

2018 ACCESSORIES & EQUIPMENT

Driver Assistance Systems - Equinox & Terrain

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE:

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

Application	Specification
	Metric (English)
Forward Collision Alert Display Bolt	2.5 N.m (22 lb in)
Side Object Sensing Alert Module Bolt	2.5 N.m (22 lb in)

SCHEMATIC WIRING DIAGRAMS

DRIVER ASSISTANCE SYSTEMS WIRING SCHEMATICS

Forward Collision Alert and Lane Assist (UEU/UHX)

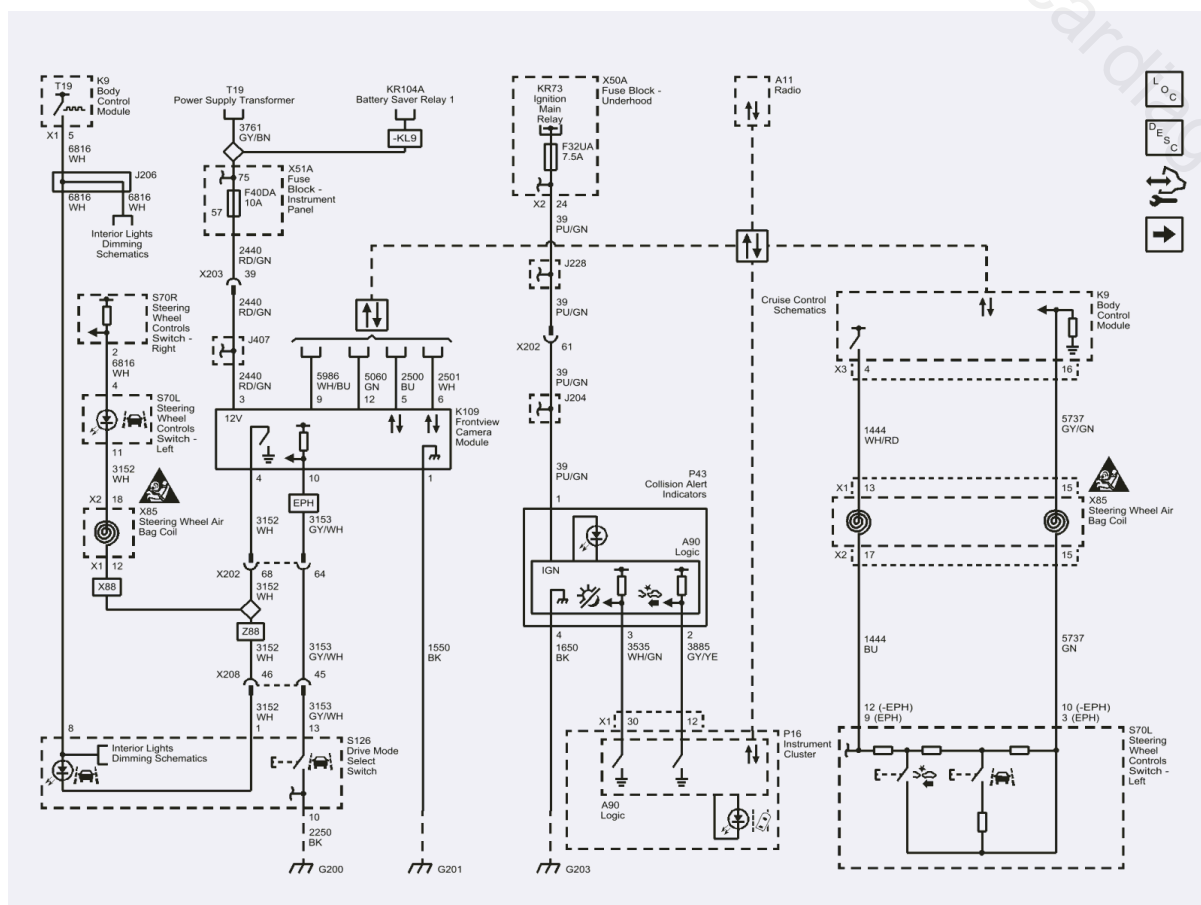


Fig. 1: Forward Collision Alert and Lane Assist (UEU/UHX)

Courtesy of GENERAL MOTORS COMPANY

Safety Alert Seat (A45 or A74 with UEU and UHX)

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

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC B094B

Left Side Object Detection Control Module

DTC B094C

Right Side Object Detection Control Module

Symptom Byte Information: [Symptom Byte List](#)

Circuit/System Description

Component	Description
B218L Side Object Sensor Module - Left	The assembly has several functions: Side Blind Zone Alert Rear Cross Traffic Audible Alert Rear Cross Traffic Visual Alert
• B218R Side Object Sensor Module - Right	The assembly has several functions: Side Blind Zone Alert Rear Cross Traffic Audible Alert Rear Cross Traffic Visual Alert

Conditions for Running the DTC

Ignition On

Conditions for Setting the DTC

- B094B 00, B094C 00 - System Internal Malfunctions
- B094B 08, B094C 08 - Signal Performance
- B094B 45, B094C 45 - Variant Not Programmed
- B094B 45, B094C 45 - High Temperature
- B094B 58, B094C 58 - Performance

Actions Taken When the DTC Sets

- B218 Side Object Sensor Module = Inoperative
- Driver Information Center Display - Display "Service Side Detection System" Message

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

Diagnostic Aids

If DTC B094B 58 is set or DTC B094C 58 is set. - Remove any snow, ice or mud from the vehicle. Also verify the fascia panels in near the radar are damage-free and not obstructed by any add-on accessories such as emblems, etc.

Reference Information

Schematic Reference

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Side Blind Zone Alert Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC B094B 45/B094C 45 is not set.
 - **If the DTC is set**
 1. Program the control module: B218 Side Object Sensor Module
 2. Verify the DTC does not set.
 - If the DTC is set
Replace the appropriate component: B218 Side Object Sensor Module
 - If the DTC is not set
3. All OK.
 - **Go to next step: If the DTC is set**
3. Verify DTC B094B 00, B094C 00, B094B 08, B094C 08, B094B 54, B094C 54 is not set.
 - If the DTC is set
Replace the appropriate component: B218 Side Object Sensor Module
 - **Go to next step: If the DTC is not set**
4. Verify DTC B094B 58/B094C 58 is not set.
 - **If the DTC is set**
Verify the following conditions do not exist:
 - Visible Damage
 - Dirty
 - If a condition exists - Repair or replace as necessary
 - If no conditions exist - Replace the appropriate component: B218 Side Object Sensor Module
 - **Go to next step: If the DTC is not set**
5. All OK.

[Repair Instructions](#)

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

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

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

Diagnostic Instructions

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

DTC Descriptors

DTC B094D

Left Side Object Detection Indicator Circuit

DTC B094E

Right Side Object Detection Indicator Circuit

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

Diagnostic Fault Information

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

Circuit/System Description

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

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

Conditions for Running the DTC

- Engine running.
- The Side blind zone alert is active from speeds of 10 km/h (6.2 MPH) up to 140 km/h (87 MPH).

Conditions for Setting the DTC

B094D 02

The module has detected a short to ground in the left side object detection indicator circuit.

B094D 01

The module has detected a short to voltage in the left side object detection indicator circuit.

B094E 02

The module has detected a short to ground in the right side object detection indicator circuit.

B094E 01

The module has detected a short to voltage in the right side object detection indicator circuit.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

- Review the system description and operation in order to familiarize yourself with the system functions. For an overview of the component/system, refer to: [Side Blind Zone Alert Description and Operation](#)
- The side blind zone system can be disabled if any of the following occur:
 - Disabled by Driver Personalization
 - There is a loss of serial data communication with a sensor or between modules.
- The side blind zone may be temporarily unavailable due to the following:
 - 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.
 - The side blind zone alert system will read the GPS latitude and longitude on the serial data bus and calculate if the vehicle is within a Radio Astronomy zone. These zones are located in Europe and Japan and require the sensors to be turned off. The "Side Detection System Unavailable" message will be displayed to the driver when this occurs.
- Because the sensors are identical, they may be swapped from one side of the vehicle to the other in an attempt to isolate a concern. Sensors should NOT be swapped from one vehicle to another.
- The side blind zone system is designed to ignore stationary objects; however, the system may occasionally detect guard rails, signs, trees, shrubs, or other stationary objects as an object in the blind zone. This is normal system operation and does not require service.
- The side blind zone system may indicate an object in the blind zone if a trailer is attached to the vehicle, or a bicycle or object is extending out to either side of the vehicle. This is normal operation and does not require service.
- Lane Change Alert (LCA) can be disabled in vehicle personalized settings, this will also disable the Side Blind Zone Alert (SBZA) system. When disabled, the bulb check of the mirror indicators will also be disabled. A driver information center message will be displayed at start up when the LCA system is disabled. This feature must be enabled prior to trying to diagnose the system.

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Side Blind Zone Alert Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

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

Special Tools

EL-35616-210 Test Light - Probe Kit

Circuit/System Verification

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

Refer to Circuit/System Testing

 - **Go to next step: If both side blind zone alert indicators briefly turn ON and OFF**
3. All OK.

Circuit/System Testing

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

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector for the appropriate A9 Outside Rearview Mirror. It may take up to 2 min for all vehicle systems to power down.
 - X510 - Driver Door Harness to Outside Rearview Mirror
 - X610 - Passenger Door Harness to Outside Rearview Mirror
2. Test for less than 10 Ω between the ground circuit terminal 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. Ignition ON, connect a test lamp between the control circuit terminal 19 and the ground circuit terminal 7.
4. Verify the test lamp turns ON and OFF when commanding the Object Detection Alert Indicators On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the harness connector at the appropriate B218 Side Object Sensor Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the B218 Side Object Sensor Module.
 - **If the test lamp is always ON**

1. Ignition OFF, disconnect the harness connector at the B218 Side Object Sensor Module, ignition ON.
2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the B218 Side Object Sensor Module.
- **Go to next step: If the test lamp turns ON and OFF**
5. Test or replace the A9 Outside Rearview Mirror Glass.

Repair Instructions

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

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

DTC B0987: VEHICLE DIRECTION CAMERA INDICATOR CIRCUIT (CHEVROLET)

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC B0987

Vehicle Direction Camera Indicator Circuit

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 11 @ S70L Steering Wheel Controls Switch - Left	B0987 06, 1	B0987 06, B0987 0B	B0987 01, B0987 0B	-
Control - Terminal 4 @ B174W Frontview Camera - Windshield	1	1	1	-
1. Lane Departure Warning Indicator Malfunction				

Circuit/System Description

Component	Description
S70L Steering Wheel Controls Switch - Left	The assembly contains individual switches. Each function has its own switch. The switches are connected to a resistor ladder so that a specific resistance is generated for each switch.
B174W Frontview Camera - Windshield	The video camera and the control module are a single serviceable component. This camera delivers live video of what is in front of the vehicle. The video can be used for several functions, like lane departure warning, lane keep assist, road sign recognition and more. The control module also reads various switches and sensors and makes their values available via serial data.

Component	Description
K9 Body Control Module	Depending on the version, the control module can support different functions: • Exterior Illumination • Interior Illumination • Steering Wheel Controls • Power Mode Control The control module also reads various switches and sensors and makes their values available via serial data.

