

2017 ACCESSORIES & EQUIPMENT

Object Detection and Pedestrian Protection - Description and Operation - CT6

DESCRIPTION AND OPERATION

PARKING ASSIST DESCRIPTION AND OPERATION (WITH UD7)

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

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

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

Parking Assist Control Module

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

Object Sensors

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

Parking Assist Switch

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

Parking Assist Switch Indicator

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

Infotainment System

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

Parking Assist Operation

When an object is within the measuring range of the sensor, the ultrasonic pulse is reflected and is received by the sending or a neighboring sensor. The sensor converts this signal into a voltage signal and sends this signal to the parking assist control module. The parking assist control module evaluates the received sensor signals. As soon as an object is within the measuring range, the parking assist control module sends a message via serial data to the infotainment system to provide an alert signal.

The parking assist system can detect objects greater than 7.6 cm (3 in) wide and 25.4 cm (10 in) tall. The system cannot detect objects below the bumper or underneath the vehicle.

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

The parking assist control module carries out a self test and monitors the sensors for electrical and mechanical faults. Monitored is the power supply of each sensor and the sensor signals. Mud, ice and snow may cause obstruction of the function of the sensors. The parking assist control module also determines if the correct type of sensor is installed. If any of these tests fails, a DTC with corresponding symptom is set and the parking assist system is deactivated.

Parking Assist System Driver Information Center Messages

SERVICE PARK ASSIST

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

PARK ASSIST OFF

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

- The parking assist system is manually disabled using the parking assist switch.
- An object is attached to the rear of the vehicle, such as a trailer, bicycle rack, trailer hitch receiver or tow bar. Also, an object extending beyond a lowered tailgate will disable the system.
- The object sensors are covered by snow, mud, dirt, slush or ice.
- The rear fascia is damaged.
- Excessive paint thickness on a replacement parking assist sensor.
- The object sensors are disrupted by vibrations, like those caused by a large nearby vehicle or from heavy equipment such as a jackhammer.

PARKING ASSIST DESCRIPTION AND OPERATION (WITH UD5)

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

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

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

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

Front and Rear Parking Assist Control Module

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

Object Sensors

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

Parking Assist Switch (All except Cadillac with UGN)

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

Parking Assist Switch (Cadillac with UGN)

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

Parking Assist Indicator (All except Cadillac with UGN)

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

Parking Assist Indicator (Cadillac with UGN)

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

Infotainment System

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

Safety Alert Seat

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

Parking Assist Operation

When an object is within the measuring range of the sensor, the ultrasonic pulse is reflected and is received by the sending or a neighboring sensor. The sensor converts this signal into a voltage signal and sends this signal to the front and rear parking assist control module. The front and rear parking assist control module evaluates the received sensor signals. As soon as an object is within the measuring range, the front and rear parking assist control module sends a message via serial data to the infotainment system to provide an alert signal.

The parking assist system can detect objects greater than 7.6 cm (3 in) wide and 25.4 cm (10 in) tall. The system cannot detect objects below the bumper or underneath the vehicle.

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

The front and rear parking assist control module carries out a self test and monitors the sensors for electrical and mechanical faults. Monitored is the power supply of each sensor and the sensor signals. Mud, ice and snow may cause obstruction of the function of the sensors. The front and rear parking assist control module also determines if the correct type of sensor is installed. If any of these tests fails, a DTC with corresponding symptom is set and the parking assist system is deactivated.

Parking Assist System Driver Information Center Messages

SERVICE PARK ASSIST

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

PARK ASSIST OFF

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

- The parking assist system is manually disabled using the parking assist switch.
- An object is attached to the rear of the vehicle, such as a trailer, bicycle rack, trailer hitch receiver or tow bar. Also, an object extending beyond a lowered tailgate will disable the system.
- The parking assist sensors are covered by snow, mud, dirt, slush or ice.
- The vehicle bumper is damaged.
- Excessive paint thickness on a replacement parking assist sensor.
- The parking assist sensors are disrupted by vibrations, like those caused by a large nearby vehicle or from heavy equipment such as a jackhammer.

PARKING ASSIST DESCRIPTION AND OPERATION (WITH PARALLEL PARKING OR AUTOMATIC PARKING ASSIST)

NOTE: The parallel parking assist system can steer the vehicle automatically. Be aware that, in some unlikely situations, the vehicle steering wheel and wheels/tires may move without warning. Please be especially aware of situations when vehicle front tires are lifted above the ground on a vehicle hoist as the wheels could move without warning. Please exercise special care if any work is performed with the vehicle running and in gear while elevated on a hoist.

In addition to the 8 ultrasonic sensors used for front and rear park assist, the parallel parking assist system uses, additional sensors located on the front fascia and/or two additional sensors located on the

rear fascia. These sensors face toward the side of the vehicle and are used to aid the driver in positioning the vehicle in a parallel parking maneuver.

NOTE: Any malfunction in the Parking Assist system may disable parallel parking. Parallel parking will NOT operate if the Parking Assist system is disabled.

Parallel Parking Assist Components

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

- Parking assist control module
- Front parking assist sensors
- Rear parking assist sensors
- Parking assist side sensors
- Parallel Parking assist switch
- Parking assist switch indicator (if equipped)

Parking Assist Control Module

The parking assist control module provides a reference voltage and a low reference to the parking assist sensors. The parking assist control module receives individual signals from each of the sensors and determines the location and distance of an object based on these inputs. When an object is detected, the parking assist control module will send a serial data message to the radio requesting an audible alert or to the memory seat module for a haptic alert (if equipped). Refer to the owner's manual for more information on Vehicle Personalization.

Parking Assist Sensors and Parking Aid Side Sensors

The parking assist sensors are located in the bumpers of the vehicle. The sensors are used to determine the distance between an object and the bumper. Each sensor emits an ultrasonic frequency which is reflected off any object located in front of or behind the vehicle. These reflections are received by the sensors. The time difference between the emission of the frequency and when the reflection is received is known as sensor ring time, it is used to determine the distance to the object. The sensors report this information to the parking assist control module. The parking assist sensors detect object to approximately 2.5 m (8 ft). The parking assist side sensors (located on the side of the vehicle) detect objects to approximately 4.5 m (15 ft).

Parking Assist Switch

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

Parking Assist Switch Indicator (if equipped)

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

Parallel Parking Assist Switch

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

Parking Assist Operation

For traditional parking assist operation, refer to Parking Assist description and operation

Parallel Parking Assist Operation

The parallel parking assist system aids the driver when attempting a parallel parking maneuver. The parking assist control module uses the parallel parking assist sensors located in the front fascia, along

with the front and rear parking assist sensors, to guide the driver into a parking space.

The parallel parking assist switch is used to initiate the parallel parking assist system when traveling at speeds below approximately 30 km/h (18 mph) (refer to owners manual for exact speed). While driving along a row of vehicles in which the driver wishes to parallel park, the parallel parking assist switch is pressed. This will enable the parallel parking assist system and the parking assist control module will begin seeking potential parking spots using the parallel parking assist sensor.

When a parking spot of suitable size is found, the parking assist control module will display a stop message on the driver information center. The driver accepts the decision by stopping the vehicle. The system calculates the optimal path into the parking lot and will then guide the vehicle into the chosen spot by taking over the steering control from the driver. The driver only needs to shift gears, brake and accelerate following the instructions given on the driver information center. Once in the spot, the parking assist control module uses the front and rear park assist sensors to center the vehicle in the parking spot.

If the parallel parking assist system is unable to complete a parallel parking maneuver, a message indicating that the maneuver has been aborted will be displayed on the driver information center.

Parking Assist System Driver Information Center Messages

SERVICE PARK ASSIST

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

PARK ASSIST OFF

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

- The parking assist system is manually disabled using the park assist switch.
- An object is attached to the vehicle which is interfering with the park assist system field of view. Example items are a trailer, bicycle rack, trailer hitch receiver, tow bar, aftermarket front license plate frame or a bent front license plate.
- The parking assist sensors are covered by snow, mud, dirt or ice.
- The vehicle bumper is damaged.
- Excessive paint thickness on a replacement parking assist sensor.
- The parking assist sensors are disrupted by vibrations, like those caused by a large nearby vehicle or from heavy equipment such as a jackhammer.

LANE DEPARTURE WARNING DESCRIPTION AND OPERATION (WITHOUT UGN)

The lane departure warning system is a convenience feature that utilizes the frontview camera module to determine if the vehicle has unintentionally crossed a lane marking and issue a warning. The frontview camera module is located behind the windshield, looking out at the road ahead and detecting any lane markings. When the vehicle unintentionally leaves a detected lane, visual and audible or haptic (if equipped) alerts are given to the driver. The visual alert cannot be changed, but the driver can select between audible or haptic alerts (if equipped) via 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 DEPARTURE WARNING DESCRIPTION AND OPERATION (UGN)

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

The lane departure warning system utilizes the following components:

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

Active Safety Control Module

The active safety control module communicates with the frontview camera module via serial data and acts as the image processor, monitoring lane markings and making the determination if a lane departure warning is warranted. The active safety control module receives image data from the frontview camera module and detects visual queues such as lane markings. When it is determined that the vehicle has unintentionally moved outside of the lane, visual and audible or haptic warning is given to the driver. The active safety control module receives an input from the lane departure warning switch and controls the lane departure warning switch indicator output. The active safety control module also communicates via serial data with the instrument cluster, infotainment system and memory seat module to request visual and audible or haptic alerts.

Frontview Camera Module

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

Lane Departure Warning Switch

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

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

Instrument Cluster

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

Infotainment System

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

Safety Alert Seat

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

Lane Departure Warning Operation

System Operational Modes

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

Lane Crossing Alerts

- 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, the memory seat module will command three pulses to the left or right side of the seat, depending on the lane departure direction.

Yaw Rate Sensor

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

Electric Power Steering

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

Lane Keep Assist Operation

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

System operation can be described by the following modes:

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

Lane Crossing Alerts

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

- Three chimes are activated through the radio.
- or **if equipped** , three pulses to the left or right side of the seat.

Lane Keep Assist System Driver Information Center Messages

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

CROSS TRAFFIC ALERT DESCRIPTION AND OPERATION

Rear Cross Traffic Alert Block Diagram

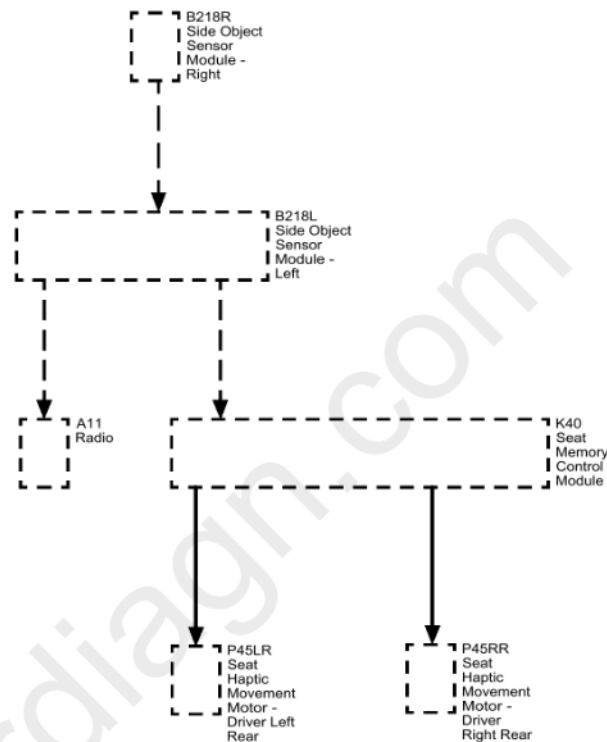


Fig. 1: Rear Cross Traffic Alert Block Diagram (with Rear Cross Traffic Alert, UFG, N America)
 Courtesy of GENERAL MOTORS COMPANY

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 2M (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.

ACTIVE SAFETY SEAT DESCRIPTION AND OPERATION

The Active Safety Seats provide a vibration in the driver's seat bottom cushion to alert the driver of a number of concerns. There are two motors providing the vibration and are located on the left and right sides. Depending on the alert, either the left, right or both motors will activate.

The Active Safety Seat is made up of the following components:

- Seat Memory Control Module
- Haptic Signal Motor - Driver Left Rear
- Haptic Signal Motor - Driver Right Rear

Seat Memory Control Module

The Seat Memory Control Module receives serial data messages from other modules and provides a voltage output to turn on the haptic signal motors. The Seat Memory Control Module will pulse the left, right or both motors the number of pulses requested over serial data. The module monitors the circuits for open, short to ground and short to voltage conditions and will set DTCs if a problem is detected. The modules that can request haptic motor operation are:

- Front and Rear Parking Assist Control Module (Front and Rear Parking Assist)
- Vehicle Camera Module (Lane Departure Warning, Forward Collision Alert)
- Side Object Sensor Modules (Rear Cross Traffic Alert)

Haptic Signal Motors - Driver Left Rear and Driver Right Rear

The motors are located in the driver's seat bottom cushion and are positioned on the left and right sides. The motors are connected to ground and receive voltage from the Seat Memory Control Module. There are no connectors other than at the Seat Memory Control Module.

Active Safety Seat Operation

System operation can be described by the following alerts:

- Front and Rear Parking Assist - when an object is first detected both motors will be pulsed twice. If a potential crash is detected, both motors will be pulsed five times.
- Lane Departure Warning - when the vehicle crosses a lane marking either the left or right motor will be pulsed three times depending on which side the warning is for.
- Forward Collision Alert warning - both motors will be pulsed five times.
- Rear Cross Traffic Alert - When backing up, if rear cross traffic is detected, either the left or right motor will be pulsed three times, depending on which side the warning is for.

Active Safety Seat

The user can select between haptic or audible (beeps) alerts. This setting can be found in the vehicle personalization menus. See the user's manual for more detailed information on vehicle personalization.

SIDE BLIND ZONE ALERT DESCRIPTION AND OPERATION

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

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

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

Side Blind Zone Alert System Components

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

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

Side Object Sensor Module

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

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

Outside Rearview Mirrors

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

Infotainment System

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

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

Safety Alert Seat

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

Side Blind Zone Alert Operation

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

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

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

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

Lane Change Alert Operation

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

When the vehicle is started, both outside mirror displays will briefly come on to indicate that the system is operating. The warning symbols will vary brightness based on the ambient light conditions. Lane change alert is active when the vehicle is out of park or the parking brake is off on manual transmission vehicles. When the system detects a vehicle in the side blind zone or approaching in the lane change alert zone while driving forward, an amber warning symbol will light up in the appropriate outside mirror. This indicates that it may be unsafe to change lanes. If the driver then activates the turn signal, the amber warning symbol starts flashing as an extra warning not to change lanes.

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

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

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

Rear Cross Traffic Alert Operation

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

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

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

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

Side Blind Zone Alert Driver Information Center Messages

SIDE BLIND ZONE ALERT OFF

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

LANE CHANGE ALERT OFF

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

REAR CROSS TRAFFIC ALERT OFF

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

SERVICE SIDE DETECTION SYSTEM

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

SIDE DETECTION SYSTEM UNAVAILABLE

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

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

FORWARD COLLISION ALERT DESCRIPTION AND OPERATION (WITH UGN)

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

FORWARD COLLISION ALERT DESCRIPTION AND OPERATION (WITHOUT UGN)

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

Forward collision alert does not provide a warning to help avoid a crash, unless it detects a vehicle. Forward collision alert may not detect a vehicle ahead if the frontview camera module is blocked by dirt, snow or ice or if the windshield is damaged. It may also not detect a vehicle on winding or hilly roads or in conditions that can limit visibility such as fog, rain or snow or if the headlamps or windshield are not cleaned or in proper condition. Keep the windshield, headlamps and frontview camera module clean and in good repair.

Forward collision alert may provide unnecessary alerts for turning vehicles, vehicles in other lanes, objects that are not vehicles or shadows. These alerts are normal operation and the vehicle does not need service.

Front Automatic Braking (if equipped)

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

The system works when driving in a forward gear between 5 mph (8 km/h) and 50 mph (80 km/h) or on vehicles with Adaptive Cruise Control above 2 mph (4 km/h). It can detect vehicles up to approximately 197 ft (60 m).

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

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

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

The Pedestrian Collision Mitigation Braking system can detect and alert to up to 10 pedestrians in a forward gear at speeds between 5 mph (8 km/h) and 50 mph (80 km/h). During daytime driving, the

system detects pedestrians up to a distance of approximately 40 m (131 ft). Pedestrians must be at least 31.5 inches (80 cm) tall to be detected.

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

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

- Frontview camera module
- Forward collision alert switch
- Instrument cluster
- Collision alert indicators (without UV6)
- Head-up display (with UV6)
- Infotainment system
- Safety alert seat, if equipped

Frontview Camera Module

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

Forward Collision Alert Switch

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

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

Instrument Cluster

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

Collision Alert Indicators (without UV6)

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

The collision alert indicators receive power and ground and are discretely controlled by the instrument cluster through a pair of low control circuits. When requested by the frontview camera module, the instrument panel will pulse the low control circuits, flashing the LEDs as a visual alert that another vehicle is being approached too rapidly.

Head-up Display (with UV6)

The instrument cluster controls the head-up display via serial data. The instrument cluster will command the head-up display to flash the collision alert indicator as a visual alert when approaching another vehicle too rapidly as requested by the frontview camera module.

Infotainment System

The infotainment system controls the audible alerts for the forward collision alert system. If the host vehicle is approaching another vehicle too rapidly, the frontview camera module will command the infotainment system issue an audible alert to the driver.

Safety Alert Seat (if equipped)

The memory seat module controls the haptic alert provided by the seats. If the vehicle is approaching another vehicle too quickly, the frontview camera module will command the memory seat module to pulse both sides of the seat.

ACTIVE SAFETY SYSTEM DESCRIPTION AND OPERATION

The active safety system is a comprehensive feature set designed to help a driver avoid collisions or reduce crash damage while driving, backing and parking. The active safety control module is the primary controller for the active safety system. The active safety control module communicates on multiple serial data busses to share information with various control modules throughout the vehicle. The active safety control module uses various sensors and control modules to monitor the vehicle surroundings and take deliberate action to avoid collisions or reduce crash damage. The active safety system tightly integrates the forward collision alert, adaptive cruise control, front and rear parking assist and active emergency braking systems into a single cohesive system.

The active safety control module communicates via serial data on the object detection bus with the vehicle direction camera, radar sensor module - long range, radar sensor module - short range left front and radar sensor module - short range right front to create a virtual fusion image of the area in front of the vehicle. The active safety control module observes an actual visual image of the area directly ahead of the vehicle, within 60 m (197 ft), with the vehicle direction camera. The radar sensor module - long range is used to measure the distance to objects that are up to 200 m (656 ft) in front the vehicle and the two radar sensor modules - short range are used to measure the distance to objects that are within 30 m (98 ft) of the front of the vehicle. Within 60 m (197 ft) of the vehicle, all of these inputs are combined to create a fusion image of the area in front of the vehicle. At up to 200 m (656 ft), the radar sensor module - long range will detect and begin tracking objects immediately in front of the vehicle. Within 60 m (197 ft), the vehicle direction camera will confirm objects that have been detected by the radar sensor module - long range. The two radar sensor modules - short range improve cut-in detection, which are objects that enter the vehicle path from the side and are not necessarily detected by the vehicle direction camera and radar sensor module - long range, who's focus are those object directly in front of the vehicle.

The fusion image created by the active safety control module is used to detect collision risks and take action based on the immediacy of the risk. The a collision risk exists, the active safety control module will alert the driver using the forward collision alert system. This will provide the driver with a visual and audible or haptic alert that a collision risk has been detected. If the driver does not take action to reduce the risk of collision, such as changing lanes or applying the brakes, the intelligent brake assist system will pre-fill the brake hydraulic system to reduce system response time and increase pressure when quickly applying the brakes. If a collision risk is imminent, the active safety control module will enter automatic collision preparation, which will automatically apply the brakes in an effort to mitigate the collision or reduce collision damage.

The active safety control module communicates with the steering wheel angle sensor and the multi-axis acceleration sensor via serial data on the chassis expansion bus. These sensors are used to determine the intended vehicle path. Using the steering data and vehicle acceleration data, the active safety control module will determine where the vehicle will be traveling and focus attention on objects in this path. An example would be a driver quickly changing lanes to avoid a collision. This would mitigate the collision risk in the previous lane and the active safety control module would quickly transition to tracking objects for any collision risk in the new lane based on intended vehicle path. The active safety control module also communicates with the electronic brake control module to instigate the braking functions of intelligent brake assist and automatic collision preparation.

At the rear of the vehicle, the active safety control module uses the radar sensor module - short range left rear, radar sensor module - short range right rear and the front and rear parking assist control module as part of the backing warning system and the rear automatic braking system. Typical rear parking assist utilizes the front and rear parking assist control module and the four ultrasonic rear parking assist sensors to detect object when reversing at speed of up to 8 km/h (5 mph). The backing warning systems utilizes both the four ultrasonic rear parking assist sensors, as well as the radar sensor module - short range left rear and radar sensor module - short range right to detect object at speeds above 8 km/h (5

mph). The rear automatic braking system is intended to help avoid or reduce the harm caused by backing crashes or prevent the vehicle from being from being reversed into an object if the vehicle is already stopped.

The active safety system analyzes data from the various control modules and sensors listed below:

- Active safety control module
- Vehicle direction camera
- Radar sensor module - long range
- Radar sensor module - short range left front
- Radar sensor module - short range right front
- Radar sensor module - short range left rear
- Radar sensor module - short range right rear
- Front and rear parking assist control module
- Electronic brake control module

Component Description

Active Safety Control Module

The active safety control module analyzes data from various modules, sensors and switches to provide enhanced safety features. In addition to providing alerts, the active safety control module will provide driver assistance through integrated brake assist, automatic collision preparation, rear emergency braking and adaptive cruise control. Inputs and outputs can either be connected directly to the active safety control module or communicate through serial data. The active safety control module communicates on a dedicated object detection bus, as well as the chassis expansion bus and low speed GMLAN.

Forward collision alert, lane departure warning and park assist alerts can be user selected to either a haptic signal utilizing the driver's haptic signal motor seat or using beeps through the audio system. This setting can be found in the vehicle personalization menus. See the owner's manual for more detailed information on vehicle personalization.

If there is a DTC set in any of the modules that the active safety control module uses as inputs, it will send a "Service Driver Assist" to the instrument cluster to alert the driver of a problem with the system. No other specific details are given unless the driver attempts to activate a specific system. For example if the driver attempts to turn on lane departure warning, the instrument cluster will display "Lane Departure Unavailable" and the indicator will flash and then go out. A scan tool must be used to read the DTCs that are causing the malfunction to help find the problem. Some of the inputs to the active safety control module can affect forward facing features, rear facing features or all features. Systems to check to determine which area to focus are rear park assist for rear features and lane departure warning and adaptive cruise control for front features. If none of the active safety system features are operative, there may be an issue with another module on the vehicle not providing the proper data to the active safety control module. If all active safety control module features are inoperative, check the Adaptive Cruise Control Inhibit History and Disengage History scan tool data for the reason for the malfunction. Definitions of parameters and suggestions on what to look for can be found in [**Active Safety Control Module Scan Tool Information**](#). Any item with a "Yes" was the reason why the adaptive cruise control system was inoperative at that time. In some cases verifying the module is the correct part number, has the latest version of software is necessary and is calibrated properly.

- Active safety control module inputs:
 - Vehicle direction camera
 - Radar sensor module - long range
 - Radar sensor module - short range left front
 - Radar sensor module - short range right front
 - Radar sensor module - short range left rear
 - Radar sensor module - short range right rear
 - Front and rear parking assist control module

- Multi-axis acceleration sensor
- Steering wheel angle sensor
- Wheel speed sensors
- Forward collision alert switch
- Lane departure warning switch
- Parking assist switch
- Active safety control module outputs:
 - Body control module
 - Electronic brake control module
 - Engine control module
 - Instrument cluster
 - Head-up display
 - Memory seat module (safety alert seats)
 - Lane departure warning switch indicator
 - Parking assist switch indicator
 - Infotainment system

Vehicle Direction Camera

The vehicle direction camera is located behind the windshield, looking out at the road ahead and detects lane markings and objects directly ahead, within a distance of approximately 60 meters (197 ft). The vehicle direction camera is used for lane departure warning and forward collision alert systems. The vehicle direction camera communicates with the active safety control module via serial data on the object detection bus.

Using information from the vehicle direction camera, the active safety control module will provide forward collision alert and lane departure warning to the driver when appropriate. The alerts and warnings can be user-selected to be audible through the audio system or haptic using the active safety seat.

Radar Sensor Module - Long Range

The radar sensor module - long range is located behind the front grille emblem and is used in the 30-200 m (98-656 ft) range. The radar sensor module - long range communicates with the active safety control module via serial data on the object detection bus. In addition to the wiring harness ground, the module is grounded through the mounting bracket.

Radar Sensor Module - Short Range Front

There are two radar sensor module - short range front located behind the front fascia that detect objects up to approximately 30 meters (98 ft). The radar sensor modules - short range front communicate with the active safety control module via serial data on the object detection bus.

Radar Sensor Module - Short Range Rear

There are two radar sensor modules - short range rear located behind the rear fascia that detect objects up to approximately 30 meters (98 ft). The radar sensor modules - short range rear communicate with the active safety control module via serial data on the object detection bus.

Front and Rear Parking Assist Control Module

The front and rear parking assist control module uses ultrasonic object sensors located in the front and rear fascias to provide distance measurements to nearby objects. The front and rear park assist module sends rear object data to the active safety control module via serial data.

Electronic Brake Control Module

The electronic brake control module performs the braking activities of the active safety system. When requested by the active safety control module, the electronic brake control module will prepare or apply

the brakes as necessary in response to an imminent collision.

Active Safety System Operation

Forward Collision Alert

The forward collision alert system is a convenience feature of the active safety control module, vehicle direction camera, radar sensor module - long range, radar sensor module - short range left front and radar sensor module - short range right front that issues a warning to the driver when a potential collision risk exists. When the system detects a vehicle in the path ahead, the green vehicle ahead indicator is illuminated on the instrument cluster. If the vehicle ahead is being followed too closely, the vehicle ahead indicator will be amber. When approaching another vehicle too rapidly, the collision alert symbol will flash in the head-up display. An audible alert sound will simultaneously sound or the safety alert seat will provide haptic feedback. The visual alert cannot be changed, but the driver can select between audible or haptic alerts in the vehicle personalization menus. Refer to the vehicle owner manual for more detailed information on vehicle personalization.

Forward collision alert does not provide a warning to help avoid a crash, unless it detects a vehicle. Forward collision alert may not detect a vehicle ahead if the vehicle direction camera is blocked by dirt, snow or ice or if the windshield is damaged. It may also not detect a vehicle on winding or hilly roads or in conditions that can limit visibility such as fog, rain or snow or if the headlamps or windshield are not cleaned or in proper condition. Keep the windshield, headlamps and vehicle direction camera area clean and in good repair.

Forward collision alert may provide unnecessary alerts for turning vehicles, vehicles in other lanes, objects that are not vehicles or shadows. These alerts are normal operation and the vehicle does not need service.

Intelligent Brake Assist

Intelligent brake assist is designed to pre-fill the brake hydraulic system to reduce system response time and increase pressure when quickly applying the brakes. Using the active safety control module, vehicle direction camera, radar sensor module - long range, radar sensor module - short range left front and radar sensor module - short range right front, the system monitors the approach speed and distance to a vehicle ahead. If the Intelligent brake assist system determines a collision risk exists, it will begin preparations to the brake hydraulic system. When active, minor brake pedal pulsations or pedal movement may occur and this should be considered normal. Intelligent brake assist will resort to normal braking operation after an intelligent brake assist even has occurred when the brake pedal is released.

Automatic Collision Preparation

Automatic collision preparation system uses the active safety control module, vehicle direction camera, radar sensor module - long range, radar sensor module - short range left front and radar sensor module - short range right front to determine if an imminent collision risk exists. If the brakes have not been applied, the system will automatically apply the brakes in an effort to mitigate the collision or reduce collision damage. The system has a detection range of approximately 60 m (197 ft) and will only function when a vehicle is detected, as indicated by the green vehicle ahead indicator is illuminated on the instrument cluster.

Automatic collision preparation is not a substitute for normal vehicle braking and should not be relied on to brake the vehicle. Automatic collision preparation may not detect a vehicle ahead if the vehicle direction camera is blocked by dirt, snow or ice or if the windshield is damaged. It may also not detect a vehicle on winding or hilly roads or in conditions that can limit visibility such as fog, rain or snow or if the headlamps or windshield are not cleaned or in proper condition. Keep the windshield, headlamps and vehicle direction camera area clean and in good repair.

Backing Warning System

The backing warning system utilized the active safety control module, radar sensor module - short range left rear, radar sensor module - short range right rear and the front and rear parking assist control module to warn of rear objects when backing up at speeds greater than 8 km/h (5 mph). Utilizing the ultrasonic rear object sensors, the front and rear parking assist control module can only detect object at seeps up to 8 km/h (5 mph). By utilizing the active safety control module and radar sensor modules - short range

along with the front and rear parking assist control module and the rear object sensors, object can be detected at speeds greater than 8 km/h (5 mph).

While reversing at speeds greater than 8 km/h (5 mph), the backing warning system will alert the driver with an audible alert or through haptic feedback from the safety alert seat when an object is first detected. If the system detects a potential collision risk, a series of audible beeps or haptic feedback pulses will be provided, as well as a quick pulse of the brakes.

Rear Automatic Braking

The rear automatic braking system is designed to help avoid or reduce the harm caused by backing crashes. If the system detects the vehicle is backing too fast to avoid a collision, it may automatically brake hard to a stop.

Utilizing the active safety control module, radar sensor module - short range left rear, radar sensor module - short range right rear and the front and rear parking assist control module, rear automatic braking attempts to avoid imminent collision by automatically braking the vehicle when traveling in reverse. In conjunction with the backing warning system, if the driver does not respond to the audible and haptic alerts while reversing, the system will automatically brake the vehicle to a stop.

Rear automatic braking also prevents the vehicle from backing into an object if the vehicle is stopped and shifted to R. If the system detects an object immediately behind the vehicle while attempting to reverse from a stop, the brakes will be applied.

Pressing the brake pedal after the vehicle comes to a stop will release the rear automatic braking. It may be necessary to release the electronic parking brake. When it is safe to do so, pressing the accelerator pedal firmly at any time will override the rear automatic braking. If rear automatic braking is active and there is no object behind the vehicle, make sure there is no snow, ice or debris on the rear object sensors.

Lane Departure Warning

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

Refer to [Lane Departure Warning Description and Operation \(without UGN\)](#) and/or [Lane Departure Warning Description and Operation \(UGN\)](#) for more information about the Lane Departure Warning function.

