω replace the K41 Front and Rear Parking Assist Control Module.
    - **If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the 12 V reference circuit terminal 1 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the X3 harness connector at the K41 Front and Rear Parking Assist Control Module.
    2. Test for infinite resistance between the 12 V reference circuit and ground.
        - If less than infinite resistance, repair the short to ground on the circuit.
        - If infinite resistance
    3. Test for less than 2 Ω in the 12 V reference circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the K41 Front and Rear Parking Assist Control Module.
    - **If the test lamp illuminates**
5. Test for 10.0 - 12.0 V between the signal circuit terminal 2 and ground.
    - **If less than 10.0 V**
    1. Ignition OFF, disconnect the X3 harness connector at the K41 Front and Rear 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.

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- 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 K41 Front and Rear Parking Assist Control Module.
- **If greater than 12.0 V**

1. Ignition OFF, disconnect the X3 harness connector at the K41 Front and Rear Parking Assist Control Module, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
    - If 1 V or greater, repair the short to voltage on the circuit.
    - If less than 1 V, replace the K41 Front and Rear Parking Assist Control Module.
- **If between 10.0 - 12.0 V**

6. Test or replace the B78 Front Object Sensor.

Repair Instructions

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

- Refer to **Front Parking Assist Alarm Sensor Replacement**
- Refer to **Control Module References** for front and rear parking assist control module replacement, programming, and setup.

DTC B0958, B0959, B0960, OR B0961: PARKING ASSIST REAR SENSORS

Diagnostic Instructions

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

DTC Descriptors

DTC B0958

Parking Assist Rear Sensor Left Corner Circuit

DTC B0959

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Parking Assist Rear Sensor Left Middle Circuit

DTC B0960

Parking Assist Rear Sensor Right Middle Circuit

DTC B0961

Parking Assist Rear Sensor Right Corner Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12 V Reference	B1405 02	B0958 04, B0959 04, B0960 04, B0961 04	-	-
Left Rear Object Sensor Signal	B0958 02	B0958 04	B0958 01	B0958 08, B0958 22
Left Middle Rear Object Sensor Signal	B0959 02	B0959 04	B0959 01	B0959 08, B0959 22
Right Middle Rear Object Sensor Signal	B0960 02	B0960 04	B0960 01	B0960 08, B0960 22
Right Rear Object Sensor Signal	B0961 02	B0961 04	B0961 01	B0961 08, B0961 22
Low Reference	-	B0958 01, B0959 01, B0960 01, B0961 01	-	-

Circuit/System Description

The object sensors are 3-wire ultrasonic sensors that are used to determine the distance between the vehicle and an object. The front and rear 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 front and rear parking assist control module triggers the sensors in a sequential loop. After each sensor transmits, the front and rear parking assist control module uses the sensor echo received through the signal circuit to calculate the distance and position of an object.

Conditions for Running the DTC

- Ignition ON
- Parking assist is activated.

Conditions for Setting the DTC

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

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

B0958 02, B0959 02, B0960 02, or B0961 02

The front and rear parking assist control module has determined the sensor signal circuit is shorted to ground.

B0958 04, B0959 04, B0960 04, or B0961 04

The front and rear parking assist control module has determined the sensor signal circuit is open.

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

The front and rear parking assist control module has received an invalid signal.

B0958 18, B0959 18, B0960 18, or B0961 18

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

B0958 22, B0959 22, B0960 22, or B0961 22

The front and rear parking assist control module determines no change in the position of an object while the vehicle is in motion.

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

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

B0958 3B, B0959 3B, B0960 3B, or B0961 3B

The front and rear parking assist control module determines the sensor self test has not successfully completed.

Action Taken When the DTC Sets

- The parking assist system is disabled.
- A service message may be displayed on the driver information center.

Conditions for Clearing the DTC

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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 UD7)Parking Assist Description and Operation (with UD5)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

      Refer to **DTC B1405 (with UD5)DTC B1405 (with UD7)**

    - **If the DTC is not set**
3. Verify that DTC B0958 01, B0959 01, B0960 01, B0961 01, B0958 22, B0959 22, B0960 22 or B0961 22 is not set.

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- **If the DTC is set**

1. Verify the B78 Rear Object Sensors are not contaminated with snow, mud, dirt, slush, or ice.
    - If contaminated, clean the B78 Rear Object Sensors.
    - If there is no contamination
2. Refer to Circuit/System Testing.

- **If the DTC is not set**

4. Verify that DTC B0958 3A, B0959 3A, B0960 3A or B0961 3A is not set.
    - **If the DTC is set**

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

    - **If the DTC is not set**
5. Ignition ON, transmission in R.
6. Verify the scan tool Parking Assist System Status parameter is Enabled.
    - **If the parameter is Disabled**

      Refer to Circuit/System Testing.

    - **If the parameter is Enabled**
7. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness at the appropriate B78 Rear 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 3 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF, disconnect the harness connector X2 at the K41 Front and Rear Parking Assist Control Module.
    2. Test for less than 2 Ω in the low reference circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω replace the K41 Front and Rear Parking Assist Control Module.
    - **If less than 10 Ω**

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3. Ignition ON.
4. Verify a test lamp illuminates between the 12 V reference circuit terminal 1 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the X2 harness connector at the K41 Front and Rear Parking Assist Control Module.
    2. Test for infinite resistance between the 12 V reference circuit and ground.
        - If less than infinite resistance, repair the short to ground on the circuit.
        - If infinite resistance
    3. Test for less than 2 Ω in the 12 V reference circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the K41 Front and Rear Parking Assist Control Module.
    - **If the test lamp illuminates**
5. Test for 10.0 - 12.0 V between the signal circuit terminal 2 and ground.
    - **If less than 10.0 V**
    1. Ignition OFF, disconnect the X2 harness connector at the K41 Front and Rear 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 K41 Front and Rear Parking Assist Control Module.
    - **If greater than 12.0 V**
    1. Ignition OFF, disconnect the X2 harness connector at the K41 Front and Rear Parking Assist Control Module, ignition ON.
    2. Test for less than 1 V between the signal circuit and ground.
        - If 1 V or greater, repair the short to voltage on the circuit.
        - If less than 1 V, replace the K41 Front and Rear Parking Assist Control Module.
    - **If between 10.0 - 12.0 V**
6. Test or replace the B78 Rear Object Sensor.

Repair Instructions

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

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

DTC B0967: PARKING ASSIST ON/OFF 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 Descriptor

DTC B0967

Parking Assist On/Off 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
Signal	B0967 02	1	1	-
Ground	-	1	-	-
1. Parking Assist Switch Inoperative				

Circuit/System Description

The parking assist system can be activated and deactivated by pressing the parking assist switch. The front and rear parking assist control module applies voltage and monitors the parking assist switch signal circuit. The parking assist switch is a normally open switch. With the switch open, voltage seen at the front and rear front and rear parking assist control module is high. When the parking assist switch is pressed, the switch is closed and the signal circuit is pulled to ground. With the switch closed, voltage seen at the front and rear front and rear parking assist control module is low. The front and rear parking assist control module will respond to this by activating or deactivating the parking assist function.

Conditions for Running the DTC

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- Ignition ON
- Parking assist is active.

Conditions for Setting the DTC

The front and rear parking assist control module has detected a short to ground on the parking assist switch signal circuit.

Action Taken When the DTC Sets

- The parking assist system is disabled.
- The driver information center may display a system service message.

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 UD7)Parking Assist Description and Operation (with UD5)

Electrical Information Reference

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

Scan Tool Reference

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Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Parking Assist Switch parameter changes between Active and Inactive when cycling the parking assist switch.
    - **If the parameter does not change between Active and Inactive**

      Refer to Circuit/System Testing.

    - **If the parameter changes between Active and Inactive**
3. All OK.

Circuit/System Testing

Chevrolet/GMC

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 8 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**
3. Verify the scan tool Parking Assist Switch parameter is Inactive.
    - **If the parameter is not Inactive**
    1. Ignition OFF, disconnect the X1 harness connector at the K41 Front and Rear Parking Assist Control Module.
    2. Test for infinite resistance between the signal circuit terminal 3 and ground.
        - If less than infinite resistance, repair the short to ground on the signal circuit.
        - If infinite resistance, replace the K41 Front and Rear Parking Assist Control Module.
    - **If the parameter is Inactive**

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4. Connect a 3 A fused jumper wire between the signal circuit terminal 3 and ground.
5. Verify the scan tool Parking Assist Switch parameter is Active.
    - **If the parameter is not Active**
    1. Ignition OFF, disconnect the X1 harness connector at the K41 Front and Rear Parking Assist 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, replace the K41 Front and Rear Parking Assist Control Module.
    3. Ignition OFF.
    4. Test for less than 2 Ω in the signal circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the K41 Front and Rear Parking Assist Control Module.
    - **If the parameter is Active**
6. Test or replace the S48A Multifunction Switch - Instrument Panel.

Cadillac

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 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**
3. Verify the scan tool Parking Assist Switch parameter is Inactive.
    - **If the parameter is not Inactive**
    1. Ignition OFF, disconnect the X1 harness connector at the K41 Front and Rear Parking Assist Control Module.
    2. Test for infinite resistance between the signal circuit terminal 6 and ground.
        - If less than infinite resistance, repair the short to ground on the signal circuit.

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- If infinite resistance, replace the K41 Front and Rear Parking Assist Control Module.

- **If the parameter is Inactive**

4. Connect a 3 A fused jumper wire between the signal circuit terminal 6 and ground.
5. Verify the scan tool Parking Assist Switch parameter is Active.
    - **If the parameter is not Active**
    1. Ignition OFF, disconnect the X1 harness connector at the K41 Front and Rear Parking Assist 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, replace the K41 Front and Rear Parking Assist Control Module.
    3. Ignition OFF.
    4. Test for less than 2 Ω in the signal circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the K41 Front and Rear Parking Assist Control Module.
    - **If the parameter is Active**
6. 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 Accessory Bezel Replacement (Chevrolet / GMC)** **Instrument Panel Accessory Bezel Replacement (Cadillac)** for multifunction switch - instrument panel replacement
- Refer to **Instrument Panel Upper Trim Panel Bracket Replacement (Cadillac)** for multifunction switch 2 - instrument panel replacement
- Refer to **Control Module References** for front and rear parking assist control module replacement, programming, and setup

DTC B0968: PARKING ASSIST ON/OFF SWITCH INDICATOR CIRCUIT (CHEVROLET, GMC)

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 Descriptor

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
High Control (Terminal 5)	1	1	-	-
Low Control (Terminal 4)	2	1	B0968 01	-
1. Parking Assist Switch Indicator Inoperative 2. Parking Assist Switch Indicator Always On				

Circuit/System Description

When the parking assist system is enabled, the front and rear parking assist control module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the front and rear parking assist control module.

Conditions for Running the DTC

- Ignition ON
- Parking assist is active.

Conditions for Setting the DTC

The front and rear parking assist control module has detected a short to battery on the parking assist indicator control circuit.

Action Taken When the DTC Sets

- The parking assist system is disabled.
- The driver information center may display a system service message.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

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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 UD7)Parking Assist Description and Operation (with UD5)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the parking assist switch indicator turns ON and OFF when turning the parking assist system on and off with the park assist switch.
    - **If the indicator does not turn ON and OFF**

      Refer to Circuit/System Testing.

    - **If the indicator turns ON and OFF**
3. All OK.

Circuit/System Testing

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1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 5 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
    2. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .
    - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48A Multifunction Switch - Instrument Panel. Disconnect the X1 harness connector at the K41 Front and Rear Parking Assist Control Module.
4. Verify the parking assist switch indicator is not illuminated.
    - **If the parking assist switch indicator is illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.
    2. Test for infinite resistance between the S48A Multifunction Switch - Instrument Panel control circuit terminal 4 and ground.
        - If less than infinite resistance, repair the short to ground in the circuit.
        - If infinite resistance, replace the S48A Multifunction Switch - Instrument Panel.
    - **If the parking assist switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 3 and ground.
6. Verify the parking assist switch indicator is illuminated.
    - **If the parking assist switch indicator is not illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.
    2. Test for less than 1 V between the control circuit and ground.
        - If 1 V or greater, repair the short to voltage on the circuit.
        - If less than 1 V
    3. Ignition OFF.
    4. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the S48A Multifunction Switch - Instrument Panel.
    - **If the parking assist switch indicator is illuminated**

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7. Replace the K41 Front and Rear Parking Assist Control Module.

Repair Instructions

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

- Refer to **Instrument Panel Accessory Bezel Replacement (Chevrolet / GMC)** for multifunction switch - instrument panel replacement
- Refer to **Control Module References** for front and rear parking assist control module replacement, programming, and setup

DTC B0968: PARKING ASSIST ON/OFF SWITCH INDICATOR CIRCUIT (CADILLAC, WITHOUT UGN)

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 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
High Control (Terminal 3)	1	1	-	-
Low Control (Terminal 2)	2	1	B0968 01	-
1. Parking Assist Switch Indicator Inoperative 2. Parking Assist Switch Indicator Always On				

Circuit/System Description

When the parking assist system is enabled, the front and rear parking assist control module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the front and rear parking assist control module.

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Conditions for Running the DTC

- Ignition ON
- Parking assist is active.

Conditions for Setting the DTC

The front and rear parking assist control module has detected a short to battery on the parking assist indicator control circuit.

Action Taken When the DTC Sets

- The parking assist system is disabled.
- The driver information center may display a system service message.

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 UD7)Parking Assist Description and Operation (with UD5)

Electrical Information Reference

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

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Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the parking assist switch indicator turns ON and OFF when turning the parking assist system on and off with the park assist switch.
    - **If the indicator does not turn ON and OFF**

      Refer to Circuit/System Testing.

    - **If the indicator turns ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
    2. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .
    - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. Disconnect the X1 harness connector at the K41 Front and Rear Parking Assist Control Module.
4. Verify the parking assist switch indicator is not illuminated.
    - **If the parking assist switch indicator is illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel control circuit terminal 2 and ground.
        - If less than infinite resistance, repair the short to ground in the circuit.
        - If infinite resistance, replace the S48D Multifunction Switch 2 - Instrument Panel.

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- **If the parking assist switch indicator is not illuminated**

5. Connect a 3 A fused jumper wire between the control circuit terminal 3 and ground.
6. Verify the parking assist switch indicator is illuminated.
    - **If the parking assist switch indicator is not illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    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 S48D Multifunction Switch 2 - Instrument Panel.
    - **If the parking assist switch indicator is illuminated**
7. Replace the K41 Front and Rear Parking Assist Control Module.

Repair Instructions

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

- Refer to **Instrument Panel Upper Trim Panel Bracket Replacement (Cadillac)** for multifunction switch 2 - instrument panel replacement
- Refer to **Control Module References** for front and rear parking assist control module replacement, programming, and setup

DTC B0968: PARKING ASSIST ON/OFF SWITCH INDICATOR CIRCUIT (CADILLAC, WITH UGN)

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 B0968

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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
High Control (Terminal 3)	1	1	-	-
Low Control (Terminal 2)	2	1	B0968 0B	-
1. Parking Assist Switch Indicator Inoperative 2. Parking Assist Switch Indicator Always On				

Circuit/System Description

When the parking assist system is enabled, the active safety control module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the active safety control module.

Conditions for Running the DTC

- Ignition ON
- Parking assist is active.

Conditions for Setting the DTC

The active safety control module has detected high current on the parking assist indicator control circuit.

Action Taken When the DTC Sets

- The parking assist system is disabled.
- The driver information center may display a system service message.

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7)Parking Assist Description and Operation (with UD5)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the parking assist switch indicator turns ON and OFF when turning the parking assist system on and off with the park assist switch.
    - **If the indicator does not turn ON and OFF**

      Refer to Circuit/System Testing.

    - **If the indicator turns ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
    - **If the test lamp does not illuminate**

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1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
2. Test for less than 2 Ω in the control circuit end to end.
    - If 2 Ω or greater, repair the open/high resistance in the circuit.
    - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .
- **If the test lamp illuminates**

3. Ignition OFF, connect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. Disconnect the X1 harness connector at the K124 Active Safety Control Module.
4. Verify the parking assist switch indicator is not illuminated.
    - **If the parking assist switch indicator is illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel control circuit terminal 2 and ground.
        - If less than infinite resistance, repair the short to ground in the circuit.
        - If infinite resistance, replace the S48D Multifunction Switch 2 - Instrument Panel.
    - **If the parking assist switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 2 and ground.
6. Verify the parking assist switch indicator is illuminated.
    - **If the parking assist switch indicator is not illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    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 S48D Multifunction Switch 2 - Instrument Panel.
    - **If the parking assist switch indicator is illuminated**
7. Replace the K124 Active Safety Control Module.

Repair Instructions

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

- Refer to **Instrument Panel Upper Trim Panel Bracket Replacement (Cadillac)** for multifunction switch 2 - instrument panel replacement
- Refer to **Control Module References** for active safety control module replacement, programming, and setup

DTC B0987: VEHICLE DIRECTION CAMERA INDICATOR CIRCUIT (CHEVROLET, GMC)

Diagnostic Instructions

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

DTC Descriptors

DTC B0987

Vehicle Direction Camera Indicator Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Control (Terminal 5)	B0987 06, B1011 00	B0987 06, B1011 00	-	-
Low Control (Terminal 6)	B0987 06, B1011 00	B0987 06, B1011 00	B0987 01, B1011 00	-

Circuit/System Description

When the lane departure warning is enabled, the frontview camera module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the frontview camera module.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

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B0987 01

The frontview camera module detects a short to voltage on the control circuit.

B0987 06

The frontview camera module detects a short to ground or an open/high resistance on the control circuit.

Action Taken When the DTC Sets

- Lane departure warning and forward collision alert features are disabled
- The driver information center may display a system service message.

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 (except Cadillac with UGN)

Electrical Information Reference

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

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Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the lane departure warning indicator turns ON and OFF when turning the lane departure warning system on and off with the lane departure warning switch.
    - **If the indicator does not turn ON and OFF**

      Refer to Circuit/System Testing.

    - **If the indictor turns ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 5 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
    2. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .
    - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48A Multifunction Switch - Instrument Panel. Disconnect the X1 harness connector at the B174W Frontview Camera - Windshield, ignition ON.
4. Verify the lane departure warning switch indicator is not illuminated.
    - **If the lane departure warning switch indicator is illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.
    2. Test for infinite resistance between the S48A Multifunction Switch - Instrument Panel control circuit terminal 6 and ground.
        - If less than infinite resistance, repair the short to ground in the circuit.

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- If infinite resistance, replace the S48A Multifunction Switch - Instrument Panel.

- **If the lane departure warning switch indicator is not illuminated**

5. Connect a 3 A fused jumper wire between the control circuit terminal 4 and ground.
6. Verify the lane departure warning switch indicator is illuminated.
   - **If the lane departure warning switch indicator is not illuminated**
   1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.
   2. Test for less than 1 V between the control circuit and ground.
      - If 1 V or greater, repair the short to voltage on the circuit.
      - If less than 1 V
   3. Ignition OFF.
   4. Test for less than 2 Ω in the control circuit end to end.
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, replace the S48A Multifunction Switch - Instrument Panel.
   - **If the lane departure warning switch indicator is illuminated**
7. Replace the B174W Frontview Camera - Windshield.

Repair Instructions

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

- Refer to **Instrument Panel Accessory Bezel Replacement (Chevrolet / GMC)** for multifunction switch - instrument panel replacement
- Refer to **Control Module References** for control module replacement, programming, and setup.

DTC B0987: VEHICLE DIRECTION CAMERA INDICATOR CIRCUIT (CADILLAC, WITHOUT UGN)

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

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DTC B0987

Vehicle Direction Camera Indicator Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Control (Terminal 3)	B0987 06, B1011 00	B0987 06, B1011 00	-	-
Low Control (Terminal 9)	B0987 06, B1011 00	B0987 06, B1011 00	B0987 01, B1011 00	-

Circuit/System Description

When the lane departure warning is enabled, the frontview camera module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the frontview camera module.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

B0987 01

The frontview camera module detects a short to voltage on the control circuit.

B0987 06

The frontview camera module detects a short to ground or an open/high resistance on the control circuit.

Action Taken When the DTC Sets

- Lane departure warning and forward collision alert features are disabled
- The driver information center may display a system service message.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

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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 (except Cadillac with UGN)

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 lane departure warning indicator turns ON and OFF when turning the lane departure warning system on and off with the lane departure warning switch.
   - **If the indicator does not turn ON and OFF**

     Refer to Circuit/System Testing.

   - **If the indictor turns ON and OFF**
3. All OK.

Circuit/System Testing

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1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
    2. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .
    - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. Disconnect the X1 harness connector at the B174W Frontview Camera - Windshield, ignition ON.
4. Verify the lane departure warning switch indicator is not illuminated.
    - **If the lane departure warning switch indicator is illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel control circuit terminal 9 and ground.
        - If less than infinite resistance, repair the short to ground in the circuit.
        - If infinite resistance, replace the S48D Multifunction Switch 2 - Instrument Panel.
    - **If the lane departure warning switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 4 and ground.
6. Verify the lane departure warning switch indicator is illuminated.
    - **If the lane departure warning switch indicator is not illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    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 S48D Multifunction Switch 2 - Instrument Panel.
    - **If the lane departure warning switch indicator is illuminated**

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7. Replace the B174W Frontview Camera - Windshield.

Repair Instructions

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

- Refer to **Instrument Panel Upper Trim Panel Bracket Replacement (Cadillac)** for multifunction switch 2 - instrument panel replacement
- Refer to **Control Module References** for frontview camera module replacement, programming, and setup.

DTC B0987: VEHICLE DIRECTION CAMERA INDICATOR CIRCUIT (CADILLAC, WITH UGN)

Diagnostic Instructions

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

DTC Descriptors

DTC B0987

Vehicle Direction Camera Indicator Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Control (Terminal 3)	1	1	-	-
Low Control (Terminal 9)	2	1	B0987 0B	-
1. Lane Departure Warning Switch Indicator Inoperative 2. Lane Departure Warning Switch Indicator Always On				

Circuit/System Description

When the lane departure warning is enabled, the active safety control module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the active safety control module.

Conditions for Running the DTC

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Ignition ON.

Conditions for Setting the DTC

The active safety control module detects high current on the control circuit.

Action Taken When the DTC Sets

- Lane departure warning and forward collision alert features are disabled
- The driver information center may display a system service message.

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 (Cadillac with UGN)

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

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Circuit/System Verification

1. Ignition ON.
2. Verify the lane departure warning indicator turns ON and OFF when turning the lane departure warning system on and off with the lane departure warning switch.
    - **If the indicator does not turn ON and OFF**

      Refer to Circuit/System Testing.

    - **If the indictor turns ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
    2. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .
    - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. Disconnect the X1 harness connector at the K124 Active Safety Control Module, ignition ON.
4. Verify the lane departure warning switch indicator is not illuminated.
    - **If the lane departure warning switch indicator is illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel control circuit terminal 9 and ground.
        - If less than infinite resistance, repair the short to ground in the circuit.
        - If infinite resistance, replace the S48D Multifunction Switch 2 - Instrument Panel.
    - **If the lane departure warning switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 3 and ground.

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6. Verify the lane departure warning switch indicator is illuminated.
    - **If the lane departure warning switch indicator is not illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    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 S48D Multifunction Switch 2 - Instrument Panel.
    - **If the lane departure warning switch indicator is illuminated**
7. Replace the K124 Active Safety Control Module.

Repair Instructions

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

- Refer to **Instrument Panel Upper Trim Panel Bracket Replacement (Cadillac)** for multifunction switch 2 - instrument panel replacement
- Refer to **Control Module References** for active safety 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** .

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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

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Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning Description and Operation (except Cadillac with UGN)Lane Departure Warning Description and Operation (Cadillac with UGN)

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. Verify that DTC B1008 is not set.
   - **If DTC is set**
   1. Calibrate the front camera module. Refer to **Front View Camera Module Calibration**.
   2. Verify the DTC does not set.

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- If the DTC sets, replace the frontview camera module.
- If the DTC does not set

3. All OK.

- **If the DTC is not set**

4. 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 B1011: SYSTEM DISABLED INFORMATION STORED MALFUNCTION

Diagnostic Instructions

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

DTC Descriptor

DTC B1011 00

System Disabled Information Stored Malfunction

Circuit/System Description

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

Conditions for Running the DTC

- Ignition ON
- Frontview camera enabled

Conditions for Setting the DTC

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The frontview camera module detects a malfunction.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

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

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

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

- Lane Departure Warning Indicator Malfunction
- Lane Departure Warning Switch Malfunction
- Camera Obstructed
- Accelerator Pedal Position Out of Range
- Driven Wheel Speed Signal Invalid
- Non-Driven Wheel Speed Signal Invalid
- Brake Pedal Moderate Travel Signal Invalid
- Brake Pedal Initial Travel Position Achieved
- Lost Communication with Steering Wheel Angle Sensor Module
- Invalid Data Received From Steering Wheel Angle Sensor Module

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- Forward Collision Alert Switch Malfunction
- Clutch Pedal Position (CPP) Sensor Performance
- Clutch Pedal Position (CPP) Sensor Performance
- Transmission Gear Engaged
- Acceleration Sensor Longitudinal Signal
- Invalid Data Received From Yaw Rate Sensor Module
- Power Mode Controlled by Backup Device
- System Power Mode
- Overvoltage
- Undervoltage
- Undefined

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning Description and Operation (except Cadillac with UGN)Lane Departure Warning Description and Operation (Cadillac with UGN)

Electrical Information Reference

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

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Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE: **Do not replace B174W Frontview Camera - Windshield for this DTC. DTC B1011 is an information DTC.**

1. Ignition ON.
2. Verify no other DTC is set except for DTC B1011.
   - **If any other DTCs are set**

     Diagnose those first. Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

   - **If no other DTCs are set**

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

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

Repair Instructions

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

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

DTC B1015: VEHICLE IDENTIFICATION NUMBER INFORMATION

Diagnostic Instructions

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

DTC Descriptor

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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 control module receives the vehicle identification number (VIN) from the body control module (BCM). The control module 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 associated system is disabled.
- A service message may be displayed on the driver information center.

Conditions for Clearing the DTC

The stored VIN matches the VIN stored in the BCM.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

Repair Instructions

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

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

DTC B127B: REARVIEW CAMERA INPUT SIGNAL CIRCUIT MISSING REFERENCE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.

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

DTC Descriptors

DTC B127B 2B

Rearview Camera Input Signal Circuit Missing Reference

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

- Engine running
- Transmission in R

Conditions for Setting the DTC

The video signal from the rearview camera has not been received by the human machine interface control module for 2.5 s.

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Action Taken When the DTC Sets

- The human machine interface control module stores the DTC in memory.
- A service message may be displayed on the driver information center of info display module.

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**

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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. Engine running, transmission in R.
2. 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**
3. All OK.

Circuit/System Testing

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.
2. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B87 Rearview Camera. It may take up to 2 min for all vehicle systems to power down.
3. Test for less than 10 Ω between the ground circuit terminal 5 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**

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4. Ignition ON.
5. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
    - **If the test lamp does not illuminate and the circuit fuse is good**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ignition circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse. Refer to **Power Mode Mismatch (With BTM)** **Power Mode Mismatch (Without BTM)** .
    - **If the test lamp does not illuminate and the circuit fuse is open**
    1. Ignition OFF.
    2. Test for infinite resistance between the ignition circuit and ground.
        - If less than infinite resistance, repair the short to ground on the circuit.
        - If infinite resistance, replace the B87 Rearview Camera.
    - **If the test lamp illuminates**
6. Engine running, park brake applied, transmission in R.
7. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ignition circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, verify the fuse is good and there is voltage at the fuse. Refer to **Backup Lamps Malfunction** .
    - **If the test lamp illuminates**
8. Ignition OFF, disconnect the X2 harness connector at the K74 Human Machine Interface Control Module, ignition ON.
9. Test for less than 1 V between the signal circuit terminals listed below and ground:
    - K74 Human Machine Interface Control Module signal (+) circuit terminal 5 X2
    - K74 Human Machine Interface Control Module signal (-) circuit terminal 6 X2
    - **If 1 V or greater**

      Repair the short to voltage on the circuit.

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- **If less than 1 V**

10. Test for infinite resistance between the signal circuit terminals listed below and ground:
    - K74 Human Machine Interface Control Module signal (+) circuit terminal 5 X2
    - K74 Human Machine Interface Control Module signal (-) circuit terminal 6 X2
    - **If less than infinite resistance**

      Repair the short to ground on the circuit.

    - **If infinite resistance**
11. Test for less than 2 Ω between the K74 Human Machine Interface Control Module signal (+) circuit terminal 5 X2 and the B87 Rearview Camera signal (+) circuit terminal 1.
    - **If 2 Ω or greater**

      Repair the open/high resistance on the circuit.

    - **If less than 2 Ω**
12. Test for less than 2 Ω between the K74 Human Machine Interface Control Module signal (-) circuit terminal 6 X2 and the B87 Rearview Camera signal (-) circuit terminal 4.
    - **If 2 Ω or greater**

      Repair the open/high resistance on the circuit.

    - **If less than 2 Ω**
13. Replace the B87 Rearview Camera.
14. Engine running, transmission in R,
15. Verify a clear rear vision image is displayed on the P17 Info Display Module.
    - **If a clear rear vision image is not displayed**

      Replace the K74 Human Machine Interface Control Module.

    - **If a clear rear vision image is displayed**
16. All OK.

Repair Instructions

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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 (WITH UD5)

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

Control Module Voltage Reference Output 2 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	B0954 04, B0955 04, B0966 04, B0967 04, B0958 04, B0959 04, B0960 04, B0961 04	-	-

Circuit/System Description

The object sensors are 3-wire ultrasonic sensors that are used to determine the distance between the vehicle and an object. The front and rear 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 front and rear parking assist control module triggers the sensors in a sequential loop. After each sensor transmits, the front and rear 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

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Ignition ON

Conditions for Setting the DTC

B1405 02

The front and rear parking assist control module has detected the 12 V reference circuit is shorted to ground.

B1405 03

The front and rear parking assist control module has detected the 12 V reference circuit is low.

B1405 07

The front and rear parking assist control module has detected the 12 V reference circuit is high.

Action Taken When the DTC Sets

- Parking assist is disabled.
- The driver information center may display a system service message.

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 UD5)

Electrical Information Reference

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- **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.

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- 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

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

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

DTC B1405: CONTROL MODULE VOLTAGE REFERENCE OUTPUT 2 CIRCUIT (WITH UD7)

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

Control Module Voltage Reference Output 2 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 04, B0959 04, B0960 04, B0961 04	-	-

Circuit/System Description

The object sensors are 3-wire ultrasonic sensors that are used to determine the distance between the vehicle and an object. The front and rear 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 front and rear parking assist control module triggers the sensors in a sequential loop. After each sensor transmits, the front and rear parking assist control module uses the sensor echo received through the signal circuit to calculate the distance and position of an object.

Conditions for Running the DTC

Ignition ON

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Conditions for Setting the DTC

B1405 02

The front and rear parking assist control module has detected the 12 V reference circuit is shorted to ground.

B1405 03

The front and rear parking assist control module has detected the 12 V reference circuit is low.

B1405 07

The front and rear parking assist control module has detected the 12 V reference circuit is high.

Action Taken When the DTC Sets

- Parking assist is disabled.
- The driver information center may display a system service message.

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 UD7)

Electrical Information Reference

- **Circuit Testing**

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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 X2 harness connector at the K41 Front and Rear Parking Assist Control Module.
2. Test for infinite resistance between the 12 V reference circuit terminal 4 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. Connect the X2 harness connector at the K41 Front and Rear Parking Assist Control Module, ignition ON.
4. Verify DTC B1405 is not set.
    - **If DTC B1405 is set.**

    1. Ignition OFF, disconnect the harness connector at each of the B78 Rear 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 DTC B1405 is not set while connecting the harness connector at each B78 Rear Object Sensor, one at a time.
    - If DTC B1405 does set

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

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- If DTC B1405 does not set.