Conditions for Running the DTC

Ignition On

Conditions for Setting the DTC

B0987 01, B0987 0B

Control Circuit = Short to Voltage

B0987 06

Control Circuit = Short to Ground

B0987 06, B0987 0B

Control Circuit = Open

B0987 0B

Control Circuit = High Current

Actions Taken When the DTC Sets

- Lane Departure Warning = Inoperative
- Driver Information Center Display - Service Driver Assist

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)

- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC B356A is not set.
 - If the DTC is set

Refer to: [DTC B356A \(Chevrolet\)](#).
 - If the DTC is not set
3. Verify the component turns On and Off: Lane Departure Warning Indicator
 - Lane Departure Warning Switch
 - If the component does not turn On and Off

Refer to Circuit/System Testing.
 - If the component turns On and Off
4. All OK.

[Circuit/System Testing](#)

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: S70L Steering Wheel Controls Switch - Left
3. Connect a test lamp between the test points: Control circuit terminal 11 & B+

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

4. Perform the scan tool control function: Lane Departure Warning Indicator Command - On and Off

Verify the test lamp turns On and Off.

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

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: @ B174W Frontview Camera - Windshield
3. Ignition - On/Vehicle - In Service Mode
4. Test for less than 1 V between the test points: Control circuit terminal 4 @ B174W Frontview Camera - Windshield & Ground
 - If greater than 1 V

Repair the short to voltage on the circuit.

- If less than 1 V
5. Ignition/Vehicle - Off
 6. Test for less than 2 ohms between the test points: Control circuit terminal 4 @ B174W Frontview Camera - Windshield & Control circuit terminal 11 @ S70L Steering Wheel Controls Switch - Left
 - If 2 ohms or greater - Repair the open/high resistance in the circuit.

- If less than 2 ohms - Replace the component: B174W Frontview Camera - Windshield
- **If the test lamp is always On**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: @ B174W Frontview Camera - Windshield
 3. Test for infinite resistance between the test points: Control circuit terminal 4 @ B174W Frontview Camera - Windshield & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance - Replace the component: B174W Frontview Camera - Windshield
- 5. Test or replace the component: S70L Steering Wheel Controls Switch - Left

Repair Instructions

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

- Refer to [Cruise Control Switch Replacement \(Equinox\)](#) - Procedure for Component Replacement - S70L Steering Wheel Controls Switch - Left
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC B0987: VEHICLE DIRECTION CAMERA INDICATOR CIRCUIT (GMC)

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC B0987

Vehicle Direction Camera Indicator Circuit

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 1 @ S126 Drive Mode Select Switch	B0987 06, 1	B0987 06, B0987 0B	B0987 01, B0987 0B	-
Control - Terminal 4 @ B174W Frontview Camera - Windshield	1	1	1	-
1. Lane Departure Warning Indicator Malfunction				

Circuit/System Description

Component	Description
S126 Drive Mode Select Switch	The assembly contains individual switches. Each function has its own switch. The switches are connected to a resistor ladder so that a specific resistance is generated for each switch.

Component	Description
B174W Frontview Camera - Windshield	The video camera and the control module are a single serviceable component. This camera delivers live video of what is in front of the vehicle. The video can be used for several functions, like lane departure warning, lane keep assist, road sign recognition and more. The control module also reads various switches and sensors and makes their values available via serial data.
K9 Body Control Module	Depending on the version, the control module can support different functions: • Exterior Illumination • Interior Illumination • Steering Wheel Controls • Power Mode Control The control module also reads various switches and sensors and makes their values available via serial data.

Conditions for Running the DTC

Ignition On

Conditions for Setting the DTC

B0987 01, B0987 0B

Control Circuit = Short to Voltage

B0987 06

Control Circuit = Short to Ground

B0987 06, B0987 0B

Control Circuit = Open

B0987 0B

Control Circuit = High Current

Actions Taken When the DTC Sets

- Lane Departure Warning = Inoperative
- Driver Information Center Display - Service Driver Assist

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC B356A is not set.
 - If the DTC is set

Refer to: [DTC B356A \(GMC\)](#)
 - If the DTC is not set
3. Verify the component turns On and Off: Lane Departure Warning Indicator
 - Lane Departure Warning Switch
 - If the component does not turn On and Off

Refer to Circuit/System Testing.
 - If the component turns On and Off
4. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: S126 Drive Mode Select Switch
3. Connect a test lamp between the test points: Control circuit terminal 1 & B+

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

4. Perform the scan tool control function: Lane Departure Warning Indicator Command - On and Off

Verify the test lamp turns On and Off.

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

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: @ B174W Frontview Camera - Windshield
3. Ignition - On/Vehicle - In Service Mode
4. Test for less than 1 V between the test points: Control circuit terminal 4 @ B174W Frontview Camera - Windshield & Ground

- If greater than 1 V

Repair the short to voltage on the circuit.

- If less than 1 V

5. Ignition/Vehicle - Off
6. Test for less than 2 ohms between the test points: Control circuit terminal 4 @ B174W Frontview Camera - Windshield & Control circuit terminal 1 @ S126 Drive Mode Select Switch
 - If 2 ohms or greater - Repair the open/high resistance in the circuit.
 - If less than 2 ohms - Replace the component: B174W Frontview Camera - Windshield
- **If the test lamp is always On**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: @ B174W Frontview Camera - Windshield
 3. Test for infinite resistance between the test points: Control circuit terminal 4 @ B174W Frontview Camera - Windshield & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance - Replace the component: B174W Frontview Camera - Windshield
5. Test or replace the component: S126 Drive Mode Select Switch

Repair Instructions

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

- Refer to [Lane Keep Assist Switch Replacement](#)
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC B1011: SYSTEM DISABLED INFORMATION STORED

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC B1011

System Disabled Information Stored

Symptom Byte Information: [Symptom Byte List](#)

Circuit/System Description

Component	Description
P43 Collision Alert Indicators	The assembly contains individual switches. Each function has its own switch. The switches are connected to a resistor ladder so that a specific resistance is generated for each switch.
K109 Frontview Camera Module	This camera delivers live video of what is in front of the vehicle. The video can be used for several functions, like lane departure warning, lane keep assist, road sign recognition and more. The control module also reads various switches and sensors and makes their values available via serial data.

Component	Description
K9 Body Control Module	Depending on the version, the control module can support different functions: • Interior Illumination • Steering Wheel Controls The control module also reads various switches and sensors and makes their values available via serial data.

Conditions for Running the DTC

Ignition - On/Vehicle - In Service Mode

Conditions for Setting the DTC

K109 Frontview Camera Module - System Disabled Information Stored

Action Taken When the DTC Sets

- Lane Departure Warning = Disabled
- Forward Collision Alert = Disabled
- Driver Information Display - Service Front Camera/Service Lane Departure Warning
- K109 Frontview Camera Module - All functions = Disabled

Conditions for Clearing the DTC

- A current DTC will clear when the diagnostic runs and passes.
- A history DTC will clear after 50 consecutive malfunction-free ignition cycles.

Diagnostic Aids

Refer to: Scan Tool Information - Frontview Camera Disable History 1-4

Refer to: [Forward Collision Alert Description and Operation](#)

Reference Information

Schematic Reference

[Driver Assistance Systems Wiring Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Forward Collision Alert Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

NOTE:

This is an informal DTC which does not necessarily indicate a defective control module. DTC B1011 sets when information is stored to the frontview camera module disable history buffers. This contains the reason that one or more of the frontview camera module features is disabled

1. Ignition - On/Vehicle - In Service Mode
2. Verify no other DTCs are set.

- **If any other DTCs are set**

Diagnose other DTCs first. Refer to: [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .

- **Go to next step: If no other DTCs are set**

3. Verify the scan tool parameter: Frontview Camera Disable History 1 Malfunction

- **If the parameter displays the following: Malfunction or Undefined**

Refer to: [K109 Frontview Camera Module: Scan Tool Information](#)

- **Go to next step: If the parameter displays the following: Normal**

4. Verify the scan tool parameter: Frontview Camera Disable History 2 Malfunction

- **If the parameter displays the following: Malfunction or Undefined**

Refer to: [K109 Frontview Camera Module: Scan Tool Information](#)

- **Go to next step: If the parameter displays the following: Normal**

5. Verify the scan tool parameter: Frontview Camera Disable History 3 Malfunction

- **If the parameter displays the following: Malfunction or Undefined**

Refer to: [K109 Frontview Camera Module: Scan Tool Information](#)

- **Go to next step: If the parameter displays the following: Normal**

6. Verify the scan tool parameter: Frontview Camera Disable History 4 Malfunction

- **If the parameter displays the following: Malfunction or Undefined**

Refer to: [K109 Frontview Camera Module: Scan Tool Information](#)

- **Go to next step: If the parameter displays the following: Normal**

7. All OK.

Repair Instructions

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

For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC B1015: VEHICLE IDENTIFICATION NUMBER INFORMATION

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC B1015

Vehicle Identification Number Information

Symptom Byte Information: [Symptom Byte List](#)

Circuit/System Description

When the ignition is turned On, the control module receives the vehicle identification number (VIN) from the K9 Body Control Module.

The control module will compare the VIN received to the VIN stored in memory.

Conditions for Running the DTC

Ignition On

Conditions for Setting the DTC

The VIN stored in the control module and the VIN received via serial data from another control module are different.

Actions Taken When the DTC Sets

- Forward Collision Alert = Disabled
- Lane Departure Warning = Disabled
- K109 Frontview Camera Module = Inoperative
- K124 Active Safety Control Module - If equipped = Inoperative
- Driver Information Center Display - Service Front Camera/Service Lane Departure Warning

Conditions for Clearing the DTC

A current DTC will clear when the diagnostic runs and passes.

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Forward Collision Alert Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC B1015 is not set.
 - **If the DTC is set**
 1. Program the control module: K109 Frontview Camera Module or K124 Active Safety Control Module
 2. Ignition - On/Vehicle - In Service Mode
 3. Verify DTC B1015 is not set. If the DTC is set

- If the DTC is set

Replace the appropriate component: K109 Frontview Camera Module or K124 Active Safety Control Module

- If the DTC is not set

4. All OK.

- **Go to next step: If the DTC is not set**

3. All OK.

Repair Instructions

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

For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC B101D: ELECTRONIC CONTROL UNIT HARDWARE (FRONTVIEW CAMERA MODULE OR FRONTVIEW CAMERA - WINDSHIELD)

Diagnostic Instructions

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

DTC Descriptor

DTC B101D

Electronic Control Unit Hardware

DTC B101D 3C

Electronic Control Unit Hardware Performance Internal Communications Failure

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

B101D

The frontview camera module has detected an internal malfunction

B101D 3C

The frontview camera module has detected a software malfunction

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.