ADAPTIVE CRUISE CONTROL DESCRIPTION AND OPERATION

Adaptive Cruise Control

The adaptive cruise control system is an enhanced cruise control system with the ability to sense and react to forward traffic. Compared to the common cruise control system found on many vehicles, the main functional enhancement of the adaptive cruise control system is the ability to detect the presence of a vehicle in the path of the adaptive cruise control vehicle. Adaptive cruise control retains the existing cruise control feature that controls the vehicle speed to the driver selected speed. However, adaptive cruise control allows a driver to set and maintain a following distance to the preceding nearest vehicle in the path ahead. The active safety control module controller calculates a follow speed limit to ensure an acceptable distance is maintained to the preceding vehicle in front, should one be present. The adaptive cruise control system automatically adjusts the speed when the vehicle comes up behind a slower travelling vehicle in front. The system applies limited automatic braking and throttle control without driver input when necessary to maintain the set following distance. The preceding vehicle's speed and acceleration along with the active cruise control vehicle speed and acceleration and the distance between the two vehicles are factors used by the active safety control module controller to determine the follow speed limit. The vehicle speeds up to the original driver selected set speed when the pathway becomes clear without driver input.

Adaptive Cruise Control Description

The adaptive cruise control functionality depends on various modules on the vehicle to function and each module performs a function that is critical to the proper operation of the adaptive cruise control system. Adaptive cruise control will not operate if any components fail. Communication between modules is via serial data. The following is a functional description of the active safety control module and the other associated components:

Active Safety Control Module

The Active Safety Control Module analyzes data from various modules, sensors and switches to provide enhanced safety features. Refer to [**Active Safety System Description and Operation**](#) for more information. In addition to enhanced safety features, the active safety control module provides the adaptive cruise control system functionality. The active safety control module analyzes data from the long range radar sensor module, front short range radar sensor modules and frontview camera module to identify and classify objects in the road environment. The system scans the road environment to detect targets within its specified field of view. The active safety control module then sends throttle and/or brake commands to the engine control module (ECM) and electronic brake control module (EBCM) via serial data in order to control the vehicle acceleration/deceleration based on the data from the modules. The ECM and EBCM provide throttle control and automatic braking needed for proper cruise speed adjustment. The following is a list of the active safety control module functions pertaining to the adaptive cruise control functionality:

- The active safety control module processes the road environment to get data concerning any vehicle ahead of the adaptive cruise control vehicle. Detection, parameter estimation, tracking, object classification and diagnostics are the primary functions. When an object is detected, the controller calculates the object range, range rate, acceleration and azimuth angle parameters.
- The active safety control module performs adaptive cruise control state processing automatically - distance control or speed control. The adaptive cruise control operates in 2 possible states - cruise or follow. The normal operating state is cruise, whereby the vehicle speed is controlled to match the driver selected set speed. When a preceding forward target is identified, the adaptive cruise control system will automatically transition into the follow speed state to provide proper lane spacing behind the target vehicle in front. The preceding vehicle's speed and acceleration, with the adaptive cruise control vehicle speed, acceleration and distance between the two vehicles will be used to determine the adaptive cruise control follow speed limit. The adaptive cruise control follow speed limit will ensure that an acceptable distance is maintained to the preceding vehicle.
- The active safety control module determines the follow speed limit for throttle control by the ECM.
- The active safety control module arbitrates the adaptive cruise control system brake and throttle control between the EBCM and the ECM.
- The active safety control module requests brake light activation during automatic braking.
- The active safety control module provides operational feedback to the vehicle driver. The active safety control module sends signals for telltales and messages to be displayed on the instrument cluster or driver information center.

Body Control Module (BCM)

The following are the adaptive cruise control System functions provided by the BCM:

- The BCM provides a translating gateway for the high speed GMLAN serial data circuit.
- The BCM reads all cruise control switches and the gap switch. The active safety control module monitors a variety of user operated switches from the BCM switch status information sent via the GMLAN serial data circuit.
- The BCM illuminates the brake light based on a GMLAN message from the active safety control module during automatic braking.
- The BCM measures the brake pedal position and sends brake pedal travel status via GMLAN serial data circuit to the ECM. The ECM disengages the adaptive cruise control system when the brake is applied by the driver pressing the brake pedal.
- The BCM serves as a gateway to the instrument cluster and driver information center. The BCM will generate visual warnings based on high speed GMLAN serial data messages from the active safety control module.

Engine Control Module (ECM)

The following are the adaptive cruise control system functions performed by the ECM:

- The ECM provides the electronic throttle control to the adaptive cruise control System. The ECM is also responsible for determining when a driver is overriding the adaptive cruise control throttle position by pressing the accelerator pedal.
- The ECM processes the cruise control switch requests received via the GMLAN serial data circuit from the BCM. Engaging and disengaging the adaptive cruise control system are functions performed by the ECM.
- The ECM determines the driver selected vehicle speed. Unless the adaptive cruise control module requests a lower vehicle speed, the ECM will control the vehicle speed to the driver selected set speed.
- The ECM allows automatic braking without disengaging the adaptive cruise control.

Antilock Brake System (ABS)

The following are the adaptive cruise control System functions performed by the EBCM:

- The EBCM controls the operation of the Antilock Brake System.
- The EBCM provides automatic braking for the adaptive cruise control system. The active safety control module will request vehicle deceleration via high speed GMLAN serial data circuit.
- The EBCM determines when the driver-applied brake pressure is active. The EBCM will communicate this status via the GMLAN serial data circuit to the BCM.
- The EBCM releases vehicle automatic braking when there is a throttle override by the driver pressing the accelerator.
- The EBCM predicts brake temperatures. Due to automatic braking, the brake system may overheat. When the brakes are overheated, the EBCM requests the adaptive cruise control System to be temporarily shut down by the ECM until the brakes cool to a normal operating temperature.

Refer to [ABS Description and Operation](#) .

Transmission Control Module (TCM)

The transmission control module (TCM) provides a down shift to protect the brakes. When the TCM detects some driver braking activity or adaptive cruise control automatic braking activity, the TCM down shifts the vehicle transmission to increase engine braking. This helps reduce braking activity, extend brake pad life and reduce brake system overheating.

Driver Information Center

The driver information center is a part of the instrument cluster and displays the adaptive cruise control system warning messages. The active safety control module requests messages to be displayed on the driver information center by sending a GMLAN request to the BCM. The BCM sends a GMLAN serial data request to the instrument cluster demanding the display of the warning message. When the message is acknowledged by the driver and the cause of the message resolved, the driver information center turns the message off. The adaptive cruise control system will not operate if the driver information center fails.

Brake Pedal Position Sensor

The BCM monitors the brake pedal position sensor in order to determine when pressure is being applied to the brake by the driver stepping on the brake pedal. The brake pedal position sensor receives a low reference signal and a 5 V reference from the BCM. When the brake is applied, a signal is applied from the brake pedal position sensor through the brake pedal position sensor signal circuit to the BCM. The BCM utilizes this signal in deciding when to command the activation of the stop lamps. The BCM continuously sends signals via the GMLAN serial data circuit to the EBCM and the ECM reflecting the brake pedal position status. This will include the initial brake travel signal required for the activation of the adaptive cruise control system. The adaptive cruise control system will not engage unless the initial brake pedal travel signal is valid and received by the BCM. When the BCM brake pedal position signal indicates that brake pedal pressure is being applied by the driver when the adaptive cruise control

System is engaged, the ECM immediately disengages the adaptive cruise control System. Re-engaging the adaptive cruise control System will require the driver pressing the set or resume switch. Refer to [Exterior Lighting Systems Description and Operation](#) for more information on the brake pedal pressure sensor.

Accelerator Pedal

Deceleration of the adaptive cruise control vehicle to maintain a certain distance and speed while a slower moving vehicle is in its path is achieved through throttle control by the ECM and the application of automatic braking by the EBCM. During automatic braking the ECM is commanded to release the throttle from the currently controlled cruise position by the active safety control module. At the end of automatic braking, the ECM will control the vehicle speed to the current set vehicle speed. Driver throttle override occurs when the driver of the adaptive cruise control vehicle depresses the accelerator pedal with the intention of requesting greater speed than the current throttle position. An example is an adaptive cruise control vehicle driver stepping on the accelerator for a passing maneuver. The ECM continuously monitors the throttle and reports a throttle override condition. When no throttle override is present, automatic braking is allowed. When throttle override is detected by the ECM, automatic braking is not allowed to affect the vehicle acceleration.

Cruise Control Switch

The cruise control switch, functionally is a common feature that is shared between the adaptive cruise control system and the regular cruise control system. The adaptive cruise control system will not operate if any cruise switch fails. The cruise control switch comprises the following cruise control function switches:

- On/Off switch
- Set/decrease switch
- Resume/increase switch

The cruise control function switches are arranged in a resistive ladder design whereby each switch function is set up with different resistance values. The BCM through the cruise control switch signal circuit detects a predetermined voltage value when any cruise control switch function is activated. The associated cruise control function signal detected by the BCM is then sent to the engine control module (ECM) as a GMLAN serial data circuit message. The ECM on receiving the message provides the cruise control function requested by the BCM. The ECM is responsible for recognizing and responding to cruise control switch requests sent by the BCM. The cruise control function switches are used by the ECM to communicate to the active safety control module the driver selected vehicle speed. The driver selected vehicle speed is communicated through GMLAN serial data circuit to the active safety control module and the BCM. The adaptive cruise control system engages and adjusts vehicle speeds based on the activation of the following cruise control function switches:

On/Off Switch

The BCM monitors the switch signal circuit in order to determine when the On/Off switch is disabled or activated. The BCM detects a predetermined voltage value on the switch signal circuit. The On/Off switch state is then relayed to the ECM via the GMLAN serial data circuit. The ECM sends the On/Off switch input status to the active safety control module. When the On/Off switch is turned ON, the adaptive cruise control system enters either a standby enabled or a standby disabled mode. The standby enabled mode indicates that every condition required for the adaptive cruise control system to function has been met, but the adaptive cruise control is not engaged. When the adaptive cruise control is in the standby disabled mode, the conditions necessary for the adaptive cruise control system to function has not been met. When the On/Off switch is turned OFF, the adaptive cruise control will enter the disabled mode. The adaptive cruise control will not activate in the disabled mode.

Set/Decrease Switch

The adaptive cruise control system is engaged when the adaptive cruise control On/Off switch is turned ON and the set/decrease switch is momentarily pressed and released. When the set/decrease switch is pressed, the selected vehicle speed is set to the current vehicle speed by the ECM. The vehicle speed must be at or greater than 40 km/h (25 MPH). The selected vehicle speed is displayed by the driver information center. While in the engaged state, the selected vehicle speed and the following distance can be adjusted. Pressing and holding the set/decrease switch, when the adaptive cruise control system is

engaged, will decrease the selected vehicle speed without deactivating the adaptive cruise control. Momentarily pressing and releasing the set/decrease switch, when the adaptive cruise control is engaged, decreased the selected vehicle speed by 1.6 km/h (1 MPH) for each time that the set/decrease switch is pressed.

Resume/Increase Switch

The resume/increase switch is used in order to increase the selected vehicle speed when adaptive cruise control is active. The amount selected vehicle speed can be increased from the resume/increase switch depends on how long the switch is pressed. The presence of a slower moving vehicle in the path of the adaptive cruise control vehicle will limit the extent to which the selected vehicle speed can be achieved. If there is no preceding vehicle in front, limiting the adaptive cruise control vehicle acceleration, then the vehicle speed that is attained is the new selected vehicle speed. The current selected vehicle speed is displayed by the driver information center. Acceleration is terminated when the resume/increase switch is released. Momentarily pressing and releasing the resume/increase switch will allow the selected vehicle to accelerate in at 1.6 km/h (1 MPH) increments for each time that the resume/increase switch is momentarily pressed.

Gap Switch

The gap switch allows the driver to determine how closely the adaptive cruise control vehicle follows a target vehicle while adaptive cruise control is engaged. When the adaptive cruise control vehicle speed is being limited due to a slower travelling vehicle, the adaptive cruise control vehicle speed is automatically controlled to the follow speed limit. The gap switch has 3 following distance selections that range from 1-2 s. The gap switch following distance between the adaptive cruise control vehicle and the target vehicle is expressed in time as opposed to actual distance. The distance maintained for a selected gap will vary based on vehicle speed. The faster the vehicle speed, the further back you will follow. The gap setting can only be adjusted when the adaptive cruise control system is engaged. The gap switch is hard-wired to the BCM. Based on voltage variations, the BCM is able to read the gap switch selection and communicates the switch status on the GMLAN serial data circuit to the active safety control module. The gap switch is a momentary switch.

The initial push of the gap switch recalls the current setting and activates the display. Subsequent pushes of the gap switch will change the gap setting.

Driver Information Messages

Adaptive Cruise Control Temporarily Unavailable

The active safety control module will send this message if the adaptive cruise control has been disengage or disabled. There are many reasons that can cause this, some will also set DTCs. Check vehicle for DTCs and also check the adaptive cruise control enable and disengage scan tool data. Definitions of parameters can be found in active safety control module scan tool information.

Service Driver Assist System

This message can be set by either the active safety control module if there is a problem with the driver assist system or by the memory seat module if there is a problem with the haptic seat circuits. Check vehicle for DTCs.

Service Adaptive Cruise Control and Service Front Camera

The message is set if the active safety control module is not communicating to the instrument cluster. Check vehicle for DTCs.

Set Speed

The adaptive cruise control vehicle set speed is displayed at all times in the driver information center when adaptive cruise control is engaged. The active safety control module set speed display request is sent to the instrument cluster via the GMLAN serial data circuit.

Follow Distance

The driver information center displays the driver selected following distance when adaptive cruise control is engaged and the gap switch is active. The current follow distance setting is displayed in the driver information center for a few seconds after the gap switch is pressed to increase or decrease the following distance. The active safety control module follow distance display request is sent to the instrument cluster via the GMLAN serial data circuit.

Vehicle Ahead Indicator

The vehicle ahead indicator is displayed in the instrument cluster when the radar identifies an in-path vehicle. The vehicle ahead indicator is a warning to the driver that a vehicle is ahead. The indicator also serves as a feedback to the driver that the radar is functioning properly. The active safety control module commands the display of the vehicle ahead indicator via a GMLAN serial data message to the instrument cluster. The vehicle ahead indicator only displays with the adaptive cruise control active and may sometimes display for stationary road objects.

Cruise Engaged

The adaptive cruise control system will engage and adjust vehicle speeds based on the activation of the following cruise switches:

- On/off
- Set/decrease
- Resume/increase

Adaptive cruise control will not engage if any inhibit criteria is active. Also, the driver must step on the brakes at each ignition cycle before attempting to engage adaptive cruise control. The engine control module (ECM) looks to the BCM for the brake initial travel achieved signal indicating that the driver has stepped on the brakes before attempting to engage adaptive cruise control.

The vehicle speed must be above 45 km/h (28 MPH) and below 190 km/h (118 MPH) for the adaptive cruise control System to be engaged. In the engaged state, the adaptive cruise control System allows the driver to override the controlled vehicle speed temporarily while still remaining in the engaged state.

Cruise Inhibited

Active Safety Control Module Inhibits

The active safety control module inhibits the adaptive cruise control system when certain conditions exist. Refer to [**Active Safety Control Module Scan Tool Information**](#) for details.

Cruise Disengaged

Active Safety Control Module Disengagement

The Adaptive Cruise Control System disengages when certain conditions occur. Refer to [**Active Safety Control Module Scan Tool Information**](#) for details.

NIGHT VISION CAMERA DESCRIPTION AND OPERATION

System Operation

The night vision module sends the processed image output directly to the cluster via a dedicated cable.

The active safety control module communicates via serial data to the night vision camera module from the BCM and Motion Sensor Manager which the night vision camera module uses to turn on if the conditions are correct (ambient light and temperature) and perform detections (vehicle path and speed). The night vision camera module will send a message to the active safety control module if a warning or alert is required. Warnings and alerts are posted on the cluster or Head-Up Display, depending on vehicle equipment.

System pedestrian icons, beeps and (if equipped) Safety Alert Seat pulses can be set to Off through vehicle personalization by turning off the Front Pedestrian Braking system. If the personalization is set to Off, only highlighting will occur on night vision image. The night vision system does not automatically brake the vehicle.

Additionally, all the video signal circuits are twisted and shielded to prevent any interference that may lead to a loss of video signal resolution and cause a degraded video image. These circuits must not be spliced/removed from shielding or will cause image degradation.

Night Vision Components

The night vision system consists of the following components:

- Night Vision Camera
- Night Vision Control Module
- Night Vision Cleaning System

The system is displayed on the instrument cluster, head-up display and human machine interface module.

Night Vision Operation

WARNING: Do not stare at the image while driving as this might cause important objects ahead not to be seen. You could crash and you or others could be injured.

WARNING: The system does not detect all objects or the vehicle distance from objects. The system may not provide a warning with enough time to help avoid a crash.

Detections

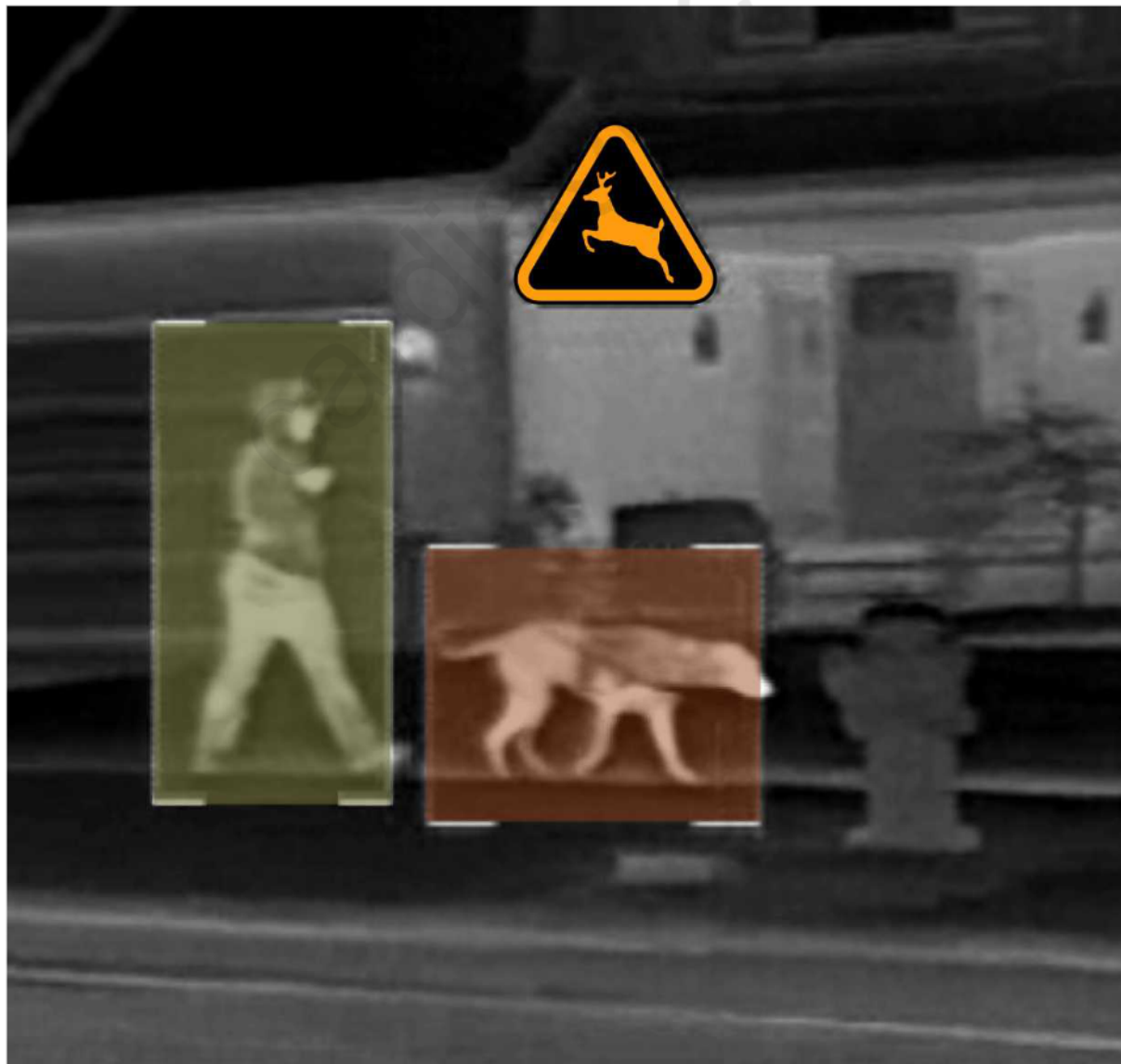


Fig. 2: Night Vision Detections

Courtesy of GENERAL MOTORS COMPANY

- Detections are outlined in yellow
- Warnings are red
- People or Pedestrians are yellow
- Animals are orange

If equipped, this system can help the driver see pedestrians or large animals ahead of the vehicle beyond the area lit by the headlights. A thermal heat image of the view ahead is displayed when it is dark enough outside. If a pedestrian or large animal is detected more than 25 m (82 ft) away, an amber pedestrian or animal icon displays and a box appears around the pedestrian or animal. When the system detects that the vehicle is approaching a pedestrian ahead much too quickly, the box changes to red.

Warm objects, such as pedestrians, animals and other moving vehicles, should appear whiter on the Night Vision display. Cold objects, such as the sky, signs and parked vehicles, should appear darker. Night Vision only shows objects that are warmer or colder than the surroundings. It does not detect brake lamps, turn signals, emergency flashers, traffic lights or sign information.

With the Front Pedestrian Braking system turned on, Night Vision provides a red Head-Up Display (HUD) alert when the system detects that the vehicle is approaching a pedestrian ahead much too quickly.

By selecting a view on the instrument cluster, the night vision image can be displayed. See Instrument Cluster. The Night Vision system can operate only if:

- The ignition is on.
- The vehicle is in P (Park) or a forward gear.
- It is dark enough outside.
- The headlamps are on.

Adjust the instrument panel brightness to make the image no brighter than necessary. Turn the image off by selecting another view on the instrument cluster.

When a pedestrian or large animal is detected, an amber box displays around the pedestrian or animal on the Night Vision display and an amber pedestrian icon or animal icon displays on the instrument cluster. This pedestrian icon is also shown on the Head-Up Display (HUD). When the system detects the vehicle is approaching a pedestrian much too quickly, the amber box turns red and a red flashing icon displays on the Head-Up Display with rapid beeping or pulsing of the Safety Alert Seat, if equipped.

The system may not detect pedestrians, object or animals:

- If they are less than 82 ft (25 m) away.
- If they are not directly ahead in the sensor coverage area, fully visible, standing upright or part of a group.
- If the pedestrian or animal is moving too quickly through the field of view, such as a bicyclist.
- If the pedestrian is wearing certain types of clothing.
- If headlamps are off, except when parked.
- If the outside temperature is higher than 86°F (30°C).
- Due to poor visibility, including in heavy fog, rain or snow.
- If the sensor is blocked by dirt, snow, rain or ice.

The Night Vision System may be disabled and or a "Night Vision Temporarily Unavailable" message if:

- In rain, snow or fog the image may not be clear and the direction of the road ahead may not be seen. In more severe weather conditions, the image may be unclear and unusable.
- The camera lens is physically blocked or broken.
- The NV camera internal temperature may be too high.

The Night Vision System may have a poor camera image if:

- Ice, snow or mud build up on the camera lens
- Damage to the front fascia or camera lens
- High ambient temperatures - the camera will not operate above outside temperatures higher than 86Å, Å°F (30Å, Å°C)

Night Vision Cleaning System

The night vision cleaning system is controlled by the BCM and the Windshield Wiper system. Activating the windshield washer when it is dark enough for the night vision system to operate, will also clean the night vision camera window. The night vision cleaning nozzle will spray every 5th windshield wash activation, though typically it will spray on the first activation in any ignition cycle. Windshield washer button presses must be long presses, a quick press may not be counted as a wash request. If the Night Vision image still looks blurry, use a soft wet cloth to gently clean the sensor camera lens and dry thoroughly.

REAR VISION CAMERA DESCRIPTION AND OPERATION

The rear vision camera system consists of the rearview camera and the infotainment system.

When the transmission is placed into R, 12 V is applied to the reverse lamp control circuit by the body control module (BCM). The rearview camera monitors this circuit and when 12 V is seen, indicating that the transmission is in R, the rearview camera will activate. The rearview camera receives ignition voltage and a constant ground to power the camera. Video signal + and video signal - circuits carry the video image from the rearview camera to the infotainment system. Additionally, the video signal circuits are shielded to prevent any interference which may lead to a loss of video signal resolution and cause a degraded video image. The shield is grounded by the rearview camera.

The following conditions may cause a degraded rear vision camera image:

- Ice, snow or mud has built up on the rear vision camera
- Dark conditions
- Extreme light conditions, such as glare from the sun or the headlights of another vehicle
- Damage to the rear of the vehicle
- Extreme high temperatures or extreme temperature changes

SAFETY ALERT SEAT DESCRIPTION AND OPERATION

The active safety seat provides a vibration in the driver's seat bottom cushion to alert the driver of a number of concerns. There are two motors providing the vibration and are located on the left and right sides of the seat cushion. Depending on the alert, either the left, right or both motors will activate.

The active safety seat is made up of the following components:

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

Seat Memory Control Module

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

Haptic Seat Motor

The motors are located in the driver's seat bottom cushion and are positioned on the left and right sides. The motors are connected to ground and receive voltage from the seat memory control module.

SURROUND VISION CAMERA DESCRIPTION AND OPERATION

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

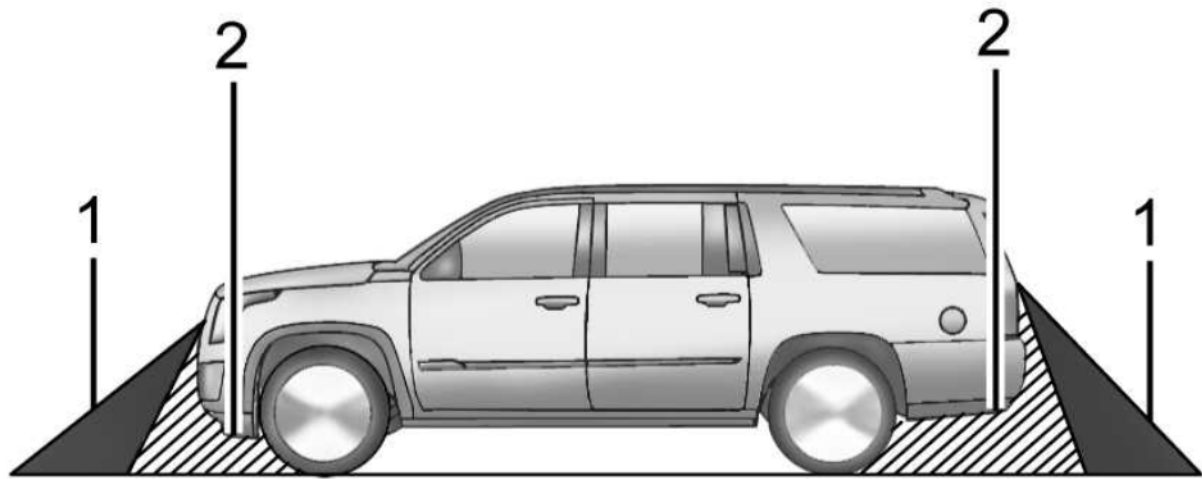


Fig. 3: Surround Vision Camera

Courtesy of GENERAL MOTORS COMPANY

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

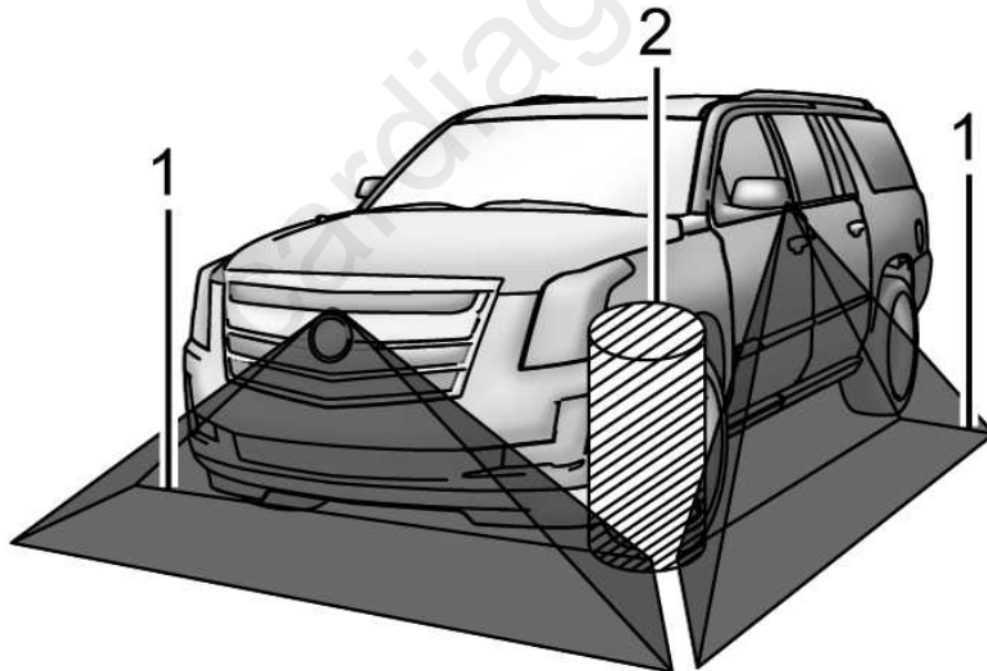


Fig. 4: Surround Vision Camera

Courtesy of GENERAL MOTORS COMPANY

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

The surround vision camera system consists of the following components:

- B87 Rearview Camera
- B174G Frontview Camera - Grille

- K157 Video Processing Control Module
- A11 Radio **OR** K74 Human Machine Interface Module
- B225L Sideview Camera - Left
- B225R Sideview Camera - Right
- X20 Memory Card Receptacle

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

The following conditions may cause a degraded surround vision camera image:

- Ice, snow or mud has built up on the rear vision camera
- Dark conditions
- Extreme light conditions, such as glare from the sun or the headlights of another vehicle
- Damage to the rear of the vehicle
- Extreme high temperatures or extreme temperature changes

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

Features of the Surround Vision System

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

System Operation

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

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

SD Card and Video Recorder Function

In Full Speed mode (12 Mbps) and High Speed (480 Mbps), the frame rate is decided by writing speed (USB cable, SD card, software) to SD card reader. The video processing control module supports only mass storage class (8 to 32 GB SDHC card with FAT32 file system, Class 4 and Over). The 5V output of video processing control module is used to switch on/off read/write device.