5. All OK.
    - **If DTC B1405 is not set.**
6. 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 B172E OR B172F: DRIVER SEAT CUSHION REAR HAPTIC ALERT MOTOR CONTROL CIRCUITS

Diagnostic Instructions

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

DTC Descriptors

DTC B172E

Driver Seat Cushion Left Rear Haptic Alert Motor Control Circuit

DTC B172F

Driver Seat Cushion Right Rear Haptic Alert Motor Control 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
Left Haptic Alert Motor Control	B172E 02	B172E 01 or B172E 02	B172E 01	-
Left Haptic Alert Motor Ground	-	B172E 01 or B172E 02	-	-

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Right Haptic Alert Motor Control	B172F 02	B172F 01 or B172F 02	B172F 01	-
Right Haptic Alert Motor Ground	-	B172F 01 or B172F 02	-	-

Circuit/System Description

The haptic seats, also known as safety alert seats, provide a vibration to alert the driver in certain circumstances. There are two motors in the driver seat cushion. Either the right or left motor can run or both depending on the alert. The seat memory control module provides the output voltage for the motors. The seat memory control module receives serial data requests from other modules to activate the appropriate seat motors with the number of pulses requested. While the motors are activated, the seat memory control module checks for either shorts to voltage or shorts to ground. Due to the nature of the PWM signal, if a motor circuit is open, it may be reported as either a short to voltage or short to ground.

Conditions for Running the DTC

- Engine ON.
- Haptic seat motor commanded ON.

Conditions for Setting the DTC

DTC B172E 01

The seat memory control module has detected a short to voltage on the left haptic seat motor control circuit.

DTC B172E 02

The seat memory control module has detected a short to ground on the left haptic seat motor control circuit.

DTC B172F 01

The seat memory control module has detected a short to voltage on the right haptic seat motor control circuit.

DTC B172F 02

The seat memory control module has detected a short to ground on the right haptic seat motor control circuit.

Action Taken When the DTC Sets

- "Service Driver Assist" will be displayed on the Driver Information Center.

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- Alerts will be communicated with beeps.

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

Safety Alert Seat 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 P45LR Seat Haptic Movement Motor - Driver Left Rear turns ON and OFF when commanding the Driver Seat Cushion Left Rear Haptic Movement On and Off with a scan tool.
    - **If the motor does not turn ON and OFF**

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Refer to Circuit/System Testing.

- **If the motor turns ON and OFF**

3. Verify the P45RR Seat Haptic Movement Motor - Driver Right Rear turns on and off when commanding the Driver Seat Cushion Right Rear Haptic Movement On and Off with a scan tool.
   - **If the motor does not turn ON and OFF**

     Refer to Circuit/System Testing.

   - **If the motor turns ON and OFF**
4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the X5 harness connector at the K40D Seat Memory Control Module - Driver, ignition ON.
2. Test for less than 1 V between the appropriate control circuit terminal listed below and ground:
   - P45LR Seat Haptic Movement Motor - Driver Left Rear terminal 5
   - P45RR Seat Haptic Movement Motor - Driver Right Rear terminal 4
   - **If 1 V or greater**

     Repair the short to voltage on the circuit.

   - **If less than 1 V**
3. Ignition OFF and all vehicle systems OFF. It may take up to 2 min for all vehicle systems to power down.
4. Test for 27-51 Ω between the appropriate control circuit terminal listed below and ground:
   - P45LR Seat Haptic Movement Motor - Driver Left Rear terminal 5
   - P45RR Seat Haptic Movement Motor - Driver Right Rear terminal 4
   - **If less than 27 Ω**

     Test or replace the appropriate P45 Seat Haptic Movement Motor - Driver.

   - **If greater than 51 Ω**
   1. Verify the circuit ground connection is clean and secure.
      - If the ground connector is not clean or secure, repair as necessary.

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- If the circuit ground connection is clean and secure

2. Replace the appropriate P45 Seat Haptic Movement Motor - Driver.

- **If between 27-51 Ω**

5. Install a 3 A fused jumper wire between the appropriate control circuit terminal listed below and B+.
   - P45LR Seat Haptic Movement Motor - Driver Left Rear terminal 5
   - P45RR Seat Haptic Movement Motor - Driver Right Rear terminal 4
6. Verify the appropriate P45 Seat Haptic Movement Motor - Driver is active.
   - **If the P45 Seat Haptic Movement Motor - Driver is not active**

     Replace the appropriate P45 Seat Haptic Movement Motor - Driver.

   - **If the P45 Seat Haptic Movement Motor - Driver is active**
7. Ignition OFF, connect the harness connector at the K40 Seat Memory Control Module, ignition ON.
8. Verify the P45LR Seat Haptic Movement Motor - Driver Left Rear turns ON and OFF when commanding the Driver Seat Cushion Left Rear Haptic Movement On and Off with a scan tool.
   - **If the motor does not turn ON and OFF**

     Replace the K40 Seat Memory Control Module.

   - **If the motor turns ON and OFF**
9. Verify the P45RR Seat Haptic Movement Motor - Driver Right Rear turns on and off when commanding the Driver Seat Cushion Right Rear Haptic Movement On and Off with a scan tool.
   - **If the motor does not turn ON and OFF**

     Replace the K40 Seat Memory Control Module.

   - **If the motor turns ON and OFF**
10. All OK.

Repair Instructions

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

- Refer to **Front Seat Lane Departure Warning Actuator Replacement**

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

Circuit/System Description

The frontview camera module monitors the lane departure warning switch signal circuit. The frontview camera module applies voltage and monitors the switch signal circuit. The lane departure warning switch is normally open switch. With the switches open, voltage seen at the frontview camera module is high. When a switch is pressed, the signal circuit is pulled to ground and the voltage seen by the frontview camera module is low. The frontview camera module will respond to this by activating or deactivating the lane departure warning feature.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

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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 for more than 10 s.

Action Taken When the DTC Sets

- Lane departure warning 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.

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 (except Cadillac with UGN)Lane Departure Warning Description and Operation (Cadillac with UGN)**
- **Forward Collision Alert Description and Operation (with UGN)Forward Collision Alert Description and Operation (without UGN)**

Electrical Information Reference

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

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- **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 when pressing and releasing the lane departure warning switch.
    - **If the parameter does not change between Active and Inactive**

      Refer to Circuit/System Testing.

    - **If the parameter changes between Active and Inactive**
3. All OK.

Circuit/System Testing

Chevrolet, GMC

1. Ignition ON and all vehicle systems OFF, disconnect the harness connector at the S48A Multifunction Switch - 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 8 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**
3. Verify the scan tool Lane Departure Warning Switch Status parameter is Open.
    - **If not Inactive**
    1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield.

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2. Test for infinite resistance between the signal circuit terminal 10 and ground.
    - If less than infinite resistance, repair the short to ground on the circuit.
    - If infinite resistance, replace the B174W Frontview Camera - Windshield Camera Module.
- **If Inactive**

4. Install a 3 A fused jumper wire between the signal circuit terminal 10 and ground.
5. Verify the scan tool Lane Departure Warning Switch Status parameter is Closed.
    - **If not Closed**
    1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield, ignition ON.
    2. Test for less than 1 V between the signal circuit and ground.
        - If 1 V or greater, repair the short to voltage on the circuit.
        - If less than 1 V
    3. Ignition OFF
    4. Test for 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**
6. Test or replace the S48A Multifunction Switch - Instrument Panel.

Cadillac

1. Ignition ON 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 5 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**
3. Verify the scan tool Lane Departure Warning Switch Status parameter is Open.

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- **If not Inactive**

1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield.
2. Test for infinite resistance between the signal circuit terminal 10 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 Inactive**

4. Install a 3 A fused jumper wire between the signal circuit terminal 10 and ground.
5. Verify the scan tool Lane Departure Warning Switch Status parameter is Closed.

- **If not Closed**

1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
    - If 1 V or greater, repair the short to voltage on the circuit.
    - If less than 1 V
3. Ignition OFF
4. Test for 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**

6. 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 Accessory Bezel Replacement (Chevrolet / GMC)** **Instrument Panel Accessory Bezel Replacement (Cadillac)** for multifunction switch - instrument panel. replacement
- Refer to **Instrument Panel Upper Trim Panel Bracket Replacement (Cadillac)** for multifunction switch 2 - instrument panel. replacement
- Refer to **Control Module References** for control module replacement, programming, and setup.

DTC B390A: SHORT RANGE OBJECT SENSOR PERFORMANCE

Diagnostic Instructions

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- 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 B390A

Short Range Object Sensor Performance

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

Circuit/System Description

The radar sensor module - short range performs internal fault detection on itself.

Conditions for Running the DTC

The radar sensor module - short range continually runs the program to detect faults.

Conditions for Setting the DTC

The radar sensor module - short range has detected an internal malfunction.

Action Taken When the DTC Sets

The control module will not function and the Active Safety System will be inoperative.

Conditions for Clearing the DTC

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

Diagnostic Aids

- If DTC B390A 58 is set, check for anything that can interfere with the radar signal. Verify area in front of radar is clean of mud, ice, snow, etc. Also verify the fascia panels in front of the radar are damage-free and not obstructed by any add-on accessories such as emblems, stickers, etc.
- If the vehicle fascia is clean, unobstructed, and damage free, and B390A 58 is still set as current, the radar sensor has detected a blockage condition and will not been able to clear it until certain conditions are met. It is necessary to drive the vehicle at a speed greater than 9 km/h (6

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mph) and allow the radar sensor to be exposed to other vehicles and traffic in the direction of the radar sensor field of view. Usually, a short drive in normal traffic conditions will allow the radar sensor to clear the blockage condition.

- The radar sensor modules - short range cannot be swapped from side to side once they have been installed. DTC B390A 67 may set if a radar sensor module - short range is reinstalled on the incorrect side of the vehicle.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Active Safety System Description and Operation (Chevrolet, GMC with UGN)Active Safety System Description and Operation (Cadillac with UGN)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B390A 08 or DTC B390A 45 is not set.
    - **If either DTC is set**
    1. Program the appropriate B233 Radar Sensor Module - Short Range.

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2. Verify DTC B390A 08 or DTC B390A 45 is not set after programming.
    - If either DTC sets after programming, replace the appropriate B233 Radar Sensor Module - Short Range.
    - If the DTC does not set
3. All OK.

- **If both DTCs are not set**

3. Verify DTC B390A 54 is not set.

- **If the DTC is set**

  Replace the appropriate B233 Radar Sensor Module - Short Range.

- **If the DTC is not set**

4. Verify DTC B390A 58 is not set.

- **If DTC is set**

1. Verify the area in front of the sensor is clean, unobstructed, and damage-free.
    - If not clean, unobstructed, and damage-free, clean or repair as necessary.
    - If clean, unobstructed, and damage-free
2. Replace the appropriate B233 Radar Sensor Module - Short Range.

- **If DTC is not set**

5. Verify DTC B390A 67 is not set.

- **If the DTC is set in more than one B233 Radar Sensor Module - Short Range**

1. Verify none of the B233 Radar Sensor Module - Short Range have not been swapped side to side.
    - If any B233 Radar Sensor Module - Short Range have been swapped, return them to their original position.
    - If none of the B233 Radar Sensor Module - Short Range have been swapped
2. Replace the appropriate B233 Radar Sensor Module - Short Range.

- **If the DTC is set in only one B233 Radar Sensor Module - Short Range**

  Refer to Circuit/System Testing

- **If the DTC is not set**

6. All OK.

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Repair Instructions

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

Refer to **Control Module References** for radar sensor module - short range replacement, programming, and setup.

DTC B390C: LONG RANGE RADAR SENSOR 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 B390C

Long Range Radar Sensor Module

Circuit/System Description

After replacement, the radar sensor module - long range must complete an alignment procedure. The alignment procedure can be completed by driving the vehicle for approximately 30 min.

Conditions for Running the DTC

- Module alignment procedure started.
- Vehicle operating on the road.

Conditions for Setting the DTC

The radar sensor module - long range was unable to complete alignment process within approximately 30 min of drive time.

Action Taken When the DTC Sets

- The radar sensor module - long range is disabled.
- Any systems that rely on data from the radar sensor module - long range are disabled.
- A service message may be displayed on the driver information center.

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Conditions for Clearing the DTC

The radar sensor module - long range is successfully aligned.

Diagnostic Aids

The radar sensor module - long range must be securely mounted. Verify it is secured properly in it's mount.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Active Safety System Description and Operation (Chevrolet, GMC with UGN)Active Safety System Description and Operation (Cadillac with UGN)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B390C is not set

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- **If the DTC is set**

1. Perform the **Radar Sensor Module - Long Range Calibration** procedure.
2. Verify DTC B390C is not set after the calibration procedure has been completed.
    - If the DTC is set after calibration, replace the B233B Radar Sensor Module - Long Range.
    - If the DTC is not set after calibration
3. All OK.

- **If DTC B390C 66 is not set**

3. All OK.

Repair Instructions

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

Refer to **Control Module References** for radar sensor module - long range replacement, programming, and setup.

DTC B390D: 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 B390D

Frontview Camera Module

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.

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Conditions for Setting the DTC

The frontview camera module is improperly mounted.

Action Taken When the DTC Sets

- All system that operate with input from the frontview camera module are disabled.
- A service message may be displayed on the driver information center.

Conditions for Clearing the DTC

The frontview camera module is successfully aligned.

Diagnostic Aids

- The frontview camera module must be securely mounted. Verify it is secured properly in it's bracket.
- The frontview camera module must have a clear field of vision to the road ahead. Check for anything that may impair the frontview camera module's ability to clear see the area in front of the vehicle.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Active Safety System Description and Operation (Chevrolet, GMC with UGN)Active Safety System Description and Operation (Cadillac with UGN)

Electrical Information Reference

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

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- **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 B390D.
   - **If any other DTCs are set**

     Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

   - **If no other DTCs are set**

   NOTE: Before performing the calibration, verify that the B174W Frontview Camera - Windshield will not have difficulty seeing lane markings in front of the vehicle. If the view of the B174W Frontview Camera - Windshield 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. Calibrate the B174W Frontview Camera - Windshield. Refer to **Front View Camera Module Calibration**.
4. Verify DTC B390D is not set
   - **If DTC B390D is set**

     Replace the B174W Frontview Camera - Windshield.

   - **If DTC B390D is not set**
5. All OK.

Repair Instructions

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

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

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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.

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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

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

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Surround 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

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**

      Remove the B174G Frontview Camera - Grille and reinstall

    - **If the DTC is not set**
4. Verify DTC B390F 08 is not set.
    - **If DTC is set**

      Refer to Circuit/System Testing

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- **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**

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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**

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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

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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

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- 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

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround 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

1. Ignition ON.
2. Verify DTC B395A 4B is not set.

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- **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.

- **If the DTC is not set**

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. 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 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.

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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 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 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

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- **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 4 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

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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

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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

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround Vision Camera Description and Operation

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Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC 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**

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5. 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:

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- 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.

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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 (Cadillac)**
- 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** .

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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.

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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

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround 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

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.

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- 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. 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**

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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.

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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 (Cadillac)**
- Refer to **Control Module References** for control module replacement, programming, and setup.

DTC B399A: FRONTVIEW CAMERA SUPPLY CIRCUIT SHORT

Diagnostic Instructions

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- 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

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The frontview camera 6V reference circuit is shorted to voltage

B399A 02

The frontview camera 6V 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.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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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 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.

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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:
    - 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 4 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.

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

DTC B399B: REARVIEW CAMERA SUPPLY CIRCUIT SHORT

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

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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 6V reference circuit is shorted to voltage

B399B 02

The rearview camera 6V 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.

Reference Information

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Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround 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 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 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.

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- **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**

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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 4 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.

DTC B399C: SIDEVIEW CAMERA - LEFT SUPPLY CIRCUIT SHORT

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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

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B399C 01

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

B399C 02

The sideview camera - left 6V 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.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround Vision Camera Description and Operation

Electrical Information Reference

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

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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**

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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**

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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 (Cadillac)**
- Refer to **Control Module References** for control module replacement, programming, and setup.

DTC B399D: SIDEVIEW CAMERA - RIGHT SUPPLY CIRCUIT SHORT

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

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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 6V reference circuit is shorted to voltage

B399D 02

The sideview camera - right 6V 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.

Reference Information

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Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround 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 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.

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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

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- **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 (Cadillac)**
- Refer to **Control Module References** for control module replacement, programming, and setup.

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

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INCORRECT (ACTIVE SAFETY CONTROL MODULE (UGN+Z75))

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 active safety control 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 active safety control module are either corrupted or intermittently missing.

Action Taken When the DTC Sets

- The active safety control module sends a serial data message to display the appropriate indicator message
- The active safety control 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

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This is an informational DTC set by the engine control module. It is set to provide an indication that the active safety control 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 active safety control module. Do not replace the active safety control 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 active safety control 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 active safety control 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

Active Safety System Description and Operation (Chevrolet, GMC with UGN)Active Safety System Description and Operation (Cadillac with UGN)

Electrical Information Reference

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

Scan Tool Reference

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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 K124 Active Safety Control 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 active safety control module replacement, programming, and setup.

SYMPTOMS - OBJECT DETECTION

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

1. Perform the **Diagnostic System Check - Vehicle** before using the Symptom Tables in order to verify that all of the following are true: before using the Symptom Tables in order to verify that all of the following are true:
   - There are no DTCs set.

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- The control modules can communicate via the serial data link.

2. Review the system operation in order to familiarize yourself with the system functions:
   - **Parking Assist Description and Operation (with UD7)Parking Assist Description and Operation (with UD5)**
   - **Lane Departure Warning Description and Operation (except Cadillac with UGN)Lane Departure Warning Description and Operation (Cadillac with UGN)**
   - **Side Blind Zone Alert Description and Operation**
   - **Forward Collision Alert Description and Operation (with UGN)Forward Collision Alert Description and Operation (without UGN)**
   - **Active Safety System Description and Operation (Chevrolet, GMC with UGN)Active Safety System Description and Operation (Cadillac with UGN)**
   - **Adaptive Cruise Control Description and Operation (with KSG)**
   - **Rear Vision Camera Description and Operation**
   - **Safety Alert Seat 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.
- Make sure the parking assist sensors located on the vehicle front and rear bumper are clear. Remove any snow, mud or ice that is blocking the sensors.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections** .

Symptom List

- **Seat Haptic Signal Motor Malfunction**
- **Forward Collision Alert System Malfunction (except Cadillac with UGN)**
- **Parking Assist System Malfunction (Chevrolet, GMC)Parking Assist System Malfunction (Cadillac, without UGN)Parking Assist System Malfunction (Cadillac, with UGN)**
- **Rear Vision Camera System Malfunction (with IO3 and without UVH)Rear Vision Camera System Malfunction (without IO3 and UVH)**

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- **Side Object System Malfunction**
- **Lane Departure Warning System Malfunction (Chevrolet, GMC)Lane Departure Warning System Malfunction (Cadillac, without UGN)Lane Departure Warning System Malfunction (Cadillac, with UGN)**

SEAT HAPTIC SIGNAL MOTOR 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 B172E

Driver Seat Cushion Left Rear Haptic Alert Motor Control Circuit

DTC B172F

Driver Seat Cushion Right Rear Haptic Alert Motor Control 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
Left Haptic Alert Motor Control	B172E 02	B172E 01 or B172E 02	B172E 01	-
Left Haptic Alert Motor Ground	-	B172E 01 or B172E 02	-	-
Right Haptic Alert Motor Control	B172F 02	B172F 01 or B172F 02	B172F 01	-
Right Haptic Alert Motor Ground	-	B172F 01 or B172F 02	-	-

Circuit/System Description

The haptic seats, also known as safety alert seats, provide a vibration to alert the driver in certain circumstances. There are two motors in the driver seat cushion. Either the right or left motor can run or both depending on the alert. The seat memory control module provides the output voltage for the motors. The seat memory control module receives serial data requests from other modules to activate the appropriate seat motors with the number

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of pulses requested. While the motors are activated, the seat memory control module checks for either shorts to voltage or shorts to ground. Due to the nature of the PWM signal, if a motor circuit is open, it may be reported as either a short to voltage or short to ground.

Conditions for Running the DTC

- Engine ON.
- Haptic seat motor commanded ON.

Conditions for Setting the DTC

DTC B172E 01

The seat memory control module has detected a short to voltage on the left haptic seat motor control circuit.

DTC B172E 02

The seat memory control module has detected a short to ground on the left haptic seat motor control circuit.

DTC B172F 01

The seat memory control module has detected a short to voltage on the right haptic seat motor control circuit.

DTC B172F 02

The seat memory control module has detected a short to ground on the right haptic seat motor control circuit.

Action Taken When the DTC Sets

- "Service Driver Assist" will be displayed on the Driver Information Center.
- Alerts will be communicated with beeps.

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

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Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Safety Alert Seat 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 P45LR Seat Haptic Movement Motor - Driver Left Rear turns ON and OFF when commanding the Driver Seat Cushion Left Rear Haptic Movement On and Off with a scan tool.
   - **If the motor does not turn ON and OFF**

     Refer to Circuit/System Testing.

   - **If the motor turns ON and OFF**
3. Verify the P45RR Seat Haptic Movement Motor - Driver Right Rear turns on and off when commanding the Driver Seat Cushion Right Rear Haptic Movement On and Off with a scan tool.
   - **If the motor does not turn ON and OFF**

     Refer to Circuit/System Testing.

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- **If the motor turns ON and OFF**

4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the X5 harness connector at the K40D Seat Memory Control Module - Driver, ignition ON.
2. Test for less than 1 V between the appropriate control circuit terminal listed below and ground:
   - P45LR Seat Haptic Movement Motor - Driver Left Rear terminal 5
   - P45RR Seat Haptic Movement Motor - Driver Right Rear terminal 4
   - **If 1 V or greater**

     Repair the short to voltage on the circuit.

   - **If less than 1 V**
3. Ignition OFF and all vehicle systems OFF. It may take up to 2 min for all vehicle systems to power down.
4. Test for 27-51 Ω between the appropriate control circuit terminal listed below and ground:
   - P45LR Seat Haptic Movement Motor - Driver Left Rear terminal 5
   - P45RR Seat Haptic Movement Motor - Driver Right Rear terminal 4
   - **If less than 27 Ω**

     Test or replace the appropriate P45 Seat Haptic Movement Motor - Driver.

   - **If greater than 51 Ω**
   1. Verify the circuit ground connection is clean and secure.
      - If the ground connector is not clean or secure, repair as necessary.
      - If the circuit ground connection is clean and secure
   2. Replace the appropriate P45 Seat Haptic Movement Motor - Driver.
   - **If between 27-51 Ω**
5. Install a 3 A fused jumper wire between the appropriate control circuit terminal listed below and B+.
   - P45LR Seat Haptic Movement Motor - Driver Left Rear terminal 5
   - P45RR Seat Haptic Movement Motor - Driver Right Rear terminal 4
6. Verify the appropriate P45 Seat Haptic Movement Motor - Driver is active.

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- **If the P45 Seat Haptic Movement Motor - Driver is not active**

  Replace the appropriate P45 Seat Haptic Movement Motor - Driver.

- **If the P45 Seat Haptic Movement Motor - Driver is active**

7. Ignition OFF, connect the harness connector at the K40 Seat Memory Control Module, ignition ON.
8. Verify the P45LR Seat Haptic Movement Motor - Driver Left Rear turns ON and OFF when commanding the Driver Seat Cushion Left Rear Haptic Movement On and Off with a scan tool.
   - **If the motor does not turn ON and OFF**

     Replace the K40 Seat Memory Control Module.

   - **If the motor turns ON and OFF**
9. Verify the P45RR Seat Haptic Movement Motor - Driver Right Rear turns on and off when commanding the Driver Seat Cushion Right Rear Haptic Movement On and Off with a scan tool.
   - **If the motor does not turn ON and OFF**

     Replace the K40 Seat Memory Control Module.

   - **If the motor turns ON and OFF**
10. All OK.

Repair Instructions

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

- Refer to **Front Seat Lane Departure Warning Actuator Replacement**
- Refer to **Control Module References** for control module replacement, programming, and setup.

FORWARD COLLISION ALERT SYSTEM MALFUNCTION (EXCEPT CADILLAC WITH UGN)

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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Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Forward Collision Alert Indicators Ignition	1	1	-	-
Forward Collision Alert Indicators Control (Terminal 2)	2	1	1	-
Forward Collision Alert Indicators Control (Terminal 3)	1	1	1	-
Forward Collision Alert Indicators Ground	-	1	-	-
1. Forward collision alert indicators inoperative 2. Forward collision alert indicators always illuminated				

Circuit/System Description

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

Diagnostic Aids

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

The scan tool Frontview Camera Disable History parameters should be used as a starting point when diagnosis an intermittent customer complaint concerning the forward collision alert system. The parameters will identify the last four reasons the forward collision alert system was disabled.

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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 (with UGN)Forward Collision Alert Description and Operation (without UGN)

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 Forward Collision Alert Function Status parameter is not Malfunction.
    - **If the parameter is Malfunction**

      Refer to Circuit/System Testing - Frontview Camera Module Malfunction

    - **If parameter is not Malfunction**
3. Verify the forward collision alert indicators turn on and off when commanding the instrument cluster All Indicators On and Off with a scan tool.
    - **If the indicators do not illuminate**

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Refer to Circuit/System Testing - Forward Collision Alert Indicator Malfunction

- **If the indicators illuminate**

4. Verify the forward collision alert distance on the driver information center toggles between far, medium, near and off when cycling the forward collision alert distance switch.
   - **If the setting does not change**

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

   - **If the setting changes**
5. Verify the area of the B174W Frontview Camera - Windshield is not contaminated.
   - **If contaminated**

     Clean the windshield

   - **If not contaminated**
6. All OK.

Circuit/System Testing

Frontview Camera Module Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 1 and ground.
   - **If 10 Ω or greater**
   1. Ignition OFF.
   2. Test for less than 2 Ω in the ground circuit end to end.
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, repair the open/high resistance in the ground connection.
   - **If less than 10 Ω**
3. Verify a test lamp illuminates between the B+ circuit terminal 3 and ground.
   - **If the test lamp does not illuminate and the circuit fuse is good**
   1. Ignition OFF.

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2. Test for less than 2 Ω in the B+ circuit end to end.
    - If 2 Ω or greater, repair the open/high resistance in the circuit.
    - If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.
- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF.
2. Test for infinite resistance between the B+ circuit and ground.
    - If less than infinite resistance, repair the short to ground on the circuit.
    - If infinite resistance, replace the B174W Frontview Camera - Windshield.
- **If the test lamp illuminates**

4. Replace the B174W Frontview Camera - Windshield.

Forward Collision Alert Indicator Malfunction

1. Ignition OFF, and all vehicle systems OFF, disconnect the harness connector at the P43 Collision Alert Indicators. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.
    - **If 10 Ω or greater**

    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**

3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 1 and ground.
    - **If the test lamp does not illuminate and the circuit fuse is good**

    1. Ignition OFF.
    2. Test for less than 2 Ω in the ignition circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Power Mode Mismatch (With BTM)** **Power Mode Mismatch (Without BTM)** .
    - **If the test lamp does not illuminate and the circuit fuse is open**

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1. Ignition OFF.
2. Test for infinite resistance between the ignition circuit and ground.
    - If less than infinite resistance, repair the short to ground on the circuit.
    - If infinite resistance, replace the P43 Collision Alert Indicators.

- **If the test lamp illuminates**

5. Verify a test lamp illuminates between the control circuit terminal 2 and B+

- **If the test lamp does not illuminate**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.
2. Test for less than 1 V between the control circuit and ground.
    - If 1 V or greater, repair the short to voltage on the circuit.
    - If less than 1 V
3. Ignition OFF.
4. Test for less than 2 Ω in the control circuit end to end.
    - If 2 Ω or greater, repair the open/high resistance in the circuit.
    - If less than 2 Ω, replace the P16 Instrument Cluster.

- **If the test lamp illuminates**

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

- **If the test lamp does not illuminate**

1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.
2. Test for less than 1 V between the control circuit and ground.
    - If 1 V or greater, repair the short to voltage on the circuit.
    - If less than 1 V
3. Ignition OFF.
4. Test for less than 2 Ω in the control circuit end to end.
    - If 2 Ω or greater, repair the open/high resistance in the circuit.
    - If less than 2 Ω, replace the P16 Instrument Cluster.

- **If the test lamp illuminates**

7. Ignition OFF, connect the harness connector at the P43 Collision Alert Indicators, ignition ON.
8. Verify the P43 Collision Alert Indicators are not illuminated.

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- **If the P43 Collision Alert Indicators are illuminated**

1. Ignition OFF, disconnect the harness connector at the P43 Collision Alert Indicators and the P16 Instrument Cluster.
2. Test for infinite resistance between the P43 Collision Alert Indicators control circuit terminal 2 and ground.
    - If less than infinite resistance, repair the short to ground on the circuit.
    - If infinite resistance, replace the P16 Instrument Cluster.

- **If the P43 Collision Alert Indicators are not illuminated**

9. Test or replace the P43 Collision Alert Indicators.

Repair Instructions

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

- Refer to **Cruise Control Switch Replacement (Cadillac)** **Cruise Control Switch Replacement (Chevrolet/GMC)**
- Refer to **Forward Collision Alert Display Replacement**
- Refer to **Control Module References** for control module replacement, programming, and setup.

PARKING ASSIST SYSTEM MALFUNCTION (CHEVROLET, GMC)

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
High Control (Terminal 5)	2	2	-	-
Low Control (Terminal 4)	3	2	B0968 01	-
Signal	B0967 02	1	1	-
Ground	-	1	-	-
1. Parking Assist Switch Inoperative 2. Parking Assist Switch Indicator Inoperative 3. Parking Assist Switch Indicator Always On				

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Circuit/System Description

The parking assist system can be activated and deactivated by pressing the parking assist switch. The front and rear parking assist control module applies voltage and monitors the parking assist switch signal circuit. The parking assist switch is a normally open switch. With the switch open, voltage seen at the front and rear front and rear parking assist control module is high. When the parking assist switch is pressed, the switch is closed and the signal circuit is pulled to ground. With the switch closed, voltage seen at the front and rear front and rear parking assist control module is low. The front and rear parking assist control module will respond to this by activating or deactivating the parking assist function.

When the parking assist system is enabled, the front and rear parking assist control module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the front and rear parking assist control module.

Diagnostic Aids

The following is a brief description of potential causes which may aid in diagnosis:

- Manual Disable - The parking assist system has been disabled through the parking assist switch.
- Hitch/Object Attached - The front and rear parking assist control module is detecting an object that is attached to the vehicle. Common items such as a hitch receiver, trailer, or a bicycle rack may cause this concern. Additionally, damage to the rear of the vehicle or a misaligned sensor may cause this concern. If the vehicle is damaged in a manner that causes the sensor to detect the fascia itself, the front and rear parking assist control module will interpret this as an attached object and disable the system. Carefully inspect the fascia, fascia mounting surface, and sensor retainers before continuing with normal diagnosis. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 mph).
- Vehicle Overspeed - The vehicle is travelling too fast in reverse at speeds of greater than 8 km/h (5 mph).
- Inhibit - The front and rear parking assist control module has lost or received invalid GMLAN signal(s).
- Sensor Disturbance - An outside interference is causing sensor movement. Such interference may be caused a heavy pounding, like that of a nearby jackhammer, or large changes in pressure, such as a large truck air brakes.
- Sensor Ring Time - If the sensor fails its own diagnostic initialization the front and rear parking assist control module will set this error. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 mph). The following is a list of reasons this cause may have set:
    - One or more of the sensors may be blocked by snow, mud, ice, or other debris. This might happen after going through a car wash in cold weather.
    - Silicone insulator surrounding sensor maybe missing, cut, or twisted.
    - Improperly installed sensor, sensor maybe be crooked due to a tight wire harness.
    - One or more of the sensors may be scratched or the paint maybe chipped.

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- Excessive paint thickness on a sensor may cause an excessive sensor ring time. When replacing or refinishing a sensor, do not apply an excessive amount of paint or clear coat.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7)Parking Assist Description and Operation (with UD5)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Park Assist Switch parameter changes between Active and Inactive while pressing and releasing the parking assist switch.
   - **If the parameter does not change between Active and Inactive**

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

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

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3. Engine running, parking brake applied, transmission in R.
4. Verify the reverse lamps are illuminated.
    - **If the reverse lamps are not illuminated**

      Refer to **Backup Lamps Malfunction** .

    - **If the reverse lamps are illuminated**
5. Verify the scan tool Parking Assist System Status parameter is Enabled.
    - **If the parameter is not Enabled**

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

    - **If the parameter is Enabled**
6. Verify the parking assist switch indicator turns ON and OFF when turning the parking assist system on and off with the park assist switch.
    - **If the indicator does not turn ON and OFF**

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

    - **If the indicator turns ON and OFF**
7. All OK.