- A history DTC will clear once 100 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Forward Collision Alert Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Verification

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

Repair Instructions

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

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

DTC B172E OR B172F: DRIVER SEAT CUSHION LEFT/RIGHT REAR HAPTIC MOVEMENT

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC B172E

DTC B172F

Driver Seat Cushion Right Rear Haptic Movement

Symptom Byte Information: [Symptom Byte List](#)**Diagnostic Fault Information**

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 4 @ K40D Seat Memory Control Module - Driver	B172E 02	B172E 01, B172E 02	B172E 01	-
Control - Terminal 5 X1 @ K40D Seat Memory Control Module - Driver	B172F 02	B172F 01, B172F 02	B172F 01	-
Ground - Terminal 2 @ P45LR Seat Haptic Movement Motor - Driver Left Rear	-	B172E 01, B172E 02	-	-
Ground - Terminal 2 @ P45RR Seat Haptic Movement Motor - Driver Right Rear	-	B172F 01, B172F 02	-	-

Circuit/System Description

For an overview of the component/system, refer to: [Safety Alert Seat Description and Operation](#)

Circuit	Description
Control	The output circuit is switched to 12 V to activate the component.
Ground	Chassis Ground

Component	Description
K40D Seat Memory Control Module - Driver	Depending on the version, the control module can support different functions: • Left Rear Seat Haptic Movement Motor Control • Right Rear Seat Haptic Movement Motor Control • Rear Cross Traffic Haptic Alert The control module also reads various switches and sensors and makes their values available via serial data.
K109 Frontview Camera Module	The video camera and the control module are a single serviceable component. This camera delivers live video of what is in front of the vehicle. The video can be used for several functions, like lane departure warning, lane keep assist, road sign recognition and more. The control module also reads various switches and sensors and makes their values available via serial data.

Component	Description
{If equipped} K124 Active Safety Control Module	Depending on the version, the control module can support different functions: • Brake Assist • Automatic Collision Preparation • Rear Emergency Braking • Distance Sensing Cruise Control Function The control module also reads various switches and sensors and makes their values available via serial data.
P45LR Seat Haptic Movement Motor - Driver Left Rear & P45RR Seat Haptic Movement Motor - Driver Right Rear	An electric DC motor.

Conditions for Running the DTC

Ignition On

Conditions for Setting the DTC

B172E 01

Control module K40D detects: Left Rear Seat Haptic Movement Motor Control = Short to Voltage

B172E 02

Control module K40D detects: Left Rear Seat Haptic Movement Motor Control = Short to Ground

B172F 01

Control module K40D detects: Right Rear Seat Haptic Movement Motor Control = Short to Voltage

B172F 02

Control module K40D detects: Right Rear Seat Haptic Movement Motor Control = Short to Ground

Actions Taken When the DTC Sets

- Seat Cushion Haptic Motors = Inoperative
- Driver Information Center Display - Service Driver Assist

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

Diagnostic Aids

Verify the function: Seat Cushion Haptic Motors Disabled by Driver Personalization

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Safety Alert Seat Description and Operation

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

1. Ignition - On/Vehicle - In Service Mode
2. Perform the scan tool function: Driver Seat Cushion Left Rear Haptic Movement & Driver Seat Cushion Right Rear Haptic Movement - On and Off

Verify the component produces a vibration that can be heard and felt.

- **If the component does not activate**

Refer to: Circuit/System Testing

- **Go to next step: If the component activates**

3. All OK.

[Circuit/System Testing](#)

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: X5 @ K40D Seat Memory Control Module - Driver
3. Ignition - On/Vehicle - In Service Mode
4. Test for less than 1 V between the test points:
 - Control circuit terminal 4 & Ground
 - Control circuit terminal 5 & Ground
 - **If 1 V or greater**

Repair the short to voltage on the circuit.

- **Go to next step: If less than 1 V**

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

5. Ignition/Vehicle & All vehicle systems - Off
6. Test for 27 to 51 ohms between the test points:
 - Control circuit terminal 4 & Ground
 - Control circuit terminal 5 & Ground
 - **If less than 27 ohms**

Replace the appropriate component: P45LR Seat Haptic Movement Motor - Driver Left Rear or P45RR Seat Haptic Movement Motor - Driver Right Rear

- **If greater than 51 ohms**

1. Test or inspect for the following: Ground Connection - Clean & Secure
 - If not correct

Repair as necessary

- If correct
2. Replace the appropriate component: P45LR Seat Haptic Movement Motor - Driver Left Rear or P45RR Seat Haptic Movement Motor - Driver Right Rear
 - **Go to next step: If between 21 and 57 ohms**
 7. Momentarily connect a 3 A fused jumper wire between the test points:
 - Control circuit terminal 4 & B+
 - Control circuit terminal 5 & B+
 8. Verify the component turns On and Off when connecting and disconnecting the jumper wire: P45LR Seat Haptic Movement Motor - Driver Left Rear or P45RR Seat Haptic Movement Motor - Driver Right Rear
 - **If the component does not turn On and Off**

Replace the appropriate component: P45LR Seat Haptic Movement Motor - Driver Left Rear or P45RR Seat Haptic Movement Motor - Driver Right Rear
 - **Go to next step: If the component turns On and Off**
 9. Ignition/Vehicle & All vehicle systems - Off
 10. Connect the electrical connector at all components.
 11. Ignition - On/Vehicle - In Service Mode
 12. Perform the scan tool function: Driver Seat Cushion Left Rear Haptic Movement & Driver Seat Cushion Right Rear Haptic Movement - On and Off

Verify the component produces a vibration that can be heard and felt.

- **If the component does not activate**

Replace the appropriate component: K40D Seat Memory Control Module - Driver
 - **Go to next step: If the component activates**
13. All OK.

Repair Instructions

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

- Refer to [Front Seat Lane Departure Warning Actuator Replacement](#) - P45LR Seat Haptic Movement Motor - Driver Left Rear or P45RR Seat Haptic Movement Motor - Driver Right Rear
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC B356A: VEHICLE DIRECTION WARNING SWITCH CIRCUIT (CHEVROLET)

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC B356A

Vehicle Direction Warning Switch Circuit

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal - Terminal 10 @ B174W Frontview Camera - Windshield	B356A 02, 1	1	B356A 05, 1	-
Ground - Terminal 1 @ S70L Steering Wheel Controls Switch - Left	-	1	1	-
1. Lane Departure Warning = Malfunction				

Circuit/System Description

Component	Description
S70L Steering Wheel Controls Switch - Left	The assembly contains individual switches. Each function has its own switch. The switches are connected to a resistor ladder so that a specific resistance is generated for each switch.
B174W Frontview Camera - Windshield	The video camera and the control module are a single serviceable component. This camera delivers live video of what is in front of the vehicle. The video can be used for several functions, like lane departure warning, lane keep assist, road sign recognition and more. The control module also reads various switches and sensors and makes their values available via serial data.
K9 Body Control Module	Depending on the version, the control module can support different functions: • Exterior Illumination • Interior Illumination • Steering Wheel Controls • Power Mode Control The control module also reads various switches and sensors and makes their values available via serial data.

Conditions for Running the DTC

Ignition - On/Vehicle - In Service Mode

Conditions for Setting the DTC

DTC B356A 05

Control Circuit = Short to Voltage

DTC B356A 02

Control Circuit = Short to Ground

Actions Taken When the DTC Sets

- Lane Departure Warning = Inoperative
- Driver Information Center Display - Service Driver Assist

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

Diagnostic Aids

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

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Operate the component: Lane Departure Warning Switch - Cycle On and Off

Verify the scan tool parameter: Lane Departure Warning Switch Status = Active/Inactive - The value should change when selecting the different switch positions.

- **If not the specified values**

Refer to: Circuit/System Testing

- **Go to next step: If the specified values**

3. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: S70L Steering Wheel Controls Switch - Left
3. Test for less than 15 ohms between the test points: Ground circuit terminal 1 & Ground
 - **If 15 ohms or greater**
 1. Test for less than 2 ohms between the test points: Ground circuit terminal 1 & The other end of the circuit
 - If 2 ohms or greater - Repair the open/high resistance in the circuit.
 - If less than 2 ohms - Repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 15 ohms**
4. Ignition - On/Vehicle - In Service Mode
5. Verify the scan tool parameter: Lane Departure Warning Switch = Inactive

- **If not the specified state**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: B174W Frontview Camera - Windshield
3. Test for infinite resistance between the test points: Signal circuit terminal 10 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance - Replace the component: B174W Frontview Camera - Windshield

- **Go to next step: If the specified state**

6. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 10 & Ground
7. Verify the scan tool parameter: Parking Assist Switch = Active

- **If not the specified state**

1. Ignition/Vehicle - Off & Remove - Jumper wire(s)
2. Disconnect the electrical connector: B174W Frontview Camera - Windshield
3. Ignition - On/Vehicle - In Service Mode
4. Test for less than 1 V between the test points: Signal circuit terminal 10 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V
5. Ignition/Vehicle - Off
6. Test for less than 2 ohms between the test points: Signal circuit terminal 10 @ Component harness & Terminal 10 @ Control module harness
 - If 2 ohms or greater - Repair the open/high resistance in the circuit.
 - If less than 2 ohms - Replace the component: B174W Frontview Camera - Windshield

- **Go to next step: If the specified state**

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

Repair Instructions

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

- Refer to [Cruise Control Switch Replacement \(Equinox\)](#)
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC B356A: VEHICLE DIRECTION WARNING SWITCH CIRCUIT (GMC)

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC B356A

Vehicle Direction Warning Switch Circuit

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal - Terminal 10 @ B174W Frontview Camera - Windshield	B356A 02, 1	1	B356A 05, 1	-
Ground - Terminal 10 @ S126 Drive Mode Select Switch	-	1	1	-
1. Lane Departure Warning = Malfunction				

Circuit/System Description

Component	Description
S126 Drive Mode Select Switch	The assembly contains individual switches. Each function has its own switch. The switches are connected to a resistor ladder so that a specific resistance is generated for each switch.
B174W Frontview Camera - Windshield	The video camera and the control module are a single serviceable component. This camera delivers live video of what is in front of the vehicle. The video can be used for several functions, like lane departure warning, lane keep assist, road sign recognition and more. The control module also reads various switches and sensors and makes their values available via serial data.
K9 Body Control Module	Depending on the version, the control module can support different functions: • Exterior Illumination • Interior Illumination • Steering Wheel Controls • Power Mode Control The control module also reads various switches and sensors and makes their values available via serial data.

Conditions for Running the DTC

Ignition - On/Vehicle - In Service Mode

Conditions for Setting the DTC

DTC B356A 05

Control Circuit = Short to Voltage

DTC B356A 02

Control Circuit = Short to Ground

Actions Taken When the DTC Sets

- Lane Departure Warning = Inoperative
- Driver Information Center Display - Service Driver Assist

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

Diagnostic Aids

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

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Operate the component: Lane Departure Warning Switch - Cycle On and Off

Verify the scan tool parameter: Lane Departure Warning Switch Status = Active/Inactive - The value should change when selecting the different switch positions.