The recorder feature continuously records single camera views from the 360 cameras. There are two operating modes for image recording: security mode and normal mode. Security mode records images in a round robin sequence using all cameras when the module wakes up until the ignition is in accessory or run mode. Normal mode records images from front and rear cameras in ACC or RUN power mode.

The video processing control module shall stop recording and close this file when Ignition OFF or trunk is opened and start a new recording onto a new file. This is to avoid corrupting the entire drive cycle file when SD card is removed abruptly. **Disable recording before removing SD card** .

Video playback allowed in **PARK** gear only. During playback, Recording is not possible. Playback screen must be closed to allow recording.

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2017 ACCESSORIES & EQUIPMENT

Object Detection and Pedestrian Protection - Diagnostic Information and Procedures - CT6

DIAGNOSTIC INFORMATION AND PROCEDURES

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

Diagnostic Instructions

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

DTC Descriptor

DTC B094B 00

Left Side Object Detection Control Module - Malfunction

DTC B094B 08

Left Side Object Detection Control Module - Performance - Signal Invalid

DTC B094B 45

Left Side Object Detection Control Module - Variant Not Programmed

DTC B094B 54

Left Side Object Detection Control Module - High Temperature

DTC B094B 58

Left Side Object Detection Control Module - Performance

DTC B094C 00

Right Side Object Detection Control Module - Malfunction

DTC B094C 08

Right Side Object Detection Control Module - Performance - Signal Invalid

DTC B094C 45

Right Side Object Detection Control Module - Variant Not Programmed

DTC B094C 54

Right Side Object Detection Control Module - High Temperature

DTC B094C 58

Right Side Object Detection Control Module - Performance

Circuit/System Description

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

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The control module has detected a malfunction.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Side Blind Zone Alert Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

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

3. Verify that B094B 00, B094C 00, B094B 08, B094C 08, B094B 54 or B094C 54 is not set.

- **If DTC is set**

Replace the appropriate B218 Side Object Sensor Module.

- **If the DTC is not set**

4. Verify that B094B 58 or B094C 58 is not set.

- **If DTC is set**

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

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

5. All OK.

Repair Instructions

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

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

DTC B094C: RIGHT SIDE OBJECT DETECTION CONTROL MODULE

Diagnostic Instructions

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

DTC Descriptor

DTC B094C

Right Side Object Detection Control Module

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

Diagnostic Fault Information

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

Circuit/System Description

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

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

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears when the control module ignition cycle counter reaches the reset threshold of 40, without a repeat of the malfunction.

Diagnostic Aids

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Side Blind Zone Alert Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Circuit/System Verification

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

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X3 harness connector at the appropriate A9 Outside Rearview Mirror. It may take up to 2 mins for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 2 and ground.
 - **If 2 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 2 Ω**
3. Ignition ON.
4. Test for less than 1 V between the control circuit terminal 1 and ground.
 - **If 1 V or greater**
 1. Ignition OFF, disconnect the harness connector at the B218R Side Object Sensor Module - Right.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 2 Ω , replace the B218R Side Object Sensor Module - Right.
 - **If less than 1 V**
5. Command the Object Detection Alert Indicators On with a scan tool.
6. Test for greater than 3 V between the control circuit terminal 1 and ground.
 - **If 3 V or less**
 1. Ignition OFF, disconnect the harness connector at the B218R Side Object Sensor Module - Right.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
3. Ignition OFF.
4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the B218R Side Object Sensor Module - Right.
- **If greater than 3 V**
7. Replace the appropriate E17 Outside Rearview Mirror Glass.

Repair Instructions

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

- [Outside Rearview Mirror Glass Replacement](#)
- [Control Module References](#) for side object sensor 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.
- [Diagnostic Procedure Instructions](#) provides 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.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Side Blind Zone Alert Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition OFF, ignition ON.
2. Verify the side blind zone alert system indicators located in the outside rearview mirrors briefly turn ON and then OFF during the system self test 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
 - **If both side blind zone alert indicators briefly turn ON and OFF**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the 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 5 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
 3. Ignition ON, connect a test lamp between the control circuit terminal 18 and the ground circuit terminal 5.
 4. Verify the test lamp turns ON and OFF when commanding the Object Detection Alert Indicators On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the harness connector at the appropriate B218 Side Object Sensor Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the B218 Side Object Sensor Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the harness connector at the B218 Side Object Sensor Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the B218 Side Object Sensor Module.
 - **If the test lamp turns ON and OFF**
 5. Test or replace the A9 Outside Rearview Mirror Glass.

Repair Instructions

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

- [Outside Rearview Mirror Glass Replacement](#)
- [Control Module References](#) for side object sensor module replacement, programming and setup.

DTC B0954, B0955, B0956 OR B0957: PARKING ASSIST FRONT SENSOR LEFT/RIGHT CORNER/MIDDLE 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B0954

Parking Assist Front Sensor Left Corner Circuit

DTC B0955

Parking Assist Front Sensor Left Middle Circuit

DTC B0956

Parking Assist Front Sensor Right Middle Circuit

DTC B0957

Parking Assist Front Sensor Right Corner Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
8 V Reference	B1405 02	B0954 04, B0955 04, B0956 04, B0957 04, B0958 04, B0959 04, B0960 04, B0961 04	B1405 01	-
Left Front Object Sensor Signal	B0954 02	B0954 04	B0954 01	B0954 08, B0954 22
Left Middle Front Object Sensor Signal	B0955 02	B0955 04	B0955 01	B0955 08, B0955 22
Right Middle Front Object Sensor Signal	B0956 02	B0956 04	B0956 01	B0956 08, B0956 22
Right Front Object Sensor Signal	B0957 02	B0957 04	B0957 01	B0957 08, B0957 22
Low Reference	-	B0954 01, B0955 01, B0956 01, B0957 01, B0958 01, B0959 01, B0960 01, B0961 01	-	-

Circuit/System Description

The object sensors are 3-wire ultrasonic sensors that are used to determine the distance between the vehicle and an object. The parking assist control module supplies 8 V to the object sensors via the 8 V reference circuit and provides ground via the low reference circuit. The parking assist control module triggers the sensors in a sequential loop. After each sensor transmits, the parking assist control module uses the sensor echo received through the signal circuit to calculate the distance and position of an object.

Conditions for Running the DTC

- Ignition ON
- Parking assist is activated.

Conditions for Setting the DTC

B0954 01, B0955 01, B0956 01 or B0957 01

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

B0954 02, B0955 02, B0956 02 or B0957 02

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

B0954 04, B0955 04, B0956 04 or B0957 04

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

B0954 08, B0955 08, B0956 08 or B0957 08

The parking assist control module has received an invalid signal.

B0954 18, B0955 18, B0956 18 or B0957 18

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

B0954 22, B0955 22, B0956 22 or B0957 22

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

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

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

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

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7) **Parking Assist Description and Operation (with UD5)** **Parking Assist Description and Operation (with Parallel Parking or Automatic Parking Assist)**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

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

- **If the DTC is not set**

3. Verify that DTC B0954 01, B0955 01, B0956 01, B0957 01 B0954 22, B0955 22, B0956 22 or B0957 22 is not set.

- **If the DTC is set**

1. Verify the B78 Front Object Sensors are not contaminated with snow, mud, dirt, slush or ice.

- If contaminated, clean the B78 Front Object Sensors.
- If there is no contamination

2. Refer to Circuit/System Testing.

- **If the DTC is not set**

4. Verify that DTC B0954 3A, B0955 3A, B0956 3A or B0957 3A is not set.

- **If the DTC is set**

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

- **If the DTC is not set**

5. Ignition ON, transmission in R.

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

- **If the parameter is Disabled**

Refer to Circuit/System Testing.

- **If the parameter is Enabled**

7. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness at the appropriate B78 Front Object Sensor. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 10 Ω between the low reference circuit terminal 3 and ground.

- **If 10 Ω or greater**

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω replace the K182 Parking Assist Control Module.

- **If less than 10 Ω**

3. Ignition ON.

4. Test for 7.5 - 10.2 V between the 8 V reference circuit terminal 1 and ground.

- **If less than 7.5 V**

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

2. Test for infinite resistance between the 8 V reference circuit and ground.

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

3. Test for less than 2 Ω in the 8 V reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K182 Parking Assist Control Module.

- **If greater than 10.2 V**

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

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

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

- If less than 1 V, replace the K182 Parking Assist Control Module.
 - **If between 7.5 - 10.2 V**
5. Test for 10.0 - 12.0 V between the signal circuit terminal 2 and ground.
- **If less than 10.0 V**
 1. Ignition OFF, disconnect the X3 harness connector at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K182 Parking Assist Control Module.
 - **If greater than 12.0 V**
 1. Ignition OFF, disconnect the X3 harness connector at the K182 Parking Assist Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K182 Parking Assist Control Module.
 - **If between 10.0 - 12.0 V**
6. Test or replace the B78 Front Object Sensor.

Repair Instructions

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

- [Parking Assist Alarm Sensor Ring Replacement \(Front\)](#) [Parking Assist Alarm Sensor Ring Replacement \(Rear\)](#)
- [Control Module References](#) for control module replacement, programming and setup.

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

Diagnostic Instructions

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

DTC Descriptors

DTC B095D

Parking Assist Rear Sensor Left Side Circuit

DTC B095E

Parking Assist Rear Sensor Right Side Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
8 V Reference	B1405 02, B1405 03	B095D 06, B095E 06	B1405 07	-
Left Rear Side Object Sensor Signal	B095D 02, B095D 06	B095D 06	B095D 01	B095D 08, B095D 21

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Right Rear Side Object Sensor Signal	B095E 02, B095E 06	B095E 06	B095E 01	B095E 08, B095E21
Low Reference	-	B095D 01, B095D 06, B095E 01, B095E 06	-	-

Circuit/System Description

The object sensors are 3-wire ultrasonic sensors that are used to determine the distance between the vehicle and an object on the side of the vehicle, in the vehicle's blind spot. The Parking Assist Control Module supplies 8 V to the object sensors via the 8 V reference circuit and provides ground via the low reference circuit. The Parking Assist Control Module triggers the sensors in a sequential loop. After each sensor transmits, the Parking Assist Control Module uses the sensor echo received through the signal circuit to calculate the distance and position of an object.

Conditions for Running the DTC

- Ignition ON.
- The side blind zone system is activated.

Conditions for Setting the DTC

B095D 01, B095E 01

The Parking Assist Control Module has determined the sensor signal voltage is too high.

B095D 06, B095E 06

The Parking Assist Control Module has determined the sensor signal voltage is too low.

B095D 08, B095E 08

The Parking Assist Control Module has received an invalid signal.

B095D 21, B095E 21

The Parking Assist Control Module has determined no change in the position of an object while the vehicle is in motion.

B095D 3A, B095E 3A

The Parking Assist Control Module has determined the wrong sensor type is installed.

Action Taken When the DTC Sets

- The side blind zone system is disabled.
- The driver information center may display a service message.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

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

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

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

- [Parking Assist Description and Operation \(with UD7\)](#) [Parking Assist Description and Operation \(with UD5\)](#) [Parking Assist Description and Operation \(with Parallel Parking or Automatic Parking Assist\)](#)

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B1405 is not set.

- **If the DTC is set**

Refer to [DTC B1405 \(with UD5\)](#)[DTC B1405 \(with UD7\)](#)

- **If the DTC is not set**

3. Verify DTC B095D 01, B095E 01, B095D 21 or B095E 21 is not set.

- **If any of the DTCs are set**

1. Verify none of the B94 Side Object Sensors - Rear are contaminated with snow, mud, dirt, slush or ice.

- If contaminated, clean the B94 Side Object Sensors - Rear.
- If there is no contamination.

2. Refer to Circuit/System Testing.

- **If none of the DTCs are set**

4. Verify that DTC B095D 3A or B095E 3A is not set.

- **If any of the DTCs are set**

Replace the appropriate B94 Side Object Sensor - Rear with the correct sensor type.

- **If none of the DTCs are set**

5. Ignition ON.

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

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

Refer to Circuit/System Testing.

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

7. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness at the appropriate B94 Side Object Sensor - Rear. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 10 Ω between the low reference circuit terminal 3 and ground.

- **If 10 Ω or greater**

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω replace the K182 Parking Assist Control Module.

- **If less than 10 Ω**

3. Ignition ON.

4. Test for 7.5 - 10.2 V between the 8 V reference circuit terminal 1 and ground.

- **If less than 7.5 V**

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

2. Test for infinite resistance between the 8 V reference circuit and ground.

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

3. Test for less than 2 Ω in the 8 V reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K182 Parking Assist Control Module.

- **If greater than 10.2 V**

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

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

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K182 Parking Assist Control Module.

- **If between 7.5 - 10.2 V**

5. Test for 7 - 9 V between the signal circuit terminal 2 and ground.

- **If less than 7 V**

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

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

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K182 Parking Assist Control Module.

- **If greater than 9 V**

1. Ignition OFF, disconnect the X2 harness connector at the K182 Parking Assist Control Module, ignition ON.

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

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K182 Parking Assist Control Module.

• **If between 7 - 9 V**

6. Test or replace the B94 Side Object Sensor - Rear.

Repair Instructions

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

- [Parking Assist Alarm Sensor Ring Replacement \(Front\)](#) [Parking Assist Alarm Sensor Ring Replacement \(Rear\)](#)
- [Control Module References](#) for control module replacement, programming and setup.

DTC B0958, B0959, B0960 OR B0961: PARKING ASSIST REAR SENSOR LEFT/RIGHT CORNER/MIDDLE 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B0958

Parking Assist Rear Sensor Left Corner Circuit

DTC B0959

Parking Assist Rear Sensor Left Middle Circuit

DTC B0960

Parking Assist Rear Sensor Right Middle Circuit

DTC B0961

Parking Assist Rear Sensor Right Corner Circuit

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

Diagnostic Fault Information

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

Circuit/System Description

The object sensors are 3-wire ultrasonic sensors that are used to determine the distance between the vehicle and an object. The Parking Assist Control Module supplies 8 V to the object sensors via the 8 V reference circuit and provides ground via the low reference circuit. The Parking Assist Control Module triggers the sensors in a sequential loop. After each sensor transmits, the Parking Assist Control Module uses the sensor echo received through the signal circuit to calculate the distance and position of an object.

Conditions for Running the DTC

- Ignition ON
- Parking assist is activated.

Conditions for Setting the DTC

B0958 01, B0959 01, B0960 01 or B0961 01

The Parking Assist Control Module has determined the sensor signal voltage is too high.

B0958 02, B0959 02, B0960 02 or B0961 02

The Parking Assist Control Module has determined the sensor signal circuit is shorted to ground.

B0958 04, B0959 04, B0960 04 or B0961 04

The Parking Assist Control Module has determined the sensor signal circuit is open.

B0958 08, B0959 08, B0960 08 or B0961 08

The Parking Assist Control Module has received an invalid signal.

B0958 18, B0959 18, B0960 18 or B0961 18

The Parking Assist Control Module has determined the sensor signal voltage is too low.

B0958 22, B0959 22, B0960 22 or B0961 22

The Parking Assist Control Module determines no change in the position of an object while the vehicle is in motion.

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

The Parking Assist Control Module determines the wrong sensor type is installed.

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

The Parking Assist Control Module determines the sensor self test has not successfully completed.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Description and Operation

[Parking Assist Description and Operation \(with UD7\)](#) [Parking Assist Description and Operation \(with UD5\)](#) [Parking Assist Description and Operation \(with Parallel Parking or Automatic Parking Assist\)](#)

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC B1405 is not set.
 - **If the DTC is set**
Refer to [DTC B1405 \(with UD5\)](#)[DTC B1405 \(with UD7\)](#)
 - **If the DTC is not set**
3. Verify that DTC B0958 01, B0959 01, B0960 01, B0961 01, B0958 22, B0959 22, B0960 22 or B0961 22 is not set.
 - **If the DTC is set**
 1. Verify the B78 Rear Object Sensors are not contaminated with snow, mud, dirt, slush or ice.
 - If contaminated, clean the B78 Rear Object Sensors.
 - If there is no contamination
 2. Refer to Circuit/System Testing.
 - **If the DTC is not set**
4. Verify that DTC B0958 3A, B0959 3A, B0960 3A or B0961 3A is not set.
 - **If the DTC is set**
Replace the appropriate B78 Rear Object Sensor with the correct sensor type.
 - **If the DTC is not set**
5. Ignition ON, transmission in R.
6. Verify the scan tool Parking Assist System Status parameter is Enabled.
 - **If the parameter is Disabled**
Refer to Circuit/System Testing.
 - **If the parameter is Enabled**
7. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness at the appropriate B78 Front Object Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 3 and ground.
 - **If 10 Ω or greater**

1. Ignition OFF, disconnect the harness connector X2 at the K182 Parking Assist Control Module.
2. Test for less than 2 Ω in the low reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω replace the K182 Parking Assist Control Module.
- **If less than 10 Ω**
3. Ignition ON.
4. Test for 7.5 - 10.2 V between the 8 V reference circuit terminal 1 and ground.
 - **If less than 7.5 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the 8 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the 8 V reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K182 Parking Assist Control Module.
 - **If greater than 10.2 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K182 Parking Assist Control Module.
 2. Test for less than 1 V between the 8 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K182 Parking Assist Control Module.
 - **If between 7.5 - 10.2 V**
5. Test for 10.0 - 12.0 V between the signal circuit terminal 2 and ground.
 - **If less than 10.0 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K182 Parking Assist Control Module.
 - **If greater than 12.0 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K182 Parking Assist Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K182 Parking Assist Control Module.
 - **If between 10.0 - 12.0 V**
6. Test or replace the B78 Rear Object Sensor.

Repair Instructions

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

- [Parking Assist Alarm Sensor Ring Replacement \(Front\)](#) [Parking Assist Alarm Sensor Ring Replacement \(Rear\)](#)
- [Control Module References](#) for control module replacement, programming and setup.

DTC B0967 OR B0968: PARKING ASSIST ON/OFF SWITCH

Diagnostic Instructions

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

DTC Descriptor

DTC B0967 02

Parking Assist On/Off Switch Circuit Short to Ground

DTC B0968 01

Parking Assist On/Off Switch Indicator Circuit Short to Battery

DTC B0968 06

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

DTC B0968 0B

Parking Assist On/Off Switch Indicator Circuit High Current

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Parking Assist Switch Indicator Ignition	B0968 06, 2	B0968 06, 2	-	-
Parking Assist Switch Signal	B0967 02, 1	1	-	-
Parking Assist Switch Indicator Control	B0968 06, 2	B0968 06, 2	B0968 01, B0968 0B	-
Parking Assist Switch Ground	-	1	-	-
1. Parking Assist Switch Malfunction 2. Parking Assist Switch Indicator Malfunction				

Circuit/System Description

The parking assist can be enabled/disabled by pressing the parking assist switch. If the parking assist is enabled, engaging the reverse gear activates the parking assist feature. By subsequently pressing the parking assist switch the parking assist can be disabled.

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

For vehicles without UGN the indicator and switch are connected to the Park Assist Module and the system operates as a stand-alone feature.

With UGN, the indicator and switch are connected to the Active Safety Control Module. The Active Safety Control Module received input from several modules including the park assist module to provide additional features. The park assist alerts and DTCs originate from the Park Assist Module with the exception of the indicator DTCs which are set by the Active Safety Control Module. There are no switch DTCs for vehicles with the Active Safety Control Module.

Conditions for Running the DTC

- Ignition ON

- The parking assist is activated. The activation takes place by putting in the reverse gear while the system is enabled.

Conditions for Setting the DTC

B0967 02

The Parking Assist Control Module has detected a short to ground.

B0968 01

The Parking Assist Control Module has detected a short to battery.

B0968 06

The Parking Assist Control Module has detected a short to ground or open.

B0968 0B

The Active Safety Module has detected a short to ground or open in the control circuit.

Action Taken When the DTC Sets

Without UGN

- The parking assist is disabled.
- The driver information center displays "Service Park Assist".

With UGN

- The driver assist system is disabled.
- The driver information center displays "Service Driver Assist".

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

[Parking Assist Description and Operation \(with UD7\)](#) [Parking Assist Description and Operation \(with UD5\)](#) [Parking Assist Description and Operation \(with Parallel Parking or Automatic Parking Assist\)](#)

Electrical Information Reference

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

Scan Tool Reference

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

[Circuit/System Verification](#)

1. Ignition ON.
2. Verify the scan tool Park Assist Switch parameter changes between Active and Inactive when cycling the parking assist switch.
 - **If the Parking Assist Switch parameter does not change between Active and Inactive**
Refer to Parking Assist Switch Malfunction.
 - **If the Parking Assist Switch parameter changes between Active and Inactive**
3. Verify the Park Assist Switch Indicator turns ON and OFF when cycling the parking assist switch.
 - **If the indicator does not turn ON and OFF**
Refer to Parking Assist Indicator Malfunction.
 - **If the indicator turns ON and OFF**
4. All OK.

Circuit/System Testing (without UGN)

Parking Assist Switch Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 10 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON.
4. Verify the scan tool Park Assist Switch parameter is Inactive.
 - **If not Inactive**
 1. Ignition OFF, disconnect the harness connector X1 at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the signal circuit terminal 8 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K182 Parking Assist Control Module.
 - **If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 5 and ground.
6. Verify the scan tool Park Assist Switch parameter is Active.
 - **If not Active**
 1. Ignition OFF, disconnect the harness connector at the K182 Parking Assist Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K182 Parking Assist Control Module.
 - **If Active**
7. Test or replace the S48C Multifunction Switch 1 - Instrument Panel.

Parking Assist Switch Indicator Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON.

NOTE: **Verify interior dimming is set to full bright**

2. Test for 11 V or greater between the control circuit terminal 7 and ground.
 - **If the voltage is under 11 V and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - **If the voltage is under 11 V and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K182 Parking Assist Control Module.
 - **If the test voltage 11 V or greater**
3. Connect a test lamp between B+ and the control circuit terminal 7.
4. Verify the test lamp turns ON and OFF when commanding the Parking Assist Switch Indicator ON and OFF with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the harness connector at the K182 Parking Assist Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1V
 3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω replace the K182 Parking Assist Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the harness connector at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K182 Parking Assist Control Module.
 - **If the test lamp turns ON and OFF**
5. Test or replace the S48C Multifunction Switch 1 - Instrument Panel.

Circuit/System Testing (with UGN)

Parking Assist Switch Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 10 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**

3. Ignition ON.

4. Verify the scan tool Park Assist Switch parameter is Inactive.

- **If not Inactive**

1. Ignition OFF, disconnect the harness connector X1 at the K124 Active Safety Control Module.

2. Test for infinite resistance between the signal circuit terminal 11 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K124 Active Safety Control Module.

- **If Inactive**

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

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

- **If not Active**

1. Ignition OFF, disconnect the harness connector at the K124 Active Safety Control Module, ignition ON.

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

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

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

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

- **If Active**

7. Test or replace the S48C Multifunction Switch 1 - Instrument Panel.

Parking Assist Switch Indicator Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON, interior dimming set to full bright.

NOTE: Verify interior dimming is set to full bright

2. Verify a test lamp illuminates between the control circuit terminal 7 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 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 control circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K124 Active Safety Control Module.

- **If the test lamp illuminates**

3. Connect a test lamp between B+ and the control circuit terminal 7.

4. Verify the test lamp turns ON and OFF when commanding the Parking Assist Switch Indicator ON and OFF with a scan tool.

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

1. Ignition OFF, disconnect the harness connector at the K124 Active Safety Control Module, ignition ON.

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

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

3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω replace the K124 Active Safety Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the harness connector at the K124 Active Safety Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K124 Active Safety Control Module.
 - **If the test lamp turns ON and OFF**
 5. Test or replace the S48C Multifunction Switch 1 - Instrument Panel.

Repair Instructions

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

- [Parking Assist Alarm Disable Switch Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

DTC B096B: PARKING ASSIST SWITCH PARALLEL PARKING CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC B096B 02

Parking Assist Switch Parallel Parking Circuit Short to Ground

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Parallel Park Assist Switch Signal	B096B 02	1	-	-
Parallel Parking Assist Switch Ground	-	1	-	-
1. Parallel Parking Assist Switch Malfunction				

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

The Parking Assist Control Module has detected a short to ground.

Action Taken When the DTC Sets

- The parallel parking assist is disabled.

- A message is displayed in the driver information center that parking assist is not available.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7) Parking Assist Description and Operation (with UD5) Parking Assist Description and Operation (with Parallel Parking or Automatic Parking Assist)

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. Activate and deactivate the parallel park assist switch and verify the scan tool Advanced Park Assist Switch parameter changes between Active and Inactive.
 - **If the parameter does not change between Active and Inactive**
Refer to Circuit/System Testing.
 - **If the parameter change between Active and Inactive**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S107 Parking Assist On/Off Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 10 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON.
4. Verify the scan tool parallel park assist switch parameter is Inactive.
 - **If not Inactive**

1. Ignition OFF, disconnect the X1 harness connector at the K182 Parking Assist Control Module.
2. Test for infinite resistance between the signal circuit terminal 10 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K182 Parking Assist Control Module.
- **If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 6 and the ground circuit terminal 10.
6. Verify the scan tool parallel parking assist parameter is Active.
 - **If not Active**
 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K182 Parking Assist Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K182 Parking Assist Control Module.
 - **If Active**
7. Test or replace the S107 Parking Assist On/Off Switch.

Repair Instructions

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

- [Parking Assist Alarm Disable Switch Replacement](#)
- [Control Module References](#) for control module replacement, setup and programming.

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

Diagnostic Instructions

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

DTC Descriptors

DTC B096C

Parking Assist Side Sensor Left Front Circuit

DTC B096D

Parking Assist Side Sensor Right Front Circuit

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

Diagnostic Fault Information

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

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12V Reference	B1405 02	B0954 04, B0955 04, B0956 04, B0957 04, B0958 04, B0959 04, B0960 04, B0961 04, B096C 04, B096D 04, B1405 03	B0954 01, B0955 01, B0956 01, B0957 01, B0958 01, B0959 01, B0960 01, B0961 01, B096C 01, B096D 01, B1405 07	-
Left Side Object Sensor Signal	B096C 02	B096C 04	B096C 01	B096C08, B096C18, B096 22
Right Side Object Sensor Signal	B096D 02	B096D 04	B096D 01	B096D08, B096D18, B096D 22
Low Reference	-	B0954 04, B0955 04, B0956 04, B0957 04, B0958 04, B0959 04, B0960 04, B0961 04, B096C 04, B096D 04	-	-

Circuit/System Description

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

Conditions for Running the DTC

- Ignition ON
- The parallel parking assist is activated. The activation takes place through operating the parallel parking assist switch.

Conditions for Setting the DTC

B096C 01 or B096D 01

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

B096C 02 or B096D 02

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

B096C 04 or B096D 04

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

B096C 08 or B096D 08

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

B096C 18 or B096D 18

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

B096C 22 or B096D 22

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

B096C 3A or B096D 3A

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

B096C 3B or B096D 3B

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7) **Parking Assist Description and Operation (with UD5)** **Parking Assist Description and Operation (with Parallel Parking or Automatic Parking Assist)**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC B1405 is not present.
 - **If the DTC is set**
Refer to **DTC B1405 (with UD5)** and/or **DTC B1405 (with UD7)**.
 - **If the DTC does not set**
3. Verify that DTC B096C 3A, B096C 3B, B096D 3A or B096D 3B is not set.
 - **If the DTC is set**
Replace the appropriate sensor.
 - **If the DTC does not set**
4. Verify that DTC B096C 22 or B096D 22 is not present.
 - **If the DTC is set**

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

- **If the DTC does not set**

5. Verify that DTC B096C or B096D is not set.

- **If the DTC is set**

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

- **If the DTC does not set**

6. All OK.

Circuit/System Testing

1. Ignition OFF for 30 s, disconnect the harness connector at the appropriate B94 Side Object Sensor.

2. Test for less than 10 Ω between the low reference circuit terminal 3 and ground.

- **If 10 Ω or greater**

1. Ignition OFF, disconnect the harness connector at the K41 Front and Rear Parking Assist Control Module.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K41 Front and Rear Parking Assist Control Module.

- **If less than 10 Ω**

3. Ignition ON, engine running.

4. Test for 11.5-13.5 V between the 12 V reference circuit terminal 1 and ground.

- **If less than 11.5 V**

1. Ignition OFF, disconnect the harness connector at the K41 Front and Rear Parking Assist Control Module.

2. Test for infinite resistance between the 12 V reference circuit and ground.

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

3. Test for less than 2 Ω in the 12 V reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K41 Parking Assist Control Module.

- **If greater than 13.5 V**

1. Ignition OFF, disconnect the harness connector at the K41 Parking Assist Control Module, ignition ON.

2. Test for less than 1 V between the 12 V reference circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K41 Front and Rear Parking Assist Control Module.

- **If between 11.5-13.5 V**

5. Test for 11.5-13.5 V between the signal circuit terminal 2 and ground.

- **If less than 11.5 V**

1. Ignition OFF, disconnect the harness connector at the K41 Front and Rear Parking Assist Control Module.

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

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K41 Front and Rear Parking Assist Control Module.

- **If greater than 13.5 V**

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

- **If between 11.5-13.5 V**

6. Test or replace the appropriate B94 Side Object Sensor.

Repair Instructions

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

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

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

Diagnostic Instructions

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

DTC Descriptors

DTC B0987

Vehicle Direction Camera Indicator Circuit

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

B0987 01

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

B0987 06

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

Action Taken When the DTC Sets

- Lane departure warning and forward collision alert features are disabled

- The driver information center may display a system service message.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning Description and Operation (without UGN) **Lane Departure Warning Description and Operation (UGN)**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the lane departure warning indicator turns ON and OFF when turning the lane departure warning system on and off with the lane departure warning switch.
 - **If the indicator does not turn ON and OFF**
Refer to Circuit/System Testing.
 - **If the indicator turns ON and OFF**
3. All OK.

Circuit/System Testing

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

1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
2. Test for infinite resistance between the S48D Multifunction Switch 2 - Instrument Panel control circuit terminal 9 and ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance, replace the S48D Multifunction Switch 2 - Instrument Panel.
- **If the lane departure warning switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 4 and ground.
6. Verify the lane departure warning switch indicator is illuminated.
 - **If the lane departure warning switch indicator is not illuminated**
 - 1. Ignition OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel.
 - 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 - 3. Ignition OFF.
 - 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the S48D Multifunction Switch 2 - Instrument Panel.
 - **If the lane departure warning switch indicator is illuminated**
7. Replace the B174W Frontview Camera - Windshield.

Repair Instructions

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

- [Instrument Panel Upper Trim Panel Bracket Replacement](#) for multifunction switch 2 - instrument panel replacement
- [Control Module References](#) for frontview camera module replacement, programming and setup.

DTC B0987: VEHICLE DIRECTION CAMERA INDICATOR CIRCUIT (UGN)

Diagnostic Instructions

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

DTC Descriptors

DTC B0987

Vehicle Direction Camera Indicator Circuit

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Lane Departure Warning Description and Operation (without UGN) Lane Departure Warning Description and Operation (UGN)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

Refer to Circuit/System Testing.
 - **If the indicator turns ON and OFF**
3. All OK.