Circuit/System Testing

Parking Assist Switch Circuit Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 8 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**

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3. Verify the scan tool Parking Assist Switch parameter is Inactive.
    - **If the parameter is not Inactive**
    1. Ignition OFF, disconnect the X1 harness connector at the K41 Front and Rear Parking Assist Control Module.
    2. Test for infinite resistance between the signal circuit terminal 3 and ground.
        - If less than infinite resistance, repair the short to ground on the signal circuit.
        - If infinite resistance, replace the K41 Front and Rear Parking Assist Control Module.
    - **If the parameter is Inactive**
4. Connect a 3 A fused jumper wire between the signal circuit terminal 3 and ground.
5. Verify the scan tool Parking Assist Switch parameter is Active.
    - **If the parameter is not Active**
    1. Ignition OFF, disconnect the X1 harness connector at the K41 Front and Rear Parking Assist 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, replace the K41 Front and Rear Parking Assist Control Module.
    3. Ignition OFF.
    4. Test for less than 2 Ω in the signal circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the K41 Front and Rear Parking Assist Control Module.
    - **If the parameter is Active**
6. Test or replace the S48A Multifunction Switch - Instrument Panel.

Parking Assist Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 5 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
    2. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .

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- **If the test lamp illuminates**

3. Ignition OFF, connect the harness connector at the S48A Multifunction Switch - Instrument Panel. Disconnect the X1 harness connector at the K41 Front and Rear Parking Assist Control Module.
4. Verify the parking assist switch indicator is not illuminated.
    - **If the parking assist switch indicator is illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.
    2. Test for infinite resistance between the S48A Multifunction Switch - Instrument Panel control circuit terminal 4 and ground.
        - If less than infinite resistance, repair the short to ground in the circuit.
        - If infinite resistance, replace the S48A Multifunction Switch - Instrument Panel.
    - **If the parking assist switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 3 and ground.
6. Verify the parking assist switch indicator is illuminated.
    - **If the parking assist switch indicator is not illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.
    2. Test for less than 1 V between the control circuit and ground.
        - If 1 V or greater, repair the short to voltage on the circuit.
        - If less than 1 V
    3. Ignition OFF.
    4. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the S48A Multifunction Switch - Instrument Panel.
    - **If the parking assist switch indicator is illuminated**
7. Replace the K41 Front and Rear Parking Assist Control Module.

Repair Instructions

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

- Refer to **Instrument Panel Accessory Bezel Replacement (Chevrolet / GMC)** for multifunction switch - instrument panel replacement
- Refer to **Control Module References** for front and rear parking assist control module replacement, programming, and setup.

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PARKING ASSIST SYSTEM MALFUNCTION (CADILLAC, WITHOUT UGN)

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
High Control (Terminal 3)	2	2	-	-
Low Control (Terminal 2)	3	2	B0968 01	-
Signal	B0967 02	1	1	-
Ground	-	1	-	-
1. Parking Assist Switch Inoperative 2. Parking Assist Switch Indicator Inoperative 3. Parking Assist Switch Indicator Always On				

Circuit/System Description

The parking assist system can be activated and deactivated by pressing the parking assist switch. The front and rear parking assist control module applies voltage and monitors the parking assist switch signal circuit. The parking assist switch is a normally open switch. With the switch open, voltage seen at the front and rear front and rear parking assist control module is high. When the parking assist switch is pressed, the switch is closed and the signal circuit is pulled to ground. With the switch closed, voltage seen at the front and rear front and rear parking assist control module is low. The front and rear parking assist control module will respond to this by activating or deactivating the parking assist function.

When the parking assist system is enabled, the front and rear parking assist control module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the front and rear parking assist control module.

Diagnostic Aids

The following is a brief description of potential causes which may aid in diagnosis:

- Manual Disable - The parking assist system has been disabled through the parking assist switch.
- Hitch/Object Attached - The front and rear parking assist control module is detecting an object that is attached to the vehicle. Common items

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such as a hitch receiver, trailer, or a bicycle rack may cause this concern. Additionally, damage to the rear of the vehicle or a misaligned sensor may cause this concern. If the vehicle is damaged in a manner that causes the sensor to detect the fascia itself, the front and rear parking assist control module will interpret this as an attached object and disable the system. Carefully inspect the fascia, fascia mounting surface, and sensor retainers before continuing with normal diagnosis. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 mph).

- Vehicle Overspeed - The vehicle is travelling too fast in reverse at speeds of greater than 8 km/h (5 mph).
- Inhibit - The front and rear parking assist control module has lost or received invalid GMLAN signal(s).
- Sensor Disturbance - An outside interference is causing sensor movement. Such interference may be caused a heavy pounding, like that of a nearby jackhammer, or large changes in pressure, such as a large truck air brakes.
- Sensor Ring Time - If the sensor fails its own diagnostic initialization the front and rear parking assist control module will set this error. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 mph). The following is a list of reasons this cause may have set:
  - One or more of the sensors may be blocked by snow, mud, ice, or other debris. This might happen after going through a car wash in cold weather.
  - Silicone insulator surrounding sensor maybe missing, cut, or twisted.
  - Improperly installed sensor, sensor maybe be crooked due to a tight wire harness.
  - One or more of the sensors may be scratched or the paint maybe chipped.
  - Excessive paint thickness on a sensor may cause an excessive sensor ring time. When replacing or refinishing a sensor, do not apply an excessive amount of paint or clear coat.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7)Parking Assist Description and Operation (with UD5)

Electrical Information Reference

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- **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 Park Assist Switch parameter changes between Active and Inactive while pressing and releasing the parking assist switch.
    - **If the parameter does not change between Active and Inactive**

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

    - **If the parameter changes between Active and Inactive**
3. Engine running, parking brake applied, transmission in R.
4. Verify the reverse lamps are illuminated.
    - **If the reverse lamps are not illuminated**

      Refer to **Backup Lamps Malfunction** .

    - **If the reverse lamps are illuminated**
5. Verify the scan tool Parking Assist System Status parameter is Enabled.
    - **If the parameter is not Enabled**

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

    - **If the parameter is Enabled**
6. Verify the parking assist switch indicator turns ON and OFF when turning the parking assist system on and off with the park assist switch.
    - **If the indicator does not turn ON and OFF**

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

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- **If the indicator turns ON and OFF**

7. All OK.

Circuit/System Testing

Parking Assist Switch Circuit 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 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**
3. Verify the scan tool Parking Assist Switch parameter is Inactive.
    - **If the parameter is not Inactive**
    1. Ignition OFF, disconnect the X1 harness connector at the K41 Front and Rear Parking Assist Control Module.
    2. Test for infinite resistance between the signal circuit terminal 6 and ground.
        - If less than infinite resistance, repair the short to ground on the signal circuit.
        - If infinite resistance, replace the K41 Front and Rear Parking Assist Control Module.
    - **If the parameter is Inactive**
4. Connect a 3 A fused jumper wire between the signal circuit terminal 6 and ground.
5. Verify the scan tool Parking Assist Switch parameter is Active.
    - **If the parameter is not Active**
    1. Ignition OFF, disconnect the X1 harness connector at the K41 Front and Rear Parking Assist 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, replace the K41 Front and Rear Parking Assist Control Module.
    3. Ignition OFF.

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4. Test for less than 2 Ω in the signal circuit end to end.
    - If 2 Ω or greater, repair the open/high resistance in the circuit.
    - If less than 2 Ω, replace the K41 Front and Rear Parking Assist Control Module.
- **If the parameter is Active**

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

Parking Assist Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
    2. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .
    - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. Disconnect the X1 harness connector at the K41 Front and Rear Parking Assist Control Module.
4. Verify the parking assist switch indicator is not illuminated.
    - **If the parking assist switch indicator is illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel control circuit terminal 2 and ground.
        - If less than infinite resistance, repair the short to ground in the circuit.
        - If infinite resistance, replace the S48D Multifunction Switch 2 - Instrument Panel.
    - **If the parking assist switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 3 and ground.
6. Verify the parking assist switch indicator is illuminated.
    - **If the parking assist switch indicator is not illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    2. Test for less than 1 V between the control circuit and ground.

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- 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 S48D Multifunction Switch 2 - Instrument Panel.

- **If the parking assist switch indicator is illuminated**

7. Replace the K41 Front and Rear Parking Assist Control Module.

Repair Instructions

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

- Refer to **Instrument Panel Upper Trim Panel Bracket Replacement (Cadillac)** for multifunction switch 2 - instrument panel replacement
- Refer to **Control Module References** for front and rear parking assist control module replacement, programming, and setup.

PARKING ASSIST SYSTEM MALFUNCTION (CADILLAC, WITH UGN)

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
High Control (Terminal 3)	2	2	-	-
Low Control (Terminal 2)	3	2	B0968 0B	-
Signal	1	1	1	-
Ground	-	1	-	-
1. Parking Assist Switch Inoperative 2. Parking Assist Switch Indicator Inoperative 3. Parking Assist Switch Indicator Always On				

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Circuit/System Description

The parking assist system can be activated and deactivated by pressing the parking assist switch. The active safety control module applies voltage and monitors the parking assist switch signal circuit. The parking assist switch is a normally open switch. With the switch open, voltage seen at the active safety control module is high. When the parking assist switch is pressed, the switch is closed and the signal circuit is pulled to ground. With the switch closed, voltage seen at the active safety control module is low. The active safety control module will respond to this by activating or deactivating the parking assist function.

When the parking assist system is enabled, the active safety control module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the active safety control module.

Diagnostic Aids

The following is a brief description of potential causes which may aid in diagnosis:

- Manual Disable - The parking assist system has been disabled through the parking assist switch.
- Hitch/Object Attached - The front and rear parking assist control module is detecting an object that is attached to the vehicle. Common items such as a hitch receiver, trailer, or a bicycle rack may cause this concern. Additionally, damage to the rear of the vehicle or a misaligned sensor may cause this concern. If the vehicle is damaged in a manner that causes the sensor to detect the fascia itself, the front and rear parking assist control module will interpret this as an attached object and disable the system. Carefully inspect the fascia, fascia mounting surface, and sensor retainers before continuing with normal diagnosis. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 mph).
- Vehicle Overspeed - The vehicle is travelling too fast in reverse at speeds of greater than 8 km/h (5 mph).
- Inhibit - The active safety control module has lost or received invalid GMLAN signal(s).
- Sensor Disturbance - An outside interference is causing sensor movement. Such interference may be caused a heavy pounding, like that of a nearby jackhammer, or large changes in pressure, such as a large truck air brakes.
- Sensor Ring Time - If the sensor fails its own diagnostic initialization the active safety control module will set this error. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 mph). The following is a list of reasons this cause may have set:
    - One or more of the sensors may be blocked by snow, mud, ice, or other debris. This might happen after going through a car wash in cold weather.
    - Silicone insulator surrounding sensor maybe missing, cut, or twisted.
    - Improperly installed sensor, sensor maybe be crooked due to a tight wire harness.
    - One or more of the sensors may be scratched or the paint maybe chipped.

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- Excessive paint thickness on a sensor may cause an excessive sensor ring time. When replacing or refinishing a sensor, do not apply an excessive amount of paint or clear coat.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Parking Assist Description and Operation (with UD7)Parking Assist Description and Operation (with UD5)

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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 the scan tool Parking Assist Switch Status parameter changes between Active and Inactive while pressing and releasing the parking assist switch.
   - **If the parameter does not change between Active and Inactive**

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

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

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3. Engine running, parking brake applied, transmission in R.
4. Verify the reverse lamps are illuminated.
    - **If the reverse lamps are not illuminated**

      Refer to **Backup Lamps Malfunction** .

    - **If the reverse lamps are illuminated**
5. Verify the scan tool Parking Assist System Status parameter is Enabled.
    - **If the parameter is not Enabled**

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

    - **If the parameter is Enabled**
6. Verify the parking assist switch indicator turns ON and OFF when turning the parking assist system on and off with the park assist switch.
    - **If the indicator does not turn ON and OFF**

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

    - **If the indicator turns ON and OFF**
7. All OK.

Circuit/System Testing

Parking Assist Switch Circuit 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 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**

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3. Verify the scan tool Parking Assist Switch Status parameter is Inactive.
    - **If the parameter is not Inactive**
    1. Ignition OFF, disconnect the X1 harness connector at the K124 Active Safety Control Module.
    2. Test for infinite resistance between the signal circuit terminal 6 and ground.
        - If less than infinite resistance, repair the short to ground on the signal circuit.
        - If infinite resistance, replace the K124 Active Safety Control Module.
    - **If the parameter is Inactive**
4. Connect a 3 A fused jumper wire between the signal circuit terminal 6 and ground.
5. Verify the scan tool Parking Assist Switch Status parameter is Active.
    - **If the parameter is not Active**
    1. Ignition OFF, disconnect the X1 harness connector at the K124 Active Safety 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, replace the K124 Active Safety Control Module.
    3. Ignition OFF.
    4. Test for less than 2 Ω in the signal circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the K124 Active Safety Control Module.
    - **If the parameter is Active**
6. Test or replace the S48D Multifunction Switch 2 - Instrument Panel.

Parking Assist Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
    2. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .

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- **If the test lamp illuminates**

3. Ignition OFF, connect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. Disconnect the X1 harness connector at the K124 Active Safety Control Module.
4. Verify the parking assist switch indicator is not illuminated.
    - **If the parking assist switch indicator is illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel control circuit terminal 2 and ground.
        - If less than infinite resistance, repair the short to ground in the circuit.
        - If infinite resistance, replace the S48D Multifunction Switch 2 - Instrument Panel.
    - **If the parking assist switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 2 and ground.
6. Verify the parking assist switch indicator is illuminated.
    - **If the parking assist switch indicator is not illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    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 S48D Multifunction Switch 2 - Instrument Panel.
    - **If the parking assist switch indicator is illuminated**
7. Replace the K124 Active Safety Control Module.

Repair Instructions

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

- Refer to **Instrument Panel Upper Trim Panel Bracket Replacement (Cadillac)** for multifunction switch 2 - instrument panel replacement
- Refer to **Control Module References** for active safety control module replacement, programming, and setup

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REAR VISION CAMERA SYSTEM MALFUNCTION (WITH IO3 AND WITHOUT UVH)

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
Ignition	1	1	-	-
Backup Signal	2	1	-	-
Camera Module signal +	3	1	2	-
Camera Module signal -	3	1	1	-
Ground	-	1	-	-
Shield	-	3	-	-
1. Rear vision camera inoperative 2. Rear vision camera image always displayed 3. Poor Quality Image				

Circuit/System Description

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

Diagnostic Aids

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

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

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will correct the high resistance condition due to terminal fretting corrosion.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Description and Operation

Rear 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

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

1. Verify there is no debris on the B87 Rearview Camera 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 there is no debris on the lens**

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2. Engine running, transmission in R.
3. Verify the backup lamps are illuminated.
    - **If the backup lamps are not illuminated**

      Refer to **Backup Lamps Malfunction** .

    - **If the backup lamps are illuminated**
4. Engine running, transmission in R.
5. Verify a clear rear vision image is displayed on the A11 Radio.
    - **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 and all vehicle systems 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 5 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
    - **If the test lamp does not illuminate and the circuit fuse is good**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ignition circuit end to end.

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- 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 (With BTM)** **Power Mode Mismatch (Without BTM)** .

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

1. Ignition OFF.
2. Test for infinite resistance between the ignition circuit and ground.
    - If less than infinite resistance, repair the short to ground on the circuit.
    - If infinite resistance, replace the B87 Rearview Camera.

- **If the test lamp illuminates**

5. Engine running, park brake applied, transmission in R.
6. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
    - **If the test lamp does not illuminate**

    1. Ignition OFF, disconnect the X4 harness connector at the X50A Fuse Block - Underhood
    2. Test for less than 2 Ω in the ignition circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Backup Lamps Malfunction** .

    - **If the test lamp illuminates**

7. Ignition OFF, disconnect the X1 harness connector at the A11 Radio, ignition ON.
8. Test for less than 1 V between the signal circuit terminals listed below and ground:
    - A11 Radio signal (+) circuit terminal 5 X1
    - A11 Radio signal (-) circuit terminal 4 X2
    - **If 1 V or greater**

      Repair the short to voltage on the circuit.

    - **If less than 1 V**
9. Test for infinite resistance between the signal circuit terminals listed below and ground:
    - A11 Radio signal (+) circuit terminal 5 X1
    - A11 Radio signal (-) circuit terminal 4 X2
    - **If less than infinite resistance**

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Repair the short to ground on the circuit.

- **If infinite resistance**

10. Test for less than 2 Ω between the A11 Radio signal (+) circuit terminal 5 X1 and the B87 Rearview Camera signal (+) circuit terminal 1.
    - **If 2 Ω or greater**

      Repair the open/high resistance in the circuit.

    - **If less than 2 Ω**
11. Test for less than 2 Ω between the A11 Radio signal (+) circuit terminal 4 X1 and the B87 Rearview Camera signal (+) circuit terminal 4.
    - **If 2 Ω or greater**

      Test the signal circuit for an open/high resistance.

    - **If less than 2 Ω**
12. Replace the B87 Rearview Camera.
13. Engine running, transmission in R.
14. Verify a clear rear vision image is displayed on the A11 Radio.
    - **If a clear rear vision image is not displayed**

      Replace the A11 Radio.

    - **If a clear rear vision image is displayed**
15. 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 radio replacement, programming, and setup.

REAR VISION CAMERA SYSTEM MALFUNCTION (WITHOUT IO3 AND UVH)

Diagnostic Instructions

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- 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
Ignition	B127B 2B, 1	B127B 2B, 1	-	-
Backup Signal	B127B 2B	B127B 2B, 1	-	-
Camera Module signal +	B127B 2B, 3	B127B 2B, 1	B127B 2B, 2	-
Camera Module signal -	B127B 2B, 3	B127B 2B, 1	B127B 2B, 1	-
Ground	-	B127B 2B, 1	-	-
Shield	-	3	-	-
1. Rear vision camera inoperative 2. Rear vision camera image always displayed 3. Poor Quality Image				

Circuit/System Description

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

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

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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

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

1. Verify there is no debris on the B87 Rearview Camera 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 there is no debris on the lens**
2. Engine running, transmission in R.
3. Verify the backup lamps are illuminated.

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

  Refer to **Backup Lamps Malfunction** .

- **If the backup lamps are illuminated**

4. Engine running, transmission in R.
5. 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**
6. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems 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 5 and ground.
   - **If 10 Ω or greater**
   1. Ignition OFF.
   2. Test for less than 2 Ω in the ground circuit end to end.
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, repair the open/high resistance in the ground connection.
   - **If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
   - **If the test lamp does not illuminate and the circuit fuse is good**
   1. Ignition OFF.
   2. Test for less than 2 Ω in the ignition circuit end to end.
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, verify the fuse is OK and there is voltage at the fuse. Refer to **Power Mode Mismatch (With BTM)** **Power**

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Mode Mismatch (Without BTM) .

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

1. Ignition OFF.
2. Test for infinite resistance between the ignition circuit and ground.
    - If less than infinite resistance, repair the short to ground on the circuit.
    - If infinite resistance, replace the B87 Rearview Camera.

- **If the test lamp illuminates**

5. Engine running, park brake applied, transmission in R.
6. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
    - **If the test lamp does not illuminate**

    1. Ignition OFF, disconnect the X4 harness connector at the X50A Fuse Block - Underhood
    2. Test for less than 2 Ω in the ignition circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Backup Lamps Malfunction** .

    - **If the test lamp illuminates**

7. Ignition OFF, disconnect the X2 harness connector at the K74 Human Machine Interface Control Module, ignition ON.
8. Test for less than 1 V between the signal circuit terminals listed below and ground:
    - K74 Human Machine Interface Control Module signal (+) circuit terminal 5 X2
    - K74 Human Machine Interface Control Module signal (-) circuit terminal 6 X2
    - **If 1 V or greater**

      Repair the short to voltage on the circuit.

    - **If less than 1 V**
9. Test for infinite resistance between the signal circuit terminals listed below and ground:
    - K74 Human Machine Interface Control Module signal (+) circuit terminal 5 X2
    - K74 Human Machine Interface Control Module signal (-) circuit terminal 6 X2
    - **If less than infinite resistance**

      Repair the short to ground on the circuit.

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- **If infinite resistance**

10. Test for less than 2 Ω between the K74 Human Machine Interface Control Module signal (+) circuit terminal 5 X2 and the B87 Rearview Camera signal (+) circuit terminal 1.
    - **If 2 Ω or greater**

      Repair the open/high resistance in the circuit.

    - **If less than 2 Ω**
11. Test for less than 2 Ω between the K74 Human Machine Interface Control Module signal (+) circuit terminal 6 X2 and the B87 Rearview Camera signal (+) circuit terminal 4.
    - **If 2 Ω or greater**

      Test the signal circuit for an open/high resistance.

    - **If less than 2 Ω**
12. Replace the B87 Rearview Camera.
13. Engine running, transmission in R.
14. Verify a clear rear vision image is displayed on the P17 Info Display Module.
    - **If a clear rear vision image is not displayed**

      Replace the K74 Human Machine Interface Control Module.

    - **If a clear rear vision image is displayed**
15. 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 human machine interface control module replacement, programming, and setup.

SIDE OBJECT SYSTEM MALFUNCTION

Diagnostic Instructions

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- 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 Module - Left B+	U0232	U0232	-	-
Side Object Sensor Module - Left Serial Data (Terminal 1)	1	1	1	-
Side Object Sensor Module - Left Serial Data (Terminal 4)	U18A6	U18A6	U18A6	-
Side Object Sensor Module - Left Serial Data (Terminal 5)	-	U18A6	U18A6	-
Side Object Sensor - Left Control (Terminal 3)	U18A6	U18A6	-	-
Side Object Sensor Module - Left Ground	-	1	-	-
Side Object Sensor Module - Right B+	U18A6	U18A6	-	-
Side Object Sensor Module - Right Control (Terminal 2)	B094C 39	3	2	-
Side Object Sensor Module - Right Control (Terminal 1)	B094C 39	3	2	-
Side Object Sensor Module - Right Ground	-	U18A6	-	-
1. No communication with side object sensor module - left 2. Side blind zone alert indicator illuminated at all times 3. Side blind zone alert indicator does not illuminate				

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 though 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

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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.

The side object sensor modules are also used to provide cross traffic alerts when backing up. If a vehicle is approaching the vehicle while reversing, the side object sensor modules will request a warning be displayed through the infotainment system on the info display module.

Diagnostic Aids

- When the ignition is turned on, or the engine is started, both outside rearview mirror displays will briefly illuminate to indicate that the system is operating.
- The conditions for disabling the side blind zone alert system are captured by DTCs. The driver information center will display Service Side Detection System if one of the sensors has failed.
- The side blind zone system will be disabled if 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.
- The side blind zone may be temporarily unavailable if a blockage condition exists (i.e. mud/snow buildup in front of the sensor). A driver information message "Side Detection System Unavailable" will be displayed. The side blind zone 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.
- Because the sensors are NOT identical, they must NOT be swapped from one side of the vehicle to the other in an attempt to isolate a concern. Sensors should also 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. This is normal operation and does not require service.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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Description and Operation

Side Blind Zone Alert Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool can communicate with the B218L Side Object Sensor Module - Left.
   - **If the scan tool cannot communicate with the B218R Side Object Sensor Module - Left**

     Refer to Circuit/System Testing - Left Side Object Sensor Malfunction.

   - **If the scan tool can communicate with the B218L Side Object Sensor Module - Left**
3. Verify DTC U18A6 is not set.
   - **If DTC U18A6 is set**

     Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

   - **If DTC U18A6 is not set**
4. Ignition OFF, ignition ON.
5. Verify that both side blind zone alert system indicators located in the outside rearview mirrors briefly turn ON and then turn OFF during the system self test.
   - **If both side blind zone alert indicators do not briefly turn ON and OFF**
   1. Verify the system is enabled

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- If disabled, refer to Diagnostic Aids for cause of disable.
- If enabled, refer to Circuit/System Testing - Side Object Indicator Malfunction.

- **If only one indicator does not briefly illuminate during the self test**

  Refer to Circuit/System Testing - Side Object Indicator Malfunction.

- **If both side blind zone alert indicators briefly turn ON and OFF**

6. 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 - Side Object Indicator Malfunction.

   - **If both indicators turn ON and OFF**
7. All OK.

Circuit/System Testing

Left Side Object Sensor Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B218L Side Object Sensor Module - Left. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between ground circuit terminal 7 and ground.
   - **If 10 Ω or greater**
   1. Ignition OFF.
   2. Test for less than 2 Ω in the ground circuit end to end.
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, repair the open/high resistance in the ground connection.
   - **If less than 10 Ω**
3. Verify a test lamp illuminates between the B+ circuit terminal 8 and ground.

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

1. Ignition Off.
2. Test for less than 2 Ω in the B+ circuit end to end.
    - If 2 Ω or greater, repair the open/high resistance in the circuit.
    - If less than 2 Ω, verify the fuse is not open and there is voltage at the fuse.

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

1. Ignition OFF.
2. Test for infinite resistance between the B+ circuit and ground.
    - If less than infinite resistance, repair the short to ground on the circuit.
    - If infinite resistance, replace the B218L Side Object Sensor Module - Left.

- **If the test lamp illuminates**

4. Ignition OFF and all vehicle systems OFF.
5. Test for less than 2 Ω between the B218L Side Object Sensor Module - Left serial data circuit terminal 1 and the X84 Data Link Connector serial data circuit terminal 1.
    - **If 2 Ω or greater**

      Repair the open/high resistance in the circuit.

    - **If less than 2 Ω**
6. Replace the B218L Side Object Sensor Module - Left.

Side Object Indicator Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the X3 harness connector at the appropriate A9 Outside Rearview Mirror. 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 2 and ground.
    - **If 2 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.

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- **If less than 2 Ω**

3. Ignition ON.
4. Test for less than 1 V between the control circuit terminal 1 and ground.
    - **If 1 V or greater**
    1. Ignition 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 1 and ground.
    - **If 3 V or less**
    1. Ignition 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. 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 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 (DR4)** **Outside Rearview Mirror Glass Replacement (DL3, DL8)**
- Refer to **Control Module References** for side object sensor module replacement, programming, and setup.

LANE DEPARTURE WARNING SYSTEM MALFUNCTION (CHEVROLET, GMC)

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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
Signal	B356A 02	1	B356A 05	-
Ground	-	1	-	-
High Control (Terminal 5)	B0987 06, B1011 00	B0987 06, B1011 00	-	-
Low Control (Terminal 6)	B0987 06, B1011 00	B0987 06, B1011 00	B0987 01, B1011 00	-
1. Lane departure warning switch malfunction.				

Circuit/System Description

The frontview camera module monitors the lane departure warning switch signal circuit. The frontview camera module applies voltage and monitors the switch signal circuit. The lane departure warning switch is normally open switch. With the switches open, voltage seen at the frontview camera module is high. When a switch is pressed, the signal circuit is pulled to ground and the voltage seen by the frontview camera module is low. The frontview camera module will respond to this by activating or deactivating the lane departure warning feature.

When the lane departure warning is enabled, the frontview camera module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the frontview camera module.

Diagnostic Aids

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

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Additionally, the Frontview Camera Disable History can give useful hints about what affected the operation of the lane departure warning system. For the Frontview Camera Disable History, refer to **DTC B1011**.

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 (except Cadillac with UGN)Lane Departure Warning Description and Operation (Cadillac with UGN)

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 Frontview Camera System Status parameter is Normal.
    - **If the parameter is Undefined or Malfunction**

      Refer to Diagnostic Aids.

    - **If the parameter is Normal**

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3. Verify the scan tool Lane Departure Warning Switch Status parameter changes between Open and Closed when pressing and releasing the lane departure warning switch.
    - **If the parameter does not change between Open and Closed**

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

    - **If the parameter changes between Open and Closed**
4. Verify the lane departure warning indicator turns ON and OFF when turning the lane departure warning system on and off with the lane departure warning switch.
    - **If the indicator does not turn ON and OFF**

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

    - **If the indictor turns ON and OFF**
5. All OK.

Circuit/System Testing

Lane Departure Warning Switch Circuit Malfunction

1. Ignition ON and all vehicle systems OFF, disconnect the harness connector at the S48A Multifunction Switch - 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 8 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**
3. Verify the scan tool Lane Departure Warning Switch Status parameter is Open.
    - **If not Inactive**
    1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield.
    2. Test for infinite resistance between the signal circuit terminal 10 and ground.

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

- **If Inactive**

4. Install a 3 A fused jumper wire between the signal circuit terminal 10 and ground.
5. Verify the scan tool Lane Departure Warning Switch Status parameter is Closed.
   - **If not Closed**
   1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield, ignition ON.
   2. Test for less than 1 V between the signal circuit and ground.
      - If 1 V or greater, repair the short to voltage on the circuit.
      - If less than 1 V
   3. Ignition OFF
   4. Test for 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**
6. Test or replace the S48A Multifunction Switch - Instrument Panel.

Lane Departure Warning Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 5 and ground.
   - **If the test lamp does not illuminate**
   1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
   2. Test for less than 2 Ω in the control circuit end to end.
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .
   - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48A Multifunction Switch - Instrument Panel. Disconnect the X1 harness connector at the B174W Frontview Camera - Windshield, ignition ON.
4. Verify the lane departure warning switch indicator is not illuminated.

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- **If the lane departure warning switch indicator is illuminated**

1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.
2. Test for infinite resistance between the S48A Multifunction Switch - Instrument Panel control circuit terminal 6 and ground.
    - If less than infinite resistance, repair the short to ground in the circuit.
    - If infinite resistance, replace the S48A Multifunction Switch - Instrument Panel.

- **If the lane departure warning switch indicator is not illuminated**

5. Connect a 3 A fused jumper wire between the control circuit terminal 4 and ground.
6. Verify the lane departure warning switch indicator is illuminated.
    - **If the lane departure warning switch indicator is not illuminated**

    1. Ignition OFF, disconnect the harness connector at the S48A Multifunction Switch - Instrument Panel.
    2. Test for less than 1 V between the control circuit and ground.
        - If 1 V or greater, repair the short to voltage on the circuit.
        - If less than 1 V
    3. Ignition OFF.
    4. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the S48A Multifunction Switch - Instrument Panel.

    - **If the lane departure warning switch indicator is illuminated**

7. Replace the B174W Frontview Camera - Windshield.

Repair Instructions

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

- Refer to **Instrument Panel Accessory Bezel Replacement (Chevrolet / GMC)** for multifunction switch - instrument panel. replacement
- Refer to **Control Module References** for control module replacement, programming, and setup.

LANE DEPARTURE WARNING SYSTEM MALFUNCTION (CADILLAC, WITHOUT UGN)

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.

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- 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
Signal	B356A 02	1	B356A 05	-
Ground	-	1	-	-
High Control (Terminal 3)	B0987 06, B1011 00	B0987 06, B1011 00	-	-
Low Control (Terminal 9)	B0987 06, B1011 00	B0987 06, B1011 00	B0987 01, B1011 00	-
1. Lane departure warning switch malfunction.				

Circuit/System Description

The frontview camera module monitors the lane departure warning switch signal circuit. The frontview camera module applies voltage and monitors the switch signal circuit. The lane departure warning switch is normally open switch. With the switches open, voltage seen at the frontview camera module is high. When a switch is pressed, the signal circuit is pulled to ground and the voltage seen by the frontview camera module is low. The frontview camera module will respond to this by activating or deactivating the lane departure warning feature.

When the lane departure warning is enabled, the frontview camera module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the frontview camera module.

Diagnostic Aids

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

Additionally, the Frontview Camera Disable History can give useful hints about what affected the operation of the lane departure warning system. For the Frontview Camera Disable History, refer to **DTC B1011**.

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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 (except Cadillac with UGN)

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 Frontview Camera System Status parameter is Normal.
    - **If the parameter is Undefined or Malfunction**

      Refer to Diagnostic Aids.

    - **If the parameter is Normal**
3. Verify the scan tool Lane Departure Warning Switch Status parameter changes between Open and Closed when pressing and releasing the lane departure warning switch.
    - **If the parameter does not change between Open and Closed**

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

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

4. Verify the lane departure warning indicator turns ON and OFF when turning the lane departure warning system on and off with the lane departure warning switch.
    - **If the indicator does not turn ON and OFF**

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

    - **If the indictor turns ON and OFF**
5. All OK.

Circuit/System Testing

Lane Departure Warning Switch Circuit Malfunction

1. Ignition ON 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 5 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**
3. Verify the scan tool Lane Departure Warning Switch Status parameter is Open.
    - **If not Inactive**
    1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield.
    2. Test for infinite resistance between the signal circuit terminal 10 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 Inactive**

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4. Install a 3 A fused jumper wire between the signal circuit terminal 10 and ground.
5. Verify the scan tool Lane Departure Warning Switch Status parameter is Closed.
    - **If not Closed**
    1. Ignition OFF, disconnect the harness connector at the B174W Frontview Camera - Windshield, ignition ON.
    2. Test for less than 1 V between the signal circuit and ground.
        - If 1 V or greater, repair the short to voltage on the circuit.
        - If less than 1 V
    3. Ignition OFF
    4. Test for 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**
6. Test or replace the S48D Multifunction Switch 2 - Instrument Panel.