- **If not the specified values**

Refer to: Circuit/System Testing

- **Go to next step: If the specified values**

3. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: S126 Drive Mode Select Switch
3. Test for less than 15 ohms between the test points: Ground circuit terminal 10 & Ground
 - **If 15 ohms or greater**
 1. Test for less than 2 ohms between the test points: Ground circuit terminal 10 & The other end of the circuit
 - If 2 ohms or greater - Repair the open/high resistance in the circuit.
 - If less than 2 ohms - Repair the open/high resistance in the ground connection.
 - **Go to next step: If less than 15 ohms**
4. Ignition - On/Vehicle - In Service Mode
5. Verify the scan tool parameter: Lane Departure Warning Switch = Inactive

- **If not the specified state**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: B174W Frontview Camera - Windshield
3. Test for infinite resistance between the test points: Signal circuit terminal 10 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance - Replace the component: B174W Frontview Camera - Windshield

- **Go to next step: If the specified state**

6. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 13 & Ground
7. Verify the scan tool parameter: Parking Assist Switch = Active

- **If not the specified state**

1. Ignition/Vehicle - Off & Remove - Jumper wire(s)
2. Disconnect the electrical connector: B174W Frontview Camera - Windshield
3. Ignition - On/Vehicle - In Service Mode
4. Test for less than 1 V between the test points: Signal circuit terminal 13 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V
5. Ignition/Vehicle - Off
6. Test for less than 2 ohms between the test points: Signal circuit terminal 13 @ Component harness & Terminal 10 @ Control module harness
 - If 2 ohms or greater - Repair the open/high resistance in the circuit.
 - If less than 2 ohms - Replace the component: B174W Frontview Camera - Windshield

- **Go to next step: If the specified state**

8. Test or replace the component: S126 Drive Mode Select Switch

Repair Instructions

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

- Refer to [Lane Keep Assist Switch Replacement](#)
- For control module replacement, programming, and setup refer to: [Control Module References](#)

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

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC P15F6

Front Object Detection Control Module Torque Request Signal Message Counter Incorrect

Symptom Byte Information: [Symptom Byte List](#)

Circuit/System Description

Component	Description

Component	Description
K109 Frontview Camera Module	The video camera and the control module are a single serviceable component. This camera delivers live video of what is in front of the vehicle. The video can be used for several functions, like lane departure warning, lane keep assist, road sign recognition and more. The control module also reads various switches and sensors and makes their values available via serial data.

Conditions for Running the DTC

The vehicle speed is greater than 1 km/h (1 MPH).

Conditions for Setting the DTC

The engine control module 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 frontview camera module sends a serial data message to display the appropriate indicator message
- The frontview camera module features are unavailable.

Conditions for Clearing the DTC

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

Diagnostic Aid

This is an informational DTC set by the engine control module. It is set to provide an indication that the active safety control module will not be able to perform as intended. Diagnose any other DTCs first.

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Control Module References

Circuit/System Verification

NOTE:

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

1. Ignition - On/Vehicle - In Service Mode
2. Verify no other DTCs are set.

- **If any other DTCs are set**

Diagnose other DTCs first. Refer to: [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .

- **Go to next step: If no other DTCs are set**

3. Complete the diagnosis by looking for an intermittent serial data circuit fault. Refer to [Scan Tool Does Not Communicate with High Speed GMLAN Device](#) .

- **If an intermittent serial data circuit fault is found**

Repair as necessary.

- **Go to next step: If an intermittent serial circuit fault is not found**

4. Clear DTCs and operate the vehicle in the conditions that the customer experienced.
5. Verify DTC P15F6 is not set.

- **If the DTC sets**

Replace the component: K109 Frontview Camera Module

- **Go to next step: If the DTC does not set**

6. All OK.

Repair Instructions

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

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

DTC P15F7: REAR OBJECT DETECTION CONTROL MODULE TORQUE REQUEST SIGNAL MESSAGE COUNTER INCORRECT**Diagnostic Instructions**

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor**DTC P15F7**

Rear Object Detection Control Module Torque Request Signal Message Counter Incorrect

Symptom Byte Information: [Symptom Byte List](#)

Circuit/System Description

Component	Description

Component	Description
K182 Parking Assist Control Module	Depending on the version, the control module can support different functions: • Front Parking Assist • Rear Parking Assist The control module also reads various switches and sensors and makes their values available via serial data.

Conditions for Running the DTC

The vehicle speed is greater than 1 km/h (1 MPH).

Conditions for Setting the DTC

The engine control module detects that the engine speed and torque modification messages from the rear parking assist control module are either corrupted or intermittently missing.

Action Taken When the DTC Sets

- The rear parking assist control module sends a serial data message to display the appropriate indicator message
- The rear parking assist 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.

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (UD7). Parking Assist Description and Operation (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

NOTE:

- DTC P15F7 is an informational DTC.
- Diagnose all other K20 Engine Control Module DTCs prior to DTC P15F7.

1. Verify there are no other K20 Engine Control Module or communication DTCs set.
 - **If a DTC is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **Go to next step: If a DTC is not set**
2. Complete the diagnosis by looking for an intermittent serial data circuit fault. Refer to [Scan Tool Does Not Communicate with High Speed GMLAN Device](#).
 - **If an intermittent serial data circuit fault is found**
Repair as necessary.
 - **Go to next step: If an intermittent serial circuit fault is not found**
3. Clear DTCs and operate the vehicle in the conditions that the customer experienced.
4. Verify DTC P15F7 does not set.
 - **If the DTC sets**
Replace the appropriate component: K182 Parking Assist Control Module
 - **Go to next step: If the DTC does 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.

SYMPTOMS - DRIVER ASSISTANCE SYSTEMS

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.
 - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions:
 - [Lane Departure Warning Description and Operation](#)
 - [Lane Keep Assist Description and Operation](#)
 - [Cross Traffic Alert Description and Operation](#)
 - [Side Blind Zone Alert Description and Operation](#)
 - [Forward Collision Alert 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](#)
- [Rear Cross Traffic Alert System Malfunction](#)
- [Side Blind Zone Alert System Malfunction](#)
- [Lane Departure Warning System Malfunction](#)
- [Lane Keep Assist System Malfunction](#)

SEAT HAPTIC SIGNAL MOTOR MALFUNCTION

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC B172E

Driver Seat Cushion Left Rear Haptic Movement

DTC B172F

Driver Seat Cushion Right Rear Haptic Movement

Symptom Byte Information: [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 4 @ K40D Seat Memory Control Module - Driver	B172E 02	B172E 01, B172E 02	B172E 01	-
Control - Terminal 5 X1 @ K40D Seat Memory Control Module - Driver	B172F 02	B172F 01, B172F 02	B172F 01	-
Ground - Terminal 2 @ P45LR Seat Haptic Movement Motor - Driver Left Rear	-	B172E 01, B172E 02	-	-
Ground - Terminal 2 @ P45RR Seat Haptic Movement Motor - Driver Right Rear	-	B172F 01, B172F 02	-	-

Circuit/System Description

For an overview of the component/system, refer to: [Safety Alert Seat Description and Operation](#)

Circuit	Description
Control	The output circuit is switched to 12 V to activate the component.
Ground	Chassis Ground

Component	Description
K40D Seat Memory Control Module - Driver	Depending on the version, the control module can support different functions: • Left Rear Seat Haptic Movement Motor Control • Right Rear Seat Haptic Movement Motor Control • Rear Cross Traffic Haptic Alert The control module also reads various switches and sensors and makes their values available via serial data.
K109 Frontview Camera Module	The video camera and the control module are a single serviceable component. This camera delivers live video of what is in front of the vehicle. The video can be used for several functions, like lane departure warning, lane keep assist, road sign recognition and more. The control module also reads various switches and sensors and makes their values available via serial data.
{If equipped} K124 Active Safety Control Module	Depending on the version, the control module can support different functions: • Brake Assist • Automatic Collision Preparation • Rear Emergency Braking • Distance Sensing Cruise Control Function The control module also reads various switches and sensors and makes their values available via serial data.
P45LR Seat Haptic Movement Motor - Driver Left Rear & P45RR Seat Haptic Movement Motor - Driver Right Rear	An electric DC motor.

Conditions for Running the DTC

Ignition On

Conditions for Setting the DTC

B172E 01

Control module K40D detects: Left Rear Seat Haptic Movement Motor Control = Short to Voltage

B172E 02

Control module K40D detects: Left Rear Seat Haptic Movement Motor Control = Short to Ground

B172F 01

Control module K40D detects: Right Rear Seat Haptic Movement Motor Control = Short to Voltage

B172F 02

Control module K40D detects: Right Rear Seat Haptic Movement Motor Control = Short to Ground

Actions Taken When the DTC Sets

- Seat Cushion Haptic Motors = Inoperative
- Driver Information Center Display - Service Driver Assist

Conditions for Clearing the DTC

The conditions for setting the DTC no longer exist.

Diagnostic Aids

Verify the function: Seat Cushion Haptic Motors Disabled by Driver Personalization

Reference Information

Schematic Reference

Driver Assistance Systems Wiring 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

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Perform the scan tool function: Driver Seat Cushion Left Rear Haptic Movement & Driver Seat Cushion Right Rear Haptic Movement - On and Off

Verify the component produces a vibration that can be heard and felt.

- **If the component does not activate**
Refer to: Circuit/System Testing
- **Go to next step: If the component activates**

3. All OK.

Circuit/System Testing

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: X5 @ K40D Seat Memory Control Module - Driver
3. Ignition - On/Vehicle - In Service Mode
4. Test for less than 1 V between the test points:
 - Control circuit terminal 4 & Ground
 - Control circuit terminal 5 & Ground
 - **If 1 V or greater**

Repair the short to voltage on the circuit.

- **Go to next step: If less than 1 V**

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be

performed.

5. Ignition/Vehicle & All vehicle systems - Off

6. Test for 27 to 51 ohms between the test points:

- Control circuit terminal 4 & Ground
- Control circuit terminal 5 & Ground
- **If less than 72 ohms**

Replace the appropriate component: P45LR Seat Haptic Movement Motor - Driver Left Rear or P45RR Seat Haptic Movement Motor - Driver Right Rear

- **If greater than 51 ohms**

1. Test or inspect for the following: Ground Connection - Clean & Secure

- If not correct

Repair as necessary

- If correct

2. Replace the appropriate component: P45LR Seat Haptic Movement Motor - Driver Left Rear or P45RR Seat Haptic Movement Motor - Driver Right Rear

- **Go to next step: If between 21 and 57 ohms**

7. Momentarily connect a 3 A fused jumper wire between the test points:

- Control circuit terminal 4 & B+
- Control circuit terminal 5 & B+

8. Verify the component turns On and Off when connecting and disconnecting the jumper wire:

P45LR Seat Haptic Movement Motor - Driver Left Rear or P45RR Seat Haptic Movement Motor - Driver Right Rear

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

Replace the appropriate component: P45LR Seat Haptic Movement Motor - Driver Left Rear or P45RR Seat Haptic Movement Motor - Driver Right Rear

- **Go to next step: If the component turns On and Off**

9. Ignition/Vehicle & All vehicle systems - Off

10. Connect the electrical connector at all components.

11. Ignition - On/Vehicle - In Service Mode

12. Perform the scan tool function: Driver Seat Cushion Left Rear Haptic Movement & Driver Seat Cushion Right Rear Haptic Movement - On and Off

Verify the component produces a vibration that can be heard and felt.