Circuit/System Testing

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

Repair Instructions

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

- [Instrument Panel Upper Trim Panel Bracket Replacement](#) for multifunction switch 2 - instrument panel replacement
- [Control Module References](#) for active safety control module replacement, programming and setup.

DTC B1008: CALIBRATION DATA NOT PROGRAMMED

Diagnostic Instructions

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

DTC Descriptor

DTC B1008

Calibration Data Not Programmed

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

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing

- The DTC will transition to history when the fault is no longer present.
- A history DTC will clear after 50 malfunction-free ignition cycles.

Diagnostic Aids

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

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

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.

NOTE: Do not diagnose this DTC if set in history

2. Verify that DTC B101E 42 is not set.

- If DTC is set

Perform the [Front View Camera Module Programming and Setup](#) procedure.

- If the DTC is not set

3. Perform the [Vehicle Yaw Sensor Learn](#) procedure.

4. Verify that DTC B1008 is not set.

- If DTC is set

1. Calibrate the front camera module. Refer to [Front View Camera Module Learn \(-HP9\)](#) and/or [Front View Camera Module Learn \(HP9\)](#).

2. Verify the DTC does not set.

- If the DTC sets, replace the B174W Frontview Camera - Windshield.
- If the DTC does not set

3. All OK.

- If the DTC is not set

5. All OK.

Repair Instructions

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

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

DTC B1011: SYSTEM DISABLED INFORMATION STORED MALFUNCTION

Diagnostic Instructions

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

DTC Descriptor

DTC B1011 00

System Disabled Information Stored Malfunction

Circuit/System Description

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

Conditions for Running the DTC

- Ignition ON
- Frontview camera enabled

Conditions for Setting the DTC

The frontview camera module detects a malfunction.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Diagnostic Aids

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

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

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

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Lane Departure Warning Description and Operation (without UGN) Lane Departure Warning Description and Operation (UGN)

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.

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

2. Verify no other DTC is set except for DTC B1011.

- If any other DTCs are set

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

- If no other DTCs are set

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

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

Repair Instructions

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

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

DTC B1015: VEHICLE IDENTIFICATION NUMBER INFORMATION

Diagnostic Instructions

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

DTC Descriptor

DTC B1015

Vehicle Identification Number Information

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

Circuit/System Description

When the ignition is turned ON, the control module receives the vehicle identification number (VIN) from the body control module (BCM). The control module will compare the VIN received to the VIN stored in memory.

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

- The stored VIN does not match the received VIN.
- No VIN received
- No VIN received in allotted time

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The stored VIN matches the VIN stored in the BCM.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

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

Repair Instructions

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

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

DTC B1024: CIRCUIT BOARD TEMPERATURE SENSOR

Diagnostic Instructions

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

DTC Descriptor

DTC B1024 54

Circuit Board Temperature Sensor Above Maximum Threshold

Circuit/System Description

The Night Vision Camera Control Module monitors the internal circuitry for excessive temperature. When a temperature outside of the range is detected, the module sets the DTC and limits its operation to avoid damage.

Conditions for Running the DTC

- Ignition is ON or in the ACC position
- The system voltage is 9-16 V
- The test is run once per second when the infotainment system is operating

Conditions for Setting the DTC

B1024 53

The module senses an internal temperature less than -40°C (-40°F).

B1024 54

The module senses an internal temperature greater than 80°C (176°F).

Action Taken When the DTC Sets

- The Night Vision Camera Control Module sets the DTC.
- A message is displayed indicating that the system performance is being impacted by the excessive temperature condition.
- The Night Vision Camera Control Module will have limited or no functionality.
- Components or other subsystems that interface with the night vision system may have limited or no functionality.

Conditions for Clearing the DTC

- The internal temperature is between -40°F (-40°C) and 80°C (176°F).
- A history DTC will clear once 100 consecutive malfunction-free ignition cycles have occurred.

Diagnostic Aids

Under certain conditions it may be normal for this DTC to set to prevent permanent damage to the module.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Description and Operation

Night Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE: **Allow the vehicle cabin to cool if the temperature inside the vehicle is excessive before proceeding with this diagnostic procedure.**

1. Verify the DTC sets outside of the Conditions for Running and Setting. Since most occurrences of this DTC are caused by extreme vehicle cabin temperatures due to ambient conditions, review with the customer the conditions under which the DTC set.

- **If the DTC sets within the Conditions for Running and Setting.**

The system is operating as designed, All OK.

- **If the DTC sets outside the Conditions for Running and Setting.**

2. Using the scan tool, clear the DTC.

3. Verify the DTC does not set while operating the infotainment system under the conditions the customer experienced the concern.

- **If the DTC sets**

Replace the K172 Night Vision Camera Control Module

- **If the DTC does not set**

4. All OK.

Repair Instructions

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

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

DTC B101D: ELECTRONIC CONTROL UNIT HARDWARE (WITH SIDE OBJECT DETECTION, EXCEPT NORTH AMERICA)

Diagnostic Instructions

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

DTC Descriptor

DTC B101D

Electronic Control Unit Hardware

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

Circuit/System Description

The side detection system uses two modules B218L Side Object Sensor Module - Left and B218R Side Object Sensor Module - Right. The left module is the master and is on the vehicle's serial data bus and communicates to the right module on a private bus. The internal fault detection is handled inside the B218L Side Object Sensor Module - Left. No external circuit diagnosis is involved.

Conditions for Running the DTC

The B218L Side Object Sensor Module - Left is awake and communicating.

Conditions for Setting the DTC

The B218L Side Object Sensor Module - Left has detected an internal malfunction.

Action Taken When the DTC Sets

- The side object sensor system is disabled.
- The driver information center displays SERVICE SIDE DETECTION SYSTEM

Conditions for Clearing the DTC

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

Diagnostic Aids

- This DTC may be stored as a history DTC without affecting the operation of the B218L Side Object Sensor Module - Left.
- Do not replace B218L Side Object Sensor Module - Left based only on DTC B101D being set in history.
- If DTC B101D is set as current, replace the B218L Side Object Sensor Module - Left.
- Since the left module is the master, if it is replaced, there still may be a problem with the right side as the module may have been unable to report it. Once the left module is replaced, check DTCs and verify operation of the system to assure proper functionality.

Reference Information

Schematic Reference

- [Data Communication Schematics](#)
- [Control Module References](#)

Connector End View Reference

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Data Link Communications Description and Operation

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B101D is not set.
 - **If DTC B101D is set**
 1. Replace the B218L Side Object Sensor Module - Left.
 2. Verify no new DTCs set and side object system operates properly.
 - If there are new DTCs, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) or if the system does not operate properly, refer to [Symptoms - Object Detection](#).
 - If there are no new DTCs and the side object system operates properly
 - **If DTC B101D is not set**
3. All OK

Repair Instructions

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

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

DTC B101D: ELECTRONIC CONTROL UNIT HARDWARE (WITH PEDESTRIAN DETECTION, B3T)

Diagnostic Instructions

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

DTC Descriptor

DTC B101D

Electronic Control Unit Hardware

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

Circuit/System Description

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

Conditions for Running the DTC

- The device runs the program to detect an internal fault when power up is commanded. The only requirements are voltage and ground. This program runs even if the voltage is out of the valid operating range.
- The keyless entry control module will set this DTC with symptom byte 39 when the keyless entry control module antenna is activated.

Conditions for Setting the DTC

The device has detected an internal malfunction.

Action Taken When the DTC Sets

The device refuses all additional inputs.

Conditions for Clearing the DTC

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

Diagnostic Aids

- This DTC may be stored as a history DTC without affecting the operation of the device.
- Do not replace the pedestrian impact detection module based only on DTC B101D being set in history.
- If DTC B101D is set as current, replace the appropriate device.

Reference Information

Schematic Reference

- [Data Communication Schematics](#)
- [Control Module References](#)

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B101D is not set.
 - **If DTC B101D is set**
Replace the K36 Inflatable Restraint and Sensing Diagnostic Module.
 - **If DTC B101D is not set**
3. All OK

Repair Instructions

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

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

DTC B101E: ELECTRONIC CONTROL UNIT SOFTWARE (K36 INFLATABLE RESTRAINT SENSING AND DIAGNOSTIC MODULE)

Diagnostic Instructions

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

DTC Descriptor

DTC B101E

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

Circuit/System Description

Some devices must be configured with specific software, serial numbers, vehicle options or other information. If a device was not properly configured after installation that module may set DTC B101E. The symptom byte information is for engineering reference only. No external circuit diagnosis is involved.

Conditions for Running the DTC

Battery voltage is between 9-16 V and data link communications operate normally.

Conditions for Setting the DTC

The device is not configured properly.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

- [Data Communication Schematics](#)
- [Control Module References](#)

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B101E is not set.

- **If DTC B101E is set**

Replace the K42 Pedestrian Impact Detection Module.

- **If DTC B101E is not set**

3. All OK

Repair Instructions

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

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

DTC B101E: ELECTRONIC CONTROL UNIT SOFTWARE (K172 NIGHT VISION CAMERA CONTROL MODULE)

Diagnostic Instructions

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

DTC Descriptor

DTC B101E

Electronic Control Unit Software

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

Circuit/System Description

Some devices must be configured with specific software, serial numbers, vehicle options or other information. If a device was not properly configured after installation that module may set DTC B101E. The symptom byte information is for engineering reference only. No external circuit diagnosis is involved.

Conditions for Running the DTC

Battery voltage is between 9-16 V and data link communications operate normally.

Conditions for Setting the DTC

The device is not configured properly.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

- [Data Communication Schematics](#)
- [Control Module References](#)

Connector End View Reference

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- [Wiring Repairs](#)

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

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B101E 4B is not set.

- **If DTC B101E 4B is set**

Perform [Night Vision Camera Control Module Learn](#) .

- **If DTC B101E 4B is not set**

3. Verify DTC B101E is not set.

- **If DTC B101E is set**

Program the K172 Night Vision Camera Control Module. Refer to [Night Vision Camera Control Module Learn](#) .

- **If DTC B101E is not set**

4. All OK

Repair Instructions

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

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

DTC B124B: UNIVERSAL SERIAL BUS (USB) 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B124B 01

Universal Serial Bus (USB) Circuit - Short to Battery

DTC B124B 02

Universal Serial Bus (USB) Circuit - Short to Ground

DTC B124B 04

Universal Serial Bus (USB) Circuit - Open Circuit

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

Circuit/System Description

The video processing control module system has a memory card receptacle located in the trunk. The memory card receptacle interfaces with the video processing control module via a USB cable. The memory card receptacle also receives fused battery voltage and ground from the video processing control module. The video processing control module uses the memory card as a mass storage device, similar to a USB storage device.

Conditions for Running the DTC

- Ignition Switch in RUN position.

- System voltage is greater than 9 V and less than 16 V.

Conditions for Setting the DTC

B124B 0B

The video processing control module detects an excessive current condition on the USB 5 V circuit.

Action Taken When the DTC Sets

The memory card receptacle is inoperative while the DTC is current.

Conditions for Clearing the DTC

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

Diagnostic Aids

- This DTC may be set due to the connection of an incompatible or faulty USB device.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Surround Vision Camera Description and Operation

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- [Connector Repairs](#)
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- [Wiring Repairs](#)

Scan Tool Reference

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

Special Tools

EL-50334-50 GM Infotainment Tester Kit

Circuit/System Testing

1. Ignition OFF, disconnect the X1 harness connector at the X20 Memory Card Receptacle.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Verify that a test lamp illuminates between the B+ circuit terminal 6 and ground.
 - **If the test lamp does not illuminate**

1. Ignition OFF, remove the test lamp.
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 the test lamp illuminates**
4. Verify the USB cable is properly connected at all components and in-line connections and there is no damage to the cable or connections.
 - **If connection problems or cable damage is noted.**

Perform the appropriate repair or replacement to correct any issues.
 - **If no connection problems or cable damage is noted.**
5. Connect the **EL-50334-50** to the memory card receptacle connector X2 and the K157 Video Processing Control Module connector X3.
6. Ignition ON, surround vision or curb view system ON.
7. Verify the memory card receptacle operates properly while operating the surround vision or curb view system.
 - **If memory card receptacle does not operate properly**
 1. Replace the X20 Memory Card Receptacle.
 2. Verify the memory card receptacle operates properly while operating the surround vision or curb view system.
 - **If memory card receptacle does not operate properly**

Replace the K157 Video Processing Control Module.
 - **If memory card receptacle operates properly**

All OK
 - **If memory card receptacle operates properly**
8. Replace the USB harness.

Repair Instructions

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

- [Card Reader Receptacle Replacement - Video](#)
- [Control Module References](#) for control module replacement, programming and setup.

DTC B127B: REARVIEW CAMERA INPUT SIGNAL CIRCUIT MISSING REFERENCE (UVC)

Diagnostic Instructions

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

DTC Descriptors

DTC B127B 2B

Rearview Camera Input Signal Circuit Missing Reference

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	B127B 2B, 1	B127B 2B, 1	-	-
Backup Signal	B127B 2B, 1	B127B 2B, 1	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Camera Module signal (+)	B127B 2B, 3	B127B 2B, 1	B127B 2B, 2	-
Camera Module signal (-)	B127B 2B, 3	B127B 2B, 1	B127B 2B, 1	-
Ground	-	B127B 2B, 1	-	-
Shield	-	3	-	-
1. Rear Vision Camera Inoperative 2. Rear Vision Camera Image Always Displayed 3. Poor Quality Image				

Circuit/System Description

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

Conditions for Running the DTC

- Engine running
- Transmission in R

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Diagnostic Aids

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

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Verification

1. Engine running, transmission in R.
2. Verify a clear rear vision image is displayed on the P17 Info Display Module.
 - **If a clear image is not displayed**

Refer to Circuit/System Testing.
 - **If a clear image is displayed**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B87 Rearview Camera. It may take up to 2 min for all vehicle systems to power down.

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

2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. Refer to [Power Mode Mismatch \(Without HP9\)](#) and/or [Power Mode Mismatch \(With HP9\)](#).
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the B87 Rearview Camera.
 - **If the test lamp illuminates**
5. Engine running, park brake applied, transmission in R.

6. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
- **If the test lamp does not illuminate**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is good and there is voltage at the fuse. Refer to [Backup Lamps Malfunction](#).
 - **If the test lamp illuminates**
7. Ignition OFF, disconnect the X2 harness connector at the K74 Human Machine Interface Control Module, ignition ON.
8. Test for less than 1 V between the signal circuit terminals listed below and ground:
- K74 Human Machine Interface Control Module signal (+) circuit terminal 5 X2
 - K74 Human Machine Interface Control Module signal (-) circuit terminal 6 X2
 - **If 1 V or greater**

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

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

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

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

Replace the K74 Human Machine Interface Control Module.
 - **If a clear rear vision image is displayed**
15. All OK.

Repair Instructions

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

- [Rearview Driver Information Camera Replacement \(Without UVH\)](#) [Rearview Driver Information Camera Replacement \(With UVH\)](#) [Rearview Driver Information Camera Replacement \(With DRZ\)](#)

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

DTC B127B: REARVIEW CAMERA INPUT SIGNAL CIRCUIT (UVH)

Diagnostic Instructions

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

DTC Descriptors

B127B

Rearview Camera Input Signal 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
Video Processing Control Module B+	B127B 2B, 1	B127B2B, 1	-	-
Video Processing Control Module Serial Data	U0078, U0140, U0151, U0155, U0184, 1	B127B 2B, 1	U0078, U0140, U0151, U0155, U0184, 1	-
Video Processing Control Module signal +	B127B 2B, 3	B127B 2B, 1	B127B 2B, 2	-
Video Processing Control Module signal -	B127B 2B, 3	B127B 2B, 1	B127B 2B, 1	-
Video Processing Control Module Ground	-	B127B2B, 1	-	-
Shield	-	3	-	-
1. Video Processing Control Module inoperative 2. Video Processing Control Module image always displayed 3. Poor Quality Image				

Circuit/System Description

When the engine running and the transmission is placed into R, a serial data message is sent to the Human Machine Interface Control Module and to the Video Processing Control Module indicating that camera operation is requested. Battery voltage, serial data and ground are supplied to the video processing control module and receives inputs from cameras attached to it. The Video Processing Control Module sends video information to the Human Machine Interface Control Module through a video signal + and a video signal - circuit. A grounded shielding also wraps the video signal circuits to reduce electronic interference which may degrade the video signal and cause a distorted or otherwise degraded image.

Conditions for Running the DTC

- Engine running
- Transmission in R

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Diagnostic Aids

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

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Verification

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

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

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

Refer to Circuit/System Testing.

- **If a clear image is displayed**

3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X2 harness connector at the K157 Video Processing Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 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.
4. Verify a test lamp illuminates between the ignition circuit terminal 1 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. Refer to **Power Mode Mismatch (Without HP9)** **Power Mode Mismatch (With HP9)** .
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K157 Video Processing Control Module.
 - **If the test lamp illuminates**
5. Test for 1-4.5 V between the serial data circuit terminal 3 and ground.
 - **If less than 1 V or greater than 4.5 V**

Refer to **Scan Tool Does Not Communicate with Low Speed GMLAN Device**
 - **If between 1-4.5 V**
6. Ignition OFF, disconnect the X2 harness connector at the K74 Human Machine Interface Control Module, ignition ON.
7. Test for less than 1 V between the signal circuit terminals listed below and ground:
 - K74 Human Machine Interface Control Module signal (+) circuit terminal 5 X2
 - K74 Human Machine Interface Control Module signal (-) circuit terminal 6 X2
 - **If 1 V or greater**

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

Repair the short to ground on the circuit.
 - **If infinite resistance**
9. Test for less than 2 Ω between the K74 Human Machine Interface Control Module signal (+) circuit terminal 5 X2 and the K157 Video Processing Control Module signal (+) circuit terminal 6 X2.
 - **If 2 Ω or greater**

Repair the open/high resistance on the circuit.

- **If less than 2 Ω**

10. Test for less than 2 Ω between the K74 Human Machine Interface Control Module signal (-) circuit terminal 6 X2 and the K157 Video Processing Control Module signal (-) circuit terminal 12 X2.

- **If 2 Ω or greater**

Repair the open/high resistance on the circuit.

- **If less than 2 Ω**

11. Replace the K157 Video Processing Control Module.

12. Engine running, transmission in R,

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

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

Replace the K74 Human Machine Interface Control Module.

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

14. All OK.

Repair Instructions

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

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

DTC B133A: NIGHT VISION CAMERA CALCULATED VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC B133A 00

Night Vision Camera Calculated Voltage - System Voltage Not Plausible

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

Circuit/System Description

The Night Vision Control Module performs fault detection on itself and the camera attached to it. The camera is attached to the Night Vision Control Module via a USB type cable. All of the video signals, communication signals, as well as the power and ground are provided by the USB cable.

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B133A 00

The Night Vision Control Module has determined supply voltage seen by camera differs from supply voltage measured by Night Vision Control Module by more than 2 V

Action Taken When the DTC Sets

- The Night Vision Control Module requests the instrument cluster to display "Service Night Vision System".
- The Night Vision Control Module will disable the Night Vision Camera System.

Conditions for Clearing the DTC

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

Diagnostic Aids

Poor or incomplete connections are the most common cause of this DTC. Verify all of the USB connections, including inlines, are seated properly. A common poor connection is at the Instrument Cluster.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Night Vision Camera Description and Operation

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- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B133A 00 is not set.
 - **If DTC is set**
 1. Physically cycle each connection of the B276 Night Vision Camera cables between the camera and module.
 2. Verify DTC B133A 00 is set after cycling the cable connections.
 - If the DTC does not set
All OK.
 - If the DTC sets after cycling the cable connections
3. Replace the K172 Night Vision Control Module to B276 Night Vision Camera cables between the camera and module.
4. Verify DTC B133A 00 is set after replacing the cables.
 - If the DTC does not set
All OK.
 - If the DTC sets after replacing the cables
5. Replace the B276 Night Vision Camera
6. Verify DTC B133A 00 is set after replacing the B276 Night Vision Camera.

- If the DTC does not set

All OK.

- If the DTC is set

7. Replace the K172 Night Vision Control Module.

- **If the DTC is not set**

3. All OK.

Repair Instructions

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

- [Night Vision Camera Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

DTC B1405: CONTROL MODULE VOLTAGE REFERENCE OUTPUT 2 CIRCUIT (WITH UD5)

Diagnostic Instructions

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

DTC Descriptors

DTC B1405

Control Module Voltage Reference Output 2 Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
8 V Reference	B1405 02	B0954 04, B0955 04, B0966 04, B0967 04, B0958 04, B0959 04, B0960 04, B0961 04	-	-

Circuit/System Description

The object sensors are 3-wire ultrasonic sensors that are used to determine the distance between the vehicle and an object. The parking assist control module supplies 8 V to the object sensors via the 8 V reference circuit and provides ground via the low reference circuit. The front and rear parking assist control module triggers the sensors in a sequential loop. After each sensor transmits, the front and rear parking assist control module uses the sensor echo received through the signal circuit to calculate the distance and position of an object.

Conditions for Running the DTC

Ignition ON

Conditions for Setting the DTC

B1405 02

The parking assist control module has detected the 8 V reference circuit is shorted to ground.

B1405 03

The parking assist control module has detected the 8 V reference circuit is less than 7.2 V.

B1405 07

The parking assist control module has detected the 8 V reference circuit is greater than 9.2 V.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7) **Parking Assist Description and Operation (with UD5)** **Parking Assist Description and Operation (with Parallel Parking or Automatic Parking Assist)**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the X2 and X3 harness connectors at the K182 Parking Assist Control Module.
2. Test for infinite resistance between the 8 V reference circuit terminal 4 X2 and ground.
 - **If less than infinite resistance**
 1. Ignition OFF, disconnect the harness connector at each of the B78 Rear Object Sensors.
 2. Test for infinite resistance between the 8 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If less than 2 Ω , replace the appropriate B78 Rear Object Sensor.
 - **If infinite resistance**
3. Test for infinite resistance between the 8 V reference circuit terminal 1 X3 and ground.
 - **If less than infinite resistance**
 1. Ignition OFF, disconnect the harness connector at each of the B78 Front Object Sensors.
 2. Test for infinite resistance between the 8 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If less than 2 Ω , replace the appropriate B78 Front Object Sensor.

- **If infinite resistance**
4. Ignition ON.
 5. Test for less than 1 V between the 8 V reference circuit terminal 4 X2 and ground.
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at each of the B78 Rear Object Sensors.
 2. Test for less than 1 V between the 8 V reference circuit and ground.
 - If greater than 1 V, repair the short to voltage on the circuit.
 - If less than 1 V, replace the appropriate B78 Front Object Sensor.
 - **If less than 1 V**
 6. Test for less than 1 V between the 8 V reference circuit terminal 1 X3 and ground.
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at each of the B78 Front Object Sensors.
 2. Test for less than 1 V between the 8 V reference circuit and ground.
 - If greater than 1 V, repair the short to voltage on the circuit.
 - If less than 1 V, replace the appropriate B78 Front Object Sensor.
 - **If less than 1 V**
 7. Connect the X2 and X3 harness connector at the K182 Parking Assist Control Module, ignition ON.
 8. Verify DTC B1405 is not set.
 - **If DTC B1405 is set**
 1. Ignition OFF, disconnect the harness connector at each of the B78 Object Sensors.
 2. Verify DTC B1405 is not set.
 - If DTC B1405 is set

Replace the K182 Parking Assist Control Module.
 - If DTC B1405 is not set.
 - 3. Verify the DTC B1405 does not set while connecting the harness connector at each B78 Object Sensor, one at a time.
 - If DTC B1405 does set

Replace the B78 Object Sensor that was connected immediately before DTC B1405.
 - If DTC B1405 does not set.
 4. All OK.
 - **If DTC B1405 is not set.**
 9. All OK.

Repair Instructions

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

- [Parking Assist Alarm Sensor Ring Replacement \(Front\)](#) [Parking Assist Alarm Sensor Ring Replacement \(Rear\)](#)
- [Control Module References](#) for control module replacement, programming and setup.

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

Diagnostic Instructions

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

DTC Descriptors

DTC B1405

Control Module Voltage Reference Output 2 Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
8 V Reference	B1405 02	B0958 04, B0959 04, B0960 04, B0961 04	-	-

Circuit/System Description

The object sensors are 3-wire ultrasonic sensors that are used to determine the distance between the vehicle and an object. The front and rear parking assist control module supplies 8 V to the object sensors via the 8 V reference circuit and provides ground via the low reference circuit. The front and rear parking assist control module triggers the sensors in a sequential loop. After each sensor transmits, the front and rear parking assist control module uses the sensor echo received through the signal circuit to calculate the distance and position of an object.

Conditions for Running the DTC

Ignition ON

Conditions for Setting the DTC

B1405 02

The front and rear parking assist control module has detected the 8 V reference circuit is shorted to ground.

B1405 03

The front and rear parking assist control module has detected the 8 V reference circuit is less than 7.2 V.

B1405 07

The front and rear parking assist control module has detected the 8 V reference circuit is greater than 9.2 V.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7) Parking Assist Description and Operation (with UD5) Parking Assist Description and Operation (with Parallel Parking or Automatic Parking Assist)

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Testing

1. Ignition OFF, disconnect the X2 harness connector at the K182 Parking Assist Control Module.
2. Test for infinite resistance between the 8 V reference circuit terminal 4 and ground.
 - **If less than infinite resistance**
 1. Ignition OFF, disconnect the harness connector at each of the B78 Rear Object Sensors.
 2. Test for infinite resistance between the 8 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If less than 2 Ω , replace the appropriate B78 Rear Object Sensor.
 - **If infinite resistance**
3. Connect the X2 harness connector at the K182 Parking Assist Control Module, ignition ON.
4. Verify DTC B1405 is not set.
 - **If DTC B1405 is set.**
 1. Ignition OFF, disconnect the harness connector at each of the B78 Rear Object Sensors.
 2. Verify DTC B1405 is not set.
 - If DTC B1405 is set.

Replace the K182 Parking Assist Control Module.
 - If DTC B1405 is not set.
3. Verify DTC B1405 is not set while connecting the harness connector at each B78 Rear Object Sensor, one at a time.
 - If DTC B1405 does set

Replace the B78 Rear Object Sensor that was connected immediately before DTC B1405 set.
 - If DTC B1405 does not set.
5. All OK.
 - **If DTC B1405 is not set.**
6. All OK.

Repair Instructions

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

- [**Parking Assist Alarm Sensor Ring Replacement \(Front\) Parking Assist Alarm Sensor Ring Replacement \(Rear\)**](#)
- [**Control Module References**](#) for control module replacement, programming and setup.

DTC B172E OR B172F: DRIVER SEAT CUSHION LEFT/RIGHT REAR HAPTIC ALERT MOTOR CONTROL 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC B172E

Driver Seat Cushion Left Rear Haptic Alert Motor Control Circuit

DTC B172F

Driver Seat Cushion Right Rear Haptic Alert Motor Control Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Haptic Alert Motor Control	B172E 02	B172E 01 or B172E 02	B172E 01	-
Left Haptic Alert Motor Ground	-	B172E 01 or B172E 02	-	-
Right Haptic Alert Motor Control	B172F 02	B172F 01 or B172F 02	B172F 01	-
Right Haptic Alert Motor Ground	-	B172F 01 or B172F 02	-	-

Circuit/System Description

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

Conditions for Running the DTC

- Engine ON.
- Haptic seat motor commanded ON.

Conditions for Setting the DTC

DTC B172E 01

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

DTC B172E 02

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

DTC B172F 01

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

DTC B172F 02

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Safety Alert Seat Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

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

Refer to Circuit/System Testing.
 - **If the motor turns ON and OFF**
4. All OK.

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

Repair the short to voltage on the circuit.

- **If less than 1 V**

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

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

- **If greater than 51 Ω**

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

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

- **If between 27-51 Ω**

5. Install a 3 A fused jumper wire between the appropriate control circuit terminal listed below and B+.
 - P45LR Seat Haptic Movement Motor - Driver Left Rear terminal 5
 - P45RR Seat Haptic Movement Motor - Driver Right Rear terminal 4
6. Verify the appropriate P45 Seat Haptic Movement Motor - Driver is active.

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

Replace the appropriate P45 Seat Haptic Movement Motor - Driver.

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

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

Replace the K40 Seat Memory Control Module.

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

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

Replace the K40 Seat Memory Control Module.

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

10. All OK.

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

- [Front Seat Lane Departure Warning Actuator Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

DTC B356A: VEHICLE DIRECTION WARNING SWITCH CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B356A

Vehicle Direction Warning Switch Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	B356A 02	1	B356A 05	-
Ground	-	1	-	-
1. Lane Departure Warning Switch Malfunction				

Circuit/System Description

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

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

DTC B356A 02

The frontview camera module has detected a short to ground for more than 10 s.

DTC B356A 05

The frontview camera module has detected a short to voltage for more than 10 s.

Action Taken When the DTC Sets

- Lane departure warning is disabled.
- The driver information center may display a service message.

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

- [Lane Departure Warning Description and Operation \(without UGN\)](#) [Lane Departure Warning Description and Operation \(UGN\)](#)
- [Forward Collision Alert Description and Operation \(with UGN\)](#) [Forward Collision Alert Description and Operation \(without UGN\)](#)

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Lane Departure Warning Switch Status parameter changes between Open and Closed when pressing and releasing the lane departure warning switch.
 - **If the parameter does not change between Active and Inactive**
Refer to Circuit/System Testing.
 - **If the parameter changes between Active and Inactive**
3. All OK.

Circuit/System Testing

Chevrolet, GMC

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

- **If Inactive**

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

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

- **If not Closed**

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

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

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

3. Ignition OFF

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the B174W Frontview Camera - Windshield.

- **If Closed**

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

Cadillac

1. Ignition ON and all vehicle systems OFF, disconnect the harness connector at the S48D Multifunction Switch 2 - Instrument Panel. It may take up to 2 min for all vehicle systems to power down.

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

- **If 10 Ω or greater**

1. Ignition OFF.

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

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

- **If less than 10 Ω**

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

- **If not Inactive**

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

2. Test for infinite resistance between the signal circuit terminal 10 and ground.

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

- **If Inactive**

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

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

- **If not Closed**

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

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

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

3. Ignition OFF

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the B174W Frontview Camera - Windshield.

- **If Closed**

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

Repair Instructions

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

- **Instrument Panel Accessory Bezel Replacement** for multifunction switch - instrument panel. replacement
- **Instrument Panel Upper Trim Panel Bracket Replacement** for multifunction switch 2 - instrument panel. replacement
- **Control Module References** for control module replacement, programming and setup.