Lane Departure Warning Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
    - **If the test lamp does not illuminate**
    1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
    2. Test for less than 2 Ω in the control circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .
    - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. Disconnect the X1 harness connector at the B174W Frontview Camera - Windshield, ignition ON.
4. Verify the lane departure warning switch indicator is not illuminated.
    - **If the lane departure warning switch indicator is illuminated**
    1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
    2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel control circuit terminal 9 and ground.

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- If less than infinite resistance, repair the short to ground in the circuit.
- If infinite resistance, replace the S48D Multifunction Switch 2 - Instrument Panel.

- **If the lane departure warning switch indicator is not illuminated**

5. Connect a 3 A fused jumper wire between the control circuit terminal 4 and ground.
6. Verify the lane departure warning switch indicator is illuminated.
   - **If the lane departure warning switch indicator is not illuminated**
   1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
   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 S48D Multifunction Switch 2 - Instrument Panel.
   - **If the lane departure warning switch indicator is illuminated**
7. Replace the B174W Frontview Camera - Windshield.

Repair Instructions

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

- Refer to **Instrument Panel Upper Trim Panel Bracket Replacement (Cadillac)** for multifunction switch 2 - instrument panel. replacement
- Refer to **Control Module References** for control module replacement, programming, and setup.

LANE DEPARTURE WARNING SYSTEM MALFUNCTION (CADILLAC, WITH UGN)

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

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	B356A 02	1	B356A 05	-
Ground	-	1	-	-
High Control (Terminal 3)	1	1	-	-
Low Control (Terminal 9)	2	1	B0987 0B	-
1. Lane departure warning switch malfunction. 2. Lane departure warning switch indicator malfunction.				

Circuit/System Description

The active safety control module monitors the lane departure warning switch signal circuit. The active safety control module applies voltage and monitors the switch signal circuit. The lane departure warning switch is normally open switch. With the switches open, voltage seen at the active safety control module is high. When a switch is pressed, the signal circuit is pulled to ground and the voltage seen by the active safety control module is low. The active safety control module will respond to this by activating or deactivating the lane departure warning feature.

Diagnostic Aids

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Description and Operation

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Lane Departure Warning Description and Operation (Cadillac with UGN)

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 Frontview Camera Mode parameter is Normal.
   - **If the parameter is Undefined or Malfunction**

     Refer to Diagnostic Aids.

   - **If the parameter is Normal**
3. Verify the scan tool Lane Departure Warning Switch Status parameter changes between Open and Closed when pressing and releasing the lane departure warning switch.
   - **If the parameter does not change between Open and Closed**

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

   - **If the parameter changes between Open and Closed**
4. Verify the lane departure warning indicator turns ON and OFF when turning the lane departure warning system on and off with the lane departure warning switch.
   - **If the indicator does not turn ON and OFF**

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

   - **If the indictor turns ON and OFF**

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5. All OK.

Circuit/System Testing

Lane Departure Warning Switch Circuit Malfunction

1. Ignition ON 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 5 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
        - If less than 2 Ω, repair the open/high resistance in the ground connection.
    - **If less than 10 Ω**
3. Verify the scan tool Lane Departure Warning Switch Status parameter is Open.
    - **If not Inactive**
    1. Ignition OFF, disconnect the X2 harness connector at the K124 Active Safety Control Module.
    2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel signal circuit terminal 10 and ground.
        - If less than infinite resistance, repair the short to ground on the circuit.
        - If infinite resistance, replace the K124 Active Safety Control Module.
    - **If Inactive**
4. Install a 3 A fused jumper wire between the signal circuit terminal 10 and ground.
5. Verify the scan tool Lane Departure Warning Switch Status parameter is Closed.
    - **If not Closed**
    1. Ignition OFF, disconnect the X2 harness connector at the K124 Active Safety Control Module, ignition ON.
    2. Test for less than 1 V between the signal circuit and ground.
        - If 1 V or greater, repair the short to voltage on the circuit.
        - If less than 1 V
    3. Ignition OFF
    4. Test for less than 2 Ω in the signal circuit end to end.

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- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω, replace the K124 Active Safety Control Module.

- **If Closed**

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

Lane Departure Warning Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
   - **If the test lamp does not illuminate**
   1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
   2. Test for less than 2 Ω in the control circuit end to end.
      - If 2 Ω or greater, repair the open/high resistance in the circuit.
      - If less than 2 Ω, refer to **Interior Backlighting Malfunction** .
   - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. Disconnect the X1 harness connector at the K124 Active Safety Control Module, ignition ON.
4. Verify the lane departure warning switch indicator is not illuminated.
   - **If the lane departure warning switch indicator is illuminated**
   1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
   2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel control circuit terminal 9 and ground.
      - If less than infinite resistance, repair the short to ground in the circuit.
      - If infinite resistance, replace the S48D Multifunction Switch 2 - Instrument Panel.
   - **If the lane departure warning switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 3 and ground.
6. Verify the lane departure warning switch indicator is illuminated.
   - **If the lane departure warning switch indicator is not illuminated**
   1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
   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.

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- 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 S48D Multifunction Switch 2 - Instrument Panel.
- **If the lane departure warning switch indicator is illuminated**

7. Replace the K124 Active Safety Control Module.

Repair Instructions

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

- Refer to **Instrument Panel Upper Trim Panel Bracket Replacement (Cadillac)** for multifunction switch 2 - instrument panel. replacement
- Refer to **Control Module References** for control module replacement, programming, and setup.

VIDEO PROCESSING CONTROL MODULE 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
5 V Reference	B399A 02, B399B 02, B399C 02, B399D 02	1	B399A 01, B399B 01, B399C 01, B399D 01	-
Video Signal +	B390F 08, B395A 08, B395B 08 B395C 08, 1, 2	1	1, 2	390F 08, B395A 08, B395B 08 B395C 08
Video Signal -	B395C 08, 1, 2	1	1, 2	-
Low Reference	-	B395A 08, B395B 08, B395C 08, B390F 08, 1	-	-

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Video Shield	-	2	-	-
1. Camera inoperative 2. Poor image quality				

Circuit/System Description

When the engine is running, and the transmission is placed into R, a vehicle in reverse motion message is sent via serial data to the video processing control module indicating that camera operation is requested. When the engine is running, and the transmission is placed into D, a vehicle in forward motion message is sent via serial data to the video processing control module. The cameras send video information to the video processing control module through a video signal + and a video signal - circuit. A grounded shielding also wraps the video signal circuits to reduce electronic interference which may degrade the video signal and cause a distorted or otherwise degraded image. The signals from the cameras are combined and sent to the radio or human machine interface module.

Diagnostic Aids

A poor video image can be caused by ice, snow, and mud buildup on the lens of the appropriate 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.

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.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround Vision Camera Description and Operation

Electrical Information Reference

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- **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 there is no debris on the appropriate camera 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 there is no debris on the lens**
2. Engine running, transmission in R.
3. Verify the backup lamps are illuminated.
    - **If the backup lamps are not illuminated**

      Refer to **Backup Lamps Malfunction** .

    - **If the backup lamps are illuminated**
4. Engine running, transmission in R.
5. Verify a clear rear vision image is displayed on the A11 Radio.
    - **If a clear image is not displayed on only one camera**

      Refer to Circuit/System Testing - Only one camera image distorted.

    - **If a clear image is not displayed for all cameras**

      Refer to Circuit/System Testing - All camera images distorted with IO3 **OR** All camera images distorted with IO5 or IO6

    - **If a clear image is displayed**

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6. Engine running, transmission in D.
    - **If a clear image is not displayed on only one camera**

      Refer to Circuit/System Testing - Only one camera image distorted.

    - **If a clear image is not displayed for all cameras**

      Refer to Circuit/System Testing - All camera images distorted with IO3 **OR** All camera images distorted with IO5 or IO6

    - **If a clear image is displayed**
7. All OK.

Circuit/System Testing

Only one camera image distorted

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the appropriate 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 5 and ground.
    - **If 10 Ω or greater**
    1. Ignition OFF.
    2. Test for less than 2 Ω in the ground circuit end to end.
        - If 2 Ω or greater, repair the open/high resistance in the circuit.
        - If less than 2 Ω, replace the K157 Video Processing Control Module.
    - **If less than 10 Ω**
3. Ignition ON.
4. Test for 4.8-5.2 V between the 5 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 5 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 5 V reference circuit end to end.

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- 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 5.2 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 4.8-5.2 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 infinite resistance between the signal circuit terminals listed below and ground:
    - Vision Signal + signal circuit terminal 1
    - Vision Signal - signal circuit terminal 4
    - **If less than infinite resistance**
    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 infinite resistance**
9. Test for less than 2 Ω between the appropriate video signal circuit terminals listed below:

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- 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 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 11 X1
- 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 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 14 X1
- 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
- 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. Engine running, transmission in R.
11. Verify a clear surround vision image is displayed on the A11 Radio.
    - **If a clear surround vision image is not displayed**
    1. Replace the appropriate camera.
    2. Engine running, transmission in R.
    3. Verify a clear surround vision image is displayed on the A11 Radio.
        - If a clear surround vision image is not displayed, replace the K157 Video Processing Control Module.
        - If a clear surround vision image is displayed, all OK.
    - **If a clear surround vision image is displayed**
12. All OK.

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All camera images distorted with IO3

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K157 Video Processing Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 1 V between the signal circuit terminals listed below and ground:
    - Camera signal (+) circuit terminal 6 X2
    - Camera signal (-) circuit terminal 12 X2
    - **If 1 V or greater**

      Repair the short to voltage on the circuit.

    - **If less than 1 V**
3. Test for infinite resistance between the signal circuit terminals listed below and ground:
    - Camera signal (+) circuit terminal 6 X2
    - Camera signal (-) circuit terminal 12 X2
    - **If less than infinite resistance**

      Repair the short to ground on the circuit.

    - **If infinite resistance**
4. Test for less than 2 Ω between the camera signal (+) circuit terminal 6 X2 and the A11 Radio video signal (+) circuit terminal 5 X1.
    - **If 2 Ω or greater**

      Repair the open/high resistance in the circuit.

    - **If less than 2 Ω**
5. Test for less than 2 Ω between the camera signal (-) circuit terminal 12 X2 and the A11 Radio video signal (-) circuit terminal 4 X1.
    - **If 2 Ω or greater**

      Test the signal circuit for an open/high resistance.

    - **If less than 2 Ω**
6. Replace the K157 Video Processing Control Module.
7. Engine running, transmission in R.

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8. Verify a clear surround vision image is displayed on the A11 Radio.
    - **If a clear rear vision image is not displayed**

      Replace the A11 Radio.

    - **If a clear rear vision image is displayed**
9. All OK.

All camera images distorted with IO5 or IO6

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K157 Video Processing Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 1 V between the signal circuit terminals listed below and ground:
    - Camera signal (+) circuit terminal 6 X2
    - Camera signal (-) circuit terminal 12 X2
    - **If 1 V or greater**

      Repair the short to voltage on the circuit.

    - **If less than 1 V**
3. Test for infinite resistance between the signal circuit terminals listed below and ground:
    - Camera signal (+) circuit terminal 6 X2
    - Camera signal (-) circuit terminal 12 X2
    - **If less than infinite resistance**

      Repair the short to ground on the circuit.

    - **If infinite resistance**
4. Test for less than 2 Ω between the camera signal (+) circuit terminal 6 X2 and the K74 Human Machine Interface Control Module video signal (+) circuit terminal 5 X2.
    - **If 2 Ω or greater**

      Repair the open/high resistance in the circuit.

    - **If less than 2 Ω**

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5. Test for less than 2 Ω between the camera signal (-) circuit terminal 12 X2 and the K74 Human Machine Interface Control Module video signal (-) circuit terminal 6 X2.
    - **If 2 Ω or greater**

      Test the signal circuit for an open/high resistance.

    - **If less than 2 Ω**
6. Replace the K157 Video Processing Control Module.
7. Engine running, transmission in R.
8. Verify a clear surround vision image is displayed on the K74 Human Machine Interface Control Module.
    - **If a clear rear vision image is not displayed**

      Replace the A11 Radio.

    - **If a clear rear vision image is displayed**
9. All OK.

Repair Instructions

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

- Refer to **Rearview Driver Information Camera Replacement**
- Refer to **Side View Driver Information Camera Replacement (Cadillac)**
- Refer to **Front View Driver Information Camera Replacement (Cadillac)**
- Refer to **Control Module References** for control module replacement, programming, and setup.

REPAIR INSTRUCTIONS

FRONT SEAT LANE DEPARTURE WARNING ACTUATOR REPLACEMENT

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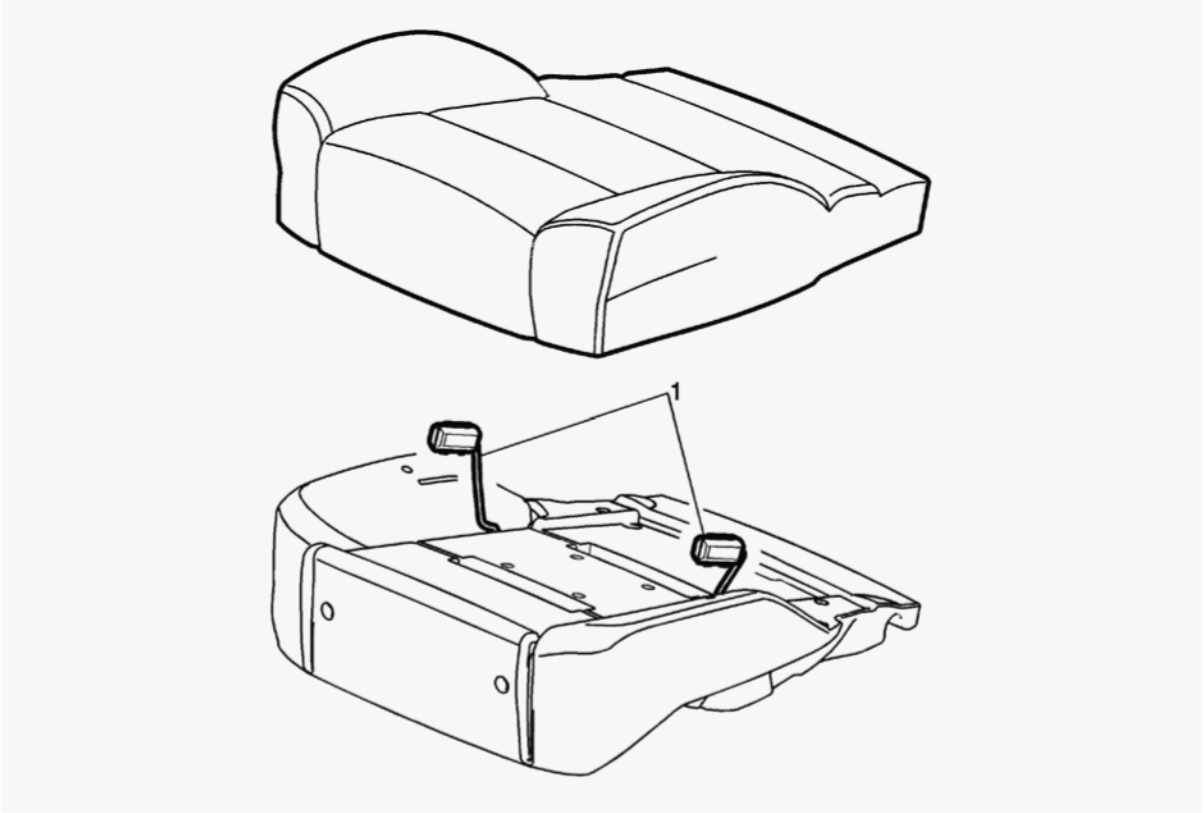


Fig. 16: Front Seat Lane Departure Warning Actuator
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: **Refer to SIR Warning .** **Preliminary Procedure** 1. Remove the driver or passenger seat. Refer to **Driver or Passenger Seat Removal and Installation** . 2. Remove the front seat cushion cover and pad. Refer to **Front Seat Cushion Cover and Pad Replacement** .	

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Callout	Component Name
1	Driver Front Seat Cushion Haptic Motor **Procedure** 1. Reposition the heater element as needed to gain access to the actuator wire. 2. Disconnect the electrical connector.

FORWARD RANGE RADAR MODULE REPLACEMENT (CHEVROLET / GMC)

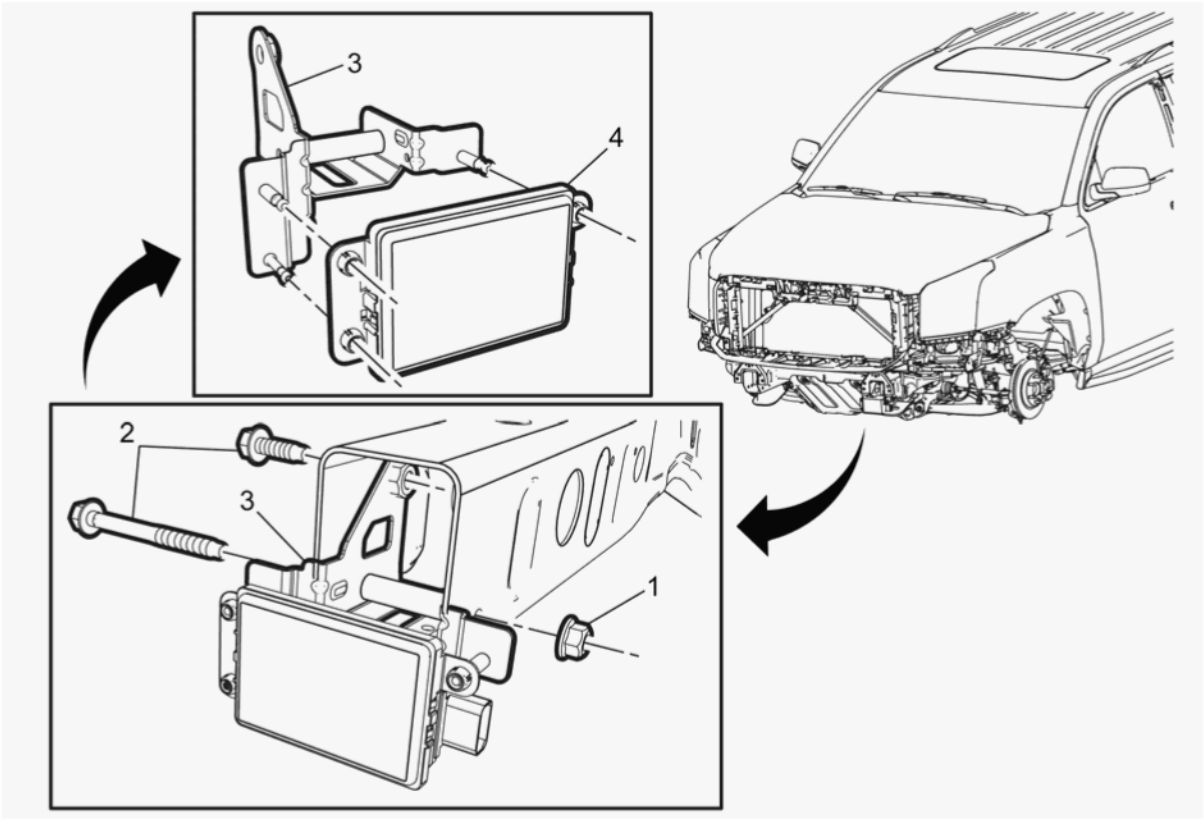


Fig. 17: Forward Range Radar Module (Chevrolet / GMC)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

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Callout	Component Name
Preliminary Procedure 1. Remove the front bumper fascia. Refer to **Front Bumper Fascia Replacement (GMC)** **Front Bumper Fascia Replacement (Chevrolet)** . 2. If replacing the forward range radar module bracket, remove the front bumper impact bar. Refer to **Front Bumper Impact Bar Replacement (GMC)** **Front Bumper Impact Bar Replacement (Chevrolet)** .	
1	Forward Range Radar Module Fastener **CAUTION:** **Refer to Fastener Caution .**
2	Forward Range Radar Module Fasteners (Qty: 2) **CAUTION:** **Refer to Fastener Caution .** **Tighten** 85 N.m (63 lb ft)
3	Forward Range Radar Module Bracket **NOTE:** **The forward range radar module bracket does not require removal to replace the module.**

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Callout	Component Name
	Inspect the bracket for damage and replace as required.
4	Forward Range Radar Module **Procedure** 1. Disconnect the electrical connector. 2. Remove the module beginning with the lower ball socket. 3. Carefully lift the module away from bracket using the appropriate tool. 4. For programming and set up, refer to **Control Module References** .

FORWARD RANGE RADAR MODULE REPLACEMENT (CADILLAC WITHOUT AVF)

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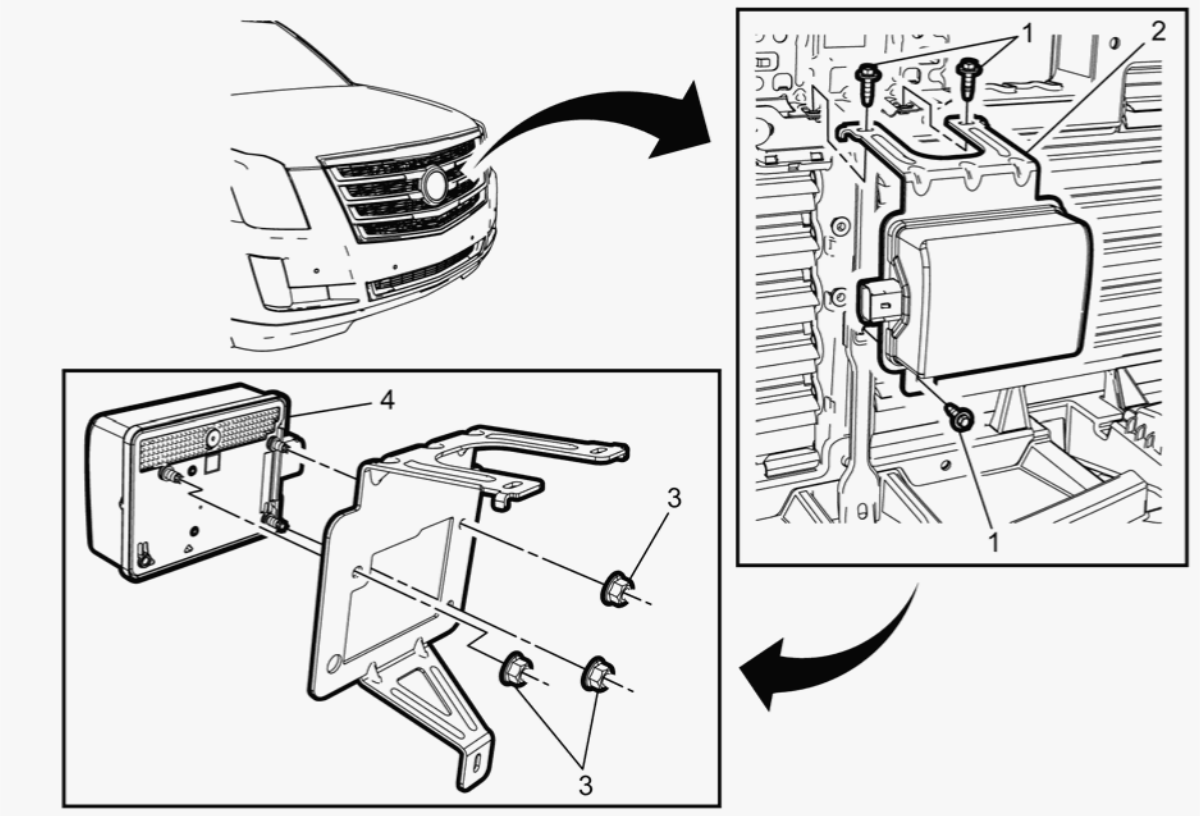


Fig. 18: Forward Range Radar Module (Cadillac without AVF)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the front bumper fascia. Refer to **Front Bumper Fascia Replacement (Cadillac)** . 2. Remove the hood primary and secondary latch. Refer to **Hood Primary and Secondary Latch Replacement** .	
1	Forward Range Radar Bracket Bolt (Qty: 3) **CAUTION:** **Refer to** **Fastener**

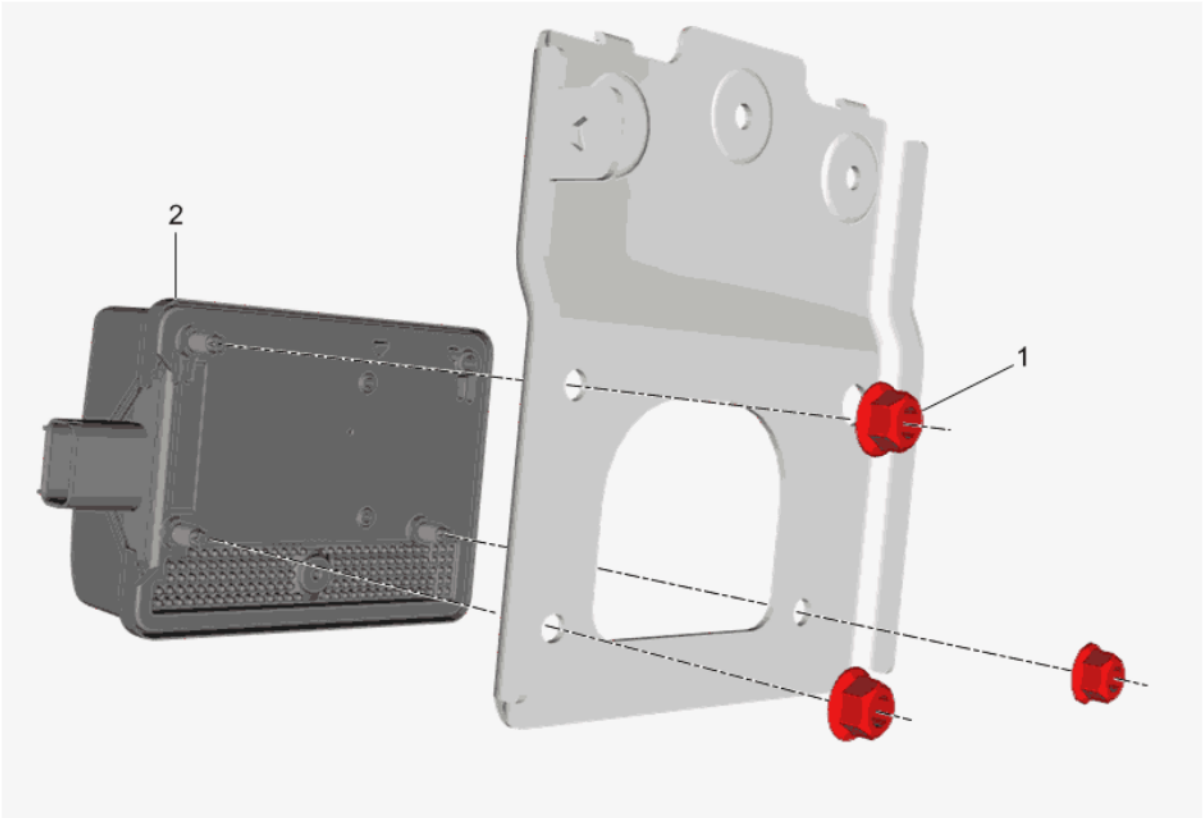
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Callout	Component Name
	Caution . **Tighten** 2.5 N.m (22 lb in)
2	Forward Range Radar Bracket
3	Forward Range Radar Module Nut (Qty: 3) **Tighten** 9 N.m (80 lb in)
4	Forward Range Radar Module **Procedure** 1. Disconnect the electrical connector. 2. For programming and set up, refer to Control Module References . 3. Use a digital angle gauge to align the forward range radar module vertically (at the edge or on the bracket behind the module). **NOTE:** • **The digital angle gauge must have an accuracy of Â±0.5 degrees (9 mm/m).** • **The vertical position**

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Callout	Component Name
	of forward range radar module is 90 degrees (Â±3 degrees).

FORWARD RANGE RADAR MODULE REPLACEMENT (CADILLAC WITH AVF)



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Fig. 19: Forward Range Radar Module (Cadillac with AVF)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Refer to **Forward Range Radar Bracket Replacement (Cadillac with AVF)**	
1	Forward Range Radar Module Nut (Qty: 3) **Tighten** 9 N.m (80 lb in)
2	Forward Range Radar Module **Procedure** 1. Disconnect the electrical connector. 2. Refer to **Control Module References** For programming and set up, if required. 3. Use a digital angle gauge to align the forward range radar module vertically (at the edge or on the bracket behind the module). **NOTE:** • **The digital angle gauge must have an accuracy of Â±0.5 degrees (9 mm/m).** • **The vertical position of forward**

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Callout	Component Name
	range radar module is 90 degrees (Â±3 degrees).

FORWARD RANGE RADAR MODULE ALIGNMENT (CHEVROLET / GMC)

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

1. Remove the front bumper fascia. Refer to **Front Bumper Fascia Replacement (GMC)** **Front Bumper Fascia Replacement (Chevrolet)** .

   Inspect the forward range radar module for damage. Refer to **Forward Range Radar Module Inspection (Chevrolet / GMC)**.

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

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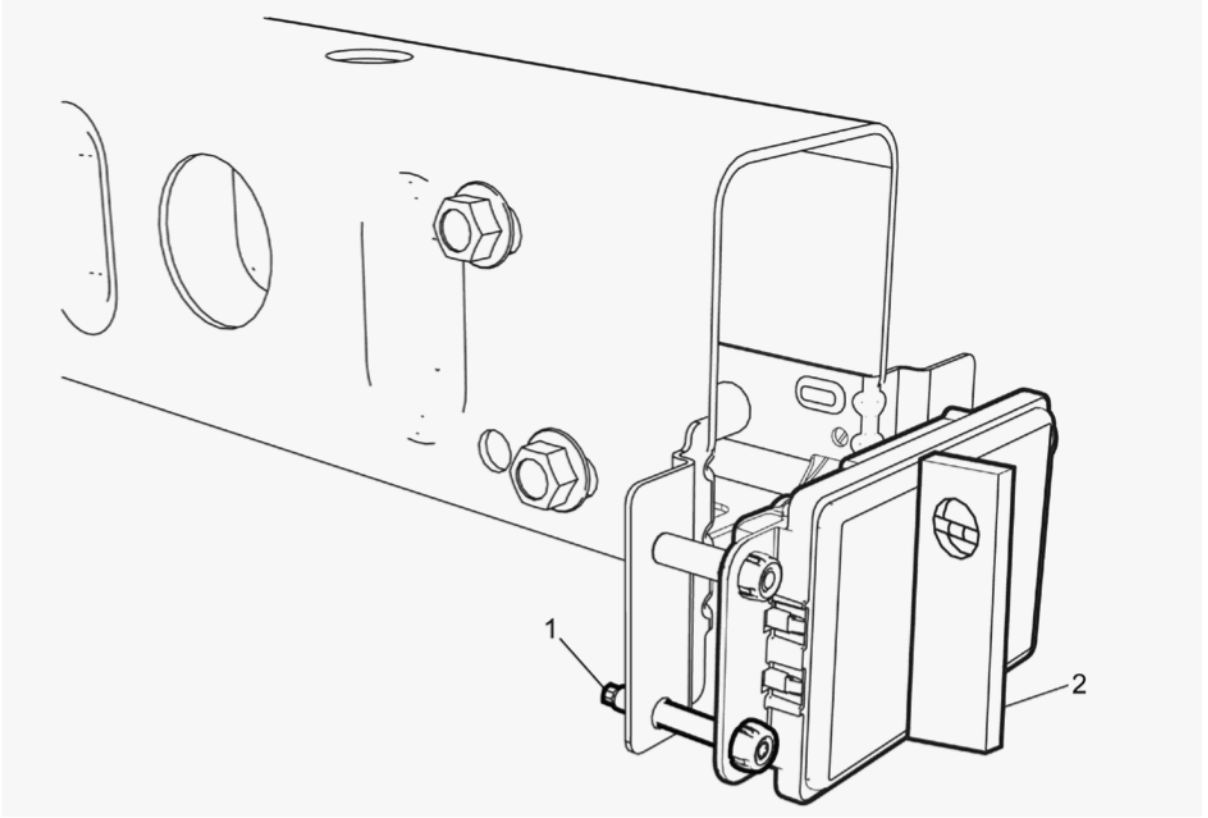


Fig. 20: Using Water Bubble Level To Align Forward Range Radar Module Vertically
Courtesy of GENERAL MOTORS COMPANY

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

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

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

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

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

FORWARD RANGE RADAR MODULE INSPECTION (CHEVROLET / GMC)

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1. Remove the front bumper fascia. Refer to **Front Bumper Fascia Replacement (GMC)** **Front Bumper Fascia Replacement (Chevrolet)** .