- **If the component does not activate**

Replace the appropriate component: K40D Seat Memory Control Module - Driver

- **Go to next step: If the component activates**

13. All OK.

Repair Instructions

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

- Refer to [Front Seat Lane Departure Warning Actuator Replacement](#) - P45LR Seat Haptic Movement Motor - Driver Left Rear or P45RR Seat Haptic Movement Motor - Driver Right Rear
- For control module replacement, programming, and setup refer to: [Control Module References](#)

FORWARD COLLISION ALERT SYSTEM MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Forward Collision Alert Indicators Ignition	1	1	-	-
Forward Collision Alert Indicators Control	2	1	1	-
Forward Collision Alert Switch Dimming Control	3	3	3	-
Forward Collision Alert Switch Signal	4	4	4	-
Forward Collision Alert Indicators Ground	-	1	-	-
1. Forward Collision Alert Indicators inoperable 2. Forward Collision Alert Indicators on all the time 3. Forward Collision Alert Indicator dimming malfunction 4. Forward Collision Switch Malfunction				

Circuit/System Description

The forward collision alert system is controlled by the frontview camera module mounted on the windshield. The system is designed to detect vehicles directly ahead, within a distance of approximately 60 meters (197 ft). The forward collision alert system operates at speeds above 3 km/h (2 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

Camera Mounting: Inspect the front view camera sensor, on the windshield near the inside rearview mirror, to make sure it is attached properly to the windshield. Calibrate the front camera module after repair. Refer to [Front View Camera Module Learn](#)

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

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

Reference Information

[Driver Assistance Systems Wiring Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Forward Collision Alert Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

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

[Circuit/System Verification](#)

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

1. Ignition ON.
2. Verify that no DTCs are set.
 - **If any DTC is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **Go to next step: If the DTC is not set**
3. Verify the scan tool Frontview Camera Disable History 1 - 4 parameters does not have a current Malfunction. Refer to [B174W Frontview Camera: Scan Tool Information](#)
 - **If the parameter is Malfunction**
Diagnose the system that set the malfunction.
 - **Go to next step: If the parameter is Normal**
4. Verify the forward collision alert indicators illuminate momentarily when turning ignition OFF and then ON.
 - **If the indicators do not illuminate**
Refer to [DTC B0987 \(Chevrolet\)DTC B0987 \(GMC\)](#).
 - **Go to next step: If the indicators illuminate**
5. Verify the driver information center forward collision alert distance indicator toggles between far, medium, near and off.
 - **If the setting does not change**
Refer to [DTC B356A \(Chevrolet\)DTC B356A \(GMC\)](#).
 - **Go to next step: If the setting changes**
6. Verify the area of the K109 Frontview Camera Module is not contaminated.
 - **If contaminated**
Clean the windshield

- Go to next step: If not contaminated

7. 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.

REAR CROSS TRAFFIC ALERT SYSTEM MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

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

Circuit/System Description

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

Diagnostic Aids

- The rear cross traffic alert system uses the same sensors as side blind zone alert so a malfunction may affect either or both systems.
- The conditions for disabling the rear cross traffic alert system are captured by DTCs. The drivers information center will display Service Side Detection System if one of the sensors has failed. A B101E 47 Electronic Control Unit Software VIN Not Programmed DTC in history will not affect sensor operation and the module should not be replaced for this DTC.
- The rear cross traffic system can be disabled if any off the following occur:
 - The driver has selected the Off mode through vehicle personalization menus. The selected mode is retained over ignition cycles. A driver information center message stating that the Rear Cross Traffic System Alert Off shall be displayed.

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

Reference Information

Schematic Reference

Driver Assistance Systems Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cross Traffic Alert Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that no DTCs are set.
 - If any DTC is set

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

- If no DTC is set
3. Verify the scan tool can communicate with the left side object sensor.
 - **If the scan tool can not communicate with the left side object sensor**

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

- **Go to next step: If the scan tool can communicate with the left side object sensor**

4. Verify the scan tool can communicate with the right side object sensor.
 - **If the scan tool can not communicate with the right side object sensor**
Refer to Circuit/System Testing - Right Side Object Sensor Malfunction.
 - **Go to next step: If the scan tool can communicate with the right side object sensor**
5. Verify that the rear cross traffic indicators turn ON and then turn OFF when commanding the Rear Cross Traffic Visual Alert Indicators ON and OFF with a scan tool.
 - **If alert indicators do not turn ON and OFF**
 1. Verify the system is enabled.
 - If disabled, refer to diagnostic aids for cause of disable.
 - If enabled test or replace the display.
 - **Go to next step: If indicators turn ON and OFF**
6. Verify that the audible alert turns ON and then turn OFF when commanding the Rear Cross Traffic Audible Alert ON and OFF with a scan tool.
 - **If the audible alert does not turn ON and OFF**
 1. Verify the system is enabled.
 - If disabled, refer to diagnostic aids for cause of disable.
 - If enabled refer to audio system malfunction.
 - **Go to next step: If audible alert turns ON and OFF**
7. All OK.

Circuit/System Testing

Left Side Object Sensor Malfunction

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

Repair the open/high resistance in the circuit.

- **Go to next step: If less than 2 Ω**

6. Replace B218L Side Object Sensor Module - Left.

Right Side Object Sensor Malfunction

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

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

- Terminal 3

- Terminal 8

- **If 10 Ω or greater**

1. 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.

- **Go to next step: If less than 10 Ω**

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

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

1. Ignition OFF.

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

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

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

1. Ignition OFF.

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

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

- **Go to next step: If the test lamp illuminates**

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

5. Test for less than 2 Ω in each of the serial data circuits end to end between the control module harness connector terminal 7 and the DLC terminal 1.

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **Go to next step: If less than 2 Ω**

6. Replace B218R Side Object Sensor Module - Right.

Repair Instructions

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

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

SIDE BLIND ZONE ALERT SYSTEM MALFUNCTION

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 4 @ B218L Side Object Sensor Module - Left	B094D 02	B094D 04	B094D 01	-
Control - Terminal 4 @ B218R Side Object Sensor Module - Right	B094E 02	B094E 04	B094E 01	-
Ground - @ A9A Outside Rearview Mirror - Driver	-	B094D 04	-	-
Ground - @ A9B Outside Rearview Mirror - Passenger	-	B094E 04	-	-

Circuit/System Description

Component	Description
B218L Side Object Sensor Module - Left	The assembly has several functions: Side Blind Zone Alert Rear Cross Traffic Audible Alert Rear Cross Traffic Visual Alert
B218R Side Object Sensor Module - Right	The assembly has several functions: Side Blind Zone Alert Rear Cross Traffic Audible Alert Rear Cross Traffic Visual Alert

Diagnostic Aids

- Review the system description and operation in order to familiarize yourself with the system functions. For an overview of the component/system, refer to: [Side Blind Zone Alert Description and Operation](#)
- The side blind zone system can be disabled if any of the following occur:
 - Disabled by Driver Personalization
 - There is a loss of serial data communication with a sensor or between modules.
- The side blind zone may be temporarily unavailable due to the following:
 - 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.
 - The side blind zone alert system will read the GPS latitude and longitude on the serial data bus and calculate if the vehicle is within a Radio Astronomy zone. These zones are located in Europe and Japan and require the sensors to be turned off. The "Side Detection System Unavailable" message will be displayed to the driver when this occurs.
- Because the sensors are identical, they may be swapped from one side of the vehicle to the other in an attempt to isolate a concern. Sensors should NOT be swapped from one vehicle to another.
- The side blind zone system is designed to ignore stationary objects; however, the system may occasionally detect guard rails, signs, trees, shrubs, or other stationary objects as an object in the blind zone. This is normal system operation and does not require service.
- The side blind zone system may indicate an object in the blind zone if a trailer is attached to the vehicle, or a bicycle or object is extending out to either side of the vehicle. This is normal operation and does not require service.
- Lane Change Alert (LCA) can be disabled in vehicle personalized settings, this will also disable the Side Blind Zone Alert (SBZA) system. When disabled, the bulb check of the mirror indicators will also be disabled. A driver information center message will be displayed at start up when the LCA system is disabled. This feature must be enabled prior to trying to diagnose the system.

Reference Information

[Driver Assistance Systems Wiring Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Side Blind Zone Alert Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

1. Ignition/Vehicle - Off
2. Ignition - On/Vehicle - In Service Mode
3. Verify the component turns On and Off:
 - Side Blind Zone Alert Indicator @ A9A Outside Rearview Mirror - Driver
 - Side Blind Zone Alert Indicator @ A9B Outside Rearview Mirror - Passenger
 - **If the component does not turn On and Off**

Refer to: [DTC B094D or B094E](#)

- **Go to next step: If the component turns On and Off**
4. Verify that no DTCs are set.
 - **If any DTC is set**

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

- **Go to next step: If no DTC is set**
5. Verify the following control modules contain the latest software: B218L Side Object Sensor Module - Left
 - **If not the latest software is contained**

Program the control module: B218L Side Object Sensor Module - Left
 - **Go to next step: If the latest software is contained**
 6. All OK.

[Repair Instructions](#)

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

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

LANE DEPARTURE WARNING SYSTEM MALFUNCTION

[Diagnostic Instructions](#)

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

Diagnostic Fault Information

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

Circuit/System Description - Chevrolet

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

The switch and indicator are connected to the body control module, with serial data from the frontview camera controlling and monitoring the indicator and switch.

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

Circuit/System Description - GMC

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

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

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

Diagnostic Aids

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

require service. The driver information center may also display Lane Departure System Unavailable due to the temporary conditions listed above.

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

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

Reference Information

Schematic Reference

[Driver Assistance Systems Wiring Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Lane Departure Warning Description and Operation](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

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

1. Ignition ON.
2. Verify the K43 Power Steering Control Module (if equipped) and the K17 Electronic Brake Control Module do not have any DTCs set.
 - **If any DTC is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **Go to next step: If the DTC is not set**
3. Verify that DTC B356A is not set.
 - **If the DTC is set**
Refer to [DTC B356A \(Chevrolet\)DTC B356A \(GMC\)](#).
 - **Go to next step: If the DTC is not set**
4. Verify that DTC B0987 is not set.
 - **If the DTC is set**
Refer to [DTC B0987 \(Chevrolet\)DTC B0987 \(GMC\)](#).
 - **Go to next step: If the DTC is not set**

5. Verify that DTC B1011 is not set.

- **If the DTC is set**

Refer to [DTC B1011](#).

- **Go to next step: If the DTC is not set**

6. Verify the scan tool Frontview Camera Disable History 1 parameter does not have a current Malfunction

- **If the parameter is Malfunction**

Refer to Diagnostic Aids.

- **Go to next step: If the parameter is Normal**

7. Verify the scan tool Frontview Camera System Status parameter is Normal.

- **If the parameter is Undefined or Malfunction**

Refer to Diagnostic Aids.

- **Go to next step: If the parameter is Normal**

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

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

Refer to [DTC B356A \(Chevrolet\)](#)[DTC B356A \(GMC\)](#).

- **Go to next step: If the parameter changes between Open and Closed**

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

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

Refer to [DTC B0987 \(Chevrolet\)](#)[DTC B0987 \(GMC\)](#).

- **Go to next step: If the indicator turns on and off**

10. Verify the area of the B174W Frontview Camera - Windshield for contamination.

- **If it needs to be cleaned**

Clean the windshield.

- **Go to next step: If it does not need to be cleaned**

11. 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.

LANE KEEP ASSIST SYSTEM MALFUNCTION

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 4 @ S70L Steering Wheel Controls Switch - Left	B0987 06, 1	B0987 06, B0987 0B	B0987 01, B0987 0B	-
Control - Terminal 5 X1 @ K9 Body Control Module	1	1	1	-
1. Lane Departure Warning Indicator Malfunction				

Circuit/System Description

Component	Description
S70L Steering Wheel Controls Switch - Left	The assembly contains individual switches. Each function has its own switch. The switches are connected to a resistor ladder so that a specific resistance is generated for each switch.
K109 Frontview Camera Module	The video camera and the control module are a single serviceable component. This camera delivers live video of what is in front of the vehicle. The video can be used for several functions, like lane departure warning, lane keep assist, road sign recognition and more. The control module also reads various switches and sensors and makes their values available via serial data.
K9 Body Control Module	Depending on the version, the control module can support different functions: • Exterior Illumination • Interior Illumination • Steering Wheel Controls • Power Mode Control The control module also reads various switches and sensors and makes their values available via serial data.