DTC B390A: SHORT RANGE OBJECT SENSOR PERFORMANCE

Diagnostic Instructions

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

DTC Descriptor

DTC B390A

Short Range Object Sensor Performance

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

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Diagnostic Aids

- If DTC B390A 58 is set, check for anything that can interfere with the radar signal. Verify area in front of radar is clean of mud, ice, snow, etc. Also verify the fascia panels in front of the radar are damage-free and not obstructed by any add-on accessories such as emblems, stickers, etc.
- If the vehicle fascia is clean, unobstructed and damage free and B390A 58 is still set as current, the radar sensor has detected a blockage condition and will not be able to clear it until certain conditions are met. It is necessary to drive the vehicle at a speed greater than 9 km/h (6 mph) and allow the radar sensor to be exposed to other vehicles and traffic in the direction of the radar sensor field of view. Usually, a short drive in normal traffic conditions will allow the radar sensor to clear the blockage condition.
- The radar sensor modules - short range cannot be swapped from side to side once they have been installed. DTC B390A 67 may set if a radar sensor module - short range is reinstalled on the incorrect side of the vehicle.

Reference Information

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Active Safety System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B390A 08 or DTC B390A 45 is not set.
 - **If either DTC is set**
 1. Program the appropriate B233 Radar Sensor Module - Short Range.
 2. Verify DTC B390A 08 or DTC B390A 45 is not set after programming.
 - If either DTC sets after programming, replace the appropriate B233 Radar Sensor Module - Short Range.
 - If the DTC does not set
 - 3. All OK.
 - **If both DTCs are not set**
3. Verify DTC B390A 54 is not set.
 - **If the DTC is set**

Replace the appropriate B233 Radar Sensor Module - Short Range.
 - **If the DTC is not set**
4. Verify DTC B390A 58 is not set.
 - **If DTC is set**
 1. Verify the area in front of the sensor is clean, unobstructed and damage-free.
 - If not clean, unobstructed and damage-free, clean or repair as necessary.
 - If clean, unobstructed and damage-free
 2. Replace the appropriate B233 Radar Sensor Module - Short Range.
 - **If DTC is not set**
5. Verify DTC B390A 67 is not set.
 - **If the DTC is set in more than one B233 Radar Sensor Module - Short Range**
 1. Verify none of the B233 Radar Sensor Module - Short Range have not been swapped side to side.
 - If any B233 Radar Sensor Module - Short Range have been swapped, return them to their original position.
 - If none of the B233 Radar Sensor Module - Short Range have been swapped
 2. Replace the appropriate B233 Radar Sensor Module - Short Range.

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

Refer to Circuit/System Testing

- If the DTC is not set

6. All OK.

Repair Instructions

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

[Control Module References](#) for radar sensor module - short range replacement, programming and setup.

DTC B390C: LONG RANGE RADAR SENSOR MODULE

Diagnostic Instructions

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

DTC Descriptor

DTC B390C

Long Range Radar Sensor Module

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The radar sensor module - long range is successfully aligned.

Diagnostic Aids

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

Reference Information

Schematic Reference

[Object Detection Schematics](#)

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Active Safety System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B390C is not set
 - **If the DTC is set**
 1. Perform the **Radar Sensor Module - Long Range Learn** procedure.
 2. Verify DTC B390C is not set after the calibration procedure has been completed.
 - If the DTC is set after calibration, replace the B233B Radar Sensor Module - Long Range.
 - If the DTC is not set after calibration
 - 3. All OK.
 - **If DTC B390C 66 is not set**
3. All OK.

Repair Instructions

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

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

DTC B390D: FRONTVIEW CAMERA MODULE

Diagnostic Instructions

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

DTC Descriptor

DTC B390D

Frontview Camera Module

Circuit/System Description

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

Conditions for Running the DTC

Vehicle operating on the road.

Conditions for Setting the DTC

The frontview camera module is improperly mounted.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The frontview camera module is successfully aligned.

Diagnostic Aids

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Active Safety System Description and Operation

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 there are no DTCs set, except for DTC B390D.

- **If any other DTCs are set**

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

- **If no other DTCs are set**

3. Calibrate the B174W Frontview Camera - Windshield. Refer to [Front View Camera Module Learn \(-HP9\)](#) and/or [Front View Camera Module Learn \(HP9\)](#) .

NOTE: Before performing the calibration, verify that the B174W Frontview Camera - Windshield will not have difficulty seeing lane markings in front of the vehicle. If the view of the B174W Frontview Camera - Windshield is blocked with mud, dirt, snow, ice or slush, if the windshield is damaged or if weather limits visibility, such as while

driving in fog, rain or snow conditions, the calibration procedure may not be able to be completed.

4. Verify DTC B390D is not set

- **If DTC B390D is set**

Replace the B174W Frontview Camera - Windshield.

- **If DTC B390D is not set**

5. All OK.

Repair Instructions

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

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

DTC B390F: FRONTVIEW CAMERA

Diagnostic Instructions

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

DTC Descriptor

DTC B390F 08

Frontview Camera Performance - Signal Invalid

DTC B390F 66

Frontview Camera Wrong Mounting Position

DTC B390F 4B

Frontview Camera Calibration Not Learned

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

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B390F 08

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

B390F 66

The frontview camera is incorrectly mounted.

B390F 4B

The camera calibration is not learned.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

- **If the DTC is set**

Remove the B174G Frontview Camera - Grille and reinstall

- **If the DTC is not set**

4. Verify DTC B390F 08 is not set.

- **If DTC is set**

Refer to Circuit/System Testing

- **If DTC is not set**

5. All OK.

Circuit/System Testing

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

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

- **If 10 Ω or greater**

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K157 Video Processing Control Module.

- **If less than 10 Ω**

3. Ignition ON.

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

- **If less than 4.8 V**

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

2. Test for infinite resistance between the 6 V reference circuit and ground.

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

3. Test for less than 2 Ω in the 6 V reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K157 Video Processing Control Module.

- **If greater than 7.2 V**

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

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

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

- **If between 4.8-7.2 V**

5. Ignition ON.

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

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

- **If 10 V or greater**

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

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

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

- **If less than 10 V**

7. Ignition OFF.

8. Test for infinite resistance between the signal circuit terminals listed below and ground:

- Vision Signal + signal circuit terminal 1
- Vision Signal - signal circuit terminal 3
- **If less than infinite resistance**

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

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

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

- **If infinite resistance**

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

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

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

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

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

12. Verify DTC B390F is not set.

- **If DTC B390F is set**

Replace the B174G Frontview Camera - Grille.

- **If DTC B390F is not set**

13. All OK.

Repair Instructions

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

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

DTC B391F: NIGHT VISION CAMERA

Diagnostic Instructions

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

DTC Descriptor

DTC B391F

Night Vision Camera

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

Circuit/System Description

The Night Vision Control Module performs fault detection on itself and the camera attached to it. The camera is attached to the Night Vision Control Module via a USB type cable. All of the video signals,

communication signals, as well as the power and ground are provided by the USB cable.

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B391F 55

The Night Vision Control Module has determined Expected Number of Transitions / Events Not Reached

B391F 56

The Night Vision Control Module has determined Allowable Number of Transitions / Events Exceeded

B391F 74

The Night Vision Control Module has determined the signal protection calculation is incorrect

B391F 7F

The Night Vision Control Module has determined the signal is erratic

Action Taken When the DTC Sets

- The Night Vision Control Module requests the instrument cluster to display "Service Night Vision System".
- The Night Vision Control Module will disable the Night Vision Camera System.

Conditions for Clearing the DTC

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

Diagnostic Aids

Poor or incomplete connections are the most common cause of this DTC. Verify all of the USB connections, including inlines, are seated properly. A common poor connection is at the Instrument Cluster.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Night Vision Camera Description and Operation

Electrical Information Reference

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

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

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B391F 59 or B391F 7F is not set.
 - **If DTC is set**
 1. Replace the B276 Night Vision Camera
 2. Verify DTC B391F 59 or B391F 7F is set after replacing the B276 Night Vision Camera.
 - If the DTC does not set

All OK.
 - If the DTC is set
 - 3. Replace the K172 Night Vision Control Module.
 - **If the DTC is not set**
3. Verify DTC B391F 55 or B391F 56 is not set.
 - **If DTC is set**

Replace the B276 Night Vision Camera
 - **If the DTC is not set**
4. Verify DTC B391F 74 is not set.
 - **If DTC is set**
 1. Physically cycle each connection of the B276 Night Vision Camera cable.
 2. Verify DTC B391F 74 is set after cycling the cable connections.
 - If the DTC does not set

All OK.
 - If the DTC sets after cycling the cable connections
 3. Replace the K172 Night Vision Control Module to B276 Night Vision Camera cables.
 4. Verify DTC B391F 74 is set after replacing the cables.
 - If the DTC does not set

All OK.
 - If the DTC sets after replacing the cables
 5. Replace the B276 Night Vision Camera
 6. Verify DTC B391F 74 is set after replacing the B276 Night Vision Camera.
 - If the DTC does not set

All OK.
 - If the DTC is set
 7. Replace the K172 Night Vision Control Module.
 - **If the DTC is not set**
5. All OK.

Repair Instructions

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

- [Night Vision Camera Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

DTC B391E OR B392F: NIGHT VISION CAMERA

Diagnostic Instructions

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

DTC Descriptor

DTC B391E

Night Vision Camera

DTC B392F

Night Vision Camera Input Power Circuit

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

Circuit/System Description

The Night Vision Control Module performs fault detection on itself and the camera attached to it. The camera is attached to the Night Vision Control Module via a USB type cable. All of the video signals, communication signals, as well as the power and ground are provided by the USB cable.

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B391E 00

The Night Vision Control Module has determined an internal fault in the camera

B391E 03

The Night Vision Control Module has determined Voltage Below Threshold

B391E 04

The Night Vision Control Module has determined Open Circuit

B391E 07

The Night Vision Control Module has determined Voltage Above Threshold

B391E 08

The Night Vision Control Module has determined Signal Invalid

B391E 0B

The Night Vision Control Module has determined Current Above Threshold

B391E 31

The Night Vision Control Module has determined General Checksum Failure

B391E 34

The Night Vision Control Module has determined RAM Failure

B391E 36

The Night Vision Control Module has determined EEPROM Failure

B391E 39

The Night Vision Control Module has determined Internal Electronic Failure

B391E 3A

The Night Vision Control Module has determined Incorrect Component Installed

B391E 3B

The Night Vision Control Module has determined Internal Self Test Failed

B391E 54

The Night Vision Control Module has determined Temperature High

B391E 55

The Night Vision Control Module has determined Expected Number of Transitions / Events Not Reached

B391E 56

The Night Vision Control Module has determined Allowable Number of Transitions / Events Exceeded

B391E 59

The Night Vision Control Module has determined Circuit / Component Protection Time-out

B391E 61

The Night Vision Control Module has determined the camera actuator is stuck

B391E 62

The Night Vision Control Module has determined the camera actuator is stuck open

B391E 63

The Night Vision Control Module has determined camera actuator is actuator stuck closed

B391E 66

The Night Vision Control Module has determined the camera is in a wrong mounting position

B391E 74

The Night Vision Control Module has determined the signal protection calculation is incorrect

B391E 7F

The Night Vision Control Module has determined the signal is erratic

B392F 03

The Night Vision Control Module has determined the camera voltage is below the set threshold

B392F 07

The Night Vision Control Module has determined the camera voltage is above the set threshold

B392F 0B

The Night Vision Control Module has determined the camera current is above the set threshold

Action Taken When the DTC Sets

- The Night Vision Control Module requests the instrument cluster to display "Service Night Vision System".
- The Night Vision Control Module will disable the Night Vision Camera System.

Conditions for Clearing the DTC

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

Diagnostic Aids

Poor or incomplete connections are the most common cause of this DTC. Verify all of the USB connections, including inlines, are seated properly. A common poor connection is at the Instrument Cluster.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Night Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B391E 3A or B391E 66 is not set.
 - **If the DTC is set**

Perform [Night Vision Camera Control Module Learn](#)
 - **If the DTC is not set**
3. Verify DTC B391E 3B, B391E 59 or B391E 7F is not set.
 - **If DTC is set**
 1. Replace the B276 Night Vision Camera
 2. Verify DTC B391E 3B, B391E 59 or B391E 7F is set after replacing the B276 Night Vision Camera.
 - If the DTC does not set

All OK.

- If the DTC is set
3. Replace the K172 Night Vision Control Module.
 - **If the DTC is not set**
 4. Verify DTC B391E 31, B391E 34, B391E 36, B391E 38 or B391E 39 is not set.
 - **If DTC is set**

Replace the B276 Night Vision Camera
 - **If the DTC is not set**
 5. Verify DTC B391E 55, B391E 56, B391E 61, B391E 62 or DTC B391E 63 is not set.
 - **If DTC is set**

Replace the B276 Night Vision Camera
 - **If the DTC is not set**
 6. Verify DTC B391E 54 is not set.

NOTE: Allow the vehicle to cool if the ambient temperature is excessive before proceeding with this diagnostic procedure. The camera will not operate with internal temperatures higher than 176°F (80°C)

- **If DTC is set**
 1. Allow the camera to cool.
 2. Clear the DTC. Verify the DTC does not set.
 - If the DTC is set, replace the B276 Night Vision Camera
 - If the DTC does not set
 3. All OK.
 - **If the DTC is not set**
7. Verify DTC B391E 00, B391E 03, B391E 04, B391E 07, B391E 08, B391E 0B, B391E 74, B392F 03, B392F 07 or B392F 0B is not set.
 - **If DTC is set**
 1. Physically cycle each connection of the B276 Night Vision Camera cable.
 2. Verify DTC B391E 00, B391E 03, B391E 04, B391E 07, B391E 08, B391E 0B, B391E 74, B392F 03, B392F 07 or B392F 0B is set after cycling the cable connections.
 - If the DTC does not set

All OK.
 - If the DTC sets after cycling the cable connections
 3. Replace the K172 Night Vision Control Module to B276 Night Vision Camera cables.
 4. Verify DTC B391E 00, B391E 03, B391E 04, B391E 07, B391E 08, B391E 0B, B391E 74, B392F 03, B392F 07 or B392F 0B is set after replacing the cables.
 - If the DTC does not set

All OK.
 - If the DTC sets after replacing the cables
 5. Replace the B276 Night Vision Camera
 6. Verify DTC B391E 00, B391E 03, B391E 04, B391E 07, B391E 08, B391E 0B, B391E 3A or B391E 74 is set after replacing the B276 Night Vision Camera.
 - If the DTC does not set

All OK.
 - If the DTC is set

7. Replace the K172 Night Vision Control Module.

- **If the DTC is not set**

8. All OK.

Repair Instructions

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

- [Night Vision Camera Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

DTC B395A: REARVIEW CAMERA

Diagnostic Instructions

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

DTC Descriptor

DTC B395A 08

Rearview Camera Performance - Signal Invalid

DTC B395A 66

Rearview Camera Wrong Mounting Position

DTC B395A 4B

Rearview Camera Calibration Not Learned

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

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B395A 08

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

B395A 66

The rearview camera is incorrectly mounted.

B395A 4B

The camera calibration is not learned.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

Remove the B87 Rearview Camera and reinstall

- **If the DTC is not set**

4. Verify DTC B395A 08 is not set.

- **If DTC is set**

Refer to Circuit/System Testing

- **If DTC is not set**

5. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the B87 Rearview Camera harness connector. It may take up to 2 min for all vehicle systems to power down.

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

- **If 10 Ω or greater**

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

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K157 Video Processing Control Module.

- **If less than 10 Ω**

3. Ignition ON.

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

- **If less than 4.8 V**

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

2. Test for infinite resistance between the 6 V reference circuit and ground.

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

3. Test for less than 2 Ω in the 6 V reference circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K157 Video Processing Control Module.

- **If greater than 7.2 V**

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

2. Test for less than 1 V between the 5 V reference circuit and ground.

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

- **If between 4.8-7.2 V**

5. Ignition ON.

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

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

- **If 10 V or greater**

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

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

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

- **If less than 10 V**

7. Ignition OFF.

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

- Vision Signal + signal circuit terminal 1

- Vision Signal - signal circuit terminal 4

- **If less than 100 Ω**

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

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

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

- **If greater than 100 Ω**

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

- B87 Rearview Camera video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 4 X1
- B87 Rearview Camera video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 14 X1

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

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

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

12. Verify DTC B395A is not set.

- **If DTC B395A is set**

Replace the B87 Rearview Camera.

- **If DTC B395A is not set**

13. All OK.

Repair Instructions

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

- **Rearview Driver Information Camera Replacement (Without UVH)** **Rearview Driver Information Camera Replacement (With UVH)** **Rearview Driver Information Camera Replacement (With DRZ)**
- **Control Module References** for control module replacement, programming and setup.

DTC B395B: SIDEVIEW CAMERA - LEFT

Diagnostic Instructions

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

DTC Descriptor

DTC B395B 08

Sideview Camera - Left Performance - Signal Invalid

DTC B395B 66

Sideview Camera - Left Wrong Mounting Position

DTC B395B 4B

Sideview Camera - Left Calibration Not Learned

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

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B395B 08

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

B395B 66

The sideview camera - left is incorrectly mounted.

B395B 4B

The sideview camera - left is not learned.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

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

Remove the B225L Sideview Camera - Left and reinstall
 - **If the DTC is not set**
4. Verify DTC B395B 08 is not set.
 - **If DTC is set**

Refer to Circuit/System Testing
 - **If DTC is not set**
5. All OK.

Circuit/System Testing

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K157 Video Processing Control Module.
- **If greater than 7.2 V**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.
 2. Test for less than 1 V between the 6 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
- **If between 4.8-7.2 V**
- 5. Ignition ON.
- 6. Test for less than 10 V between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 4
- **If 10 V or greater**
 1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
- **If less than 10 V**
- 7. Ignition OFF.
- 8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 4
- **If less than 100 Ω**
 1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.
 2. Test for infinite between the signal circuit and ground.
 - If less than infinite resistance, repair the short to voltage on the circuit.
 - If infinite resistance, replace the K157 Video Processing Control Module.
- **If greater than 100 Ω**
- 9. Test for less than 2 Ω between the video signal circuit terminals listed below:
 - B225L Sideview Camera - Left video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 5 X1
 - B225L Sideview Camera - Left video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 15 X1
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.
- **If less than 2 Ω**
- 10. Ignition OFF, connect the harness connector at the B225L Sideview Camera - Left.
- 11. Ignition ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
- 12. Verify DTC B395B is not set.
 - **If DTC B395B is set**

Replace the B225L Sideview Camera - Left.
 - **If DTC B395B is not set**
- 13. All OK.

Repair Instructions

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

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

DTC B395C: SIDEVIEW CAMERA - RIGHT

Diagnostic Instructions

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

DTC Descriptor

DTC B395C 08

Sideview Camera - Right Performance - Signal Invalid

DTC B395C 66

Sideview Camera - Right Wrong Mounting Position

DTC B395C 4B

Sideview Camera - Right Calibration Not Learned

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

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B395C 08

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

B395C 66

The sideview camera - right is incorrectly mounted.

B395C 4B

The sideview camera - right is not learned.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Description and Operation

Surround Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

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

Refer to Circuit/System Testing
 - **If DTC is not set**

5. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the B225R Sideview Camera - Right harness connector. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 5 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
 2. Test for less than 2 Ω in the low reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K157 Video Processing Control Module.
 - **If less than 10 Ω**
3. Ignition ON.
4. Test for 4.8-7.2 V between the 6 V reference circuit terminal 6 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
 2. Test for infinite resistance between the 6 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the 6 V reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K157 Video Processing Control Module.
 - **If greater than 7.2 V**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.
 2. Test for less than 1 V between the 6 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
 - **If between 4.8-7.2 V**
5. Ignition ON.
6. Test for less than 10 V between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 4
 - **If 10 V or greater**
 1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
 - **If less than 10 V**
7. Ignition OFF.
8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 4
 - **If less than 100 Ω**
 1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.
 2. Test for infinite between the signal circuit and ground.
 - If less than infinite resistance, repair the short to voltage on the circuit.

- If infinite resistance, replace the K157 Video Processing Control Module.

- **If greater than 100 Ω**

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

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

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

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

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

12. Verify DTC B395C is not set.

- **If DTC B395C is set**

Replace the B225R Sideview Camera - Right.

- **If DTC B395C is not set**

13. All OK.

Repair Instructions

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

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

DTC B399A: FRONTVIEW CAMERA SUPPLY 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B399A 01

Frontview Camera Supply Circuit Short to Battery

DTC B399A 02

Frontview Camera Supply Circuit Short to Ground

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

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B399A 01

The frontview camera 6V reference circuit is shorted to voltage

B399A 02

The frontview camera 6V reference circuit is shorted to ground

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Surround Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Testing

1. Ignition OFF, disconnect the B174G Frontview Camera - Grille harness connector. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 5 and ground.
 - **If 10 Ω or greater**

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

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

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

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

12. Verify DTC B399A is not set.

- **If DTC B399A is set**

Replace the B174G Frontview Camera - Grille.

- **If DTC B399A is not set**

13. All OK.

Repair Instructions

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

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

DTC B399B: REARVIEW CAMERA SUPPLY 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B399B 01

Rearview Camera Supply Circuit Short to Battery

DTC B399B 02

Rearview Camera Supply Circuit Short to Ground

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
6 V Reference	B395A02, B399B 08	B395A 08, 1	B399B 08	-
Video Signal +	1, 2	B395A 08, 1	1, 2	-
Video Signal -	1, 2	1	1, 2	-
Low Reference	-	B395A 08, 1	-	-
1. Camera inoperative 2. Poor image quality displayed from camera				

Circuit/System Description

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

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B399B 01

The rearview camera 6V reference circuit is shorted to voltage

B399B 02

The rearview camera 6V reference circuit is shorted to ground

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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Surround Vision Camera Description and Operation

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the B87 Rearview Camera harness connector. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 5 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
 2. Test for less than 2 Ω in the low reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K157 Video Processing Control Module.
 - **If less than 10 Ω**
3. Ignition ON.

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

- **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
2. Test for infinite resistance between the 6 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the 6 V reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K157 Video Processing Control Module.

- **If greater than 7.2 V**

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

- **If between 4.8-7.2 V**

5. Ignition ON.

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

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

- **If 10 V or greater**

1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing Control Module, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.

- **If less than 10 V**

7. Ignition OFF.

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

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

- **If less than 100 Ω**

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

- **If greater than 100 Ω**

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

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

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

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

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

12. Verify DTC B399B is not set.

- If DTC B399B is set

Replace the B87 Rearview Camera.

- If DTC B399B is not set

13. All OK.

Repair Instructions

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

- [Rearview Driver Information Camera Replacement \(Without UVH\)](#) [Rearview Driver Information Camera Replacement \(With UVH\)](#) [Rearview Driver Information Camera Replacement \(With DRZ\)](#)
- [Control Module References](#) for control module replacement, programming and setup.

DTC B399C: SIDEVIEW CAMERA - LEFT SUPPLY 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B399C 01

Sideview Camera - Left Supply Circuit Short to Battery

DTC B399C 02

Sideview Camera - Left Supply Circuit Short to Ground

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
6 V Reference	B395B 08, B399C 02	B395B 08, 1	B399C01	-
Video Signal +	1, 2	B395B 08, 1	1, 2	-
Video Signal -	1, 2	1	1, 2	-
Low Reference	-	B395B 08, 1	-	-
1. Camera inoperative 2. Poor image quality displayed from camera				

Circuit/System Description

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

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B399C 01

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

B399C 02

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

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

- If infinite resistance
- 3. Test for less than 2 Ω in the 6 V reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K157 Video Processing Control Module.
- **If greater than 7.2 V**
 - 1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.
 - 2. Test for less than 1 V between the 6 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
- **If between 4.8-7.2 V**
- 5. Ignition ON.
- 6. Test for less than 10 V between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 4
- **If 10 V or greater**
 - 1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing Control Module, ignition ON.
 - 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
- **If less than 10 V**
- 7. Ignition OFF.
- 8. Test for greater than 100 Ω between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 4
- **If less than 100 Ω**
 - 1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.
 - 2. Test for infinite between the signal circuit and ground.
 - If less than infinite resistance, repair the short to voltage on the circuit.
 - If infinite resistance, replace the K157 Video Processing Control Module.
- **If greater than 100 Ω**
- 9. Test for less than 2 Ω between the video signal circuit terminals listed below:
 - B225L Sideview Camera - Left video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 5 X1
 - B225L Sideview Camera - Left video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 15 X1
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.
- **If less than 2 Ω**
- 10. Ignition OFF, connect the harness connector at the B225L Sideview Camera - Left.
- 11. Ignition ON, clear DTCs. Operate the vehicle within the Conditions for Running the DTC.
- 12. Verify DTC B399C is not set.
 - **If DTC B399C is set**

Replace the B225L Sideview Camera - Left.
 - **If DTC B399C is not set**
- 13. All OK.

Repair Instructions

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

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

DTC B399D: SIDEVIEW CAMERA - RIGHT SUPPLY 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B399D 01

Sideview Camera - Right Supply Circuit Short to Battery

DTC B399D 02

Sideview Camera - Right Supply Circuit Short to Ground

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

Diagnostic Fault Information

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

Circuit/System Description

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

Conditions for Running the DTC

Ignition voltage is between 9-16 V.

Conditions for Setting the DTC

B399D 01

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

B399D 02

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Testing

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

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

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

• **If between 4.8-7.2 V**

5. Ignition ON.

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

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

• **If 10 V or greater**

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

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

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

• **If less than 10 V**

7. Ignition OFF.

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

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

• **If less than 100 Ω**

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

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

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

• **If greater than 100 Ω**

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

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

Repair the open/high resistance in the circuit.

• **If less than 2 Ω**

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

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

12. Verify DTC B399D is not set.

• **If DTC B399D is set**

Replace the B225R Sideview Camera - Right.

• **If DTC B399D is not set**

13. All OK.

Repair Instructions

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

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

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

Diagnostic Instructions

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

DTC Descriptors

DTC P15F6

Front Object Detection Control Module Torque Request Signal Message Counter Incorrect

Circuit/System Description

The active safety control module communicates with the engine control module (ECM), requesting engine speed or torque reduction as necessary.

Conditions for Running the DTC

Engine running.

Conditions for Setting the DTC

The ECM detects that the engine speed and torque modification messages from the active safety control module are either corrupted or intermittently missing.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Diagnostic Aid

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

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

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

Reference Information

Schematic Reference

Object Detection Schematics

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Active Safety System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

NOTE:

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

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

- **If any DTCs are set**

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

- **If no DTCs are set**

2. Clear DTCs and operate the vehicle in the conditions that the customer experienced.

3. Verify DTC P15F6 does not set.

- **If the DTC sets**

Replace K124 Active Safety Control Module

- **If the DTC does not set**

4. All OK.

Repair Instructions

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

Control Module References for active safety 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 - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P15F7

Circuit/System Description

The rear parking assist control module is constantly sending a serial data message to the engine control module requesting engine speed or torque reduction. The engine control module sets DTC P15F7 when it detects a discrepancy in the structure of the message causing the integrity of the message to be questioned. An intermittent fault in the serial data circuits will cause the engine control module to set DTC P15F7.

Conditions for Running the DTC

Engine running.

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.

Diagnostic Aid

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

NOTE: During normal diagnostic and/or repair verification technicians may find that a "Service Adaptive Cruise Control" message may be displayed by the rear parking assist control module. Do not replace the rear parking assist control module for this condition.

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

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Parking Assist Description and Operation (with UD7) Parking Assist Description and Operation (with UD5) Parking Assist Description and Operation (with Parallel Parking or Automatic Parking Assist)

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**

- **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.

- **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 K41R Rear Parking Assist Control Module.

- **If the DTC does not set**

5. All OK.

Repair Instructions

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

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

SYMPTOMS - OBJECT DETECTION

NOTE:

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

1. Perform the **Diagnostic System Check - Vehicle** before using the Symptom Tables in order to verify that all of the following are true: 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:

- [**Parking Assist Description and Operation \(with UD7\) Parking Assist Description and Operation \(with UD5\) Parking Assist Description and Operation \(with Parallel Parking or Automatic Parking Assist\)**](#)
- [**Lane Departure Warning Description and Operation \(without UGN\) Lane Departure Warning Description and Operation \(UGN\)**](#)
- [**Side Blind Zone Alert Description and Operation**](#)
- [**Forward Collision Alert Description and Operation \(with UGN\) Forward Collision Alert Description and Operation \(without UGN\)**](#)
- [**Active Safety System Description and Operation**](#)
- [**Adaptive Cruise Control Description and Operation**](#)
- [**Rear Vision Camera Description and Operation**](#)
- [**Safety Alert Seat Description and Operation**](#)

Visual/Physical Inspection

- Inspect for aftermarket devices which may affect the operation of the system. Refer to [**Checking Aftermarket Accessories**](#).
- Inspect the easily accessible or visible system components for obvious damage or conditions which may cause the symptom.
- Make sure the parking assist sensors located on the vehicle front and rear bumper are clear. Remove any snow, mud or ice that is blocking the sensors.

Intermittent

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

Symptom List

- [**Seat Haptic Signal Motor Malfunction**](#)
- [**Forward Collision Alert System Malfunction**](#)
- [**Parking Assist System Malfunction \(without UGN\) Parking Assist System Malfunction \(with UGN\)**](#)
- [**Rear Vision Camera System Malfunction \(with IO3 and without UVH\) Rear Vision Camera System Malfunction \(without IO3 and UVH\)**](#)
- [**Side Object System Malfunction**](#)
- [**Lane Departure Warning System Malfunction**](#)

SEAT HAPTIC SIGNAL MOTOR MALFUNCTION

Diagnostic Instructions

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

DTC Descriptors

DTC B172E

Driver Seat Cushion Left Rear Haptic Alert Motor Control Circuit

DTC B172F

Driver Seat Cushion Right Rear Haptic Alert Motor Control Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Haptic Alert Motor Control	B172E 02	B172E 01 or B172E 02	B172E 01	-
Left Haptic Alert Motor Ground	-	B172E 01 or B172E 02	-	-
Right Haptic Alert Motor Control	B172F 02	B172F 01 or B172F 02	B172F 01	-
Right Haptic Alert Motor Ground	-	B172F 01 or B172F 02	-	-

Circuit/System Description

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

Conditions for Running the DTC

- Engine ON.
- Haptic seat motor commanded ON.