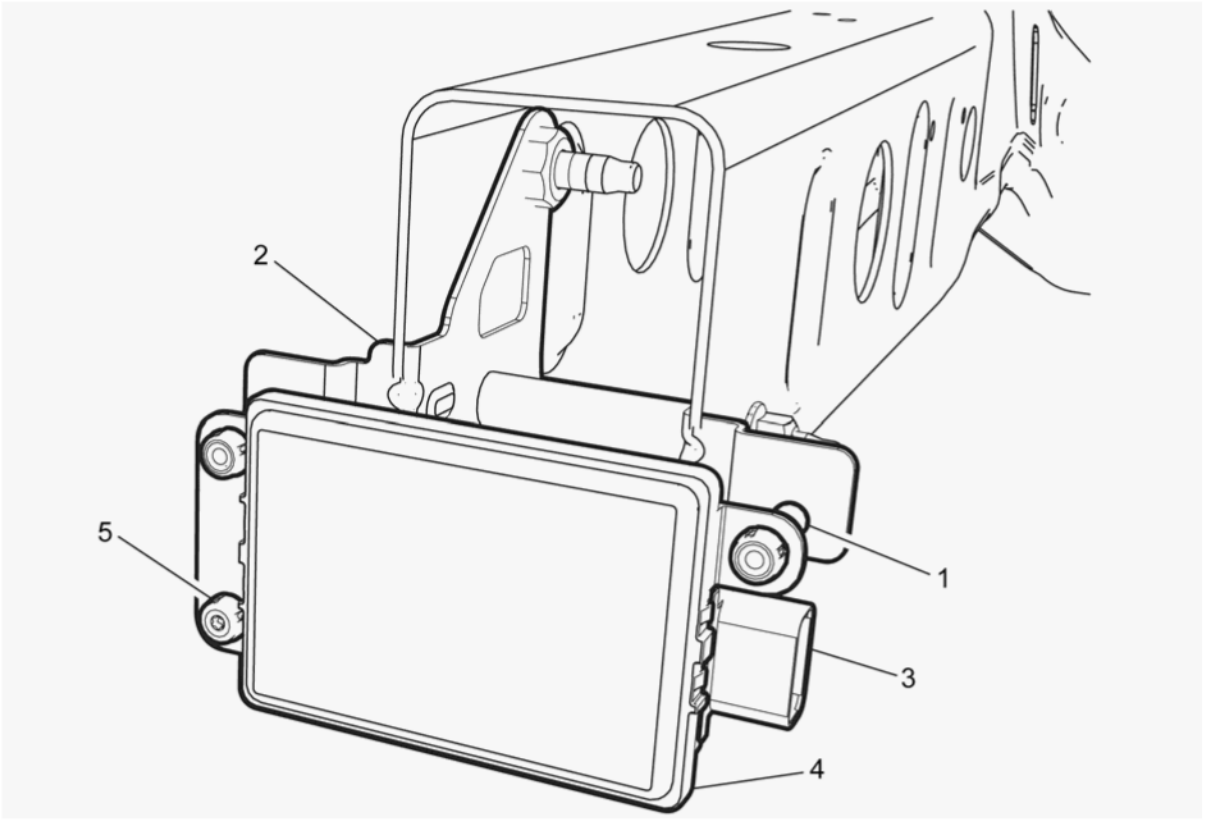


Fig. 21: Ball Sockets, Studs And Forward Range Radar Module
Courtesy of GENERAL MOTORS COMPANY

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

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7. Inspect the wiring harness plug (3) and the terminal of the forward range radar module for any damage.

FORWARD RANGE RADAR BRACKET REPLACEMENT (CADILLAC WITH AVF)

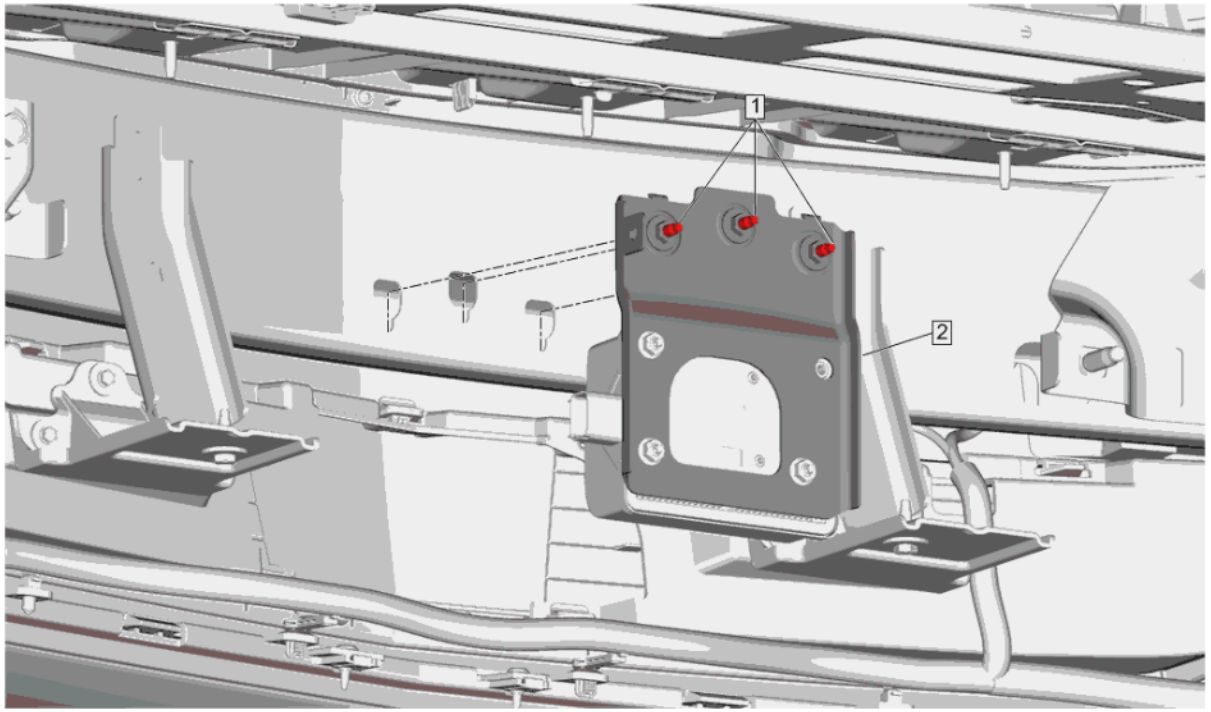


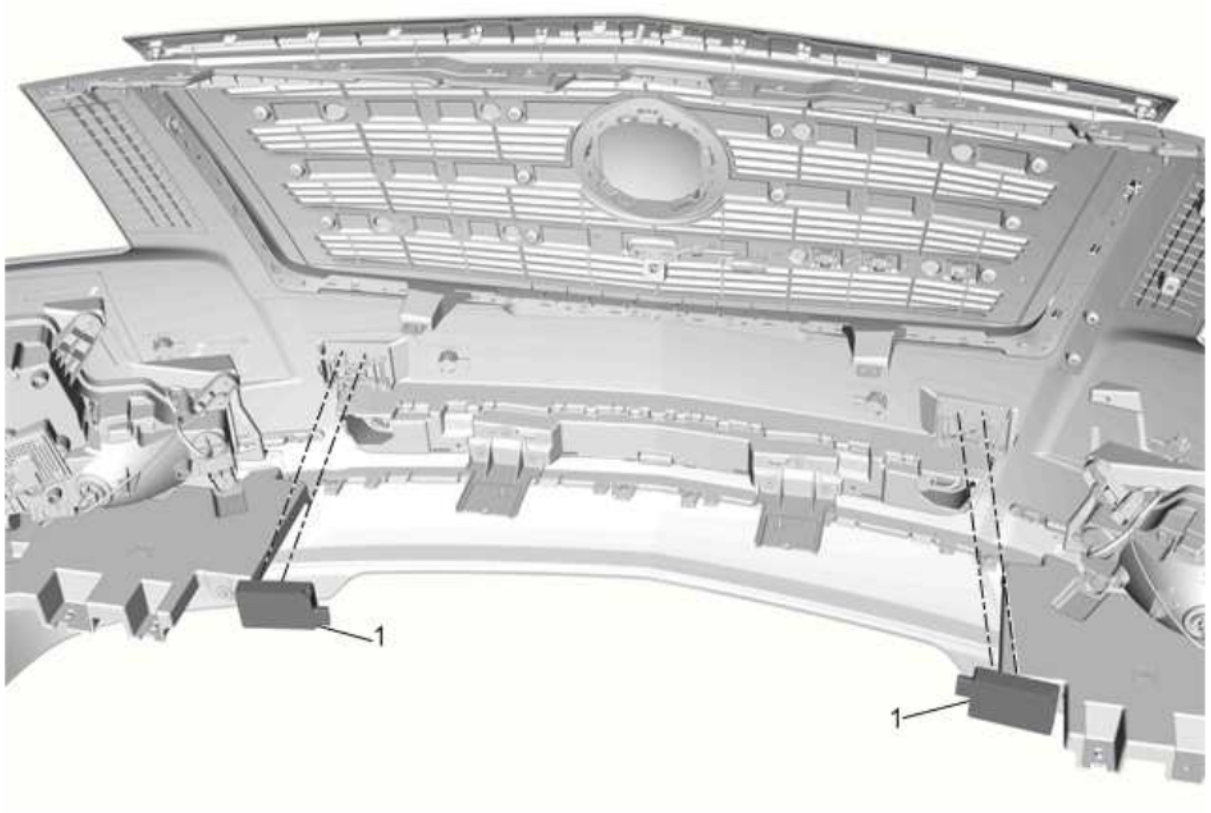
Fig. 22: Forward Range Radar Bracket (Cadillac with AVF)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Forward Range Radar Bracket Bolt (Qty: 3) **CAUTION:** **Refer to** **Fastener** **Caution** **Procedure**

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Callout	Component Name
	Using the appropriate tool on the pilot end of the bolt, loosen the bolts. **Tighten** 9 N.m (80 lb in)
2	Forward Range Radar Module Bracket **Procedure** 1. Disconnect the electrical connector. 2. Transfer components as necessary.

SHORT RANGE RADAR SENSOR REPLACEMENT (FRONT)



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Fig. 23: Short Range Radar Sensor (Front)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the front bumper fascia. Refer to **Front Bumper Fascia Replacement (GMC)** **Front Bumper Fascia Replacement (Chevrolet)** **Front Bumper Fascia Replacement (Cadillac)** .	
1	Short Range Radar Sensor (Qty 2) **Procedure** 1. Disconnect the electrical connector. 2. Release the tab on the retainer and slide the sensor upward to remove. 3. For programming and set up, refer to **Control Module References** .

SHORT RANGE RADAR SENSOR REPLACEMENT (REAR)

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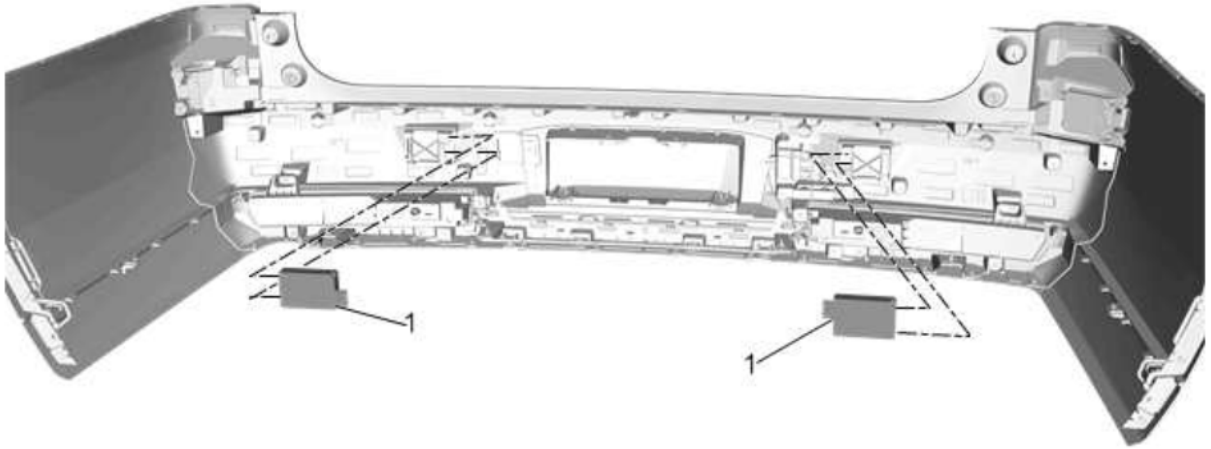


Fig. 24: Short Range Radar Sensor (Rear)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the rear bumper fascia. Refer to **Rear Bumper Fascia Replacement (Chevrolet, GMC)** **Rear Bumper Fascia Replacement (Cadillac)** .	
1	Short Range Radar Sensor (Qty: 2) **Procedure** 1. If replacing the left short range radar sensor on a vehicle equipped with a closure hands free module, disconnect the electrical connectors from the hands free module for access. 2. Disconnect the electrical connector.

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Callout	Component Name
	3. Release the tab retainer and slide the sensor through the bracket opening to remove. 4. For programming and set up, refer to **Control Module References** .

ACTIVE SAFETY CONTROL MODULE REPLACEMENT (CADILLAC)

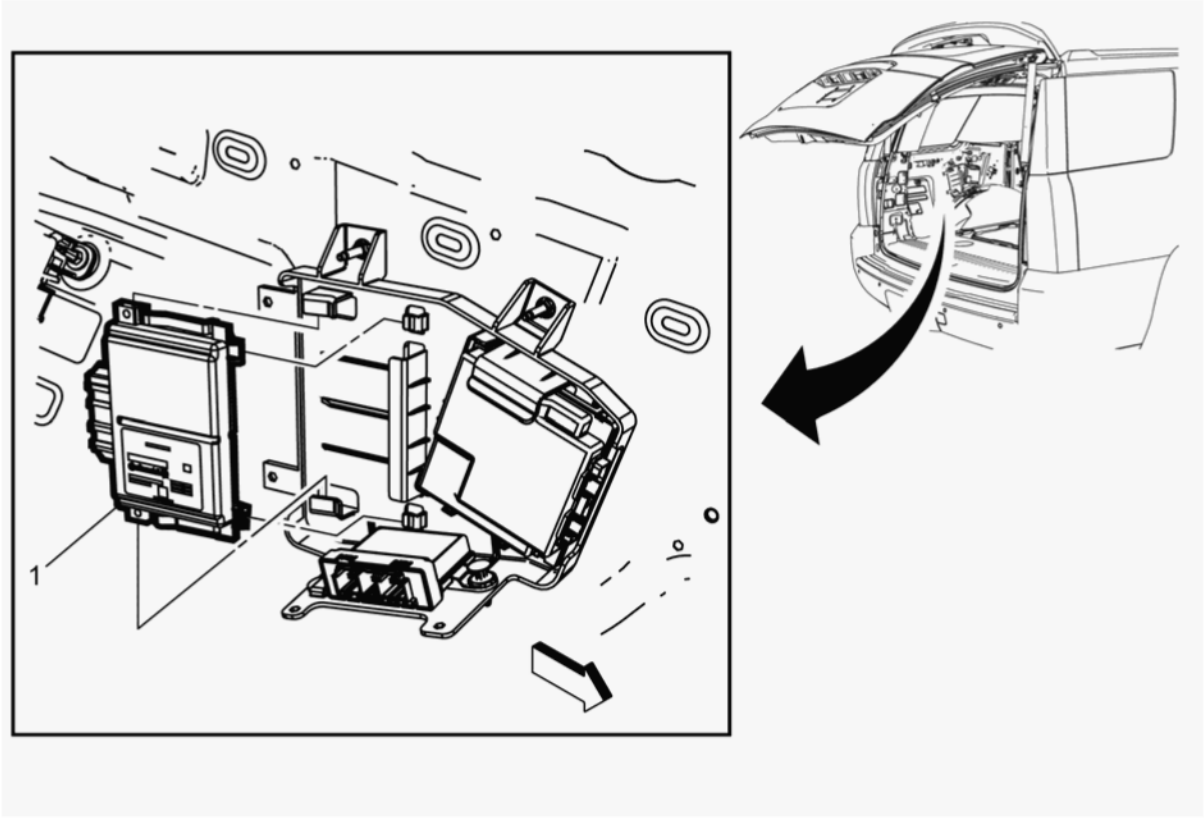


Fig. 25: Active Safety Control Module (Cadillac)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
	1. Remove the left hand quarter lower rear trim door from the left quarter lower rear trim panel.

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Callout	Component Name
2. Remove the body side rear trim panel stowage compartment tray from the left quarter lower rear trim panel, if vehicle is a long wheelbase. 3. Remove the body side rear trim panel cup holder from the quarter lower rear trim panel, if the vehicle is a short wheelbase.	
1	Active Safety Control Module **Procedure** 1. Disconnect the electrical connectors. 2. Release module from retaining tabs on bracket. 3. For programming and set up information, refer to **Control Module References** .

FORWARD COLLISION ALERT DISPLAY REPLACEMENT

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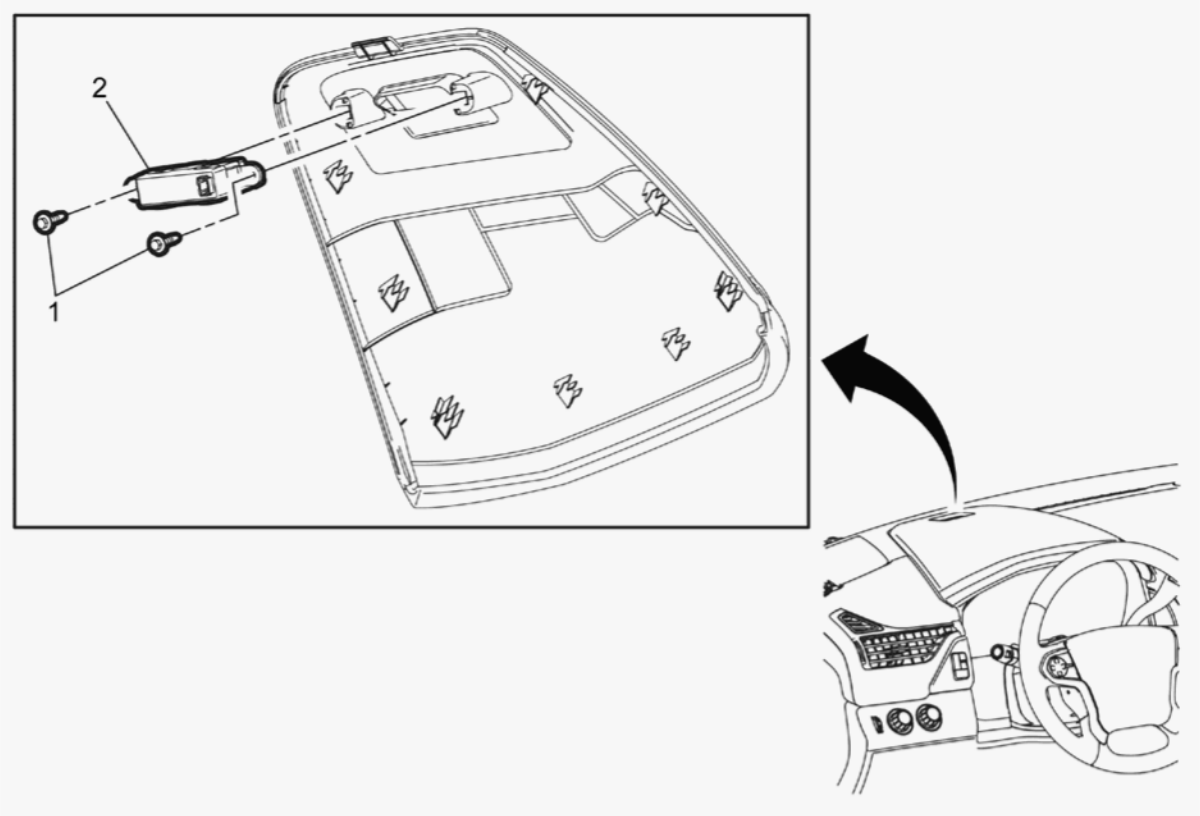


Fig. 26: Forward Collision Alert Display
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the instrument panel cluster hood. Refer to **Instrument Panel Instrument Cluster Hood Replacement (Chevrolet / GMC)** **Instrument Panel Instrument Cluster Hood Replacement (Cadillac)** .	
1	Forward Collision Alert Display Fastener (Qty: 2) **CAUTION:** **Refer to** **Fastener** **Caution** .

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Callout	Component Name
	Tighten 2.5 N.m (22 lb in)
2	Forward Collision Alert Display **Procedure** Disconnect the electrical connector.

PARKING ASSIST CONTROL MODULE REPLACEMENT

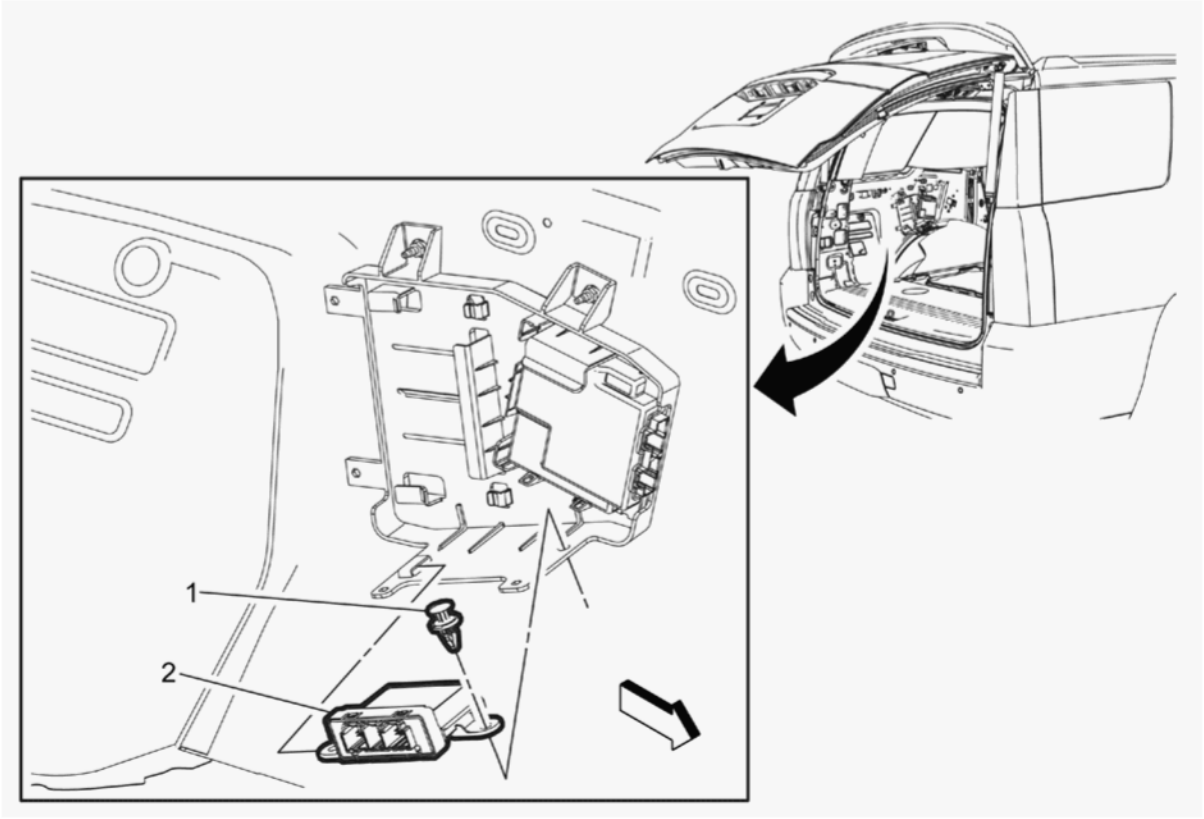


Fig. 27: Parking Assist Control Module
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

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Callout	Component Name
Preliminary Procedure 1. Remove the left hand quarter lower rear trim door from the left quarter lower rear trim panel. 2. Remove the body side rear trim panel stowage compartment tray from the left quarter lower rear trim panel, if vehicle is a long wheelbase. 3. Remove the body side rear trim panel cup holder from the quarter lower rear trim panel, if the vehicle is a short wheelbase.	
1	Rear Object Alarm Control Module Push Pin Retainer
2	Rear Object Alarm Control Module **Procedure** 1. Disconnect the electrical connectors. 2. For programming and set up, refer to **Control Module References** .

FRONT PARKING ASSIST ALARM SENSOR REPLACEMENT

Removal Procedure

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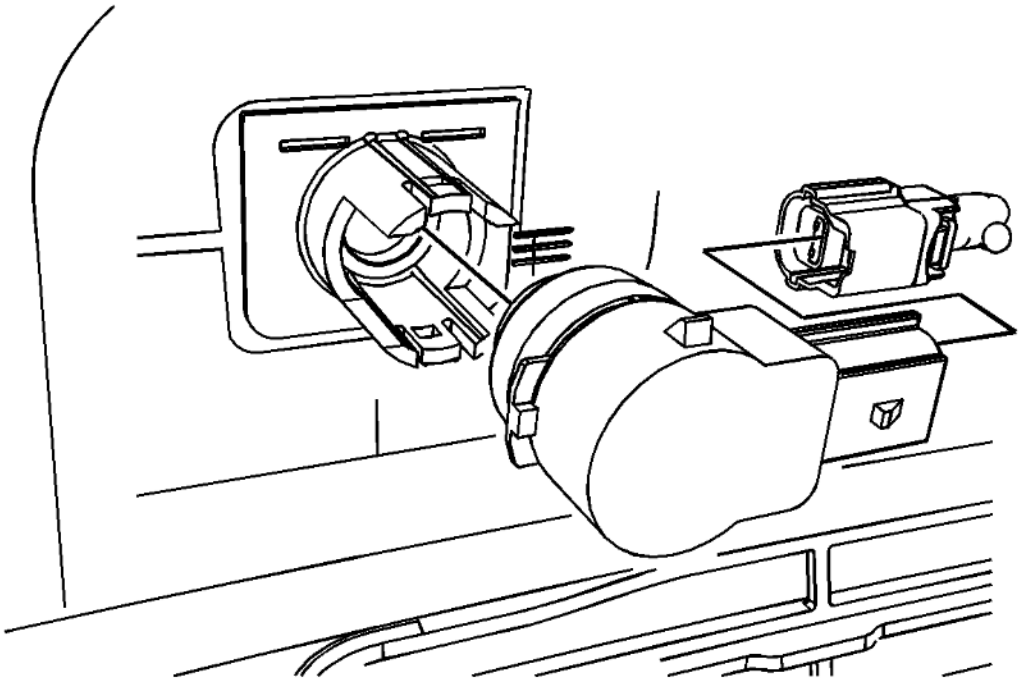


Fig. 28: Front Object Alarm Sensor And Housing
Courtesy of GENERAL MOTORS COMPANY

1. Remove front bumper fascia. Refer to **Front Bumper Fascia Replacement (GMC)** **Front Bumper Fascia Replacement (Chevrolet)** **Front Bumper Fascia Replacement (Cadillac)** .
2. Disconnect electrical from the front object alarm sensor.
3. Lift the locking tabs on the housing and remove the front object alarm sensor.

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Installation Procedure

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

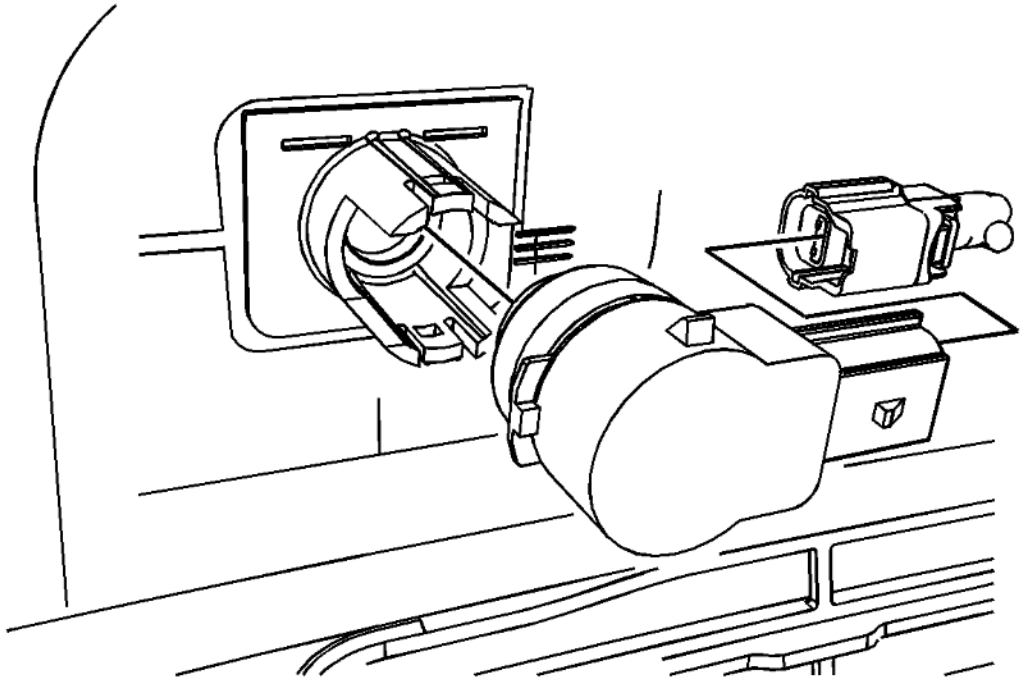


Fig. 29: Front Object Alarm Sensor And Housing
Courtesy of GENERAL MOTORS COMPANY

1. Insert the sensor into the housing.

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2. Connect the electrical connector to the front object alarm sensor.
3. Install the front bumper fascia. Refer to **Front Bumper Fascia Replacement (GMC)** **Front Bumper Fascia Replacement (Chevrolet)** **Front Bumper Fascia Replacement (Cadillac)** .

SIDE OBJECT SENSING ALERT MODULE REPLACEMENT

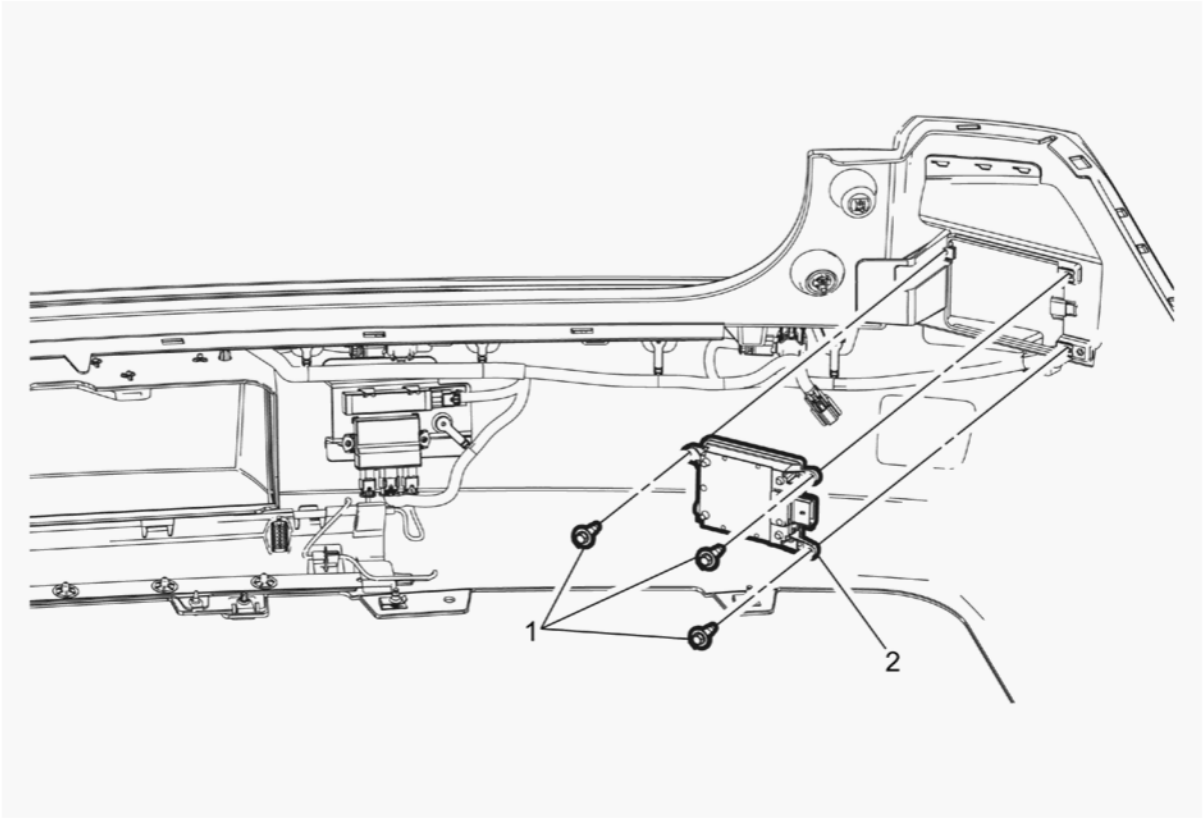


Fig. 30: Side Object Sensing Alert Module
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. If replacing the right side object sensing alert module, unclip and reposition the object sensor wiring harness.	