Diagnostic Aids

Refer to: Scan Tool Information - Frontview Camera Disable History 1-4

For more information see: [Forward Collision Alert Description and Operation](#)

For more information see: [Lane Keep Assist Description and Operation](#)

This procedure is required when the following component has been repaired, replaced, removed, or serviced: K109 Frontview Camera Module - Perform the following action: [Front View Camera Module Learn](#)

Reference Information

Schematic Reference

[Driver Assistance Systems Wiring Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Lane Departure Warning Description and Operation](#)

Lane Keep Assist 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

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify that no DTCs are set.
 - If any DTC is set

Refer to: [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - If no DTC is set
3. Verify the component turns On and Off: Lane Departure Warning Indicator
 - Lane Departure Warning Switch
 - If the component does not turn On and Off

Refer to: [DTC B0987 \(Chevrolet\) DTC B0987 \(GMC\)](#)
 - If the component turns On and Off
4. All OK.

Repair Instructions

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

For control module replacement, programming, and setup refer to: [Control Module References](#)

REPAIR INSTRUCTIONS

LANE KEEP ASSIST SWITCH REPLACEMENT

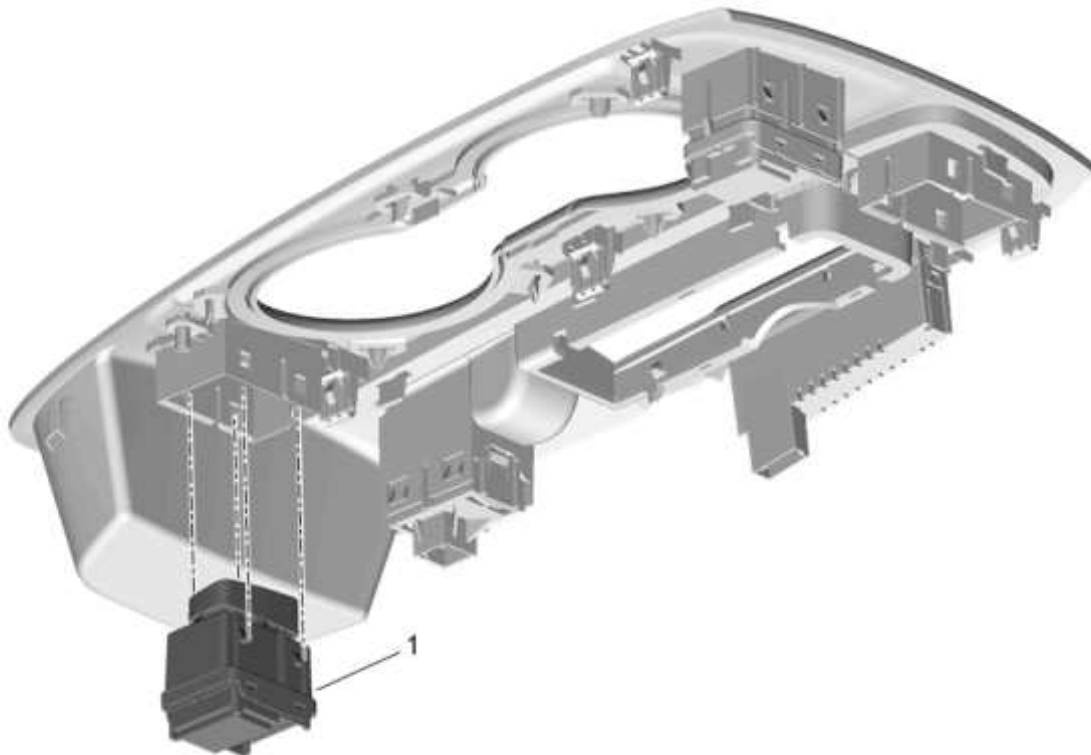


Fig. 4: Lane Keep Assist Switch

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Front Floor Console Trim Plate. Refer to Front Floor Console Trim Plate Replacement (Equinox) , Front Floor Console Trim Plate Replacement (Terrain) .	
1	Lane Keep Assist Switch Procedure 1. Release the retaining tabs. 2. Use a suitable tool.

FRONT SEAT LANE DEPARTURE WARNING ACTUATOR REPLACEMENT



Fig. 5: Front Seat Lane Departure Warning Actuator
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Front Seat Cushion Cover and Pad. Refer to Front Seat Cushion Cover and Pad Replacement	
1	Front Seat Lane Departure Warning Actuator Procedure 1. Disconnect the electrical connector. 2. Note the location and routing of the wiring harness to ensure proper reinstallation.

FORWARD COLLISION ALERT DISPLAY REPLACEMENT (EQUINOX)

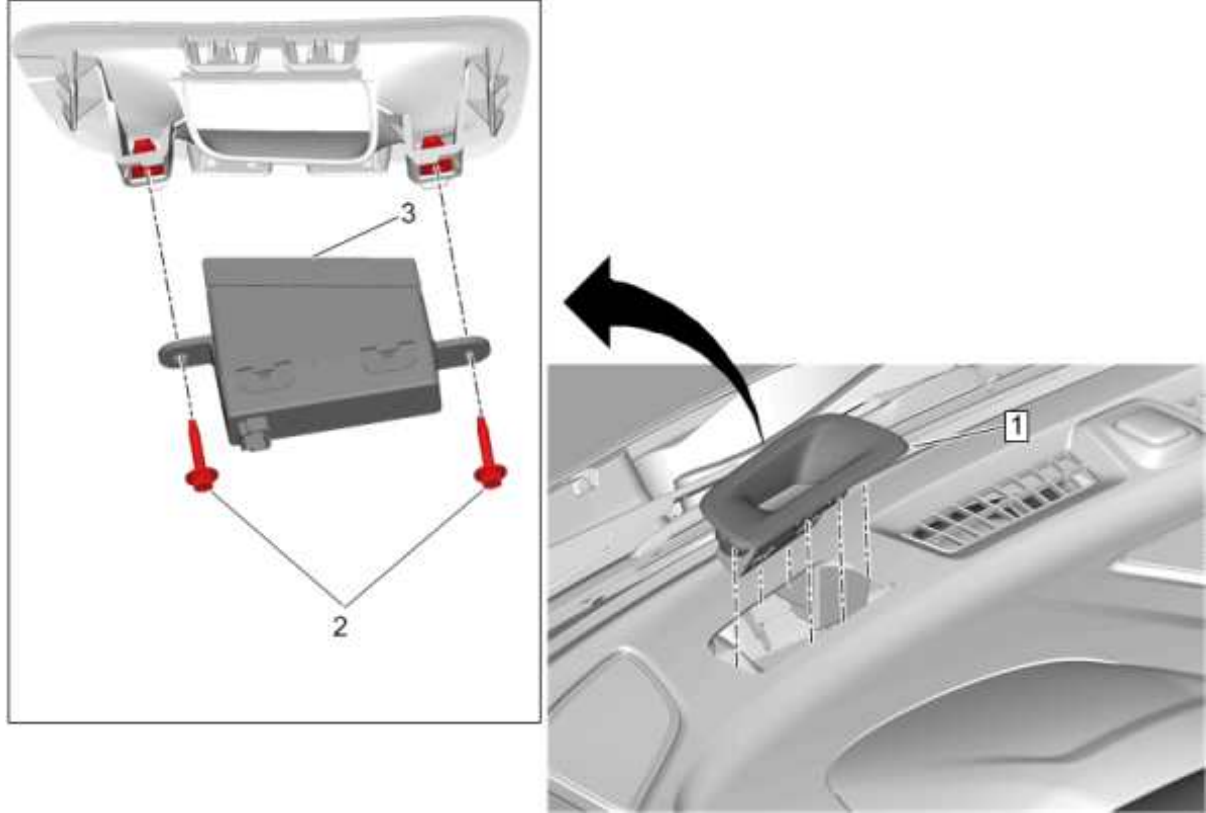


Fig. 6: Forward Collision Alert Display (Equinox)
 Courtesy of GENERAL MOTORS COMPANY

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

FORWARD COLLISION ALERT DISPLAY REPLACEMENT (TERRAIN)

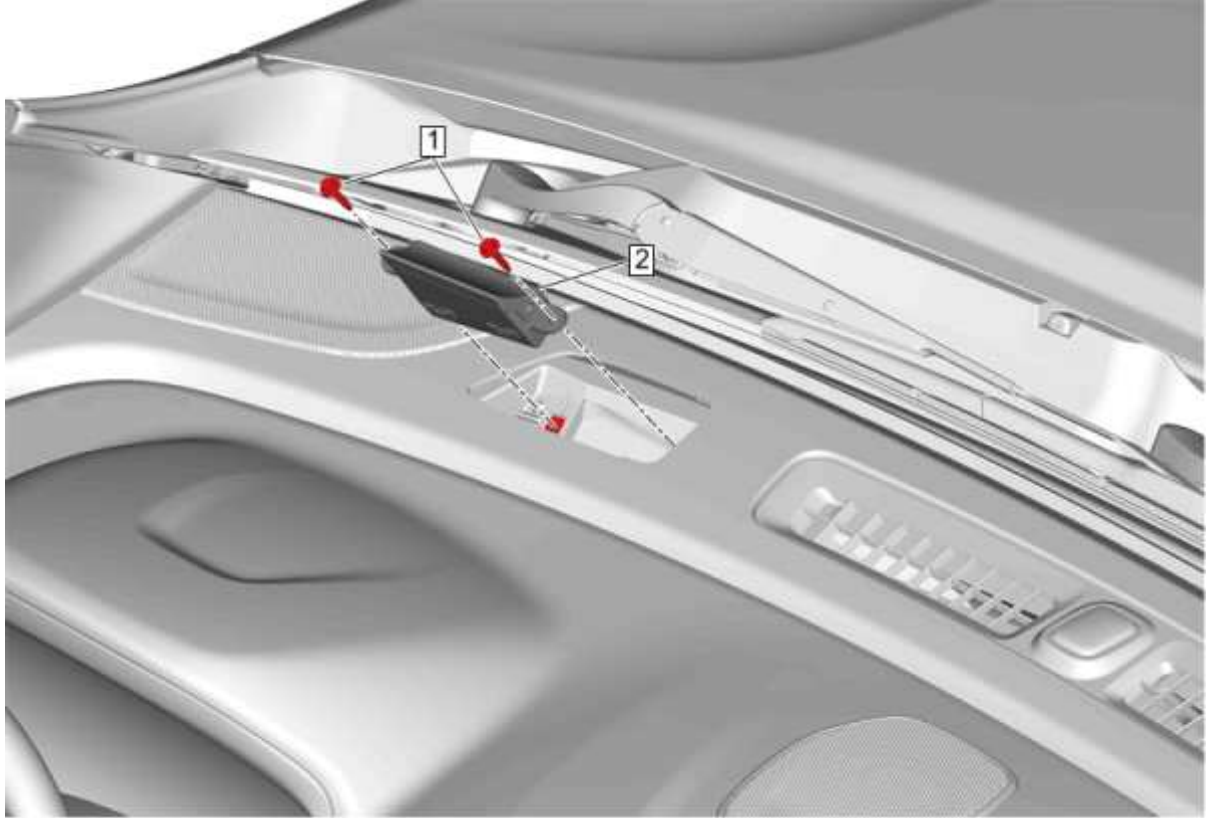


Fig. 7: Forward Collision Alert Display (Terrain)
 Courtesy of GENERAL MOTORS COMPANY