Conditions for Setting the DTC

DTC B172E 01

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

DTC B172E 02

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

DTC B172F 01

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

DTC B172F 02

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Safety Alert Seat Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify the P45LR Seat Haptic Movement Motor - Driver Left Rear turns ON and OFF when commanding the Driver Seat Cushion Left Rear Haptic Movement On and Off with a scan tool.
 - **If the motor does not turn ON and OFF**
Refer to Circuit/System Testing.
 - **If the motor turns ON and OFF**
3. Verify the P45RR Seat Haptic Movement Motor - Driver Right Rear turns on and off when commanding the Driver Seat Cushion Right Rear Haptic Movement On and Off with a scan tool.
 - **If the motor does not turn ON and OFF**
Refer to Circuit/System Testing.
 - **If the motor turns ON and OFF**
4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the X5 harness connector at the K40D Seat Memory Control Module - Driver, ignition ON.
2. Test for less than 1 V between the appropriate control circuit terminal listed below and ground:
 - P45LR Seat Haptic Movement Motor - Driver Left Rear terminal 5
 - P45RR Seat Haptic Movement Motor - Driver Right Rear terminal 4
 - **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **If less than 1 V**
3. Ignition OFF and all vehicle systems OFF. It may take up to 2 min for all vehicle systems to power down.
4. Test for 27-51 Ω between the appropriate control circuit terminal listed below and ground:
 - P45LR Seat Haptic Movement Motor - Driver Left Rear terminal 5

- P45RR Seat Haptic Movement Motor - Driver Right Rear terminal 4
- **If less than 27 Ω**

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

- **If greater than 51 Ω**

1. Verify the circuit ground connection is clean and secure.

- If the ground connector is not clean or secure, repair as necessary.
- If the circuit ground connection is clean and secure

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

- **If between 27-51 Ω**

5. Install a 3 A fused jumper wire between the appropriate control circuit terminal listed below and B+.

- P45LR Seat Haptic Movement Motor - Driver Left Rear terminal 5
- P45RR Seat Haptic Movement Motor - Driver Right Rear terminal 4

6. Verify the appropriate P45 Seat Haptic Movement Motor - Driver is active.

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

Replace the appropriate P45 Seat Haptic Movement Motor - Driver.

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

7. Ignition OFF, connect the harness connector at the K40 Seat Memory Control Module, ignition ON.

8. Verify the P45LR Seat Haptic Movement Motor - Driver Left Rear turns ON and OFF when commanding the Driver Seat Cushion Left Rear Haptic Movement On and Off with a scan tool.

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

Replace the K40 Seat Memory Control Module.

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

9. Verify the P45RR Seat Haptic Movement Motor - Driver Right Rear turns on and off when commanding the Driver Seat Cushion Right Rear Haptic Movement On and Off with a scan tool.

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

Replace the K40 Seat Memory Control Module.

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

10. All OK.

Repair Instructions

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

- [Front Seat Lane Departure Warning Actuator Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

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

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
Forward Collision Alert Indicators Ignition	1	1	-	-
Forward Collision Alert Indicators Control (Terminal 2)	2	1	1	-
Forward Collision Alert Indicators Control (Terminal 3)	1	1	1	-
Forward Collision Alert Indicators Ground	-	1	-	-
1. Forward collision alert indicators inoperative 2. Forward collision alert indicators always illuminated				

Circuit/System Description

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

Diagnostic Aids

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

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

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

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Forward Collision Alert Function Status parameter is not Malfunction.
 - **If the parameter is Malfunction**
Refer to Circuit/System Testing - Frontview Camera Module Malfunction
 - **If parameter is not Malfunction**
3. Verify the forward collision alert indicators turn on and off when commanding the instrument cluster All Indicators On and Off with a scan tool.
 - **If the indicators do not illuminate**
Refer to Circuit/System Testing - Forward Collision Alert Indicator Malfunction
 - **If the indicators illuminate**
4. Verify the forward collision alert distance on the driver information center toggles between far, medium, near and off when cycling the forward collision alert distance switch.
 - **If the setting does not change**
Test or replace the S70L Steering Wheel Controls Switch - Left.
 - **If the setting changes**
5. Verify the area of the B174W Frontview Camera - Windshield is not contaminated.
 - **If contaminated**
Clean the windshield
 - **If not contaminated**
6. All OK.

Circuit/System Testing

Frontview Camera Module Malfunction

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

2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
- **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the B174W Frontview Camera - Windshield.
- **If the test lamp illuminates**
4. Replace the B174W Frontview Camera - Windshield.

Forward Collision Alert Indicator Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the P43 Collision Alert Indicators. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 1 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to **Power Mode Mismatch (Without HP9)** **Power Mode Mismatch (With HP9)**.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the P43 Collision Alert Indicators.
 - **If the test lamp illuminates**
5. Verify a test lamp illuminates between the control circuit terminal 2 and B+
 - **If the test lamp does not illuminate**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the P16 Instrument Cluster.
 - **If the test lamp illuminates**
6. Verify a test lamp illuminates between the control circuit terminal 3 and B+
 - **If the test lamp does not illuminate**
 1. Ignition OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.

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

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

3. Ignition OFF.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the P16 Instrument Cluster.

- **If the test lamp illuminates**

7. Ignition OFF, connect the harness connector at the P43 Collision Alert Indicators, ignition ON.

8. Verify the P43 Collision Alert Indicators are not illuminated.

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

1. Ignition OFF, disconnect the harness connector at the P43 Collision Alert Indicators and the P16 Instrument Cluster.

2. Test for infinite resistance between the P43 Collision Alert Indicators control circuit terminal 2 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the P16 Instrument Cluster.

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

9. Test or replace the P43 Collision Alert Indicators.

Repair Instructions

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

- **Cruise Control Switch Replacement (Left Upper) Cruise Control Switch Replacement (Left Lower)**
- **Forward Collision Alert Display Replacement**
- **Control Module References** for control module replacement, programming and setup.

PARKING ASSIST SYSTEM MALFUNCTION (WITHOUT UGN)

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Control (Circuit 6816)	2	2	-	-
Low Control (Circuit 5852)	3	2	B0968 01	-
Switch Signal	B0967 02	1	1	-
Ground	-	1	-	-
1. Parking Assist Switch Inoperative 2. Parking Assist Switch Indicator Inoperative 3. Parking Assist Switch Indicator Always On				

Circuit/System Description

The parking assist system can be activated and deactivated by pressing the parking assist switch. The parking assist control module applies voltage and monitors the parking assist switch signal circuit. The parking assist switch is a normally open switch. With the switch open, voltage seen at the front and rear parking assist control module is high. When the parking assist switch is pressed, the switch is closed and

the signal circuit is pulled to ground. With the switch closed, voltage seen at the front and rear parking assist control module is low. The parking assist control module will respond to this by activating or deactivating the parking assist function.

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

Diagnostic Aids

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

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7) **Parking Assist Description and Operation (with UD5)** **Parking Assist Description and Operation (with Parallel Parking or Automatic Parking Assist)**

Electrical Information Reference

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

- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Park Assist Switch parameter changes between Active and Inactive while pressing and releasing the parking assist switch.
 - **If the parameter does not change between Active and Inactive**
Refer to Circuit/System Testing - Parking Assist Switch Circuit Malfunction.
 - **If the parameter changes between Active and Inactive**
3. Engine running, parking brake applied, transmission in R.
4. Verify the reverse lamps are illuminated.
 - **If the reverse lamps are not illuminated**
Refer to [Backup Lamps Malfunction](#).
 - **If the reverse lamps are illuminated**
5. Verify the scan tool Parking Assist System Status parameter is Enabled.
 - **If the parameter is not Enabled**
Refer to [Diagnostic Aids](#) to determine the cause of the inhibit.
 - **If the parameter is Enabled**
6. Verify the parking assist switch indicator turns ON and OFF when turning the parking assist system on and off with the park assist switch.
 - **If the indicator does not turn ON and OFF**
Refer to Circuit/System Testing - Parking Assist Switch Indicator Circuit Malfunction.
 - **If the indicator turns ON and OFF**
7. All OK.

Circuit/System Testing

Parking Assist Switch Circuit Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48 Multifunction Switch 1 - Instrument Panel. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 10 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the ground circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Verify the scan tool Parking Assist Switch parameter is Inactive.
 - **If the parameter is not Inactive**
 1. Ignition OFF, disconnect the X1 harness connector at the K182 Parking Assist Control Module.
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground on the signal circuit.

- If infinite resistance, replace the K182 Parking Assist Control Module.
 - **If the parameter is Inactive**
4. Connect a 3 A fused jumper wire between the signal circuit terminal 5 and ground.
 5. Verify the scan tool Parking Assist Switch parameter is Active.
 - **If the parameter is not Active**
 1. Ignition OFF, disconnect the X1 harness connector at the K182 Parking Assist Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit
 - If less than 1 V, replace the K182 Parking Assist Control Module.
 3. Ignition OFF.
 4. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K182 Parking Assist Control Module.
 - **If the parameter is Active**
 6. Test or replace the S48C Multifunction Switch 1 - Instrument Panel.

Parking Assist Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel, ignition ON.
2. Verify a test lamp illuminates between the control circuit terminal 2 and ground.
 - **If the test lamp does not illuminate**
 1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 2. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Interior Backlighting Malfunction](#).
 - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel. Disconnect the X1 harness connector at the K182 Parking Assist Control Module.
4. Verify the parking assist switch indicator is not illuminated.
 - **If the parking assist switch indicator is illuminated**
 1. Ignition OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel.
 2. Test for infinite resistance between the S48C Multifunction Switch 1 - Instrument Panel control circuit terminal 7 and ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance, replace the S48C Multifunction Switch 1 - Instrument Panel.
 - **If the parking assist switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 7 and ground.
6. Verify the parking assist switch indicator is illuminated.
 - **If the parking assist switch indicator is not illuminated**
 1. Ignition OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the S48C Multifunction Switch 1 - Instrument Panel.

- If the parking assist switch indicator is illuminated

7. Replace the K182 Parking Assist Control Module.

Repair Instructions

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

- **Parking Assist Alarm Disable Switch Replacement**
- **Control Module References** for control module replacement, programming and setup.

PARKING ASSIST SYSTEM MALFUNCTION (WITH UGN)

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Control (Terminal 3)	2	2	-	-
Low Control (Terminal 2)	3	2	B0968 0B	-
Signal	1	1	1	-
Ground	-	1	-	-
1. Parking Assist Switch Inoperative 2. Parking Assist Switch Indicator Inoperative 3. Parking Assist Switch Indicator Always On				

Circuit/System Description

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

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

Diagnostic Aids

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

- Manual Disable - The parking assist system has been disabled through the parking assist switch.
- Hitch/Object Attached - The parking assist control module is detecting an object that is attached to the vehicle. Common items such as a hitch receiver, trailer or a bicycle rack may cause this concern. Additionally, damage to the rear of the vehicle or a misaligned sensor may cause this concern. If the vehicle is damaged in a manner that causes the sensor to detect the fascia itself, the parking assist control module will interpret this as an attached object and disable the system. Carefully inspect the fascia, fascia mounting surface and sensor retainers before continuing with normal diagnosis. After the detected cause has been addressed the vehicle must be driven at speed greater than 40 km/h (25 mph).
- Vehicle Overspeed - The vehicle is travelling too fast in reverse at speeds of greater than 8 km/h (5 mph).

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7) Parking Assist Description and Operation (with UD5) Parking Assist Description and Operation (with Parallel Parking or Automatic Parking Assist)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Parking Assist Switch Status parameter changes between Active and Inactive while pressing and releasing the parking assist switch.
 - **If the parameter does not change between Active and Inactive**
Refer to Circuit/System Testing - Parking Assist Switch Circuit Malfunction.
 - **If the parameter changes between Active and Inactive**
3. Engine running, parking brake applied, transmission in R.
4. Verify the reverse lamps are illuminated.
 - **If the reverse lamps are not illuminated**
Refer to **Backup Lamps Malfunction** .
 - **If the reverse lamps are illuminated**
5. Verify the scan tool Parking Assist System Status parameter is Enabled.

- **If the parameter is not Enabled**

Refer to [Diagnostic Aids](#) to determine the cause of the inhibit.

- **If the parameter is Enabled**

6. Verify the parking assist switch indicator turns ON and OFF when turning the parking assist system on and off with the park assist switch.

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

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

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

7. All OK.

Circuit/System Testing

Parking Assist Switch Circuit Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel. It may take up to 2 min for all vehicle systems to power down.

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

- **If 10 Ω or greater**

1. Ignition OFF.

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

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

- **If less than 10 Ω**

3. Verify the scan tool Parking Assist Switch Status parameter is Inactive.

- **If the parameter is not Inactive**

1. Ignition OFF, disconnect the X1 harness connector at the K124 Active Safety Control Module.

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

- If less than infinite resistance, repair the short to ground on the signal circuit.
- If infinite resistance, replace the K124 Active Safety Control Module.

- **If the parameter is Inactive**

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

5. Verify the scan tool Parking Assist Switch Status parameter is Active.

- **If the parameter is not Active**

1. Ignition OFF, disconnect the X1 harness connector at the K124 Active Safety Control Module, ignition ON.

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

- If 1 V or greater, repair the short to voltage on the circuit
- If less than 1 V, replace the K124 Active Safety Control Module.

3. Ignition OFF.

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

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

- **If the parameter is Active**

6. Test or replace the S48C Multifunction Switch 1 - Instrument Panel.

Parking Assist Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel, ignition ON.

2. Verify a test lamp illuminates between the control circuit terminal 2 and ground.
 - **If the test lamp does not illuminate**
 1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 2. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Interior Backlighting Malfunction](#).
 - **If the test lamp illuminates**
3. Ignition OFF, connect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel. Disconnect the X1 harness connector at the K124 Active Safety Control Module.
4. Verify the parking assist switch indicator is not illuminated.
 - **If the parking assist switch indicator is illuminated**
 1. Ignition OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel.
 2. Test for infinite resistance between the S48C Multifunction Switch 1 - Instrument Panel control circuit terminal 7 and ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance, replace the S48C Multifunction Switch 1 - Instrument Panel.
 - **If the parking assist switch indicator is not illuminated**
5. Connect a 3 A fused jumper wire between the control circuit terminal 2 and ground.
6. Verify the parking assist switch indicator is illuminated.
 - **If the parking assist switch indicator is not illuminated**
 1. Ignition OFF, disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the S48C Multifunction Switch 1 - Instrument Panel.
 - **If the parking assist switch indicator is illuminated**
7. Replace the K124 Active Safety Control Module.

Repair Instructions

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

- [Parking Assist Alarm Disable Switch Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

PARALLEL PARKING ASSIST SYSTEM MALFUNCTION

Diagnostic Instructions

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

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
12V Reference	B1405 02	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B096C 06, B096D 06, B1405 03	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B096C 06, B096D 06, B1405 07	-
Parking Assist Switch Signal	B0967 02	1	-	-
Side Object Sensor Left Front Signal	B096C 06	B096C 06	B096C 01	B096C 08, B096C 21
Side Object Sensor Right Front Signal	B096D 06	B096D 06	B096D 01	B096D 08, B096D 21
Low Reference	-	B0954 06, B0955 06, B0956 06, B0957 06, B0958 06, B0959 06, B0960 06, B0961 06, B096C 06, B096D 06	-	-
Parking Assist Switch Ground	-	1	-	-
1. Parking Assist Switch Malfunction				

Circuit/System Description

The parallel parking assist is activated/deactivated by pressing the parking assist switch at speeds below 30 km/h (18 mph). The activated parallel parking assist then searches for an appropriate parking spot. If a spot is detected, feedback is given to the driver through the indicator in the driver information center. The driver accepts the decision by stopping the vehicle. The system calculates the optimal path into the parking lot and will then guide the vehicle into the chosen spot by taking over the steering control from the driver. The driver only needs to shift gears, brake and accelerate following the instructions given on the driver information center.

The system consists of the 8 parking assist sensors from the normal parking assist located in the front and rear bumper and two additional parallel parking assist sensors on the side of the vehicle. The additional parallel parking assist sensors are used to measure the parking lot size. The parallel parking assist system uses the 8 parking assist sensors to identify objects in the vehicle's path when moving into the parking lot.

Diagnostic Aids

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

- Possible disengagement reasons:
 - Steering input by driver. The driver must not interfere with the steering function during a parking maneuver.
 - Vehicle speed. The vehicle is travelling at speeds of greater than 10 km/h (6 MPH) while performing a parking maneuver.
 - Electronic stability control or anti-lock brakes are activated.
 - Failure within the system - check for DTCs.
- Manual Disable - The parking assist system has been disabled through the parking assist switch or audio system personalization menu.
- Hitch/Object Attached - The parking assist control module is detecting an object that is attached to the vehicle. Common items such as a hitch receiver, trailer or a bicycle rack may cause this

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

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Parking Assist Description and Operation (with UD7) **Parking Assist Description and Operation (with UD5)** **Parking Assist Description and Operation (with Parallel Parking or Automatic Parking Assist)**

- **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 the correct operation of the parking assist system.

- **If the parking assist system malfunctions**

Refer to **Parking Assist System Malfunction (without UGN)** and/or **Parking Assist System Malfunction (with UGN)**.

- **If the parking assist system functions properly**

2. Ignition ON.

3. Verify the scan tool Advanced Parking Assist Switch parameter changes between Active and Inactive while pressing and releasing the parallel parking assist switch.

- **If the parameter does not change**

Refer to Circuit/System Testing.

- **If the parameter changes**

4. Verify the scan tool Park Assist System Status parameter is Enable.

NOTE: After completing the next step the vehicle might need to be driven in the forward direction at speed greater than 40 km/h (25 MPH).

- **If the parameter is not Enable**

Refer to [Diagnostic Aids](#) to determine the cause of the inhibit.

- **If the parameter is Enable**

5. All OK.

Circuit/System Testing

1. Ignition ON.

2. Disconnect the harness connector at the S48C Multifunction Switch 1 - Instrument Panel.

3. Verify the scan tool Advanced Parking Assist Switch parameter is Inactive.

- **If not Inactive**

1. Ignition OFF, disconnect the X1 harness connector at the K182 Parking Assist Control Module.

2. Test for infinite resistance between the S48C Multifunction Switch 1 - Instrument Panel signal circuit terminal 6 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K182 Parking Assist Control Module.

- **If Inactive**

4. Install a 3 A fused jumper wire between the signal circuit terminal 6 and ground terminal 10.

5. Verify the scan tool Advanced Parking Assist Switch parameter Active.

- **If not Active**

1. Ignition OFF, disconnect the harness connector at the K182 Parking Assist Control Module, ignition ON.

2. Test for less than 1 V between the S48C Multifunction Switch 1 - Instrument Panel signal circuit terminal 6 and ground.

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

3. Ignition OFF

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K182 Parking Assist Control Module.

- **If Active**

6. Test or replace the S48C Multifunction Switch 1 - Instrument Panel.

Repair Instructions

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

- [Parking Assist Alarm Disable Switch Replacement](#)
- [Control Module References](#) for control module replacement, programming and setup.

NIGHT VISION CAMERA SYSTEM MALFUNCTION

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.

- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Circuit/System Description

The Night Vision Control Module performs fault detection on itself and the camera attached to it. The night vision control module sends a processed image output directly to the instrument cluster via a dedicated cable.

Diagnostic Aids

The Night Vision Camera may need a Reset Manufacturer Enable Counter if the camera is operating during daylight hours. The Night Vision System should only operate in the dark or when the Ambient Light Sensor signal is within the range where the BCM commands on the headlights. Covering the Ambient Light Sensor may enable the Night Vision System.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Night Vision Camera Description and Operation](#)

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.

NOTE: Remove items from dash that may cover the Ambient Light Sensor

2. Verify there are no DTCs set in the K172 Night Vision Control Module.

- **If any DTC is set**

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

- **If any DTC is not set**

3. Perform the Reset Manufacturer Enable Counter with a scan tool.

- **If the Request Rejected by the Control Module message does not appear**

Verify the Night Vision System operates normally.

- **If the Request Rejected by the Control Module message appears**

4. Program the K172 Night Vision Control Module. Refer to [Control Module References](#)

5. Verify the Night Vision System operates normally.

- **If Night Vision System does not operate normally**

- If Night Vision System operates normally

6. All OK.

Repair Instructions

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

[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.
- [Diagnostic Procedure Instructions](#) provides 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 of the following occur:
 - The driver has selected the Off mode through vehicle personalization menus. The selected mode is retained over ignition cycles. A driver information center message stating that the Rear Cross Traffic System Alert Off shall be displayed.
 - There is a loss of serial data communication with a sensor or between modules.
- 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

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Cross Traffic Alert Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool can communicate with the left side object sensor.
 - **If the scan tool can not communicate with the left side object sensor**

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

- **If the scan tool can communicate with the left side object sensor**
3. Verify the scan tool can communicate with the right side object sensor.
 - **If the scan tool can not communicate with the right side object sensor**
 Refer to Circuit/System Testing - Right Side Object Sensor Malfunction.
 - **If the scan tool can communicate with the right side object sensor**
 4. 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.
 - **If indicators turn ON and OFF**
 5. 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.
 - **If audible alert turns ON and OFF**
 6. 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 8 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Verify a test lamp illuminates between the B+ circuit terminal 5 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition Off.
 2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the B218L Side Object Sensor Module - Left.
 - **If the test lamp illuminates**
4. Ignition OFF and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down.
5. Test for less than 2 Ω in each of the serial data circuits end to end between the control module harness connector terminal 2 and the DLC terminal 1.
 - **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

6. Replace 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.

- **If less than 10 Ω**

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

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

1. Ignition OFF.

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

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

- If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.

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

1. Ignition OFF.

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

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

- If infinite resistance, replace the B218R Side Object Sensor Module - Right.

- **If the test lamp illuminates**

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

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

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

6. Replace B218R Side Object Sensor Module - Right.

Repair Instructions

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

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

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

Diagnostic Instructions

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

Diagnostic Fault Information

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

Circuit/System Description

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

Diagnostic Aids

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

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Rear Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

NOTE: If the condition is intermittent or cannot be duplicated, disconnect the

connectors and add Nyogel lubricant 760G. This procedure will correct the high resistance condition due to terminal fretting corrosion.

1. Verify P17 Info Display Module displays infotainment system information properly.

- **If infotainment system information does not display properly**

Refer to [Radio Information Display Malfunction](#) .

- **If infotainment system information displays properly**

2. Verify there is no debris on the B87 Rearview Camera lens and that the bezel and bezel seal are not damaged.

- **If debris is found on the lens**

Clean the lens. If the lens, bezel or bezel seal are damaged, replace as necessary.

- **If there is no debris on the lens**

3. Engine running, transmission in R.

4. Verify the backup lamps are illuminated.

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

Refer to [Backup Lamps Malfunction](#) .

- **If the backup lamps are illuminated**

5. Engine running, transmission in R.

6. Verify a clear rear vision image is displayed on the A11 Radio.

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

Refer to Circuit/System Testing.

- **If a clear image is displayed**

7. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B87 Rearview Camera. It may take up to 2 min for all vehicle systems to power down.

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

- **If 10 Ω or greater**

1. Ignition OFF.

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

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

- **If less than 10 Ω**

3. Ignition ON.

4. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.

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

1. Ignition OFF.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. Refer to [Power Mode Mismatch \(Without HP9\)](#) and/or [Power Mode Mismatch \(With HP9\)](#) .

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

1. Ignition OFF.

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

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

- If infinite resistance, replace the B87 Rearview Camera.

- **If the test lamp illuminates**

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

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

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

1. Ignition OFF, disconnect the X4 harness connector at the X50A Fuse Block - Underhood

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , refer to [Backup Lamps Malfunction](#) .

- **If the test lamp illuminates**

7. Ignition OFF, disconnect the X1 harness connector at the A11 Radio, ignition ON.

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

- A11 Radio signal (+) circuit terminal 5 X1
- A11 Radio signal (-) circuit terminal 4 X2

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

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

- A11 Radio signal (+) circuit terminal 5 X1
- A11 Radio signal (-) circuit terminal 4 X2

- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

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

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

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

- **If 2 Ω or greater**

Test the signal circuit for an open/high resistance.

- **If less than 2 Ω**

12. Add Nyogel lubricant 760G to electrical terminals.

13. Reconnect all electrical connections.

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

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

- **If a blank blue screen or distorted image is displayed**

1. Replace the B87 Rearview Camera.
2. Engine running, transmission in R,
3. Verify a clear rear vision image is displayed on the P17 Info Display Module.

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

Replace the A11 Radio.

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

4. All OK.

- If a blank black screen is displayed

Replace the A11 Radio.

- If a clear rear vision image is displayed

16. All OK.

Repair Instructions

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

- [Rearview Driver Information Camera Replacement \(Without UVH\)](#) [Rearview Driver Information Camera Replacement \(With UVH\)](#) [Rearview Driver Information Camera Replacement \(With DRZ\)](#)
- [Control Module References](#) for radio replacement, programming and setup.

REAR VISION CAMERA SYSTEM MALFUNCTION (WITHOUT IO3 AND UVH)

Diagnostic Instructions

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

Diagnostic Fault Information

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

Circuit/System Description

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

Diagnostic Aids

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

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Rear Vision Camera Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

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

1. Verify there is no debris on the B87 Rearview Camera lens and that the bezel and bezel seal are not damaged.

- **If debris is found on the lens**

Clean the lens. If the lens, bezel or bezel seal are damaged, replace as necessary.

- **If there is no debris on the lens**

2. Engine running, transmission in R.
3. Verify the backup lamps are illuminated.

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

Refer to [Backup Lamps Malfunction](#) .

- **If the backup lamps are illuminated**

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

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

Refer to Circuit/System Testing.

- **If a clear image is displayed**

6. All OK.

Circuit/System Testing

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

1. Ignition OFF.
2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
- **If less than 10 Ω**
3. Ignition ON.
4. Verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse. Refer to [Power Mode Mismatch \(Without HP9\)](#) and/or [Power Mode Mismatch \(With HP9\)](#).
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF.
 2. Test for infinite resistance between the ignition circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the B87 Rearview Camera.
 - **If the test lamp illuminates**
5. Engine running, park brake applied, transmission in R.
6. Verify a test lamp illuminates between the control circuit terminal 3 and ground.
 - **If the test lamp does not illuminate**
 1. Ignition OFF, disconnect the X4 harness connector at the X50A Fuse Block - Underhood
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Backup Lamps Malfunction](#).
 - **If the test lamp illuminates**
7. Ignition OFF, disconnect the X2 harness connector at the K74 Human Machine Interface Control Module, ignition ON.
8. Test for less than 1 V between the signal circuit terminals listed below and ground:
 - K74 Human Machine Interface Control Module signal (+) circuit terminal 5 X2
 - K74 Human Machine Interface Control Module signal (-) circuit terminal 6 X2
 - **If 1 V or greater**

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

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

Repair the open/high resistance in the circuit.
 - **If less than 2 Ω**

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

- **If 2 Ω or greater**

Test the signal circuit for an open/high resistance.

- **If less than 2 Ω**

12. Add Nyogel lubricant 760G to electrical terminals.

13. Reconnect all electrical connections.

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

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

- **If a blank blue screen or distorted image is displayed**

1. Replace the B87 Rearview Camera.

2. Engine running, transmission in R,

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

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

Replace the K74 Human Machine Interface Control Module.

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

4. All OK.

- **If a blank black screen is displayed**

Replace the K74 Human Machine Interface Control Module.

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

16. All OK.

Repair Instructions

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

- **Rearview Driver Information Camera Replacement (Without UVH) Rearview Driver Information Camera Replacement (With UVH) Rearview Driver Information Camera Replacement (With DRZ)**
- **Control Module References** for human machine interface control module replacement, programming and setup.

SIDE OBJECT 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.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Side Object Sensor Module - Left B+	U0232	U0232	-	-
Side Object Sensor Module - Left Serial Data (Terminal 1)	1	1	1	-
Side Object Sensor Module - Left Serial Data (Terminal 4)	U18A6	U18A6	U18A6	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Side Object Sensor Module - Left Serial Data (Terminal 5)	-	U18A6	U18A6	-
Side Object Sensor - Left Control (Terminal 3)	U18A6	U18A6	-	-
Side Object Sensor Module - Left Ground	-	1	-	-
Side Object Sensor Module - Right B+	U18A6	U18A6	-	-
Side Object Sensor Module - Right Control (Terminal 2)	B094C 39	3	2	-
Side Object Sensor Module - Right Control (Terminal 1)	B094C 39	3	2	-
Side Object Sensor Module - Right Ground	-	U18A6	-	-
1. No communication with side object sensor module - left 2. Side blind zone alert indicator illuminated at all times 3. Side blind zone alert indicator does not illuminate				

Circuit/System Description

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

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

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

Diagnostic Aids

- When the ignition is turned on or the engine is started, both outside rearview mirror displays will briefly illuminate to indicate that the system is operating.
- The conditions for disabling the side blind zone alert system are captured by DTCs. The driver information center will display Service Side Detection System if one of the sensors has failed.
- The side blind zone system will be disabled if the driver has selected the Off mode through vehicle personalization menus. The selected mode is retained over ignition cycles. A driver information center message stating that the side blind zone system is off shall be displayed and the outside mirror indicators will be OFF.
- The side blind zone may be temporarily unavailable if a blockage condition exists (i.e. mud/snow buildup in front of the sensor). A driver information message "Side Detection System Unavailable" will be displayed. The side blind zone system transitions back to the normal operating state when the blockage is removed. Bumper sticks, fascia damage, labels and heavy rain storms may also cause this condition. The blockage determination is performed with the vehicle in a drive gear.
- Because the sensors are NOT identical, they must NOT be swapped from one side of the vehicle to the other in an attempt to isolate a concern. Sensors should also NOT be swapped from one

vehicle to another.

- The side blind zone system is designed to ignore stationary objects; however, the system may occasionally detect guard rails, signs, trees, shrubs or other stationary objects as an object in the blind zone. This is normal system operation and does not require service.
- The side blind zone system may indicate an object in the blind zone if a trailer is attached to the vehicle or a bicycle or object is extending out to either side of the vehicle. This is normal operation and does not require service.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Side Blind Zone Alert Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool can communicate with the B218L Side Object Sensor Module - Left.
 - **If the scan tool cannot communicate with the B218R Side Object Sensor Module - Left**
Refer to Circuit/System Testing - Left Side Object Sensor Malfunction.
 - **If the scan tool can communicate with the B218L Side Object Sensor Module - Left**
3. Verify DTC U18A6 is not set.
 - **If DTC U18A6 is set**
Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
 - **If DTC U18A6 is not set**
4. Ignition OFF, ignition ON.
5. Verify that both side blind zone alert system indicators located in the outside rearview mirrors briefly turn ON and then turn OFF during the system self test.
 - **If both side blind zone alert indicators do not briefly turn ON and OFF**
 1. Verify the system is enabled
 - If disabled, refer to **Diagnostic Aids** for cause of disable.
 - If enabled, refer to Circuit/System Testing - Side Object Indicator Malfunction.
 - **If only one indicator does not briefly illuminate during the self test**
Refer to Circuit/System Testing - Side Object Indicator Malfunction.
 - **If both side blind zone alert indicators briefly turn ON and OFF**

6. Verify that both side blind spot indicators turn ON and OFF when commanding the Object Detection Alert Indicators On and Off with a scan tool.

- **If both indicators do not turn ON and OFF**

Replace the B218R Side Object Sensor Module - Right.