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REAR OBJECT ALARM SENSOR WIRING HARNESS REPLACEMENT

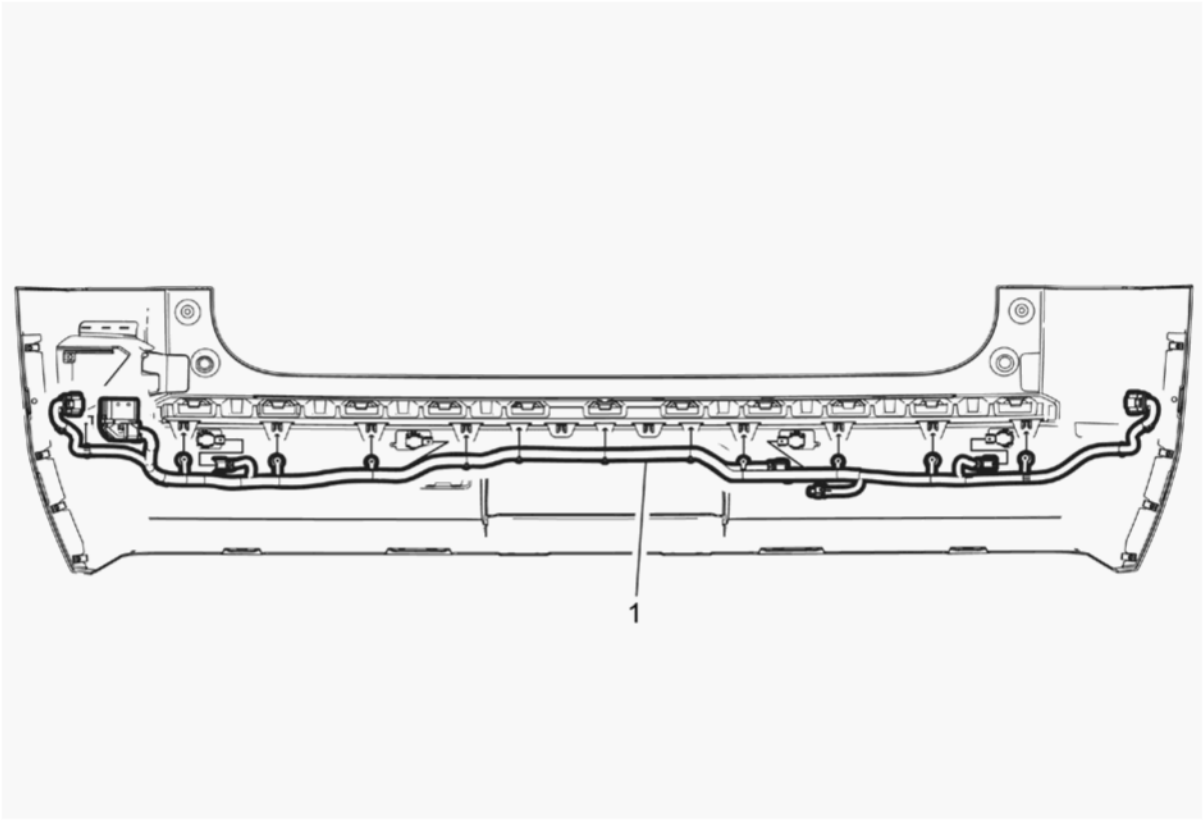


Fig. 31: Rear Object Alarm Sensor Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the rear bumper fascia. Refer to **Rear Bumper Fascia Replacement (Chevrolet, GMC)** **Rear Bumper Fascia Replacement (Cadillac)** 2. Place the rear bumper fascia face down on a clean protected surface.	
1	Rear Object Sensor Wiring Harness

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Callout	Component Name
	Procedure 1. Disconnect the rear object sensor wiring harness electrical connectors from the rear object sensors. 2. Disconnect the rear object sensor wiring harness electrical connectors from the rear module. 3. Disconnect any remaining electrical connectors. 4. Using a suitable tool, disconnect the rear object sensor wiring harness retainers from the rear bumper fascia.

REAR PARKING ASSIST ALARM SENSOR REPLACEMENT

Removal Procedure

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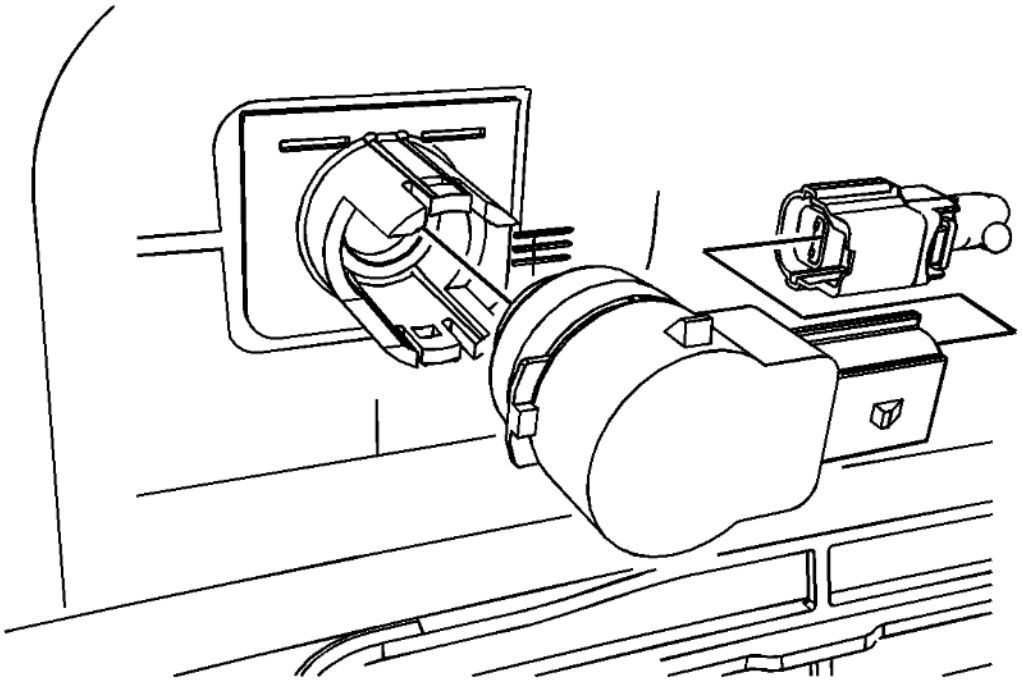


Fig. 32: Rear Object Sensor And Housing
Courtesy of GENERAL MOTORS COMPANY

1. Remove rear bumper fascia. Refer to **Rear Bumper Fascia Replacement (Chevrolet, GMC)** **Rear Bumper Fascia Replacement (Cadillac)** .
2. Disconnect electrical from the rear object sensor.

NOTE: **The rear object sensor is a one piece design. Do NOT twist the sensor cap to try and remove the painted**

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cap. Replacement sensor requires painting to match fascia/bumper body color.

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

Installation Procedure

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

1. Paint the rear object sensor. Refer to **Basecoat/Clearcoat Paint Systems** .
2. Ensure the paint does not exceed 6 mils. Use a paint thickness gauge suitable for non-ferrous metals. Refer to **Paint Gauges** .

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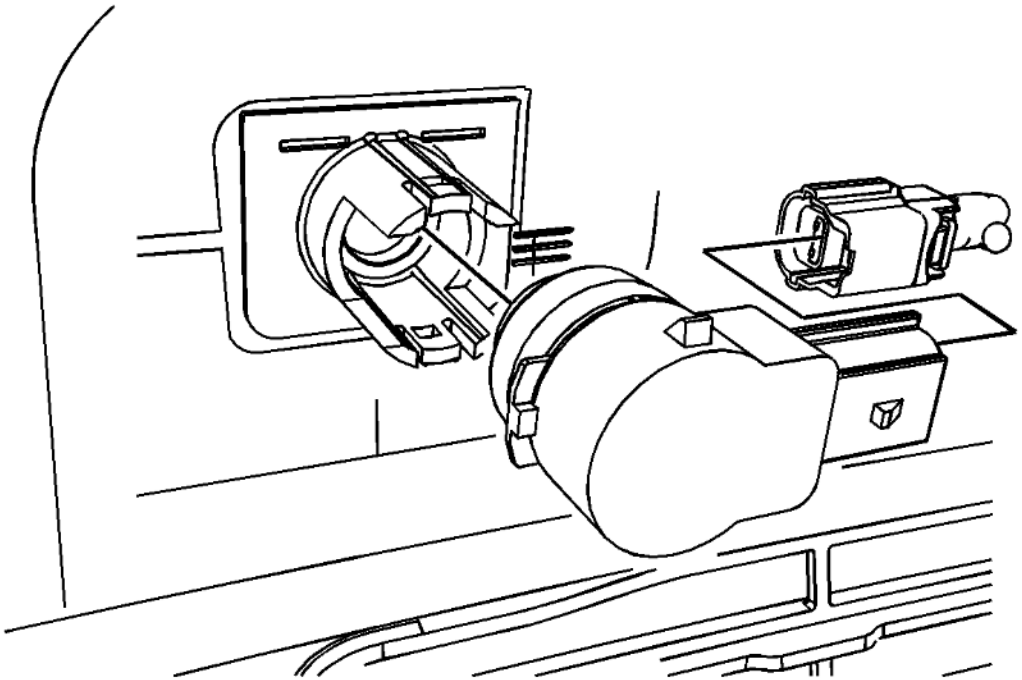


Fig. 33: Rear Object Sensor And Housing
Courtesy of GENERAL MOTORS COMPANY

3. Insert the sensor into the housing.
4. Connect the electrical connector to the rear object sensor.
5. Install the rear bumper fascia. Refer to **Rear Bumper Fascia Replacement (Chevrolet, GMC)** **Rear Bumper Fascia Replacement (Cadillac)** .

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MULTIFUNCTION RELAY MODULE BRACKET REPLACEMENT

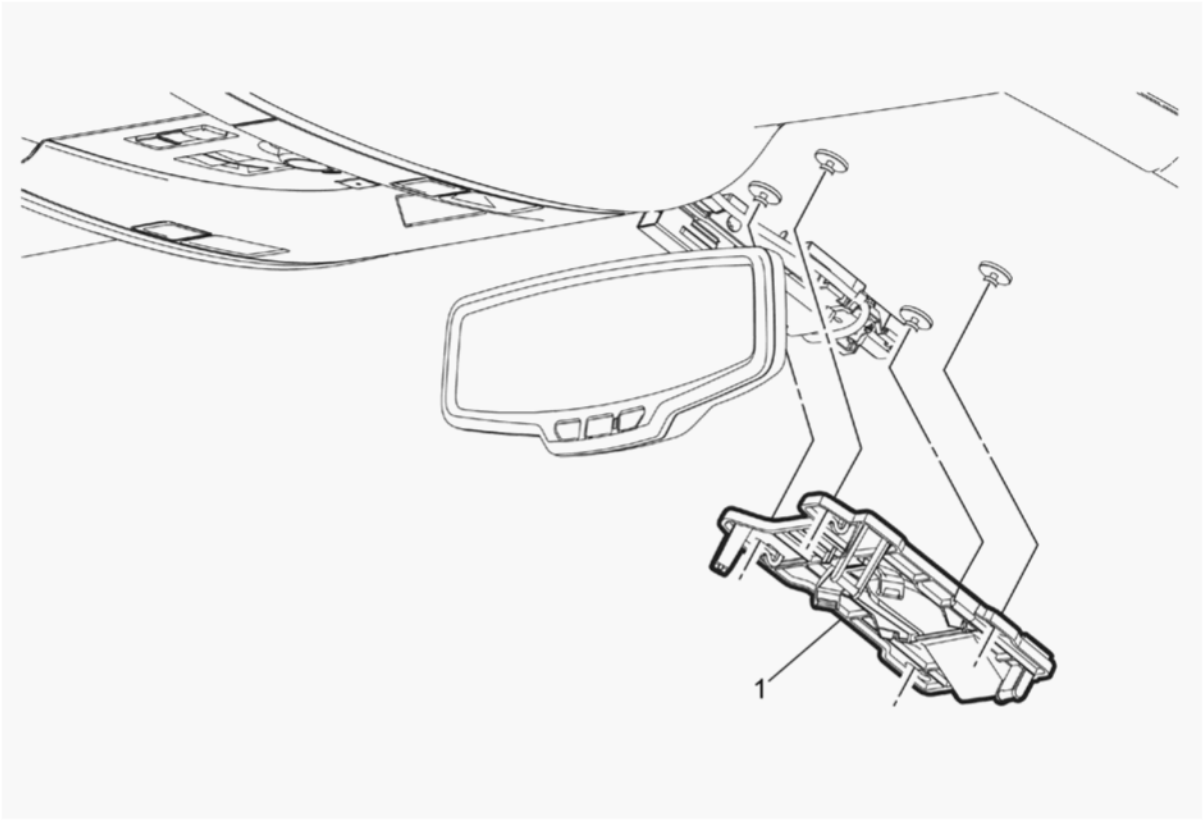


Fig. 34: Multifunction Relay Module Bracket
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the front view camera. Refer to **Front View Camera Replacement**.	
1	Multifunction Relay Module Bracket **Procedure** Slide the bracket upward to disengage tabs, gently pull from windshield.

SIDE VIEW DRIVER INFORMATION CAMERA REPLACEMENT (CADILLAC)

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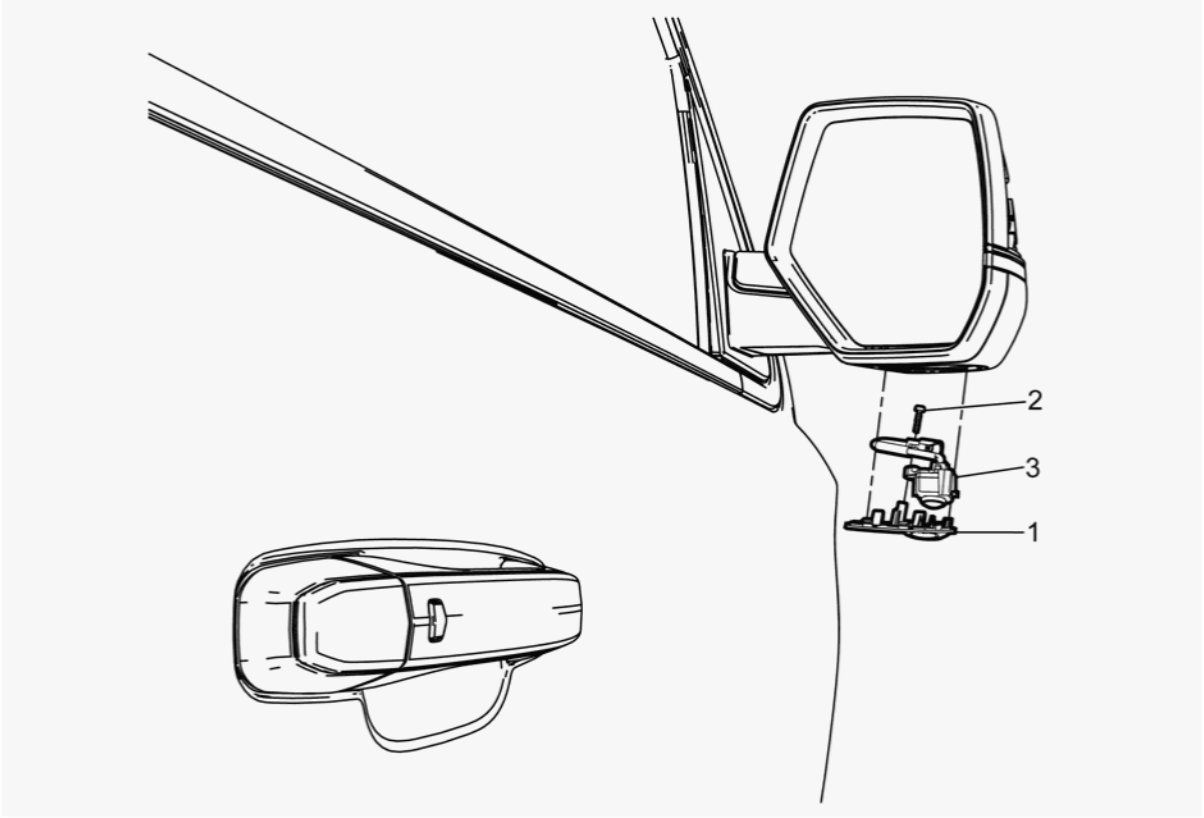


Fig. 35: Side View Driver Information Camera (Cadillac)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Outside Rearview Mirror Housing Lower Cover **Procedure** Using the appropriate tool, gently remove the cover.
2	Outside Rearview Mirror Fastener **CAUTION:** **Fastener Caution** .
3	Side View Driver Information Camera

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Callout	Component Name
	Procedure 1. Disconnect the electrical connector. 2. Calibrate the driver information camera. Refer to **Video Processing Control Module Calibration**.

FRONT VIEW CAMERA REPLACEMENT

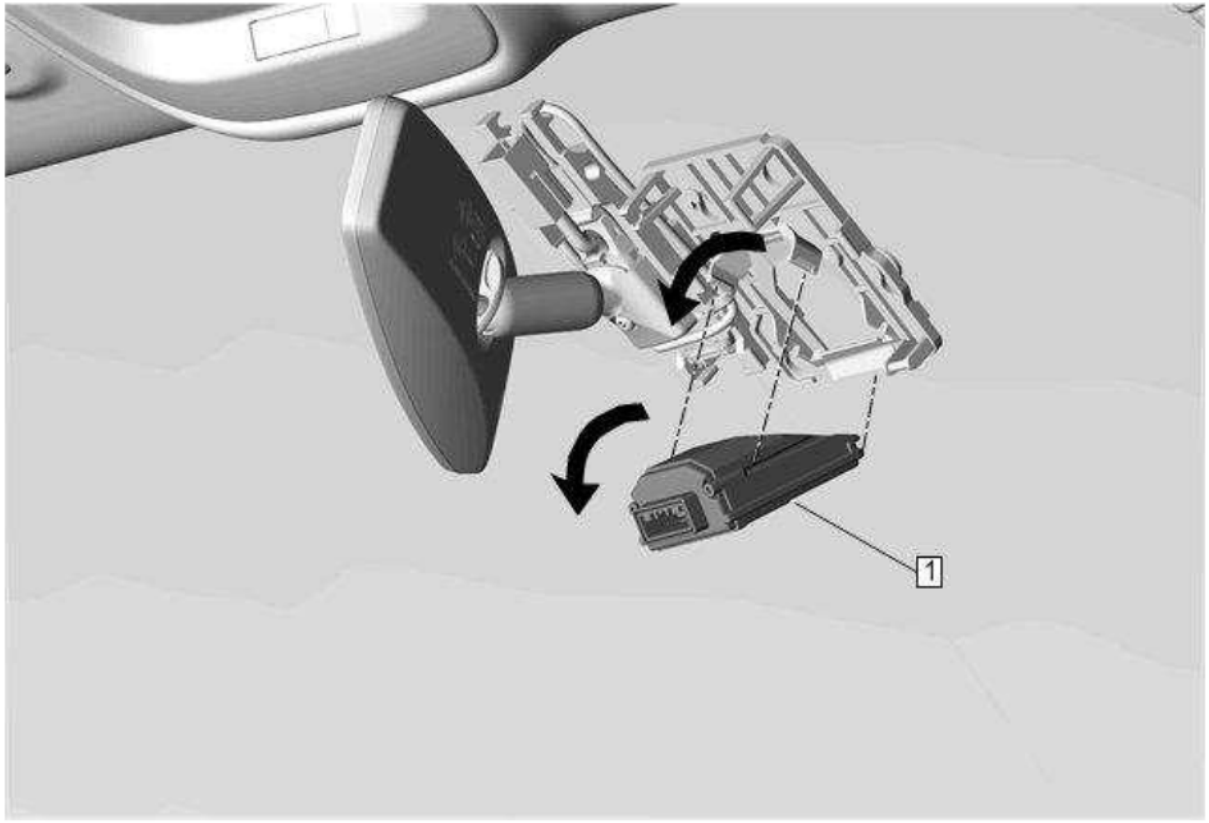


Fig. 36: Front View Camera
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	

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Callout	Component Name
Remove the windshield multifunction sensor mounting bracket cover. Refer to **Windshield Multifunction Sensor Mount Bracket Cover Replacement** .	
1	Front View Camera **Procedure** 1. Using a suitable plastic tool, insert the tool between the edge of the front view camera retainers, turn the tool to release the retainers and the camera and rotate downward. **NOTE:** **If removal of the camera is difficult, first remove the bracket from the windshield.** 2. Disconnect the electrical connector. 3. After replacement of the front view camera, program the front view camera. Refer to **Control Module References** .

FRONT VIEW DRIVER INFORMATION CAMERA REPLACEMENT (CADILLAC)

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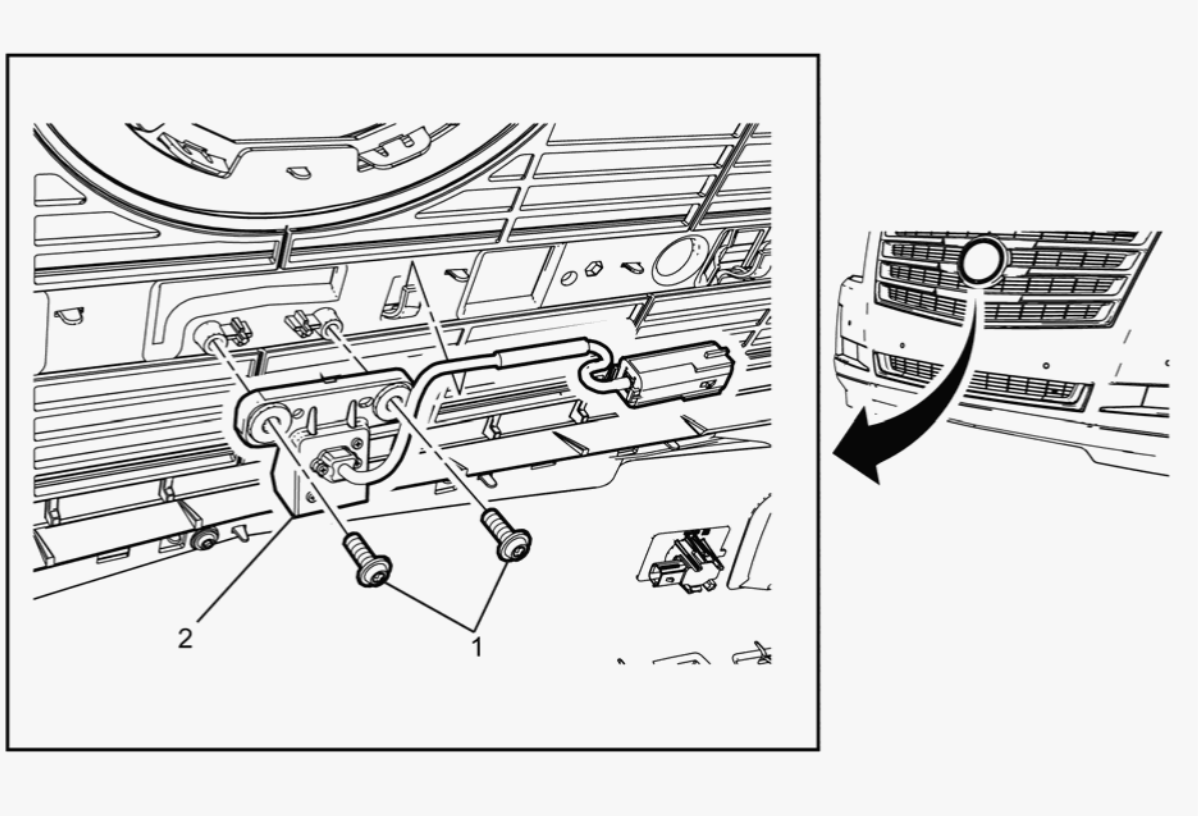


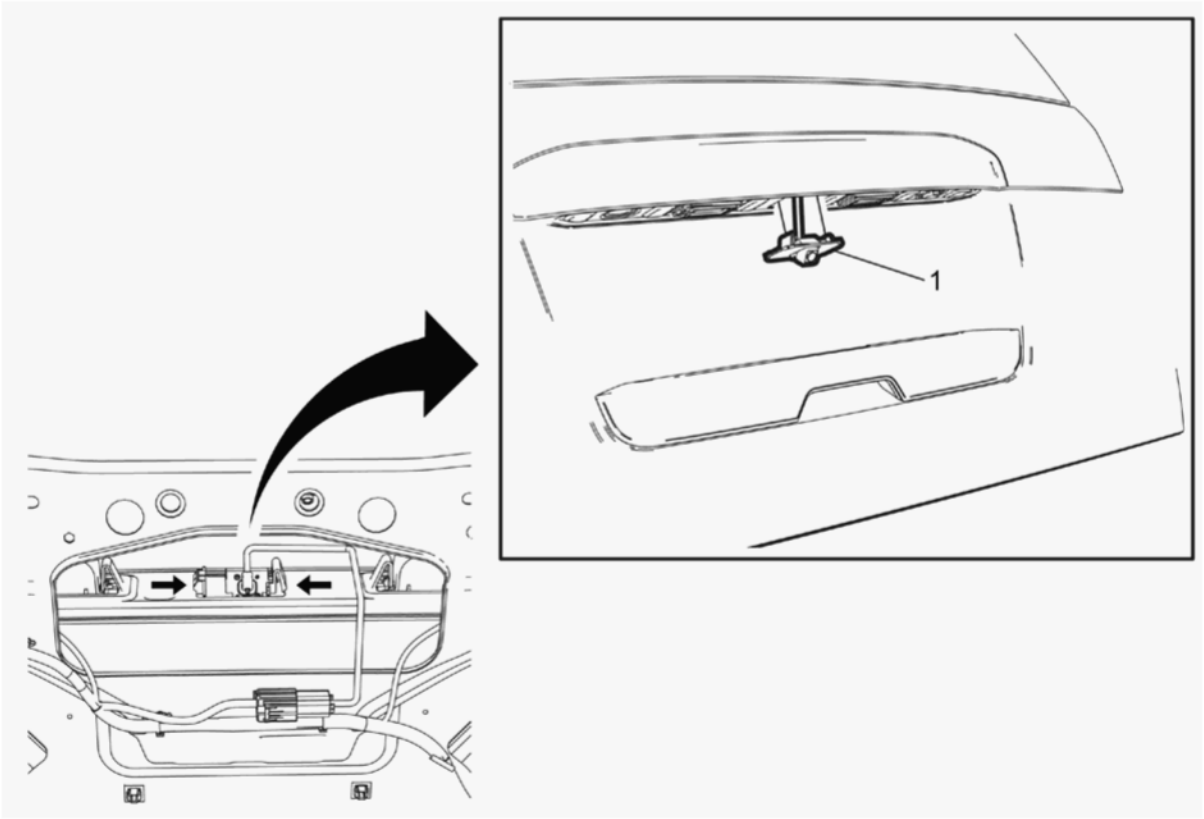
Fig. 37: Front View Driver Information Camera (Cadillac)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the front bumper fascia. Refer to **Front Bumper Fascia Replacement (Cadillac)** .	
1	Front View Driver Information Camera Fastener (Qty: 2) **CAUTION:** **Refer to Fastener Caution .**

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Callout	Component Name
	Tighten 2.5 N.m (22 lb in)
2	Front View Driver Information Camera **Procedure** 1. Disconnect the electrical connector. 2. Unclip the camera wiring from the fascia bracket. 3. Calibrate the driver information camera. Refer to **Video Processing Control Module Calibration**.

REARVIEW DRIVER INFORMATION CAMERA REPLACEMENT



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Fig. 38: Rearview Driver Information Camera
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the liftgate trim finish panel. Refer to **Liftgate Trim Finish Panel Replacement** .	
1	Rearview Driver Information Camera **Procedure** 1. Disconnect the electrical connector. 2. Depress the clip fingers and push outward to remove the camera from the panel. 3. Calibrate the driver information camera. Refer to **Video Processing Control Module Calibration**.

FRONT VIEW CAMERA MODULE CALIBRATION

Calibration (without UGN OR UGN non-Escalade)

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

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

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

- Clean windshield.
- Avoid lane changes.
- Maintain vehicle speeds between 56-90 km/h (35-56 MPH).
- Ensure the road contains visible references (well defined lane markings, curbs, etc.).

Calibration Procedure

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

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

Calibration (UGN and Escalade)

New modules must be SPS programmed prior to calibration, refer to **Control Module References**

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

NOTE: **Calibration is not required if the existing module was reprogrammed. This procedure only needs to be conducted if the module was replaced.**

Once SPS programming is complete, it is necessary to initiate the calibration using a scantool. During this time the "Service Driver Assist" service message will be displayed.

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

- Clean windshield.
- Avoid lane changes.
- Maintain vehicle speeds between 56-90 km/h (35-56 MPH).
- Ensure the road contains visible references (well defined lane markings, curbs, etc.).

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Calibration Procedure

NOTE: **It is necessary to have the scan tool connected during the entire process. Do not back out of the screen or press any other buttons.**

1. Apply the parking brake.
2. Place the transmission in Park (if applicable)
3. Install scan tool
4. Navigate to the module diagnostics menu
5. Select Frontview Camera Module
6. Select Configuration/Reset Functions menu Item
7. Select the Frontview Camera Learn procedure and follow the directions displayed on the screen.
8. Do not disconnect the scan tool, drive the vehicle to complete calibration.

Once the procedure is complete, the service message will turn off and normal operation will resume. 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:

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

No Calibration

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

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

RADAR SENSOR MODULE - LONG RANGE CALIBRATION

NOTE: **"Adaptive Cruise Temporarily Unavailable" service message may be displayed if this calibration procedure has to be performed. The radar may have become misaligned.**

After replacing and programming the Long Range Radar Sensor Module, it is necessary to perform a calibration procedure to align the radar. This is indicated to the technician by DTC B101E 4B. Calibration is performed while driving the vehicle with the scantool connected. Calibration is initialized using a scantool and the scantool must remain connected until calibration is complete. During this time the "Service Driver Assist" service message will be displayed. Once the procedure is complete, the service message will turn off and normal operation will resume.

Calibration is not required if the existing module was reprogrammed only. Calibration needs to be conducted if the module was replaced or removed and re-secured.

If calibration is not successful, it could be due to improper driving environment, module and bracket assembly bent out of position or incorrect module mounting. A typical driving environment is usually sufficient to calibrate the module within 10-30 minutes. The module needs to be mounting properly in the bracket and aimed straight ahead within +/- 3 degrees.

Calibration Procedure

1. Verify no other DTCs except for B101E 4B Electronic Control Unit Software are present.
   - **If other DTCs are present**

     Refer to service information and repair as necessary.

   - **If no other DTCs are present**
2. Prior to driving the vehicle make sure the surface in front of the radar (Cadillac emblem) is clean. Also verify the mounting area is not damaged and allows the module to face the intended direction.
3. Prepare scantool to be mobile for Long Range Radar Calibration driving phase. The scantool needs to stay connected during the driving phase

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of the calibration.

4. Engine running.
5. Initiate calibration using Long Range Radar Sensor Module Learn in the scantool. The driver information display will display "Service Driver Assist" message during calibration.