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

SIDE OBJECT SENSING ALERT MODULE REPLACEMENT

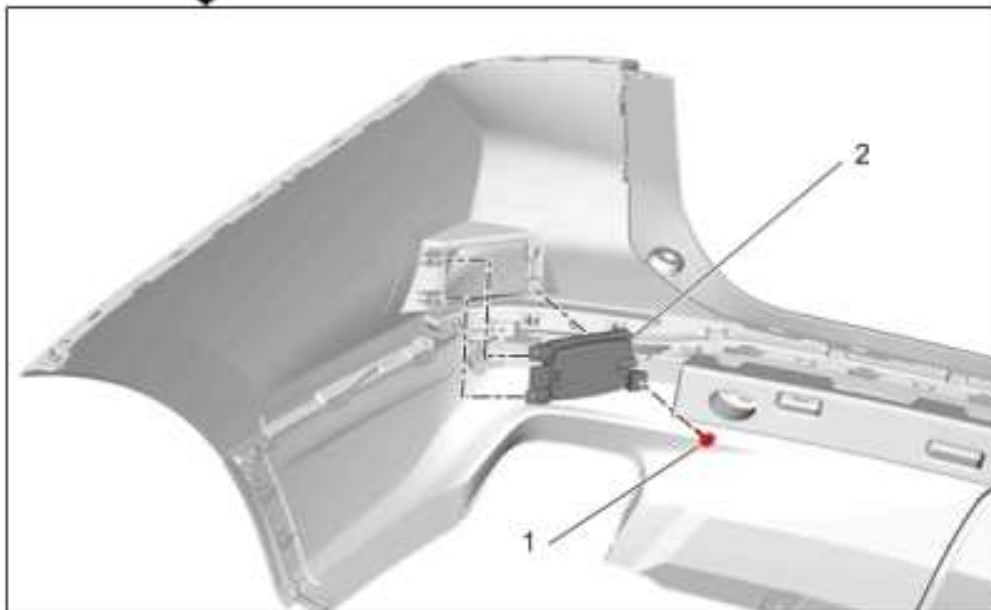


Fig. 8: Side Object Sensing Alert Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Rear Bumper Fascia. Refer to Rear Bumper Fascia Replacement (Equinox) Rear Bumper Fascia Replacement (Terrain) .	
1	Side Object Sensing Alert Module Bolt CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Side Object Sensing Alert Module Procedure 1. Disconnect the electrical connector. 2. Slide the module out of the retaining bracket. 3. Perform the necessary programming and setup procedure: Control Module References

FRONT VIEW DRIVER INFORMATION CAMERA BRACKET REPLACEMENT

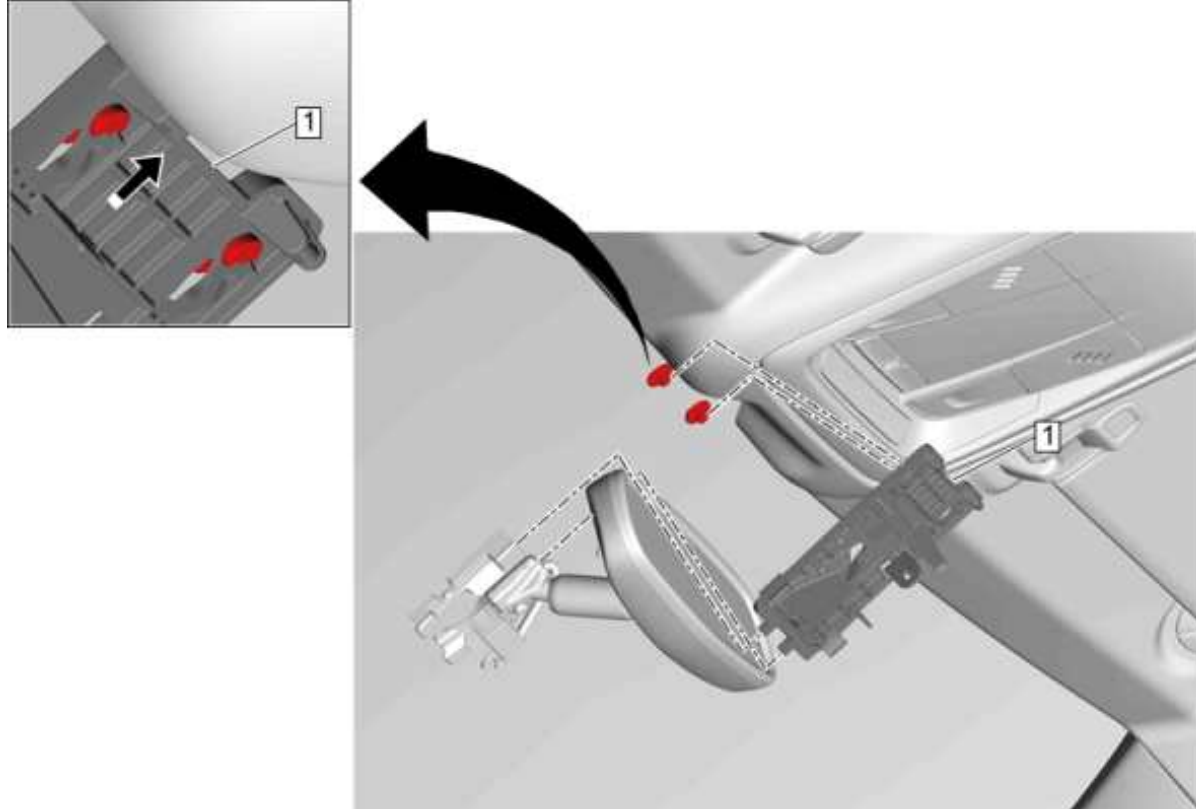


Fig. 9: Front View Driver Information Camera Bracket

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove Front View Camera. Refer to Front View Camera Replacement	
1	Front View Driver Information Camera Bracket
	Procedure
	1. Release inside air moisture and windshield temperature sensor harness retainer from camera bracket. 2. Release the retaining tabs and slide the bracket upward to disengage pins, gently pull from windshield. 3. Ensure the inside of the windshield is clean before reinstalling the bracket.
	NOTE: Do Not remove or service the sensor farm pins.

FRONT VIEW CAMERA REPLACEMENT

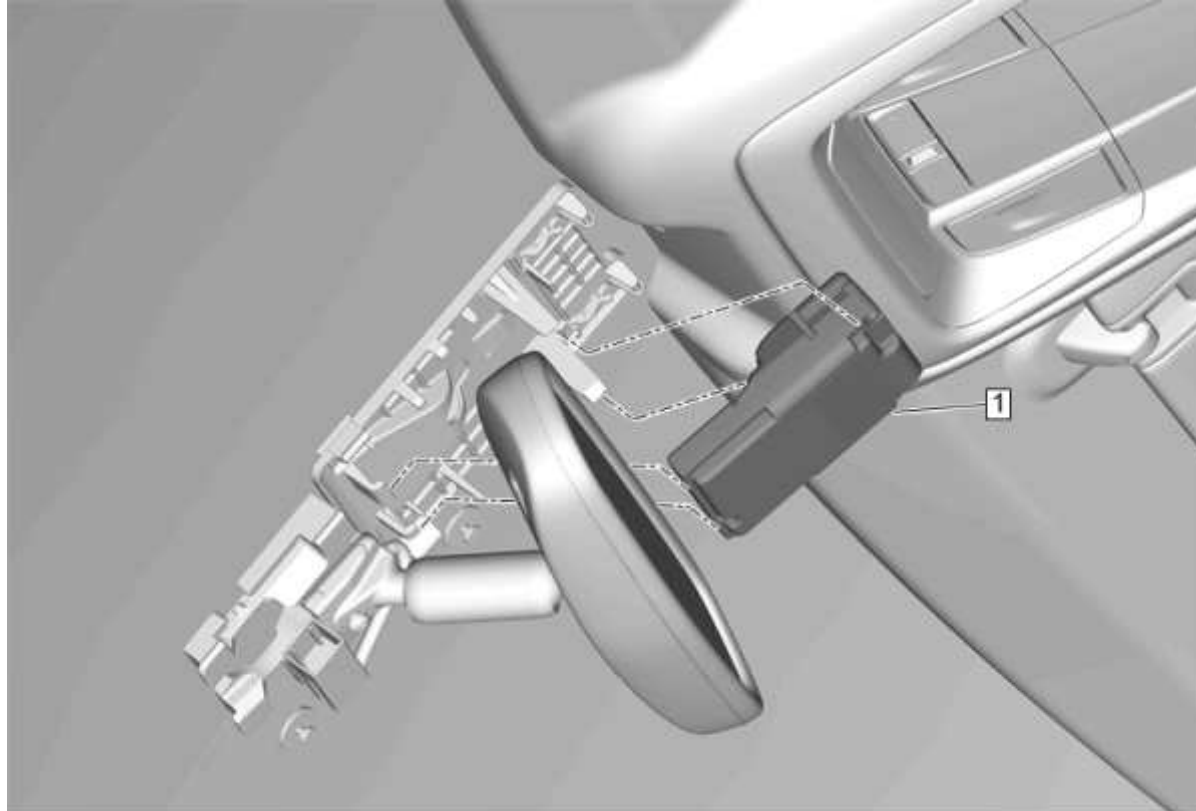


Fig. 10: Front View Camera

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Windshield Multifunction Sensor Mount Bracket Cover. Refer to Windshield Multifunction Sensor Mount Bracket Cover Replacement	
1	Front View Camera Procedure 1. Release the retaining tabs. 2. Disconnect the electrical connector. 3. Perform the necessary programming and setup procedure: Control Module References

FRONT VIEW CAMERA MODULE LEARN

Calibration (without UGN)

NOTE: Do NOT swap cameras between vehicles, it is not approved and a VIN mismatch will occur.

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

The calibration procedure may start automatically after SPS programming is complete. 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.).

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

Calibration (with UGN)

NOTE: Do NOT swap cameras between vehicles, it is not approved and a VIN mismatch will occur.

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

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.

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

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

- Clean windshield.
- Avoid aggressive and frequent lane changes. Occasional lane changes are preferred.
- Maintain vehicle speeds between 56 - 120 km/h (35 - 75 MPH).
- Ensure the road contains visible references (well defined lane markings, etc.).

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 at speeds greater than recommended

- 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](#).