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

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

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

7. All OK.

Circuit/System Testing

Left Side Object Sensor Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B218L Side Object Sensor Module - Left. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 10 Ω between ground circuit terminal 7 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

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

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

- **If less than 10 Ω**

3. Verify a test lamp illuminates between the B+ circuit terminal 8 and ground.

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

1. Ignition Off.

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

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

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

1. Ignition OFF.

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

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

- **If the test lamp illuminates**

4. Ignition OFF and all vehicle systems OFF.

5. Test for less than 2 Ω between the B218L Side Object Sensor Module - Left serial data circuit terminal 1 and the X84 Data Link Connector serial data circuit terminal 1.

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

6. Replace the B218L Side Object Sensor Module - Left.

Side Object Indicator Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the X3 harness connector at the appropriate A9 Outside Rearview Mirror. It may take up to 2 mins for all vehicle systems to power down.

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

- **If 2 Ω or greater**

1. Ignition OFF.

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

- If 2 Ω or greater, repair the open/high resistance in the ground circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 2 Ω**
3. Ignition ON.
 4. Test for less than 1 V between the control circuit terminal 1 and ground.
 - **If 1 V or greater**
 1. Ignition OFF, disconnect the harness connector at the B218R Side Object Sensor Module - Right.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 2 Ω , replace the B218R Side Object Sensor Module - Right.
 - **If less than 1 V**
 5. Command the Object Detection Alert Indicators On with a scan tool.
 6. Test for greater than 3 V between the control circuit terminal 1 and ground.
 - **If 3 V or less**
 1. Ignition OFF, disconnect the harness connector at the B218R Side Object Sensor Module - Right.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
 3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the B218R Side Object Sensor Module - Right.
 - **If greater than 3 V**
 7. Replace the appropriate E17 Outside Rearview Mirror Glass.

Repair Instructions

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

- **Outside Rearview Mirror Glass Replacement**
- **Control Module References** for side object sensor module replacement, programming and setup.

LANE DEPARTURE WARNING SYSTEM MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides 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	B356A 05	-
Lane Departure Warning Switch Ground	-	1	-	-
Lane Departure Warning Switch Indicator Ignition	2	2	-	-

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

Circuit/System Description

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

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

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

Diagnostic Aids

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

The driver information center may also display LANE DEPARTURE WARNING SYSTEM UNAVAILABLE when the front camera module and bracket assembly is not properly installed. It may be helpful to verify the correct installation of the front camera and bracket assembly. Calibrate the front camera module after repair. Refer to [Front View Camera Module Learn \(-HP9\)](#) and/or [Front View Camera Module Learn \(HP9\)](#).

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

[Lane Departure Warning Description and Operation \(without UGN\)](#) [Lane Departure Warning Description and Operation \(UGN\)](#)

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

Scan Tool Reference

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

Circuit/System Verification

NOTE: Refer to [Diagnostic Aids](#) before performing Circuit/System Verification.

1. Ignition ON.
2. Verify the K43 Power Steering Control Module (if equipped) and the K17 Electronic Brake Control Module do not have any DTCs set.
 - **If any DTC is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).
 - **If the DTC is not set**
3. Verify that DTC B356A is not set.
 - **If the DTC is set**
Refer to [DTC B356A](#).
 - **If the DTC is not set**
4. Verify that DTC B0987 is not set.
 - **If the DTC is set**
Refer to [DTC B0987 \(without UGN\)](#) and/or [DTC B0987 \(UGN\)](#).
 - **If the DTC is not set**
5. Verify that DTC B1011 is not set.
 - **If the DTC is set**
Refer to [DTC B1011](#).
 - **If the DTC is not set**
6. Verify the scan tool Frontview Camera Disable History 1 parameter does not have a current Malfunction
 - **If the parameter is Malfunction**
Refer to [Diagnostic Aids](#).
 - **If the parameter is Normal**
7. Verify the scan tool Frontview Camera System Status parameter is Normal.
 - **If the parameter is Undefined or Malfunction**
Refer to [Diagnostic Aids](#).
 - **If the parameter is Normal**
8. Verify the scan tool Lane Departure Warning Switch Status parameter changes between Open and Closed while pressing and releasing the lane departure warning switch.
 - **If the parameter does not change between Open and Closed**
Refer to Lane Departure Warning Switch Malfunction in Circuit/System Testing.

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

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

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

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

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

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

- **If it needs to be cleaned**

Clean the windshield.

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

11. All OK.

Circuit/System Testing

Lane Departure Warning Switch Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S70A Steering Wheel Controls Switch - Left Lower. Ignition ON.

2. Test for 12 V between the 12 V reference circuit terminal 3 and ground.

- **If less than 12 V**

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

2. Test for infinite resistance between the 12 V reference circuit and ground

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

3. Test for less than 2 Ω in the 12 V reference circuit end to end.

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

- **If 12 V**

3. Ignition ON.

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

- **If not Inactive**

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

2. Test for infinite resistance between the S70A Steering Wheel Controls Switch - Left Lower signal circuit terminal 2 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the K9 Body Control Module.

- **If Inactive**

5. Test or replace the S70A Steering Wheel Controls Switch - Left Lower.

Lane Departure Warning Switch Indicator Circuit Malfunction

1. Ignition OFF, disconnect the harness connector at the S70A Steering Wheel Controls Switch - Left Lower, ignition ON.

2. Test for 6.2-10.9 V between the dimming control circuit terminal 4 and ground.

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

- **If less than 6.2 V**

1. Ignition OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch - Right Upper.

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

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

- If infinite resistance
3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the S70D Steering Wheel Controls Switch - Right Upper.
 - **If greater than 10.9 V**
 1. Ignition OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch - Right Upper, 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 S70D Steering Wheel Controls Switch - Right Upper.
 - **If between 6.2-10.9 V**
3. Connect a test lamp between the control circuit terminal 5 and B+.
 4. Verify the test lamp turns ON and OFF when commanding the Lane Departure Warning Indicator ON and OFF with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the harness connector at the K109 Frontview Camera Module (without UGN) OR K124 Active Safety Control Module (With UGN), ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the S70A Steering Wheel Controls Switch - Left Lower.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the harness connector at the K109 Frontview Camera Module (without UGN) OR K124 Active Safety Control Module (With UGN).
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K109 Frontview Camera Module (without UGN) OR K124 Active Safety Control Module (With UGN).
 - **If the test lamp turns ON and OFF**
 5. Test or replace the S70A Steering Wheel Controls Switch - Left Lower.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Cruise Control Switch Replacement \(Left Upper\)](#) [Cruise Control Switch Replacement \(Left Lower\)](#)
- [Radio Control Switch Replacement - Steering Wheel \(Right Upper\)](#) [Radio Control Switch Replacement - Steering Wheel \(Right Lower\)](#)
- [Control Module References](#) for control module replacement, programming and setup.

VIDEO PROCESSING CONTROL MODULE MALFUNCTION

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	B399A 02, B399B 02, B399C 02, B399D 02	1	B399A 01, B399B 01, B399C 01, B399D 01	-
Video Signal +	B390F 08, B395A 08, B395B 08 B395C 08, 1, 2	1	1, 2	390F 08, B395A 08, B395B 08 B395C 08
Video Signal -	B395C 08, 1, 2	1	1, 2	-
Low Reference	-	B395A 08, B395B 08, B395C 08, B390F 08, 1	-	-
Video Shield	-	2	-	-
1. Camera inoperative 2. Poor image quality				

Circuit/System Description

When the engine is running and the transmission is placed into R, a vehicle in reverse motion message is sent via serial data to the video processing control module indicating that camera operation is requested. When the engine is running and the transmission is placed into D, a vehicle in forward motion message is sent via serial data to the video processing control module. The cameras send video information to the video processing control module through a video signal + and a video signal - circuit. A grounded shielding also wraps the video signal circuits to reduce electronic interference which may degrade the video signal and cause a distorted or otherwise degraded image. The signals from the cameras are combined and sent to the radio or human machine interface module.

Diagnostic Aids

- A poor video image can be caused by ice, snow and mud buildup on the lens of the appropriate camera. Also, extreme lighting conditions can affect performance, such as operating in the dark or with bright sunlight shining on the camera. Extreme high or low temperatures can also affect the image quality. An open in the shield of the video signal circuit can also cause a distorted screen.
- If any one of the cameras are **misaligned** or **replaced** on the Surround Vision Camera System, the displayed image may not be correctly stitched due to a change in the location or orientation of the camera. The only way to correct an incorrectly stitched or poorly aligned image is to perform the calibration procedure. Refer to [Video Processing Control Module Calibration](#)

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Surround Vision Camera Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

Scan Tool Reference

Circuit/System Verification

1. Verify there is no debris on the appropriate camera lens and that the bezel and bezel seal are not damaged.
 - **If debris is found on the lens**
Clean the lens. If the lens, bezel or bezel seal are damaged, replace as necessary.
 - **If there is no debris on the lens**
2. Engine running, transmission in R.
3. Verify the backup lamps are illuminated.
 - **If the backup lamps are not illuminated**
Refer to [Backup Lamps Malfunction](#).
 - **If the backup lamps are illuminated**
4. Engine running, transmission in R.
5. Verify a clear rear vision image is displayed on the A11 Radio.
 - **If a clear image is not displayed on only one camera**
Refer to Circuit/System Testing - Only one camera image distorted.
 - **If a clear image is not displayed for all cameras**
Refer to Circuit/System Testing - All camera images distorted with IO3 **OR** All camera images distorted with IO5 or IO6
 - **If a clear image is displayed**
6. Engine running, transmission in D.
 - **If a clear image is not displayed on only one camera**
Refer to Circuit/System Testing - Only one camera image distorted.
 - **If a clear image is not displayed for all cameras**
Refer to Circuit/System Testing - All camera images distorted with IO3 **OR** All camera images distorted with IO5 or IO6
 - **If a clear image is displayed**
7. All OK.

Circuit/System Testing

Only One Camera Image Distorted

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the appropriate camera. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K157 Video Processing Control Module.
 - **If less than 10 Ω**
3. Ignition ON.
4. Test for 4.8-5.2 V between the 5 V reference circuit terminal 6 and ground.
 - **If less than 4.8 V**

1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module.
2. Test for infinite resistance between the 5 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the 5 V reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K157 Video Processing Control Module.
- **If greater than 5.2 V**
1. Ignition OFF, disconnect the harness connector at the K157 Video Processing Control Module, ignition ON.
2. Test for less than 1 V between the 5 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
- **If between 4.8-5.2 V**
5. Ignition ON.
6. Test for less than 10 V between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 4
- **If 10 V or greater**
1. Ignition OFF, disconnect the X1 harness connector at the K157 Video Processing Control Module, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K157 Video Processing Control Module.
- **If less than 10 V**
7. Ignition OFF.
8. Test for infinite resistance between the signal circuit terminals listed below and ground:
 - Vision Signal + signal circuit terminal 1
 - Vision Signal - signal circuit terminal 4
- **If less than infinite resistance**
1. Disconnect the X1 harness connector at the K157 Video Processing Control Module.
2. Test for infinite between the signal circuit and ground.
 - If less than infinite resistance, repair the short to voltage on the circuit.
 - If infinite resistance, replace the K157 Video Processing Control Module.
- **If infinite resistance**
9. Test for less than 2 Ω between the appropriate video signal circuit terminals listed below:
 - B174G Frontview Camera - Grille video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 1 X1
 - B174G Frontview Camera - Grille video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 11 X1
 - B87 Rearview Camera video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 4 X1
 - B87 Rearview Camera video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 14 X1
 - B225L Sideview Camera - Left video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 5 X1
 - B225L Sideview Camera - Left video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 15 X1
 - B225R Sideview Camera - Right video signal (+) circuit terminal 1 and the K157 Video Processing Control Module video signal (+) circuit terminal 8 X1

- B225R Sideview Camera - Right video signal (+) circuit terminal 4 and the K157 Video Processing Control Module video signal (+) circuit terminal 18 X1

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

10. Engine running, transmission in R.

11. Verify a clear surround vision image is displayed on the A11 Radio.

- **If a clear surround vision image is not displayed**

1. Replace the appropriate camera.

2. Engine running, transmission in R.

3. Verify a clear surround vision image is displayed on the A11 Radio.

- If a clear surround vision image is not displayed, replace the K157 Video Processing Control Module.
- If a clear surround vision image is displayed, all OK.

- **If a clear surround vision image is displayed**

12. All OK.

All Camera Images Distorted With IO3

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K157 Video Processing Control Module. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 1 V between the signal circuit terminals listed below and ground:

- Camera signal (+) circuit terminal 6 X2
- Camera signal (-) circuit terminal 12 X2
- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

3. Test for infinite resistance between the signal circuit terminals listed below and ground:

- Camera signal (+) circuit terminal 6 X2
- Camera signal (-) circuit terminal 12 X2
- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

4. Test for less than 2 Ω between the camera signal (+) circuit terminal 6 X2 and the A11 Radio video signal (+) circuit terminal 5 X1.

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

5. Test for less than 2 Ω between the camera signal (-) circuit terminal 12 X2 and the A11 Radio video signal (-) circuit terminal 4 X1.

- **If 2 Ω or greater**

Test the signal circuit for an open/high resistance.

- **If less than 2 Ω**

6. Replace the K157 Video Processing Control Module.

7. Engine running, transmission in R.

8. Verify a clear surround vision image is displayed on the A11 Radio.

- **If a clear rear vision image is not displayed**

Replace the A11 Radio.

- **If a clear rear vision image is displayed**

9. All OK.

All Camera Images Distorted With IO5 or IO6

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the K157 Video Processing Control Module. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 1 V between the signal circuit terminals listed below and ground:

- Camera signal (+) circuit terminal 6 X2
- Camera signal (-) circuit terminal 12 X2
- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **If less than 1 V**

3. Test for infinite resistance between the signal circuit terminals listed below and ground:

- Camera signal (+) circuit terminal 6 X2
- Camera signal (-) circuit terminal 12 X2
- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

4. Test for less than 2 Ω between the camera signal (+) circuit terminal 6 X2 and the K74 Human Machine Interface Control Module video signal (+) circuit terminal 5 X2.

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

5. Test for less than 2 Ω between the camera signal (-) circuit terminal 12 X2 and the K74 Human Machine Interface Control Module video signal (-) circuit terminal 6 X2.

- **If 2 Ω or greater**

Test the signal circuit for an open/high resistance.

- **If less than 2 Ω**

6. Replace the K157 Video Processing Control Module.

7. Engine running, transmission in R.

8. Verify a clear surround vision image is displayed on the K74 Human Machine Interface Control Module.

- **If a clear rear vision image is not displayed**

Replace the A11 Radio.

- **If a clear rear vision image is displayed**

9. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Rearview Driver Information Camera Replacement \(Without UVH\)](#) [Rearview Driver Information Camera Replacement \(With UVH\)](#) [Rearview Driver Information Camera Replacement \(With DRZ\)](#)

- [Side View Driver Information Camera Replacement](#)
 - [Front View Driver Information Camera Replacement](#)
 - [Control Module References](#) for control module replacement, programming and setup.
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Object Detection and Pedestrian Protection - Repair Instructions - CT6

REPAIR INSTRUCTIONS

FRONT SEAT LANE DEPARTURE WARNING ACTUATOR REPLACEMENT



Fig. 1: Front Seat Lane Departure Warning Actuator

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Seat Cushion Cover and Pad Replacement</u>	
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 RANGE RADAR SENSOR REPLACEMENT

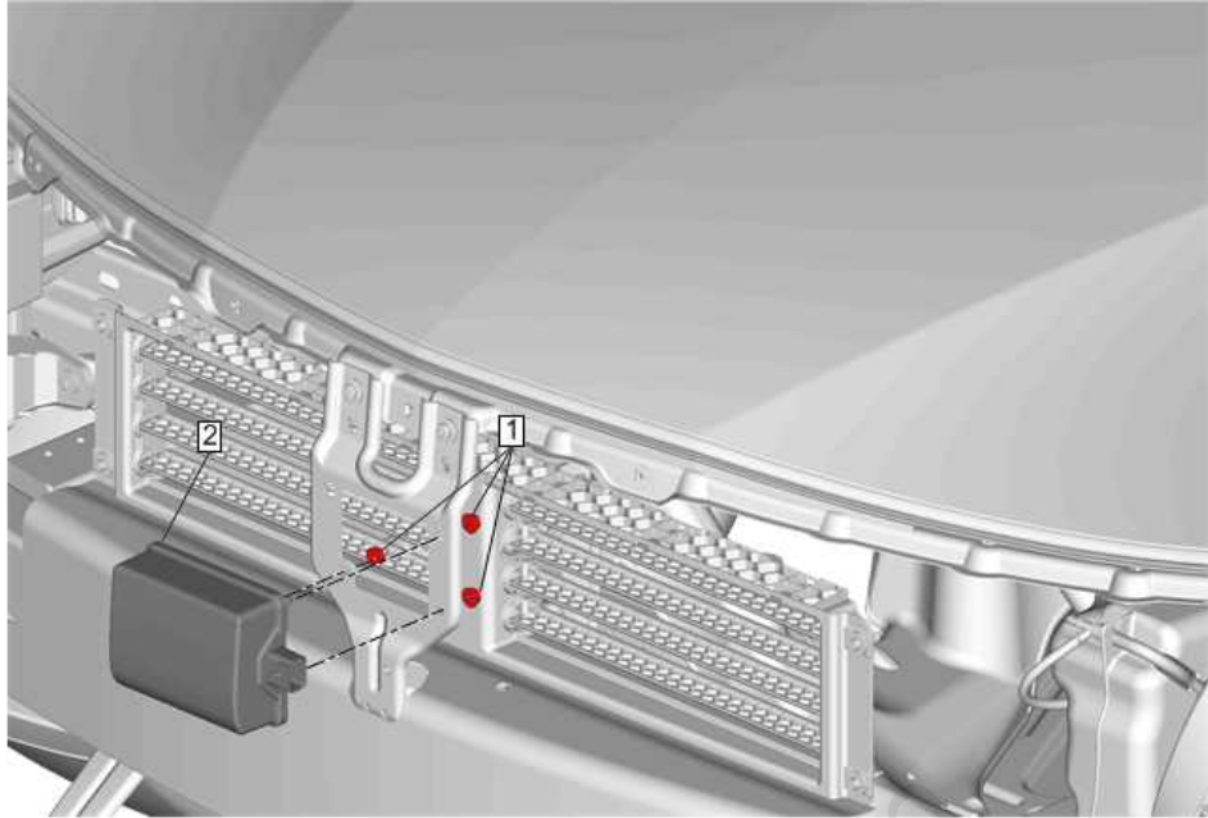


Fig. 2: Forward Long Range Radar Sensor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Bumper Fascia Replacement (Without UV3)</u> <u>Front Bumper Fascia Replacement (With UV3)</u>	
1	Forward Range Radar Sensor Fastener [3x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)
2	Forward Long Range Radar Sensor Procedure 1. Disconnect the electrical connector. 2. <u>Control Module References</u> for programming and setup information, if required.

SHORT RANGE RADAR SENSOR REPLACEMENT (FRONT)

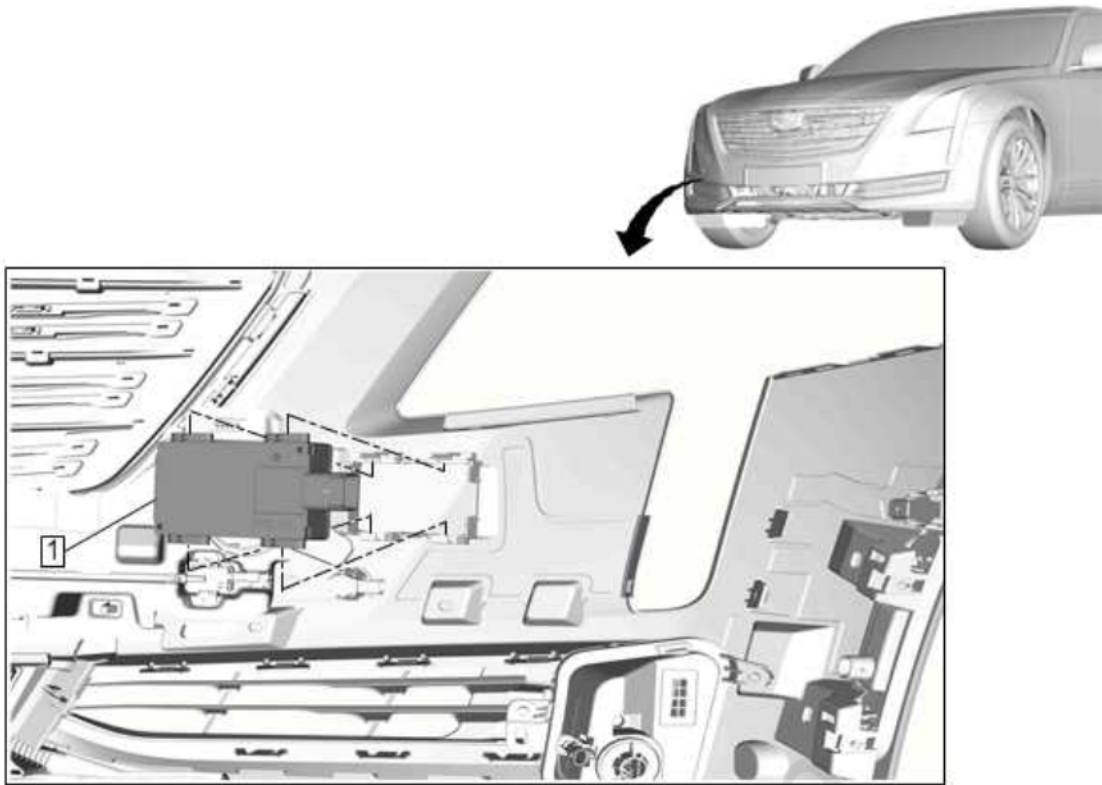


Fig. 3: Short Range Radar Sensor (Front)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Bumper Fascia Replacement (Without UV3) Front Bumper Fascia Replacement (With UV3)	
1	Short Range Radar Sensor Procedure 1. Disconnect the electrical connector. 2. Release the tab retainer tabs and remove. 3. Control Module References for programming and setup information, if required.

SHORT RANGE RADAR SENSOR REPLACEMENT (REAR)

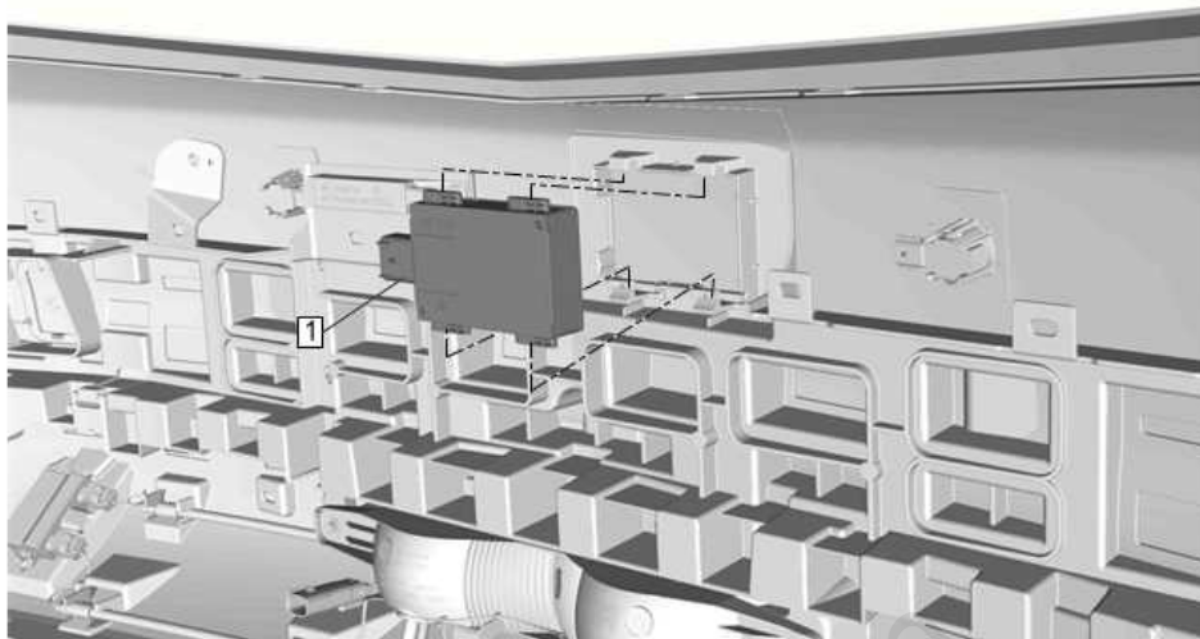


Fig. 4: Short Range Radar Sensor (Rear)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Rear Bumper Fascia Replacement</u>	
1	Short Range Radar Sensor Procedure 1. Disconnect the electrical connector. 2. Release the tab retainer tabs and remove. 3. <u>Control Module References</u> for programming and setup information, if required.

ACTIVE SAFETY CONTROL MODULE REPLACEMENT

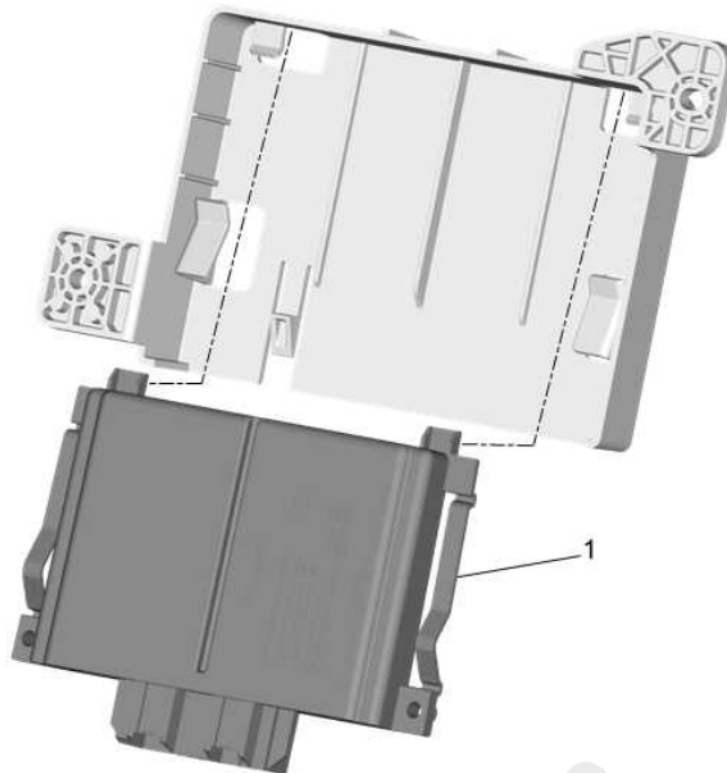


Fig. 5: Active Safety Control Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
<u>Active Safety Control Module Bracket Replacement</u>	
1	Active Safety Control Module Procedure 1. Release the retaining tabs. 2. <u>Control Module References</u> for programming and setup information, if required.

ACTIVE SAFETY CONTROL MODULE BRACKET REPLACEMENT

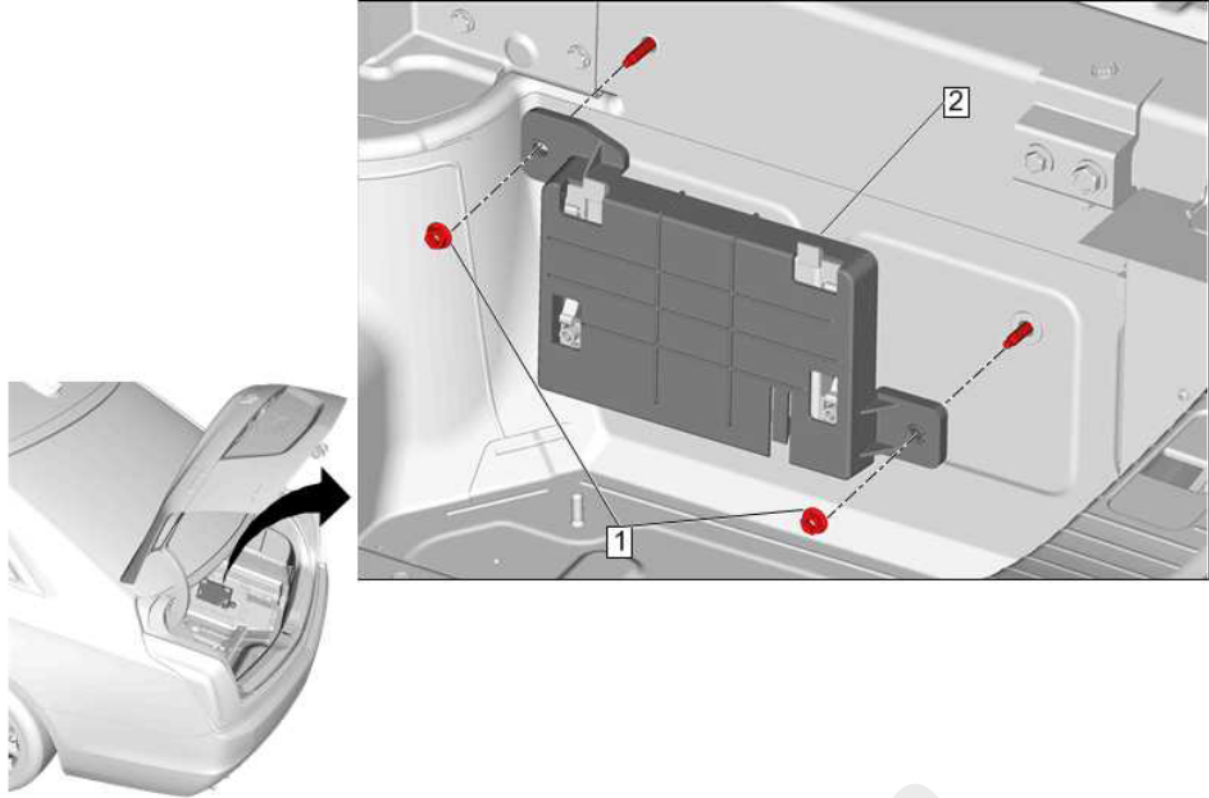


Fig. 6: Active Safety Control Module Bracket
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Rear Compartment Floor Stowage Compartment Cover Replacement (Without HP9)	
1	Active Safety Control Module Bracket Nut [2x] CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
2	Active Safety Control Module Bracket Procedure 1. Disconnect the electrical connectors. 2. Transfer components as necessary.