NOTE: **Do not back out of screen or press any other buttons until the calibration is complete.**

6. Drive the vehicle within the following conditions for 10-30 minutes or until calibration is complete. The "Service Driver Assist" message will turn off when calibration is complete.
   - Drive at speeds greater than 56 kph (35 mph)
   - Minimize tight curves
   - Avoid extreme acceleration or deceleration
   - Follow one or multiple vehicles. (typical vehicle traffic is sufficient, but vehicles 30m - 50m (100 - 165ft) away are most effective at decreasing the calibration time)
   - Drive in an environment that has stationary objects on the side of the road (street signs, guard rails, mail boxes, fences, etc)
7. Verify proper calibration by observing that the "Service Driver Assist" message turns off within 10-30 minutes of normal driving.
   - **If "Service Driver Assist" message fails to turn off**
   1. Verify correct operating conditions were met
      - If incorrect driving environment, refer to If Slow to Calibrate and repeat calibration procedure following recommended operating conditions.
      - If correct driving environment
   2. Verify DTC B390C 66 Incorrect Mounting is not set
      - If B390C 66 is set

        Refer to **DTC B390C**.

      - If B390C 66 is not set
   - **If "Service Driver Assist" message turns off**
8. Drive at speeds greater than 40 kph (25 mph) and verify engagement of Adaptive Cruise Control (cruise control icon will change from white to green)
   - **If Adaptive Cruise Control will not engage**

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Check vehicle for DTCs and correct as required.

- **If Adaptive Cruise Control engages**

9. All OK.

If Slow to Calibrate

The ideal calibration condition is driving on a freeway or two lane road with medium traffic. One or more of the following conditions may increase the length of time required to complete the self-calibration procedure:

- Heavy traffic - following too close behind vehicles for long periods (more than 40 min)
- Stop and go or very slow traffic
- Mountain roads
- Constant sharp curves in roadway
- No traffic - if no traffic is available, may need to add vehicle ahead to support calibration
- Limited or no stationary structures on side of the road - need structures such as street signs, guard rails, mail boxes, parked cars, etc.
- Driving in tunnels

VIDEO PROCESSING MODULE REPLACEMENT

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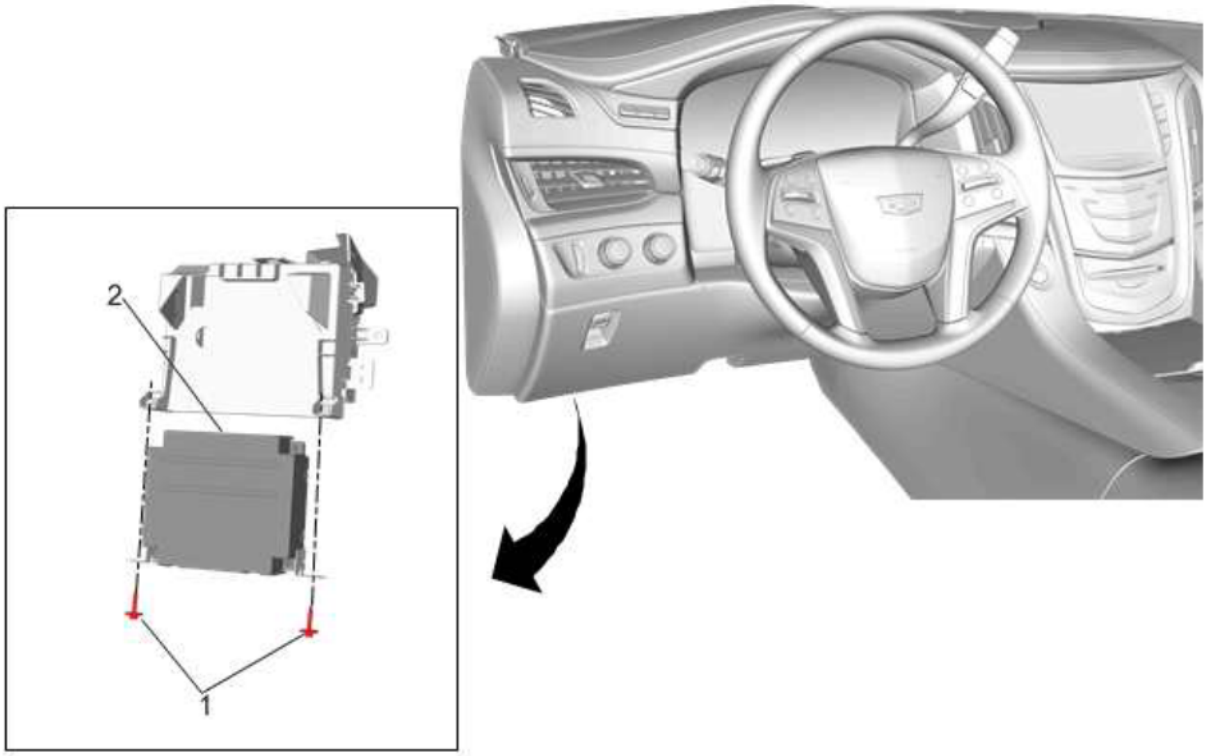


Fig. 39: Video Processing Module
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the body control module bracket. Refer to **Body Control Module Bracket Replacement** .	
1	Video Processing Control Module Fastener (Qty: 2) **CAUTION:** **Refer to** **Fastener Caution** .

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Callout	Component Name
	Tighten 6 N.m (53 lb in)
2	Video Processing Control Module **Procedure** Refer to **Control Module References** for programming and set up, if required.

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

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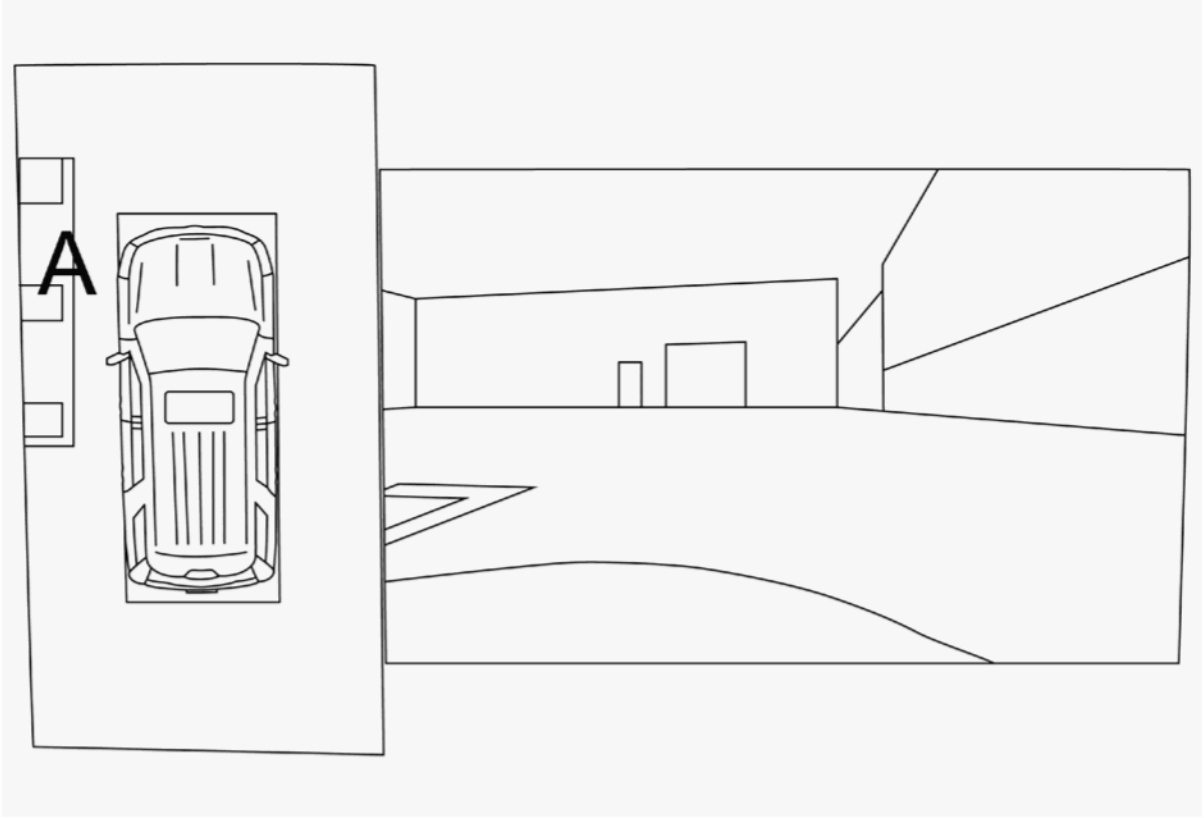


Fig. 40: Radio Display Prompt Example
Courtesy of GENERAL MOTORS COMPANY

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

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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.

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 onscreen instructions with regards to EL-51372 camera mat placement
- Vehicle must be ignition 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**

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.

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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**

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

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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

DESCRIPTION AND OPERATION

PARKING ASSIST DESCRIPTION AND OPERATION (WITH UD7)

The parking assist system is designed to identify and notify the driver of an object in the vehicle path when reversing at speeds of less than 8 km/h (5 MPH). The distance and location of the object is determined by four object sensors located in the rear fascia. The parking assist system will notify the driver using audible beeps through the infotainment system.

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

- Parking assist control module
- Object sensors
- Parking assist switch
- Parking assist switch indicator
- Infotainment system

Parking Assist Control Module

The parking assist control module provides a reference voltage 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 message via serial data to the infotainment system requesting an audible alert.

Object Sensors

The object sensors are located in the rear fascia. The sensors are used to determine the distance between an object and the rear of the vehicle. Each sensor emits an ultrasonic frequency which is reflected off an object 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

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distance to the object. The sensors report this information to the parking assist control module.

Parking Assist Switch

The parking assist system can be activated and deactivated by pressing the parking assist switch. The parking assist control module applies voltage and monitors the parking assist switch signal circuit. The parking assist switch is a normally open switch. With the switch open, voltage seen at the parking assist control module is high. When the parking assist switch is pressed, the switch is closed and the signal circuit is pulled to ground. With the switch closed, voltage seen at the parking assist control module is low. The parking assist control module will respond to this by activating or deactivating the parking assist function.

Parking Assist Switch Indicator

When the parking assist system is enabled, the parking assist control module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the parking assist control module.

Infotainment System

The infotainment system controls the audible alert for the park assist alert. If the an object is detected the infotainment system will command beeps as an audible alert to the driver.

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 parking assist control module evaluates the received sensor signals. As soon as an object is within the measuring range, the parking assist control module sends a message via serial data to the infotainment system to provide an alert 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 or underneath the vehicle.

The parking assist system can be activated and deactivated by pressing the parking assist switch. When the transmission is in R, park assist is automatically activated, unless disable by the switch.

The 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. Mud, ice and snow may cause obstruction of the function of the sensors. The parking assist control module also determines if the correct type of sensor is installed. If any of these tests fails, a DTC with corresponding symptom is set and the parking assist system is deactivated.

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Parking Assist System Driver Information Center Messages

SERVICE PARK ASSIST

The driver information center displays SERVICE PARK ASSIST when the parking assist control module detects a malfunction in the 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 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 object sensors are covered by snow, mud, dirt, slush, or ice.
- The rear fascia is damaged.
- Excessive paint thickness on a replacement parking assist sensor.
- The object 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 UD5)

The parking assist system is designed to identify and notify the driver of an object in the vehicle path when moving forward or reversing at speeds of less than 8 km/h (5 MPH). The distance and location of the object is determined by four object sensor located in the rear fascia and four object sensors located in the front fascia. The parking assist system will notify the driver using audible beeps through the infotainment system or haptic pulses through the driver's seat (if equipped).

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

- Front and rear parking assist control module
- Front object sensors
- Rear object sensors
- Parking assist switch

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- Parking assist indicator
- Infotainment system
- Safety alert seat, if equipped.

Front and Rear Parking Assist Control Module

The front and rear parking assist control module provides a reference voltage and a low reference to the eight object alarm sensors. The front and rear parking assist control module receives individual signals from each of the eight sensors and determines the location and distance of an object based on these inputs. When an object is detected, the front and rear parking assist control module will send a serial data message to the infotainment system requesting an audible alert.

Object Sensors

The object sensors are located in the front and rear fascias 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 front and rear parking assist control module.

Parking Assist Switch (All except Cadillac with UGN)

The parking assist system can be activated and deactivated by pressing the parking assist switch. The front and rear parking assist control module applies voltage and monitors the parking assist switch signal circuit. The parking assist switch is a normally open switch. With the switch open, voltage seen at the front and rear parking assist control module is high. When the parking assist switch is pressed, the switch is closed and the signal circuit is pulled to ground. With the switch closed, voltage seen at the front and rear parking assist control module is low. The front and rear parking assist control module will respond to this by activating or deactivating the parking assist function.

Parking Assist Switch (Cadillac with UGN)

The parking assist system can be activated and deactivated by pressing the parking assist switch. The active safety control module applies voltage and monitors the parking assist switch signal circuit. The parking assist switch is a normally open switch. With the switch open, voltage seen at the active safety control module is high. When the parking assist switch is pressed, the switch is closed and the signal circuit is pulled to ground. With the switch closed, voltage seen at the active safety control module is low. The active safety control module will respond to this by sending a serial data message to the front and rear parking assist control module requesting the activation or deactivation of the parking assist system.

Parking Assist Indicator (All except Cadillac with UGN)

When the parking assist system is enabled, the front and rear parking assist control module will illuminate the indicator on the switch. The indicator

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receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the front and rear parking assist control module.

Parking Assist Indicator (Cadillac with UGN)

When the parking assist system is enabled, the active safety control module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the active safety control module.

Infotainment System

The infotainment system controls the audible alert for the park assist alert. If the an object is detected the infotainment system will command beeps as an audible alert to the driver.

Safety Alert Seat

The memory seat module controls the haptic alert provided by the seats. If an object is detected, the memory seat module will command pulses to the driver's seat.

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 front and rear parking assist control module. The front and rear parking assist control module evaluates the received sensor signals. As soon as an object is within the measuring range, the front and rear parking assist control module sends a message via serial data to the infotainment system to provide an alert 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 or underneath the vehicle.

The parking assist system can be activated and deactivated by pressing the parking assist switch. When the transmission is in R, park assist is automatically activated, unless disable by the switch.

The front and rear 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. Mud, ice and snow may cause obstruction of the function of the sensors. The front and rear parking assist control module also determines if the correct type of sensor is installed. If any of these tests fails, a DTC with corresponding symptom is set and the parking assist system is deactivated.

Parking Assist System Driver Information Center Messages

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SERVICE PARK ASSIST

The driver information center displays SERVICE PARK ASSIST when the front and rear 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 front and rear 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 front and rear 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 (EXCEPT CADILLAC WITH UGN)

The lane departure warning system is a convenience feature that utilizes the frontview camera module to determine if the vehicle has unintentionally crossed a lane marking and issue a warning. The frontview camera module is located behind the windshield, looking out at the road ahead and detecting any lane markings. When the vehicle unintentionally leaves a detected lane, visual and audible or haptic (if equipped) alerts are given to the driver. The visual alert cannot be changed, but the driver can select between audible or haptic alerts (if equipped) in the vehicle personalization menus. Refer to the vehicle owner's manual for vehicle personalization options.

The lane departure warning system utilizes the following components:

- Frontview camera module
- Lane departure warning switch
- Instrument cluster
- Infotainment system

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- Safety alert seat, if equipped

Frontview Camera Module

The frontview camera module 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 (if equipped) warning is given to the driver. The frontview camera module receives an input from the lane departure warning switch and controls the lane departure warning switch indicator output. The frontview camera module also communicates via serial data with the instrument cluster, infotainment system, and memory seat module to request visual, audible, and/or haptic alerts.

Lane Departure Warning Switch

The lane departure warning switch provides an input to the frontview camera module to turn the lane departure warning system on and off. The frontview camera module applies voltage and monitors the parking assist switch signal circuit. The lane departure warning switch is a normally open switch. With the switch open, voltage seen at the frontview camera module is high. When the lane departure warning switch is pressed, the switch is closed and the signal circuit is pulled to ground. With the switch closed, voltage seen at the frontview camera module is low. The frontview camera module will respond to this by activating or deactivating the lane departure warning system.

The lane departure warning switch also utilizes the lane departure warning indicator, which is part of the lane departure warning switch and is controlled by the frontview camera module to indicate the operational status of the lane departure warning system. When the lane departure warning is enabled, the frontview camera module will illuminate the indicator on the switch. The indicator receives voltage through a high control circuit from the body control module (BCM) and is controlled through a low control circuit by the frontview camera module.

Instrument Cluster

The instrument cluster contains green and amber lane departure warning indicators. These indicators inform the driver of the current status of the lane departure warning system and are controlled via serial data by the frontview 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. If the vehicle has unintentionally left the lane, the amber indicator will flash.

Infotainment System

The infotainment system controls the audible alert for the lane departure warning. If the vehicle has unintentionally left the lane, the frontview camera module will request via serial data an audible alert to the driver through the infotainment system

Safety Alert Seat

The memory seat module controls the haptic alert provided by the seats. If the vehicle has unintentionally left the lane, the memory seat module will command pulses to the left or right side of the seat, depending on the lane departure direction.

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Lane Departure Warning Operation

System Operational Modes

- Off State: The system has been turned off by the driver using the lane departure warning switch. The lane departure warning indicator located on the lane departure warning switch will not be illuminated.
- Not Ready To Assist: The system is enabled and the lane departure warning indicator located on the lane departure warning switch is illuminated, but the system is not ready to assist because one 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 or 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 instrument cluster.

Lane Crossing Alerts

- A lane crossing alert consists of the following:
  - The amber lane departure warning indicator located on instrument cluster will flash.
  - Three chimes are activated through the infotainment system or three pulses to the left or right side of the seat, if equipped with safety alert seat
- When any of the following conditions occurs, the system will not give alerts:
  - The appropriate 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 DEPARTURE WARNING DESCRIPTION AND OPERATION (CADILLAC WITH UGN)

The lane departure warning system is a convenience feature that utilizes the frontview camera module and active safety control module to determine if the vehicle has unintentionally crossed a lane marking and issue a warning. The frontview camera module is located behind the windshield, looking out at the road ahead and detecting any lane markings. When the vehicle unintentionally leaves a detected lane, visual and audible or haptic alerts are given to the driver. The visual alert cannot be changed, but the driver can select between audible or haptic alerts in the vehicle personalization menus.

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Refer to the vehicle owner's manual for vehicle personalization options.

The lane departure warning system utilizes the following components:

- Active safety control module
- Frontview camera module
- Lane departure warning switch
- Instrument cluster
- Infotainment system
- Safety alert seat

Active Safety Control Module

The active safety control module communicates with the frontview camera module via serial data and acts as the image processor, monitoring lane markings and making the determination if a lane departure warning is warranted. The active safety control module receives image data from the frontview camera module and 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 active safety control module receives an input from the lane departure warning switch and controls the lane departure warning switch indicator output. The active safety control module also communicates via serial data with the instrument cluster, infotainment system, and memory seat module to request visual and audible or haptic alerts.

Frontview Camera Module

The frontview camera module is located behind the windshield, looking out at the road ahead and collects image data for the active safety control module. The frontview camera module communicates via serial data with the active safety control module.

Lane Departure Warning Switch

The lane departure warning switch provides an input to the active safety control module to turn the lane departure warning system on and off. The active safety control module applies voltage and monitors the parking assist switch signal circuit. The lane departure warning switch is a normally open switch. With the switch open, voltage seen at the active safety control module is high. When the lane departure warning switch is pressed, the switch is closed and the signal circuit is pulled to ground. With the switch closed, voltage seen at the active safety control module is low. The active safety control module will respond to this by activating or deactivating the lane departure warning system.

The lane departure warning switch also utilizes the lane departure warning indicator, which is part of the lane departure warning switch and is controlled by the active safety control module to indicate the operational status of the lane departure warning system. When the lane departure warning is enabled, the active safety control module will illuminate the indicator on the switch. The indicator receives voltage through a high control

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circuit from the body control module (BCM) and is controlled through a low control circuit by the active safety control module.

Instrument Cluster

The instrument cluster contains green and amber lane departure warning indicators. These indicators inform the driver of the current status of the lane departure warning system and are controlled via serial data by the active safety control 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. If the vehicle has unintentionally left the lane, the amber indicator will flash.

Infotainment System

The infotainment system controls the audible alert for the lane departure warning. If the vehicle has unintentionally left the lane, the active safety control module will request via serial data an audible alert to the driver through the infotainment system

Safety Alert Seat

The memory seat module controls the haptic alert provided by the seats. If the vehicle has unintentionally left the lane, the memory seat module will command pulses to the left or right side of the seat, depending on the lane departure direction.

Lane Departure Warning Operation

System Operational Modes

- Off State: The system has been turned off by the driver using the lane departure warning switch. The lane departure warning indicator located on the lane departure warning switch will not be illuminated.
- Not Ready To Assist: The system is enabled and the lane departure warning indicator located on the lane departure warning switch is illuminated, but the system is not ready to assist because one 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 or 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 instrument cluster.

Lane Crossing Alerts

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- A lane crossing alert consists of the following:
  - The amber lane departure warning indicator located on instrument cluster will flash.
  - Three chimes are activated through the infotainment system or three pulses to the left or right side of the seat, if equipped with safety alert seat
- When any of the following conditions occurs, the system will not give alerts:
  - The appropriate 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 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**

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

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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, 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

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power steering is used to provide steering push back.

Lane Keep Assist Operation

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

System operation can be described by the following modes:

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

Lane Crossing Alerts

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

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- 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.

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 sport 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

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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.

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 sport 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

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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

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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

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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 (WITH UGN)

On vehicles equipped with RPO UGN, forward collision alert is tightly integrated with the active safety system. Refer to **Active Safety System Description and Operation (Chevrolet, GMC with UGN)Active Safety System Description and Operation (Cadillac with UGN)**.

FORWARD COLLISION ALERT DESCRIPTION AND OPERATION (WITHOUT UGN)

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 out at the road ahead and detecting vehicles directly ahead. When the system detects a vehicle in the path ahead, the green vehicle ahead indicator is illuminated on the instrument cluster. When approaching another vehicle too rapidly, the collision alert symbol will flash in the head-up display (if equipped) or a series of red collision alert indicators will flash. An audible alert sound will simultaneously sound or the safety alert seat will provide haptic feedback. The visual alert cannot be changed, but the driver can select between audible or haptic alerts in the vehicle personalization menus. The forward collision alert system can also be turned on or off through the vehicle personalization menus. See the vehicle owner manual for more detailed information on vehicle personalization.

Forward collision alert 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. Keep the windshield, headlamps, and frontview camera module clean and in good repair.

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Forward collision alert 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.

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 50 mph (80 km/h), or on vehicles with Adaptive Cruise Control above 2 mph (4 km/h). It can detect vehicles up to approximately 197 ft (60 m).

Pedestrian Collision Mitigation Braking (if equipped) is a feature subset of Front Impact Mitigation that aims to reduce the likelihood of collisions or reduce the impact speed with pedestrians in the forward direction by the following:

- Determining the forward path of the vehicle
- Monitoring this path with respect to pedestrians in or near the forward path
- When appropriate, providing pedestrian detection pedestrian and alerts to the driver, and if certain conditions are met, providing autonomous braking to help avoid or reducing the impact speed of a collision with the pedestrian

This system is not intended to replace the driver responsibility paying careful attention to the forward scene for pedestrian, vehicle, and other potential hazards. Its function is limited to supplemental use only to assist rather than replace the driver in responding to pedestrians in the forward scene.

The Pedestrian Collision Mitigation Braking system can detect and alert to up to 10 pedestrians in a forward gear at speeds between 5 mph (8 km/h) and 50 mph (80 km/h). During daytime driving, the system detects pedestrians up to a distance of approximately 40 m (131 ft). Pedestrians must be at least 31.5 inches (80 cm) tall to be detected.

No added components are required for Front Automatic Braking, or Pedestrian Collision Mitigation Braking. Refer to Owner Manual - Driver Assistance Systems for more details.

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

- Frontview camera module
- Forward collision alert switch
- Instrument cluster

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- Collision alert indicators (without UV6)
- Head-up display (with UV6)
- Infotainment system
- Safety alert seat, if equipped

Frontview Camera Module

The frontview camera module detects vehicles in front of the vehicle. The frontview camera module communicates with the instrument cluster via serial data to illuminate the appropriate amber or green vehicle ahead indicator, collision alert symbol will flash in the head-up display, or collision alert indicators. The frontview camera module also communicates via serial data with the infotainment system and memory seat module to request audible or haptic alerts.

Forward Collision Alert Switch

The forward collision alert switch provides an input to the frontview camera module to select the alert timing sensitivity when approaching another vehicle too rapidly. The forward collision alert switch is part of the steering wheel controls switch - left and provides inputs to the body control module (BCM), which then communicates with the frontview camera module via serial data.

The BCM applies a reference voltage and monitors a low signal voltage from the normally open switch. When the switch is pressed, the signal circuit is pulled low through a specific series of resistors, indicating that the system has been requested to change the alert timing sensitivity. The first button press will show the current alert timing setting on the driver information center. With every subsequent button press, the alert timing sensitivity is changed.

Instrument Cluster

The instrument cluster communicates via serial data with the frontview camera module and will illuminate the amber or green vehicle ahead indicator as requested by the frontview camera module. The instrument cluster also controls the head-up display or the collision alert indicators.

Collision Alert Indicators (without UV6)

The collision alert indicators are a series of red LEDs that will flash when approaching another vehicle too rapidly. The collision alert indicators are located in the upper instrument panel area and reflect off the windshield when illuminated.

The collision alert indicators receive power and ground and are discretely controlled by the instrument cluster through a pair of low control circuits. When requested by the frontview camera module, the instrument panel will pulse the low control circuits, flashing the LEDs as a visual alert that another vehicle is being approached too rapidly.

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Head-up Display (with UV6)

The instrument cluster controls the head-up display via serial data. The instrument cluster will command the head-up display to flash the collision alert indicator as a visual alert when approaching another vehicle too rapidly as requested by the frontview camera module.

Infotainment System

The infotainment system controls the audible alerts for the forward collision alert system. If the host vehicle is approaching another vehicle too rapidly, the frontview camera module will command the infotainment system issue 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 is approaching another vehicle too quickly, the frontview camera module will command the memory seat module to pulse both sides of the seat.

ACTIVE SAFETY SYSTEM DESCRIPTION AND OPERATION (CHEVROLET, GMC WITH UGN)

Forward Collision Alert

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 out at the road ahead and detecting vehicles directly ahead. When the system detects a vehicle in the path ahead, the green vehicle ahead indicator is illuminated on the instrument cluster. When approaching another vehicle too rapidly, the collision alert symbol will flash in the head-up display (if equipped) or a series of red collision alert indicators will flash. An audible alert sound will simultaneously sound or the safety alert seat will provide haptic feedback. The visual alert cannot be changed, but the driver can select between audible or haptic alerts in the vehicle personalization menus. The forward collision alert system can also be turned on or off through the vehicle personalization menus. See the vehicle owner manual for more detailed information on vehicle personalization.

Forward collision alert 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. Keep the windshield, headlamps, and frontview camera module clean and in good repair.

Forward collision alert 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:

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- Frontview camera module
- Forward collision alert switch
- Instrument cluster
- Collision alert indicators (without UV6)
- Head-up display (with UV6)
- Infotainment system
- Safety alert seat, if equipped

Active Emergency Braking System

The active emergency braking systems includes the intelligent brake assist system and the automatic collision preparation system. The intelligent brake assist and the automatic collision preparation systems are designed provide a boost to braking or automatically brake the vehicle to help avoid or lessen the severity of crashes when driving in a forward gear.

Intelligent brake assist is designed to pre-fill the brake hydraulic system to reduce system response time and increase pressure when quickly applying the brakes. Using the frontview camera module and the distance sensing cruise control module, the system monitors the approach speed and distance to a vehicle ahead. If the Intelligent brake assist system determines a collision risk exists, it will begin preparations to the brake hydraulic system. When active, minor brake pedal pulsations or pedal movement may occur and this should be considered normal. Intelligent brake assist will resort to normal braking operation after an intelligent brake assist even has occurred when the brake pedal is released.

When driving in a forward gear at speeds 9 kph (5 mph), the automatic collision preparation system uses the frontview camera module and distance sensing cruise control module to determine if an imminent collision risk exists. If the brakes have not been applied, the system will automatically apply the brakes in an effort to mitigate the collision or reduce collision damage. The system has a detection range of approximately 60 m (197 ft) and will only function when a vehicle is detected, as indicated by the green vehicle ahead indicator is illuminated on the instrument cluster.

Automatic collision preparation is not a substitute for normal vehicle braking and should not be relied on to brake the vehicle. Automatic collision preparation may not detect a vehicle ahead if the frontview camera module or distance sensing cruise control 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. Keep the windshield, headlamps, distance sensing cruise control module, and frontview camera module clean and in good repair.

The active emergency braking system are made up of the following components:

- Frontview camera module
- Distance sensing cruise control module

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- Electronic brake control module

Frontview Camera Module

The frontview camera module detects vehicles in front of the vehicle. The frontview camera module communicates with the instrument cluster via serial data to illuminate the appropriate amber or green vehicle ahead indicator, collision alert symbol will flash in the head-up display, or collision alert indicators. The frontview camera module also communicates via serial data with the infotainment system and memory seat module to request audible or haptic alerts.

The frontview camera module works in conjunction with the distance sensing cruise control module to track vehicles ahead and determine if a collision risk exists. If a collision risk exists, the active emergency braking systems will be activated to reduce collision damage.

Distance Sensing Cruise Control Module

The distance sensing cruise control module works in conjunction with the frontview camera module to track vehicles ahead and determine if a collision risk exists. If a collision risk exists, the active emergency braking systems will be activated to reduce collision damage.

Electronic Brake Control Module

The electronic brake control module is used by the active emergency braking system to pre-fill and prepare for braking by the intelligent brake assist and actively brake the vehicle by the automatic collision preparation system.

Forward Collision Alert Switch

The forward collision alert switch provides an input to the frontview camera module to select the alert timing sensitivity when approaching another vehicle too rapidly. The forward collision alert switch is part of the steering wheel controls switch - left and provides inputs to the body control module (BCM), which then communicates with the frontview camera module via serial data.

The BCM applies a reference voltage and monitors a low signal voltage from the normally open switch. When the switch is pressed, the signal circuit is pulled low through a specific series of resistors, indicating that the system has been requested to change the alert timing sensitivity. The first button press will show the current alert timing setting on the driver information center. With every subsequent button press, the alert timing sensitivity is changed.

Instrument Cluster

The instrument cluster communicates via serial data with the frontview camera module and will illuminate the amber or green vehicle ahead indicator as requested by the frontview camera module. The instrument cluster also controls the head-up display or the collision alert indicators.

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Collision Alert Indicators (without UV6)

The collision alert indicators are a series of red LEDs that will flash when approaching another vehicle too rapidly. The collision alert indicators are located in the upper instrument panel area and reflect off the windshield when illuminated.

The collision alert indicators receive power and ground and are discretely controlled by the instrument cluster through a pair of low control circuits. When requested by the frontview camera module, the instrument panel will pulse the low control circuits, flashing the LEDs as a visual alert that another vehicle is being approached too rapidly.

Head-up Display (with UV6)

The instrument cluster controls the head-up display via serial data. The instrument cluster will command the head-up display to flash the collision alert indicator as a visual alert when approaching another vehicle too rapidly as requested by the frontview camera module.

Infotainment System

The infotainment system controls the audible alerts for the forward collision alert system. If the host vehicle is approaching another vehicle too rapidly, the frontview camera module will command the infotainment system issue an audible alert to the driver.

Safety Alert Seat

The memory seat module controls the haptic alert provided by the seats. If the vehicle is approaching another vehicle too quickly, the frontview camera module will command the memory seat module to pulse both sides of the seat.

ACTIVE SAFETY SYSTEM DESCRIPTION AND OPERATION (CADILLAC WITH UGN)

The active safety system is a comprehensive feature set designed to help a driver avoid collisions or reduce crash damage while driving, backing, and parking. The active safety control module is the primary controller for the active safety system. The active safety control module communicates on multiple serial data busses to share information with various control modules throughout the vehicle. The active safety control module uses various sensors and control modules to monitor the vehicle surroundings and take deliberate action to avoid collisions or reduce crash damage. The active safety system tightly integrates the forward collision alert, adaptive cruise control, front and rear parking assist, and active emergency braking systems into a single cohesive system.