Calibration Procedure (Required for North American SPS users)

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

No Calibration

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

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

DESCRIPTION AND OPERATION

CROSS TRAFFIC ALERT DESCRIPTION AND OPERATION

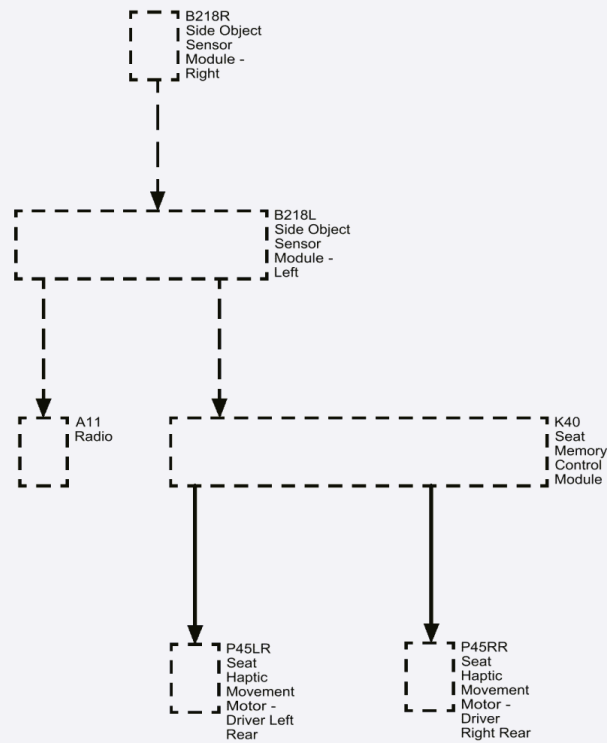


Fig. 11: Rear Cross Traffic Alert System Block Diagram
Courtesy of GENERAL MOTORS COMPANY

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

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

Rear Cross Traffic Alert System Components

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

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

Side Object Sensor Modules

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

Display Icons

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

Audio or Haptic Notification

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

Rear Cross Traffic Alert Operation

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

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

Rear Cross Traffic Alert Driver Information Center Messages

REAR CROSS TRAFFIC ALERT OFF

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

SERVICE SIDE DETECTION SYSTEM

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

SIDE DETECTION SYSTEM UNAVAILABLE

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

The rear cross traffic alert system will read the GPS latitude and longitude on the serial data bus and calculate if the vehicle is within a Radio Astronomy zone. These zones are located in Europe and Japan

and require the sensors to be turned off. The "Side Detection System Unavailable" message will be displayed to the driver when this occurs.

FORWARD COLLISION ALERT DESCRIPTION AND OPERATION

The forward collision alert system is a convenience feature of the frontview camera module that issues a warning to the driver when a potential collision risk exists. The frontview camera module is located behind the windshield, looking 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.

Forward Collision System Reduced Message

This message displays when Forward Automatic Braking or Front Automatic Braking has been set to the "Alert" setting. This setting disables most automatic braking functions. This is normal operation when the **Forward Collision System** setting is set to **OFF** or **ALERT**. This message is not present when the **Forward Collision System** is set to **Alert and Brake**.

Front Automatic Braking (UHY) (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 (UKJ) (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
- 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) (if equipped)

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) (if equipped)

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.

LANE CHANGE ALERT DESCRIPTION AND OPERATION

NOTE: When the vehicle is new, or the system has been programmed, there may be intermittent false alerts for up to 644 km (400 miles). The system is in an auto learn mode at this time.

Lane Change Alert (LCA) can be disabled in vehicle personalized settings, this will also disable the Side Blind Zone Alert (SBZA) system. When disabled, the bulb check of the mirror indicators will also be disabled. A driver information center message will be displayed at start up when the LCA system is disabled. This feature must be enabled prior to trying to diagnose the system.

This is a feature of the Side Blind Zone system, for more information, refer to [Side Blind Zone Alert Description and Operation](#). Lane Change Alert system is a lane-changing aid that assists drivers with avoiding lane change crashes that occur with moving vehicles in the side blind zone (similar to blind spot) areas or with vehicles rapidly approaching these areas from behind. The Lane Change Alert warning display will light up in the corresponding outside side mirror and will flash if the turn signal is on.

The Lane Change Alert sensor covers a zone of approximately one lane over from both sides of the vehicle, or 3.5 m (11 ft). The height of the zone is approximately between 0.5 m (1.5 ft) and 2 m (6 ft) off the ground. The Side Blind Zone Alert (SBZA) warning area starts at approximately the middle of the vehicle and goes back 5 m (16 ft). Drivers are also warned of vehicles rapidly approaching from up to 25 m (82 ft) behind the vehicle.

Feature Limitations

WARNING: LCA does not alert the driver to vehicles outside of the system detection zones, pedestrians, bicyclists, or animals. It may not provide alerts when changing lanes under all driving conditions. Failure to use proper care when changing lanes may result in injury, death, or vehicle damage. Before making a lane change, always check mirrors, glance over your shoulder, and use the turn signals.

- Lane Change Alert displays may not come on when passing a vehicle quickly, for a stopped vehicle, or when towing a trailer.
- Lane Change Alert may alert to objects attached to the vehicle, such as a trailer, bicycle, or object extending out to either side of the vehicle. Attached objects may also interfere with the detection of vehicles.
- Lane Change Alert may not always alert the driver to vehicles in the next lane over, especially in wet conditions or when driving on sharp curves.
- The system may light up due to guardrails, signs, trees, shrubs, and other non-moving objects.
- Lane Change Alert may not operate when the B218L Side Object Sensor Module - Left or B218R Side Object Sensor Module - Right sensors in the corners of the rear bumper are covered with mud, dirt, snow, ice, or slush, or in heavy rainstorms.

LANE DEPARTURE WARNING DESCRIPTION AND OPERATION

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
- 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.

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 KEEP ASSIST DESCRIPTION AND OPERATION

NOTE:

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

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

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

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

Front View Camera Module

The camera detects visual queues such as lane markings. When it is determined that the vehicle has unintentionally moved outside of the lane, visual, and audible or haptic warning is given to the driver.

The front view camera module receives an input from the lane keep assist switch and controls the lane keep assist switch indicator output. The front view camera module also communicates via serial data with the instrument cluster, radio, and memory seat module to request visual, and audible or haptic alerts.

Lane Keep Assist Switch

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

Instrument Cluster

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

Radio

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

Safety Alert Seat (if equipped)

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

Yaw Rate Sensor

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

Electric Power Steering

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

Lane Keep Assist Operation

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

System operation can be described by the following modes:

- Off State: The system has been turned off by the driver using the lane keep assist switch. The lane keep assist indicator will not be illuminated.
- Not Ready To Assist: The system is enabled and the lane keep assist indicator is illuminated, but not ready to assist when any of the following conditions is true:

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

Lane Crossing Alerts

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

Lane Keep Assist System Driver Information Center Messages

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

SAFETY ALERT SEAT DESCRIPTION AND OPERATION

The safety alert seat provides a vibration in the driver's seat bottom cushion to alert the driver of a number of concerns. Two seat haptic movement motors are utilized to create the vibration and are located on the left and right sides of the seat cushion. Utilizing two motors allows the vibration to be localized to the left or right side of the seat, depending on the side of the vehicle generating the alert, or to vibrate both simultaneously.

The active safety seat utilizes the following components:

- Seat Memory Control Module
- Seat Haptic Movement Motor - Driver Left
- Seat Haptic Movement Motor - Driver Left

Seat Memory Control Module

The seat memory control module receives serial data messages from other modules and provides voltage to control the seat haptic movement motors. The seat memory control module will pulse the left, right, or both motors with the number of pulses requested over serial data. The seat memory control module monitors the control circuits for open, short to ground, and short to voltage conditions and will set DTCs if a circuit fault is detected.

Seat Haptic Movement Motor

The seat haptic movement motor is DC motor located in the driver's seat bottom cushion. Two seat haptic movement motors are used in the seat bottom cushion, positioned on the left and right side. An

offset weight is attached to the motor. When activated, the spinning offset weight creates a vibration felt by the driver through the seat cushion.

Each seat haptic movement motor receives a constant chassis ground. The motor is controlled by the seat memory control module providing voltage through a dedicated control circuit. When an alert is required, the seat memory control module will apply voltage, activating the seat haptic movement motor.

SIDE BLIND ZONE ALERT DESCRIPTION AND OPERATION

NOTE: When the vehicle is new, or the system has been programmed, there may be intermittent false alerts for up to 644 km (400 miles). The system is in an auto learn mode at this time.

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

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

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

Side Blind Zone Alert System Components

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

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

Side Object Sensor Module

The side object sensor modules are located on each side of the vehicle behind the rear fascia and are not directly visible from outside the vehicle. The sensors use radar to determine the presence of objects nearby. The side object sensor module - left is the master that communicates on vehicle serial data bus. There is a private serial data bus between the left and right sensors. The scan tool is able to communicate only with the left sensor. The sensors are unique and not interchangeable from side to side.

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

Outside Rearview Mirrors

The outside rearview mirrors contain an icon that is backlit with high intensity, amber-colored LED's located on the mirror surface. The display brightness adapts to day and night conditions. The side object sensor module - right controls both side blind zone indicators.

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 (If Equipped)

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

Side Blind Zone Alert Operation

When the vehicle is started, both side blind zone indicators located on the left and right outside rearview mirrors will briefly illuminate to indicate that the system is operating. The system is designed to detect objects in an area approximately between 0.5 m (1.5 ft) and 2 m (6 ft) off the ground. The side blind zone alert monitors the blind spot area along side the vehicle, approximately 3.5 m (11 ft) from the side of the vehicle, extending 5 m (16 ft) behind the mid-point of the vehicle. The system may light up an indicator due to guardrails, signs, trees, shrubs, and other non-moving objects. This is normal system operation; the vehicle does not need service.

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

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

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

Lane Change Alert Operation

Lane Change Alert (LCA) can be disabled in vehicle personalized settings, this will also disable the Side Blind Zone Alert (SBZA) system. When disabled, the bulb check of the mirror indicators will also be disabled. A driver information center message will be displayed at start up when the LCA system is disabled. This feature must be enabled prior to trying to diagnose the system.

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

When the vehicle is started, both outside mirror displays will briefly come on to indicate that the system is operating. The warning symbols will vary brightness based on the ambient light conditions. Lane change alert is active when the vehicle is out of park or the parking brake is off on manual transmission

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

The system is designed to detect objects of interest as small as a 125cc motorcycle with rider. The detection zone starts at the outside rearview mirror and extends out to 3.5 m (11 ft) at the back corner of the vehicle and 70 m (230 ft) behind the vehicle at a height between 0.5 m (1.5 ft) and 2.0 m (6 ft) above the ground. The system may light up an indicator due to guardrails, signs, trees, shrubs, and other non-moving objects. This is normal system operation; the vehicle does not need service.

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

Foul weather may affect the operation of the lane change alert system. Occasional missed alerts can occur under normal circumstances and will increase in wet conditions. The number of missed alerts will increase with increased rainfall or road spray. Heavy rainfall, as well as mud, dirt, snow, ice, or slush build-up on the rear fascia, can completely disable the system. The warning symbols will vary brightness based on the ambient light conditions.

Rear Cross Traffic Alert Operation

The rear cross traffic alert system is designed to detect moving objects approaching the side of the vehicle while backing up. The detection zone extends approximately 30 m (99 ft) from the rear corner of the car and covers an area from behind the vehicle to 125 degrees towards the front at a height of 0.45 m (1.5 ft) to 2 m (6.5 ft) above ground. The system operates when vehicle speed is 10 km/h (6 mph) or less and is designed to detect objects moving at speeds up to 36 km/h (22 mph).

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

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

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

Side Blind Zone Alert Driver Information Center Messages

NOTE: Not all messages will apply

SIDE BLIND ZONE ALERT OFF

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

LANE CHANGE ALERT OFF

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

REAR CROSS TRAFFIC ALERT OFF

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

SERVICE SIDE DETECTION SYSTEM

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

SIDE DETECTION SYSTEM UNAVAILABLE

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

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