The active safety control module communicates via serial data on the object detection bus with the vehicle direction camera, radar sensor module - long range, radar sensor module - short range left front, and radar sensor module - short range right front to create a virtual fusion image of the area in front of the vehicle. The active safety control module observes an actual visual image of the area directly ahead of the vehicle, within 60 m (197 ft), with the vehicle direction camera. The radar sensor module - long range is used to measure the distance to objects that are up to 200 m (656 ft) in front the vehicle and the two radar sensor modules - short range are used to measure the distance to objects that are within 30 m (98 ft) of the front of

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the vehicle. Within 60 m (197 ft) of the vehicle, all of these inputs are combined to create a fusion image of the area in front of the vehicle. At up to 200 m (656 ft), the radar sensor module - long range will detect and begin tracking objects immediately in front of the vehicle. Within 60 m (197 ft), the vehicle direction camera will confirm objects that have been detected by the radar sensor module - long range. The two radar sensor modules - short range improve cut-in detection, which are objects that enter the vehicle path from the side and are not necessarily detected by the vehicle direction camera and radar sensor module - long range, who's focus are those object directly in front of the vehicle.

The fusion image created by the active safety control module is used to detect collision risks and take action based on the immediacy of the risk. The a collision risk exists, the active safety control module will alert the driver using the forward collision alert system. This will provide the driver with a visual and audible or haptic alert that a collision risk has been detected. If the driver does not take action to reduce the risk of collision, such as changing lanes or applying the brakes, the intelligent brake assist system will pre-fill the brake hydraulic system to reduce system response time and increase pressure when quickly applying the brakes. If a collision risk is imminent, the active safety control module will enter automatic collision preparation, which will automatically apply the brakes in an effort to mitigate the collision or reduce collision damage.

The active safety control module communicates with the steering wheel angle sensor and the multi-axis acceleration sensor via serial data on the chassis expansion bus. These sensors are used to determine the intended vehicle path. Using the steering data and vehicle acceleration data, the active safety control module will determine where the vehicle will be traveling and focus attention on objects in this path. An example would be a driver quickly changing lanes to avoid a collision. This would mitigate the collision risk in the previous lane and the active safety control module would quickly transition to tracking objects for any collision risk in the new lane based on intended vehicle path. The active safety control module also communicates with the electronic brake control module to instigate the braking functions of intelligent brake assist and automatic collision preparation.

At the rear of the vehicle, the active safety control module uses the radar sensor module - short range left rear, radar sensor module - short range right rear, and the front and rear parking assist control module as part of the backing warning system and the rear automatic braking system. Typical rear parking assist utilizes the front and rear parking assist control module and the four ultrasonic rear parking assist sensors to detect object when reversing at speed of up to 8 km/h (5 mph). The backing warning systems utilizes both the four ultrasonic rear parking assist sensors, as well as the radar sensor module - short range left rear and radar sensor module - short range right to detect object at speeds above 8 km/h (5 mph). The rear automatic braking system is intended to help avoid or reduce the harm caused by backing crashes or prevent the vehicle from being from being reversed into an object if the vehicle is already stopped.

The active safety system analyzes data from the various control modules and sensors listed below:

- Active safety control module
- Vehicle direction camera
- Radar sensor module - long range
- Radar sensor module - short range left front
- Radar sensor module - short range right front

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- Radar sensor module - short range left rear
- Radar sensor module - short range right rear
- Front and rear parking assist control module
- Electronic brake control module

Component Description

Active Safety Control Module

The active safety control module analyzes data from various modules, sensors, and switches to provide enhanced safety features. In addition to providing alerts, the active safety control module will provide driver assistance through integrated brake assist, automatic collision preparation, rear emergency braking, and adaptive cruise control. Inputs and outputs can either be connected directly to the active safety control module or communicate though serial data. The active safety control module communicates on a dedicated object detection bus, as well as the chassis expansion bus and low speed GMLAN.

Forward collision alert, lane departure warning, and park assist alerts can be user selected to either a haptic signal utilizing the driver's haptic signal motor seat or using beeps through the audio system. This setting can be found in the vehicle personalization menus. See the owner's manual for more detailed information on vehicle personalization.

If there is a DTC set in any of the modules that the active safety control module uses as inputs, it will send a "Service Driver Assist" to the instrument cluster to alert the driver of a problem with the system. No other specific details are given unless the driver attempts to activate a specific system. For example if the driver attempts to turn on lane departure warning, the instrument cluster will display "Lane Departure Unavailable" and the indictor will flash and then go out. A scan tool must be used to read the DTCs that are causing the malfunction to help find the problem. Some of the inputs to the active safety control module can affect forward facing features, rear facing features, or all features. Systems to check to determine which area to focus are rear park assist for rear features, and lane departure warning and adaptive cruise control for front features. If none of the active safety system features are operative, there may be an issue with another module on the vehicle not providing the proper data to the active safety control module. If all active safety control module features are inoperative, check the Adaptive Cruise Control Inhibit History and Disengage History scan tool data for the reason for the malfunction. Definitions of parameters and suggestions on what to look for can be found in **Active Safety Control Module Scan Tool Information** . Any item with a "Yes" was the reason why the adaptive cruise control system was inoperative at that time. In some cases verifying the module is the correct part number, has the latest version of software is necessary, and is calibrated properly.

- Active safety control module inputs:
  - Vehicle direction camera
  - Radar sensor module - long range
  - Radar sensor module - short range left front

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    - Radar sensor module - short range right front
    - Radar sensor module - short range left rear
    - Radar sensor module - short range right rear
    - Front and rear parking assist control module
    - Multi-axis acceleration sensor
    - Steering wheel angle sensor
    - Wheel speed sensors
    - Forward collision alert switch
    - Lane departure warning switch
    - Parking assist switch
- Active safety control module outputs:
    - Body control module
    - Electronic brake control module
    - Engine control module
    - Instrument cluster
    - Head-up display
    - Memory seat module (safety alert seats)
    - Lane departure warning switch indicator
    - Parking assist switch indicator
    - Infotainment system

Vehicle Direction Camera

The vehicle direction camera is located behind the windshield, looking out at the road ahead and detects lane markings and objects directly ahead, within a distance of approximately 60 meters (197 ft). The vehicle direction camera is used for lane departure warning and forward collision alert systems. The vehicle direction camera communicates with the active safety control module via serial data on the object detection bus.

Using information from the vehicle direction camera, the active safety control module will provide forward collision alert and lane departure warning to the driver when appropriate. The alerts and warnings can be user-selected to be audible through the audio system or haptic using the active safety seat.

Radar Sensor Module - Long Range

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The radar sensor module - long range is located behind the front grille emblem and is used in the 30-200 m (98-656 ft) range. The radar sensor module - long range communicates with the active safety control module via serial data on the object detection bus. In addition to the wiring harness ground, the module is grounded through the mounting bracket.

Radar Sensor Module - Short Range Front

There are two radar sensor module - short range front located behind the front fascia that detect objects up to approximately 30 meters (98 ft). The radar sensor modules - short range front communicate with the active safety control module via serial data on the object detection bus.

Radar Sensor Module - Short Range Rear

There are two radar sensor modules - short range rear located behind the rear fascia that detect objects up to approximately 30 meters (98 ft). The radar sensor modules - short range rear communicate with the active safety control module via serial data on the object detection bus.

Front and Rear Parking Assist Control Module

The front and rear parking assist control module uses ultrasonic object sensors located in the front and rear fascias to provide distance measurements to nearby objects. The front and rear park assist module sends rear object data to the active safety control module via serial data.

Electronic Brake Control Module

The electronic brake control module performs the braking activities of the active safety system. When requested by the active safety control module, the electronic brake control module will prepare or apply the brakes as necessary in response to an imminent collision.

Active Safety System Operation

Forward Collision Alert

The forward collision alert system is a convenience feature of the active safety control module, vehicle direction camera, radar sensor module - long range, radar sensor module - short range left front, and radar sensor module - short range right front that issues a warning to the driver when a potential collision risk exists. When the system detects a vehicle in the path ahead, the green vehicle ahead indicator is illuminated on the instrument cluster. If the vehicle ahead is being followed too closely, the vehicle ahead indicator will be amber. When approaching another vehicle too rapidly, the collision alert symbol will flash in the head-up display. An audible alert sound will simultaneously sound or the safety alert seat will provide haptic feedback. The visual alert cannot be changed, but the driver can select between audible or haptic alerts in the vehicle personalization menus. Refer to the vehicle owner manual for more detailed information on vehicle personalization.

Forward collision alert 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 vehicle direction camera is blocked by dirt, snow, or ice, or if the windshield is damaged. It may also not detect a vehicle on winding or

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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. Keep the windshield, headlamps, and vehicle direction camera area clean and in good repair.

Forward collision alert 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.

Intelligent Brake Assist

Intelligent brake assist is designed to pre-fill the brake hydraulic system to reduce system response time and increase pressure when quickly applying the brakes. Using the active safety control module, vehicle direction camera, radar sensor module - long range, radar sensor module - short range left front, and radar sensor module - short range right front, the system monitors the approach speed and distance to a vehicle ahead. If the Intelligent brake assist system determines a collision risk exists, it will begin preparations to the brake hydraulic system. When active, minor brake pedal pulsations or pedal movement may occur and this should be considered normal. Intelligent brake assist will resort to normal braking operation after an intelligent brake assist even has occurred when the brake pedal is released.

Automatic Collision Preparation

Automatic collision preparation system uses the active safety control module, vehicle direction camera, radar sensor module - long range, radar sensor module - short range left front, and radar sensor module - short range right front to determine if an imminent collision risk exists. If the brakes have not been applied, the system will automatically apply the brakes in an effort to mitigate the collision or reduce collision damage. The system has a detection range of approximately 60 m (197 ft) and will only function when a vehicle is detected, as indicated by the green vehicle ahead indicator is illuminated on the instrument cluster.

Automatic collision preparation is not a substitute for normal vehicle braking and should not be relied on to brake the vehicle. Automatic collision preparation may not detect a vehicle ahead if the vehicle direction camera 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. Keep the windshield, headlamps, and vehicle direction camera area clean and in good repair.

Backing Warning System

The backing warning system utilized the active safety control module, radar sensor module - short range left rear, radar sensor module - short range right rear, and the front and rear parking assist control module to warn of rear objects when backing up at speeds greater than 8 km/h (5 mph). Utilizing the ultrasonic rear object sensors, the front and rear parking assist control module can only detect object at seeps up to 8 km/h (5 mph). By utilizing the active safety control module and radar sensor modules - short range along with the front and rear parking assist control module and the rear object sensors, object can be detected at speeds greater than 8 km/h (5 mph).

While reversing at speeds greater than 8 km/h (5 mph), the backing warning system will alert the driver with an audible alert or through haptic

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feedback from the safety alert seat when an object is first detected. If the system detects a potential collision risk, a series of audible beeps or haptic feedback pulses will be provided, as well as a quick pulse of the brakes.

Rear Automatic Braking

The rear automatic braking system is designed to help avoid or reduce the harm caused by backing crashes. If the system detects the vehicle is backing too fast to avoid a collision, it may automatically brake hard to a stop.

Utilizing the active safety control module, radar sensor module - short range left rear, radar sensor module - short range right rear, and the front and rear parking assist control module, rear automatic braking attempts to avoid imminent collision by automatically braking the vehicle when traveling in reverse. In conjunction with the backing warning system, if the driver does not respond to the audible and haptic alerts while reversing, the system will automatically brake the vehicle to a stop.

Rear automatic braking also prevents the vehicle from backing into an object if the vehicle is stopped and shifted to R. If the system detects an object immediately behind the vehicle while attempting to reverse from a stop, the brakes will be applied.

Pressing the brake pedal after the vehicle comes to a stop will release the rear automatic braking. It may be necessary to release the electronic parking brake. When it is safe to do so, pressing the accelerator pedal firmly at any time will override the rear automatic braking. If rear automatic braking is active and there is no object behind the vehicle, make sure there is no snow, ice, or debris on the rear object sensors.

Lane Departure Warning

The lane departure warning system is a convenience feature that utilizes the vehicle direction camera and active safety control module to determine if the vehicle has unintentionally crossed a lane marking and issue a warning. The vehicle direction 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, visual and audible or haptic alerts are given to the driver. The visual alert cannot be changed, but the driver can select between audible or haptic alerts in the vehicle personalization menus.

Refer to **Lane Departure Warning Description and Operation (except Cadillac with UGN)Lane Departure Warning Description and Operation (Cadillac with UGN)** for more information about the Lane Departure Warning function.

ADAPTIVE CRUISE CONTROL DESCRIPTION AND OPERATION (WITH KSG)

The adaptive cruise control system is an enhanced cruise control system with the ability to sense and react to forward traffic. Compared to the common cruise control system found on many vehicles, the main functional enhancement of the adaptive cruise control system is the ability to detect the presence of a vehicle in the path of the adaptive cruise control vehicle. Adaptive cruise control retains the existing cruise control feature that controls the vehicle speed to the driver selected speed. However, adaptive cruise control allows a driver to set and maintain a following distance to the preceding nearest vehicle in the path ahead. The active safety control module controller calculates a follow speed limit to ensure an acceptable distance is maintained to the preceding vehicle in front, should one be present. The adaptive cruise control system automatically adjusts the speed

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when the vehicle comes up behind a slower travelling vehicle in front. The system applies limited automatic braking and throttle control without driver input when necessary to maintain the set following distance. The preceding vehicle's speed and acceleration along with the active cruise control vehicle speed and acceleration and the distance between the two vehicles are factors used by the active safety control module controller to determine the follow speed limit. The vehicle speeds up to the original driver selected set speed when the pathway becomes clear without driver input.

The adaptive cruise control functionality depends on various modules on the vehicle to function and each module performs a function that is critical to the proper operation of the adaptive cruise control system. Adaptive cruise control will not operate if any components fail. Communication between modules is via serial data. The following is a functional description of the active safety control module and the other associated components:

- Active safety control module
- Body control module
- Engine control module
- Electronic brake control module
- Transmission control module
- Instrument cluster
- Cruise control switch
- Gap switch

Active Safety Control Module

The active safety control module analyzes data from various modules, sensors, and switches to provide enhanced safety features. In addition to enhanced safety features, the active safety control module provides the adaptive cruise control system functionality. The active safety control module analyzes data from the long range radar sensor module, front short range radar sensor modules, and frontview camera module to identify and classify objects in the road environment. The system scans the road environment to detect targets within its specified field of view. The active safety control module then sends throttle and/or brake commands to the engine control module (ECM) and electronic brake control module (EBCM) via serial data in order to control the vehicle acceleration/deceleration based on the data from the modules. The ECM and EBCM provide throttle control and automatic braking needed for proper cruise speed adjustment. The following is a list of the active safety control module functions pertaining to the adaptive cruise control functionality:

- The active safety control module processes the road environment to get data concerning any vehicle ahead of the adaptive cruise control vehicle. Detection, parameter estimation, tracking, object classification and diagnostics are the primary functions. When an object is detected, the controller calculates the object range, range rate, acceleration and azimuth angle parameters.
- The active safety control module performs adaptive cruise control state processing automatically - distance control or speed control. The adaptive cruise control operates in 2 possible states - cruise or follow. The normal operating state is cruise, whereby the vehicle speed is

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controlled to match the driver selected set speed. When a preceding forward target is identified, the adaptive cruise control system will automatically transition into the follow speed state to provide proper lane spacing behind the target vehicle in front. The preceding vehicle's speed and acceleration, with the adaptive cruise control vehicle speed, acceleration and distance between the two vehicles will be used to determine the adaptive cruise control follow speed limit. The adaptive cruise control follow speed limit will ensure that an acceptable distance is maintained to the preceding vehicle.

- The active safety control module determines the follow speed limit for throttle control by the ECM.
- The active safety control module arbitrates the adaptive cruise control system brake and throttle control between the EBCM and the ECM.
- The active safety control module requests brake light activation during automatic braking.
- The active safety control module provides operational feedback to the vehicle driver. The active safety control module sends signals for telltales and messages to be displayed on the instrument cluster or driver information center.

Body Control Module

The following are the adaptive cruise control System functions provided by the body control module (BCM):

- The BCM provides a translating gateway for the high speed GMLAN serial data circuit.
- The BCM reads all cruise control switches and the gap switch. The active safety control module monitors a variety of user operated switches from the BCM switch status information sent via the GMLAN serial data circuit.
- The BCM illuminates the brake light based on a GMLAN message from the active safety control module during automatic braking.
- The BCM measures the brake pedal position and sends brake pedal travel status via GMLAN serial data circuit to the ECM. The ECM disengages the adaptive cruise control system when the brake is applied by the driver pressing the brake pedal.
- The BCM serves as a gateway to the instrument cluster and driver information center. The BCM will generate visual warnings based on high speed GMLAN serial data messages from the active safety control module.

Engine Control Module

The following are the adaptive cruise control system functions performed by the engine control module (ECM):

- The ECM provides the electronic throttle control to the adaptive cruise control System. The ECM is also responsible for determining when a driver is overriding the adaptive cruise control throttle position by pressing the accelerator pedal.
- The ECM processes the cruise control switch requests received via the GMLAN serial data circuit from the BCM. Engaging and disengaging the adaptive cruise control system are functions performed by the ECM.
- The ECM determines the driver selected vehicle speed. Unless the adaptive cruise control module requests a lower vehicle speed, the ECM will control the vehicle speed to the driver selected set speed.

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- The ECM allows automatic braking without disengaging the adaptive cruise control.

Electronic Brake Control Module

The following are the adaptive cruise control System functions performed by the electronic brake control module (EBCM):

- The EBCM controls the operation of the Antilock Brake System.
- The EBCM provides automatic braking for the adaptive cruise control system. The active safety control module will request vehicle deceleration via high speed GMLAN serial data circuit.
- The EBCM determines when the driver-applied brake pressure is active. The EBCM will communicate this status via the GMLAN serial data circuit to the BCM.
- The EBCM releases vehicle automatic braking when there is a throttle override by the driver pressing the accelerator.
- The EBCM predicts brake temperatures. Due to automatic braking, the brake system may overheat. When the brakes are overheated, the EBCM requests the adaptive cruise control System to be temporarily shut down by the ECM until the brakes cool to a normal operating temperature.

Transmission Control Module

The transmission control module (TCM) provides a down shift to protect the brakes. When the TCM detects some driver braking activity or adaptive cruise control automatic braking activity, the TCM down shifts the vehicle transmission to increase engine braking. This helps reduce braking activity, extend brake pad life and reduce brake system overheating.

Instrument Cluster

The driver information center is a part of the instrument cluster and displays the adaptive cruise control system warning messages. The active safety control module requests messages to be displayed on the driver information center by sending a GMLAN request to the BCM. The BCM sends a GMLAN serial data request to the instrument cluster demanding the display of the warning message. When the message is acknowledged by the driver and the cause of the message resolved, the driver information center turns the message off. The adaptive cruise control system will not operate if the driver information center fails.

Cruise Control Switch

The cruise control switch, functionally is a common feature that is shared between the adaptive cruise control system and the regular cruise control system. The adaptive cruise control system will not operate if any cruise switch fails. The cruise control switch comprises the following cruise control function switches:

- On/Off switch

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- Set/decrease switch
- Resume/increase switch

The cruise control function switches are arranged in a resistive ladder design whereby each switch function is set up with different resistance values. The BCM through the cruise control switch signal circuit detects a predetermined voltage value when any cruise control switch function is activated. The associated cruise control function signal detected by the BCM is then sent to the engine control module (ECM) as a GMLAN serial data circuit message. The ECM on receiving the message provides the cruise control function requested by the BCM. The ECM is responsible for recognizing and responding to cruise control switch requests sent by the BCM. The cruise control function switches are used by the ECM to communicate to the active safety control module the driver selected vehicle speed. The driver selected vehicle speed is communicated through GMLAN serial data circuit to the active safety control module and the BCM. The adaptive cruise control system engages and adjusts vehicle speeds based on the activation of the following cruise control function switches:

Cruise Control On/Off Switch

The BCM monitors the switch signal circuit in order to determine when the On/Off switch is disabled or activated. The BCM detects a predetermined voltage value on the switch signal circuit. The On/Off switch state is then relayed to the ECM via the GMLAN serial data circuit. The ECM sends the On/Off switch input status to the active safety control module. When the On/Off switch is turned ON, the adaptive cruise control system enters either a standby enabled or a standby disabled mode. The standby enabled mode indicates that every condition required for the adaptive cruise control system to function has been met, but the adaptive cruise control is not engaged. When the adaptive cruise control is in the standby disabled mode, the conditions necessary for the adaptive cruise control system to function has not been met. When the On/Off switch is turned OFF, the adaptive cruise control will enter the disabled mode. The adaptive cruise control will not activate in the disabled mode.

Cruise Control Set/Decrease Switch

The adaptive cruise control system is engaged when the adaptive cruise control On/Off switch is turned ON and the set/decrease switch is momentarily pressed and released. When the set/decrease switch is pressed, the selected vehicle speed is set to the current vehicle speed by the ECM. The vehicle speed must be at or greater than 40 km/h (25 MPH). The selected vehicle speed is displayed by the driver information center. While in the engaged state, the selected vehicle speed and the following distance can be adjusted. Pressing and holding the set/decrease switch, when the adaptive cruise control system is engaged, will decrease the selected vehicle speed without deactivating the adaptive cruise control. Momentarily pressing and releasing the set/decrease switch, when the adaptive cruise control is engaged, decreased the selected vehicle speed by 1.6 km/h (1 MPH) for each time that the set/decrease switch is pressed.

Cruise Control Resume/Increase Switch

The resume/increase switch is used in order to increase the selected vehicle speed when adaptive cruise control is active. The amount selected vehicle speed can be increased from the resume/increase switch depends on how long the switch is pressed. The presence of a slower moving vehicle in the path of the adaptive cruise control vehicle will limit the extent to which the selected vehicle speed can be achieved. If there is no preceding vehicle in

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front, limiting the adaptive cruise control vehicle acceleration, then the vehicle speed that is attained is the new selected vehicle speed. The current selected vehicle speed is displayed by the driver information center. Acceleration is terminated when the resume/increase switch is released. Momentarily pressing and releasing the resume/increase switch will allow the selected vehicle to accelerate in at 1.6 km/h (1 MPH) increments for each time that the resume/increase switch is momentarily pressed.

Gap Switch

The gap switch allows the driver to determine how closely the adaptive cruise control vehicle follows a target vehicle while adaptive cruise control is engaged. When the adaptive cruise control vehicle speed is being limited due to a slower travelling vehicle, the adaptive cruise control vehicle speed is automatically controlled to the follow speed limit. The gap switch has 3 following distance selections that range from 1-2 s. The gap switch following distance between the adaptive cruise control vehicle and the target vehicle is expressed in time as opposed to actual distance. The distance maintained for a selected gap will vary based on vehicle speed. The faster the vehicle speed, the further back you will follow. The gap setting can only be adjusted when the adaptive cruise control system is engaged. The gap switch is hard-wired to the BCM. Based on voltage variations, the BCM is able to read the gap switch selection and communicates the switch status on the GMLAN serial data circuit to the active safety control module. The gap switch is a momentary switch.

The initial push of the gap switch recalls the current setting and activates the display. Subsequent pushes of the gap switch will change the gap setting.

Driver Information Messages

Adaptive Cruise Control Temporarily Unavailable

The active safety control module will send this message if the adaptive cruise control has been disengage or disabled. There are many reasons that can cause this, some will also set DTCs. Check vehicle for DTCs and also check the adaptive cruise control enable and disengage scan tool data. Definitions of parameters can be found in active safety control module scan tool information.

Service Driver Assist System

This message can be set by either the active safety control module if there is a problem with the driver assist system or by the memory seat module if there is a problem with the haptic seat circuits. Check vehicle for DTCs.

Service Adaptive Cruise Control and Service Front Camera

The message is set if the active safety control module is not communicating to the instrument cluster. Check vehicle for DTCs.

Set Speed

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The adaptive cruise control vehicle set speed is displayed at all times in the driver information center when adaptive cruise control is engaged. The active safety control module set speed display request is sent to the instrument cluster via the GMLAN serial data circuit.

Follow Distance

The driver information center displays the driver selected following distance when adaptive cruise control is engaged and the gap switch is active. The current follow distance setting is displayed in the driver information center for a few seconds after the gap switch is pressed to increase or decrease the following distance. The active safety control module follow distance display request is sent to the instrument cluster via the GMLAN serial data circuit.

Vehicle Ahead Indicator

The vehicle ahead indicator is displayed in the instrument cluster hen the radar identifies an in-path vehicle. The vehicle ahead indicator is a warning to the driver that a vehicle is ahead. The indicator also serves as a feedback to the driver that the radar is functioning properly. The active safety control module commands the display of the vehicle ahead indicator via a GMLAN serial data message to the instrument cluster. The vehicle ahead indicator only displays with the adaptive cruise control active and may sometimes display for stationary road objects.

REAR VISION CAMERA DESCRIPTION AND OPERATION

The rear vision camera system consists of the rearview camera and the infotainment system.

When the transmission is placed into R, 12 V is applied to the reverse lamp control circuit by the body control module (BCM). The rearview camera monitors this circuit and when 12 V is seen, indicating that the transmission is in R, the rearview camera will activate. The rearview camera receives ignition voltage and a constant ground to power the camera. Video signal + and video signal - circuits carry the video image from the rearview camera to the infotainment system. Additionally, the video signal circuits are shielded to prevent any interference which may lead to a loss of video signal resolution and cause a degraded video image. The shield is grounded by the rearview 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

SAFETY ALERT SEAT DESCRIPTION AND OPERATION

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The active safety seat provides a vibration in the driver's seat bottom cushion to alert the driver of a number of concerns. There are two motors providing the vibration and are located on the left and right sides of the seat cushion. Depending on the alert, either the left, right, or both motors will activate.

The active safety seat is made up of the following components:

- Seat Memory Control Module
- Haptic Seat Motor - Driver Left
- Haptic Seat Motor - Driver Right

Seat Memory Control Module

The seat memory control module receives serial data messages from other modules and provides a voltage output to activate haptic signal motors. The seat memory control module will pulse the left, right, or both motors with the number of pulses requested over serial data. The module monitors the circuits for open, short to ground, and short to voltage conditions and will set DTCs if a problem is detected.

Haptic Seat Motor

The motors are located in the driver's seat bottom cushion and are positioned on the left and right sides. The motors are connected to ground and receive voltage from the seat memory control module.

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.

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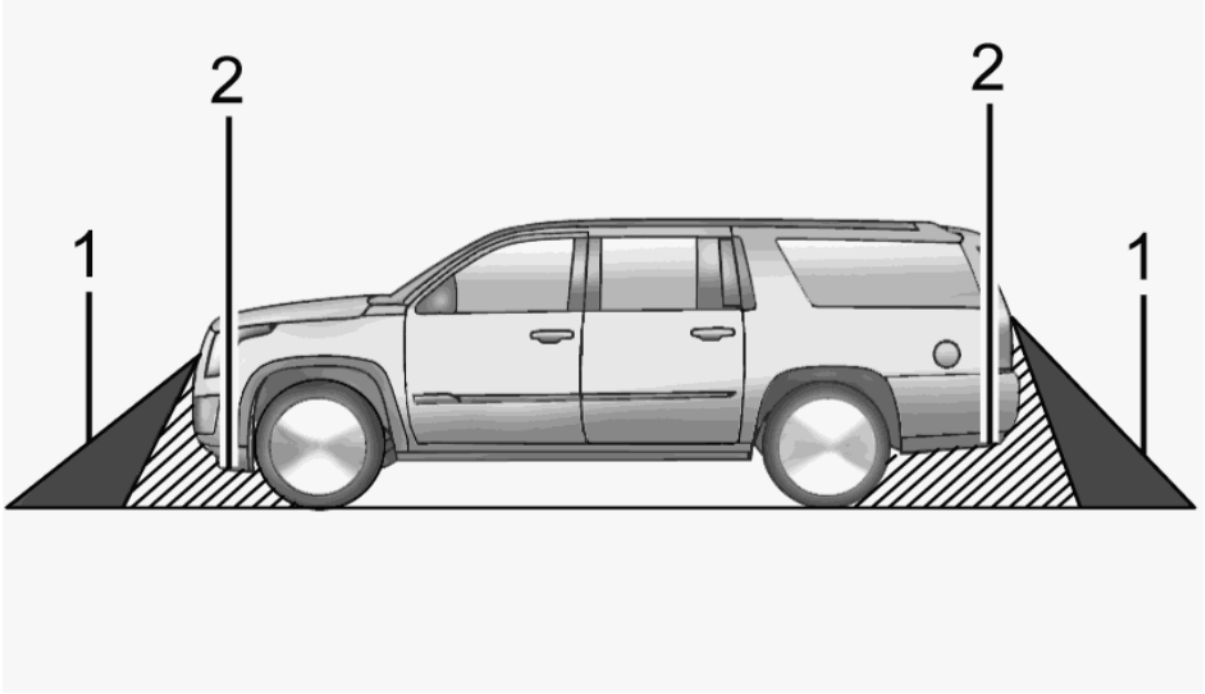


Fig. 41: Surround Vision Camera
Courtesy of GENERAL MOTORS COMPANY

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

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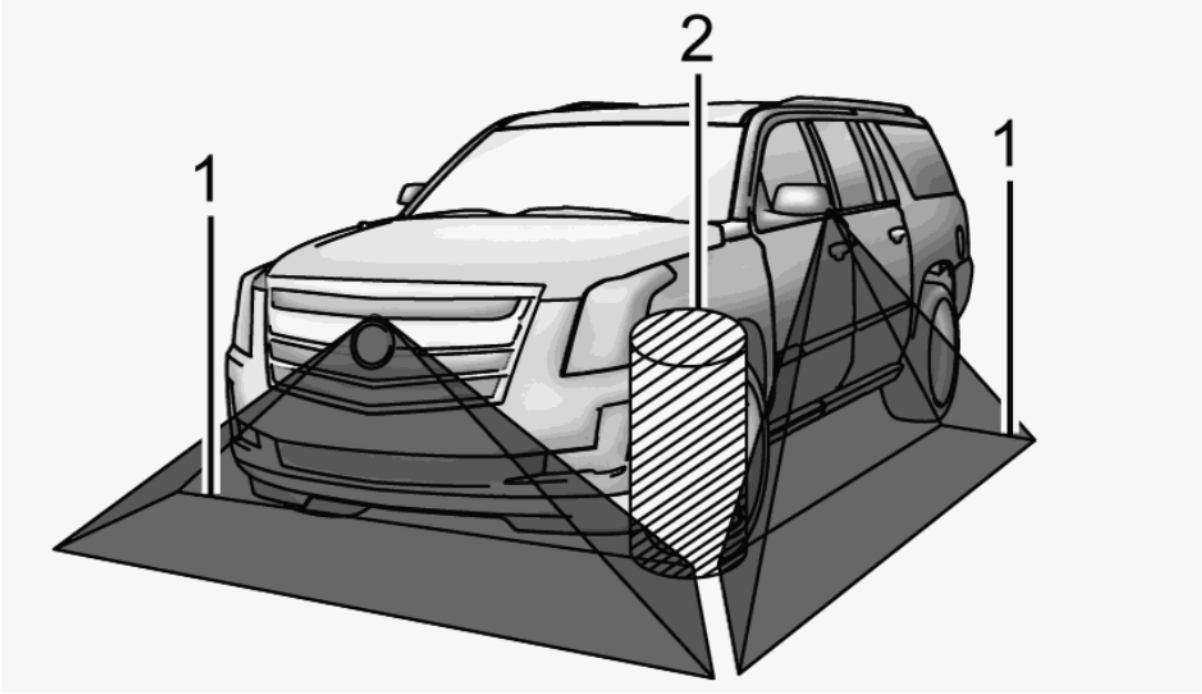


Fig. 42: Surround Vision Camera
Courtesy of GENERAL MOTORS COMPANY

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.

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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

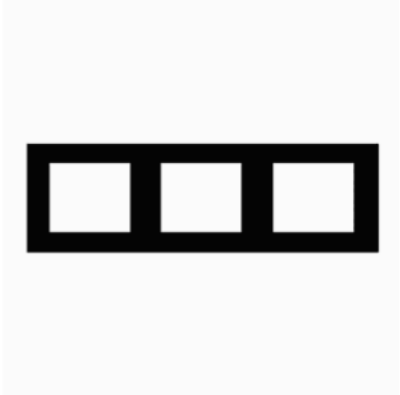
The video processing control module sends voltage and a constant ground to power the cameras. Video signal + and video signal - circuits carry the video image from the cameras to the video processing control module for processing. The video processing control module will then send the processed image 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.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

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Illustrations	Tool Number/Description
	EL-51372 Camera Calibration Mat

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