FORWARD COLLISION ALERT DISPLAY REPLACEMENT

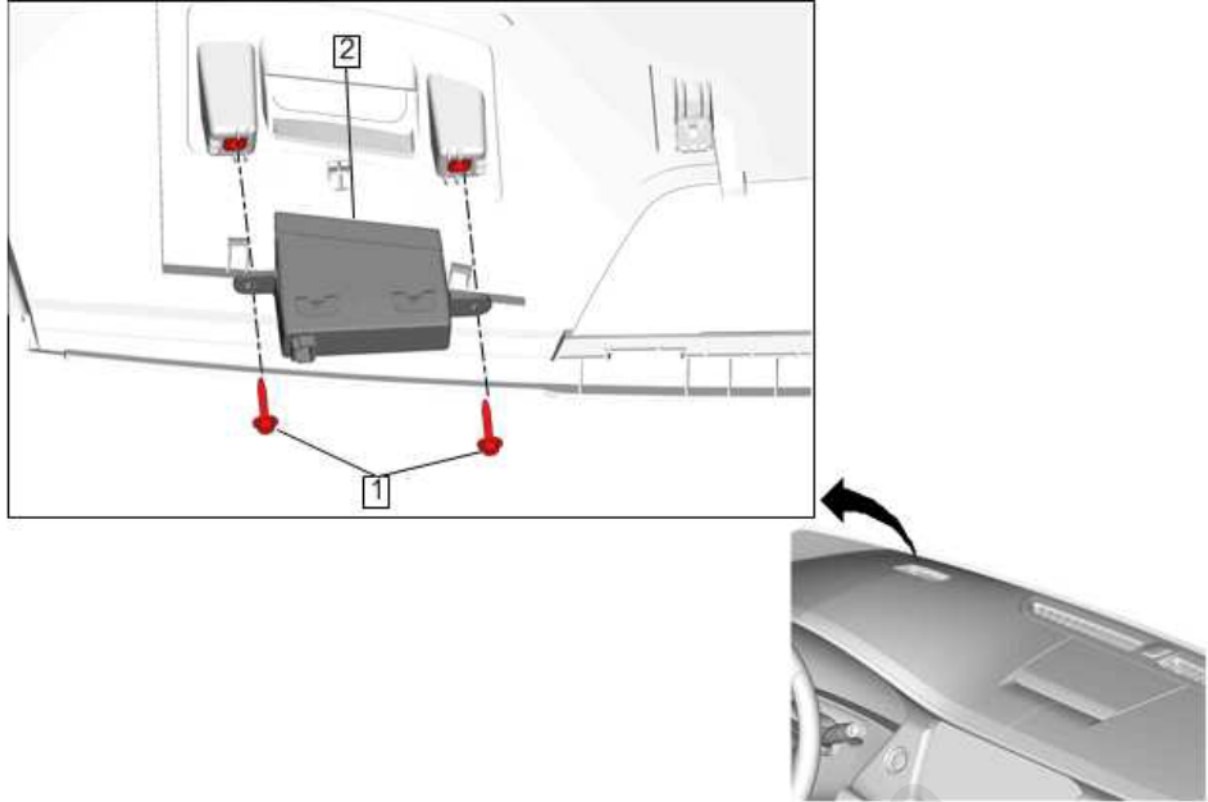


Fig. 7: Forward Collision Alert Display
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Instrument Panel Upper Trim Panel Replacement	
1	Forward Collision Alert Display Bolt [2x] CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Forward Collision Alert Display

PARKING ASSIST ALARM DISABLE SWITCH REPLACEMENT

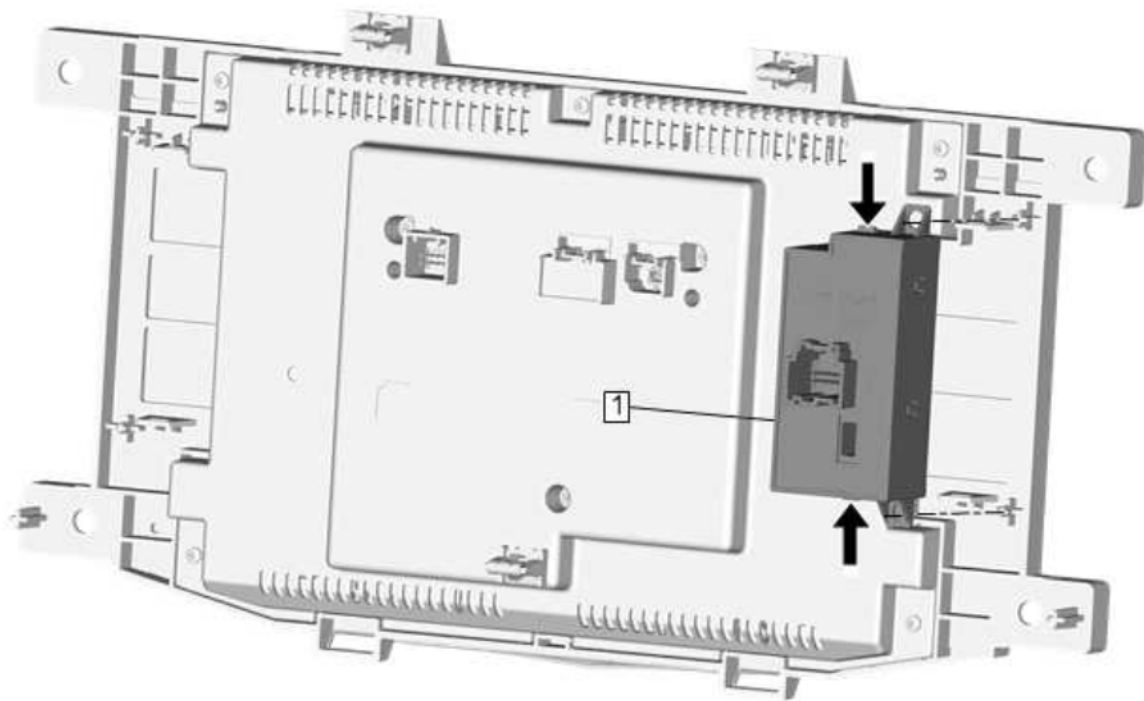


Fig. 8: Parking Assist Alarm Disable Switch
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Radio Control Assembly Replacement</u>	
1	Parking Assist Alarm Disable Switch Procedure Release the retaining tabs.

PARKING ASSIST CONTROL MODULE REPLACEMENT

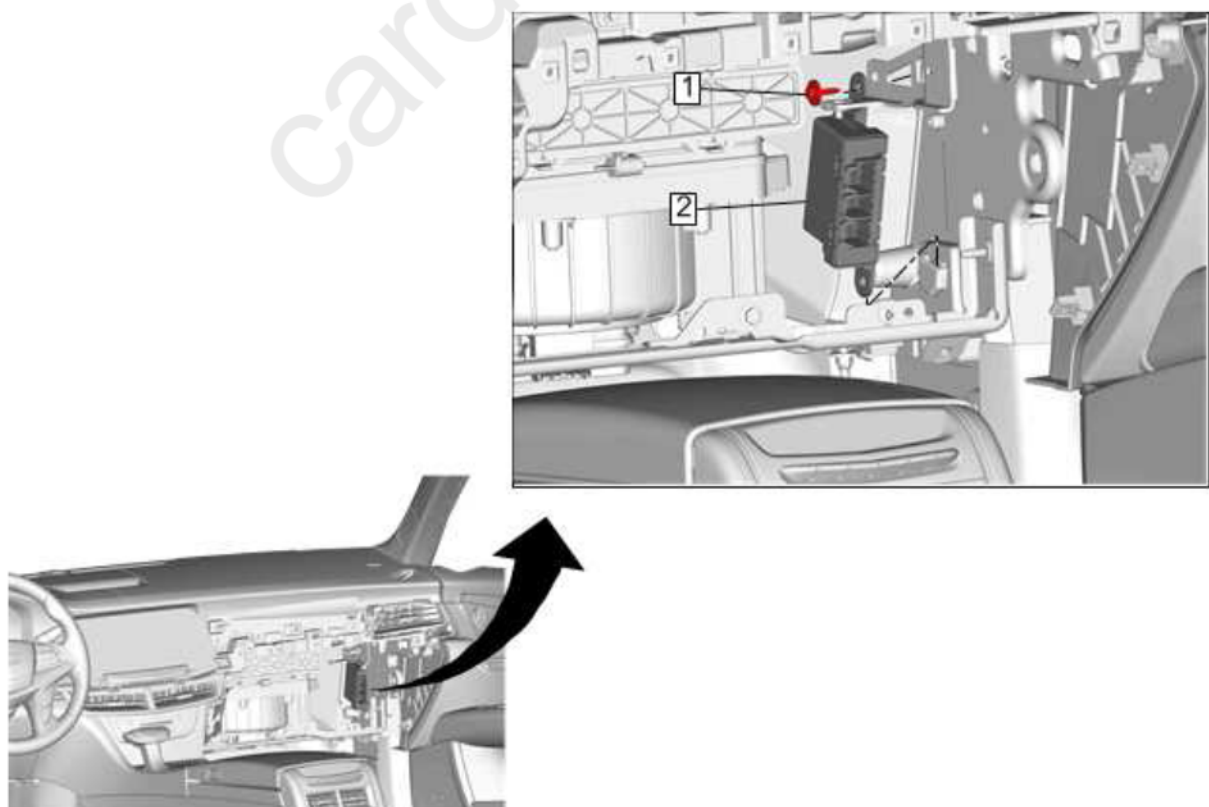


Fig. 9: Parking Assist Control Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures <u>Instrument Panel Compartment Replacement</u> <u>Communication Interface Module Bracket Replacement</u>	
1	Parking Assist Alarm Control Module Bolt CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2.5 N.m (22 lb in)
2	Parking Assist Control Module Procedure - Disconnect the electrical connectors. <u>Control Module References</u> for programming and set up information, if required.

ADVANCED PARKING ASSIST ALARM SENSOR REPLACEMENT

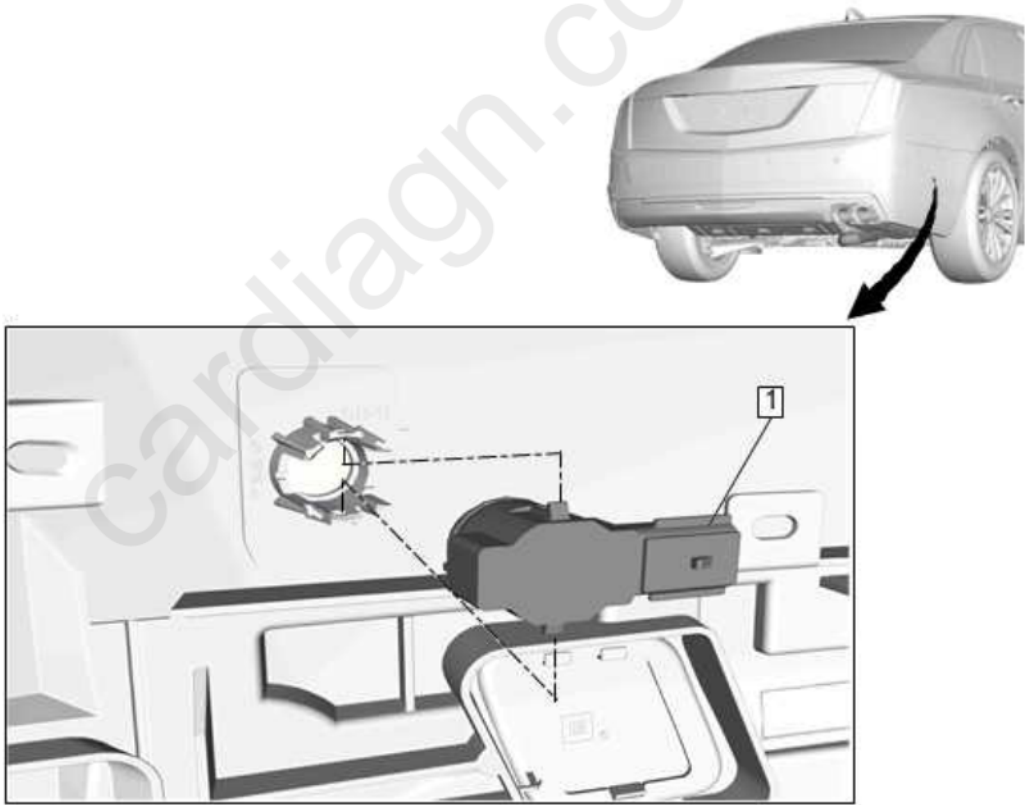


Fig. 10: Advance Parking Assist Alarm Sensor
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Rear Bumper Fascia Replacement</u>	
Empty space for content	

Callout	Component Name
1	Advance Parking Assist Alarm Sensor Procedure 1. Disconnect the electrical connector. 2. Release the locking tab from the advance parking assist alarm sensor bracket. NOTE: Do not refinish previously painted sensors. Excess paint build up will cause the sensor to be inoperative

FRONT PARKING ASSIST ALARM SENSOR REPLACEMENT

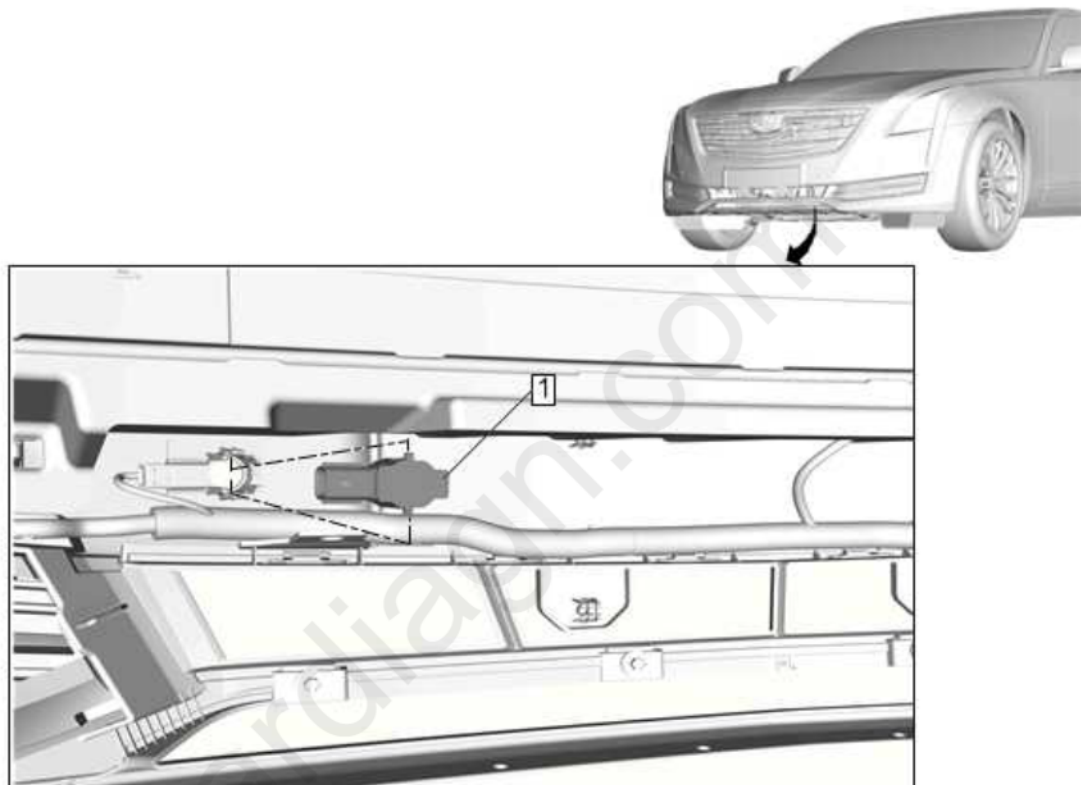


Fig. 11: Front Parking Assist Alarm Sensor
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Bumper Fascia Replacement (Without UV3)</u> <u>Front Bumper Fascia Replacement (With UV3)</u>	
1	Front Parking Assist Alarm Sensor Procedure 1. Disconnect the electrical connector. 2. Release the locking tab from the advance parking assist alarm sensor bracket. NOTE: Do not refinish previously painted sensors. Excess paint build up will cause the sensor to be inoperative

SIDE OBJECT SENSING ALERT MODULE REPLACEMENT

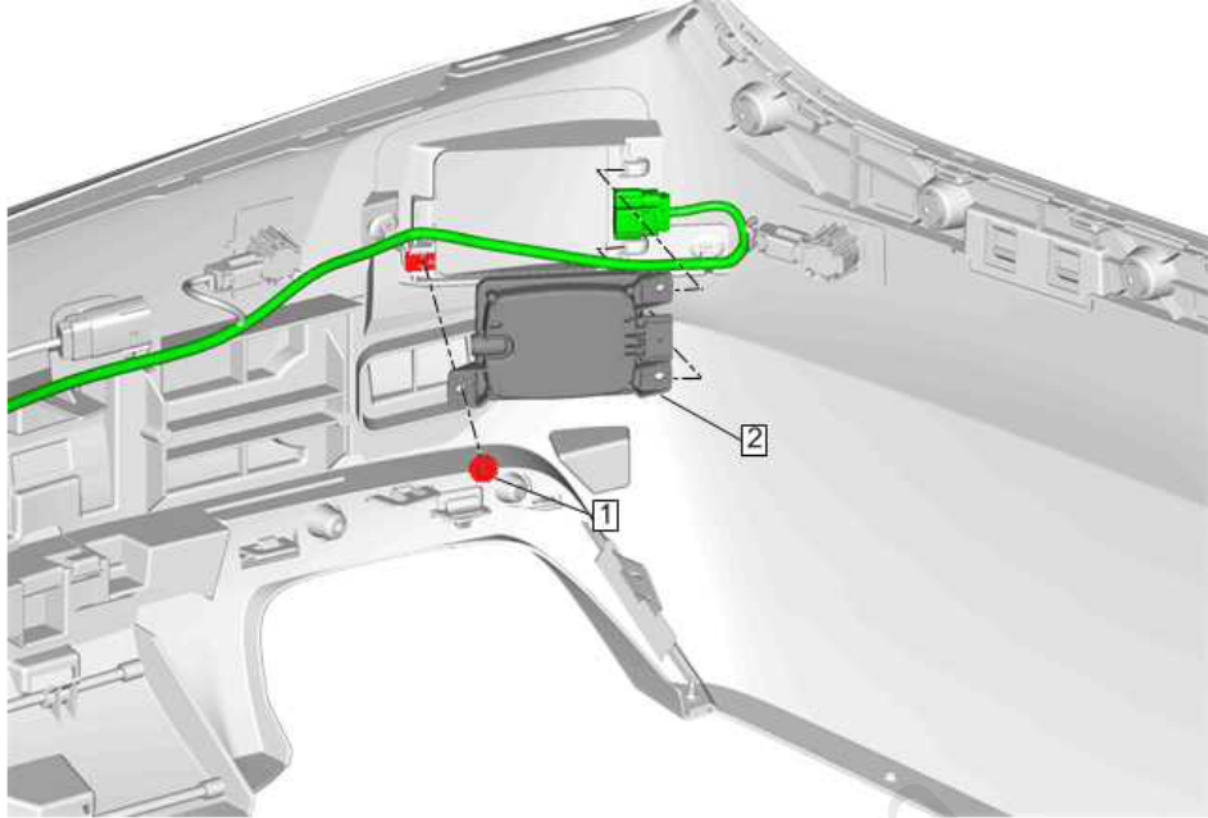


Fig. 12: Side Object Sensing Alert Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Rear Bumper Fascia Replacement	
1	Rear Bumper Fascia 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. Control Module References for programming and setup information, if required.

REAR PARKING ASSIST ALARM SENSOR REPLACEMENT

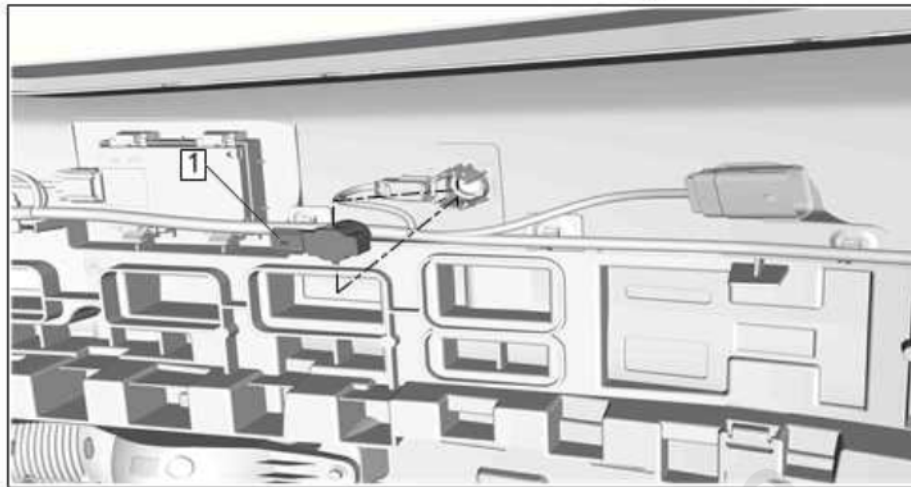


Fig. 13: Rear Parking Assist Alarm Sensor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Rear Bumper Fascia Replacement</u>	
1	Rear Parking Assist Alarm Sensor [4x] Procedure 1. Disconnect the electrical connector. 2. Release the locking tab from the advance parking assist alarm sensor bracket. NOTE: Do not refinish previously painted sensors. Excess paint build up will cause the sensor to be inoperative

PARKING ASSIST ALARM SENSOR RING REPLACEMENT (FRONT)

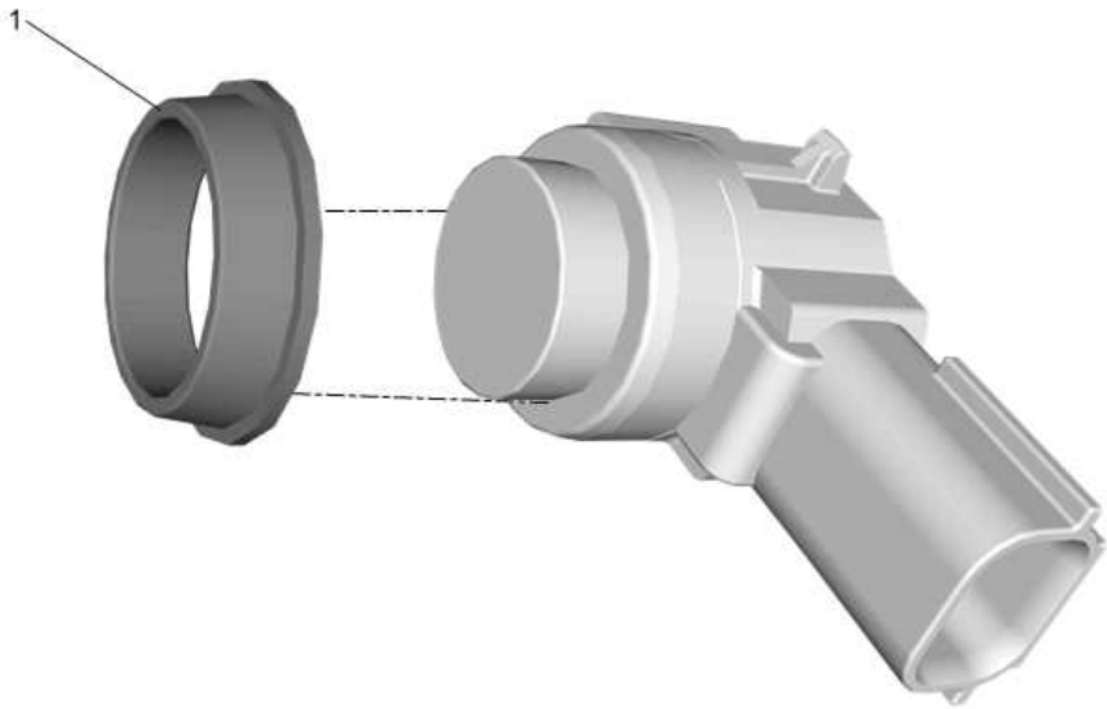


Fig. 14: Parking Assist Alarm Sensor Ring (Front)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Remove the front parking assist alarm sensor, if equipped. - <u>Front Parking Assist Alarm Sensor Replacement</u> 2. Remove the advanced parking assist alarm sensor replacement, if equipped. - <u>Advanced Parking Assist Alarm Sensor Replacement</u>	
1	Parking Assist Alarm Sensor Ring Procedure Pull the parking assist alarm sensor ring from the sensor.

PARKING ASSIST ALARM SENSOR RING REPLACEMENT (REAR)

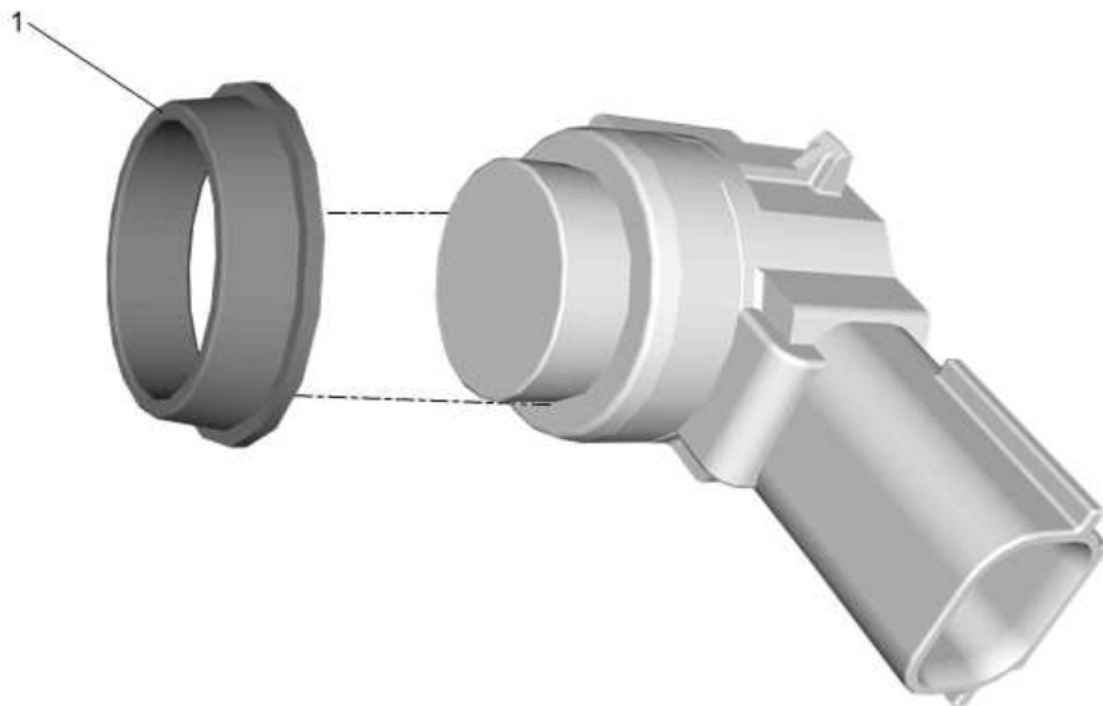


Fig. 15: Parking Assist Alarm Sensor Ring (Rear)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Rear Parking Assist Alarm Sensor Replacement</u> - Advanced Parking Assist Alarm Sensor - Rear. Refer to <u>Advanced Parking Assist Alarm Sensor Replacement</u>	
1	Parking Assist Alarm Sensor Ring Procedure Pull the parking assist alarm sensor ring from the sensor.

SIDE VIEW DRIVER INFORMATION CAMERA REPLACEMENT

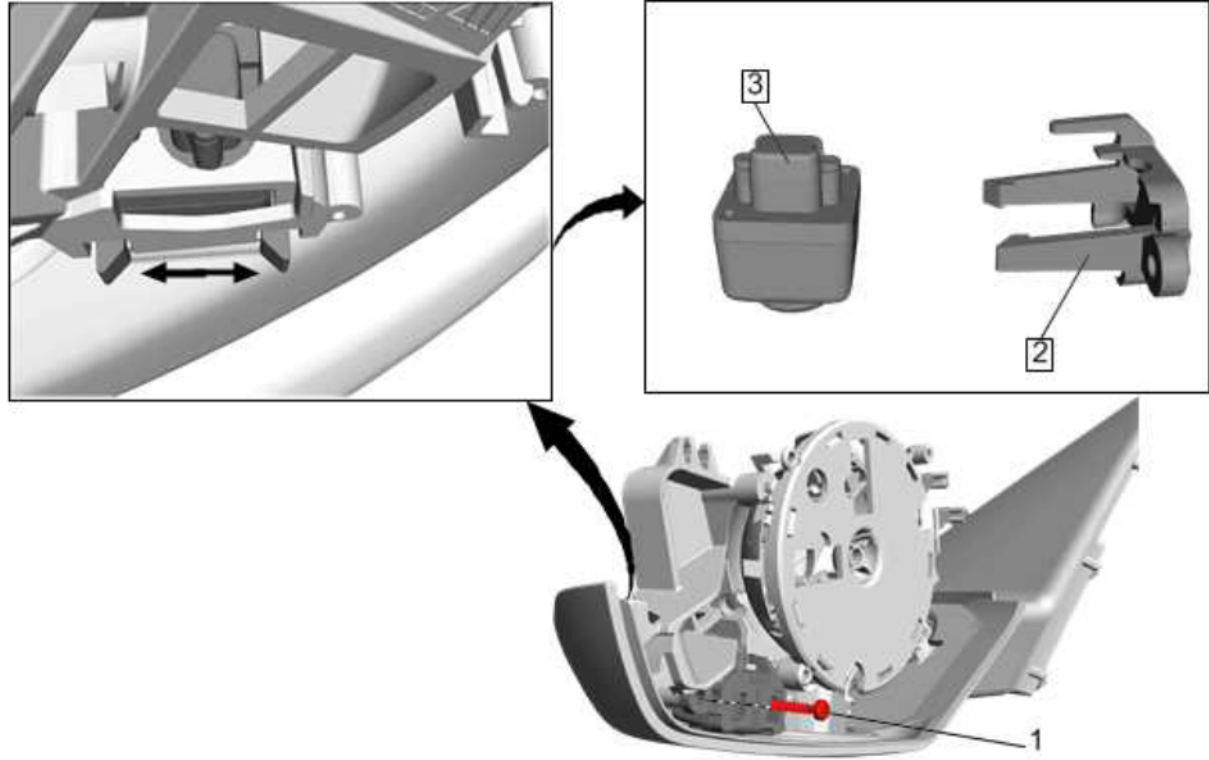


Fig. 16: Side View Driver Information Camera
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Outside Rearview Mirror Housing Upper Cover Replacement 2. Outside Rearview Mirror Inner Actuator Replacement	
1	Side View Driver Information Camera Bolt CAUTION: Fastener Caution Tighten 2.5 N.m (22 lb in)
2	Side View Driver Information Camera Bracket
3	Side View Driver Information Camera Procedure - Slide the camera out from the bracket. - Disconnect the electrical connector. 3. Video Processing Control Module Calibration

FRONT VIEW CAMERA REPLACEMENT

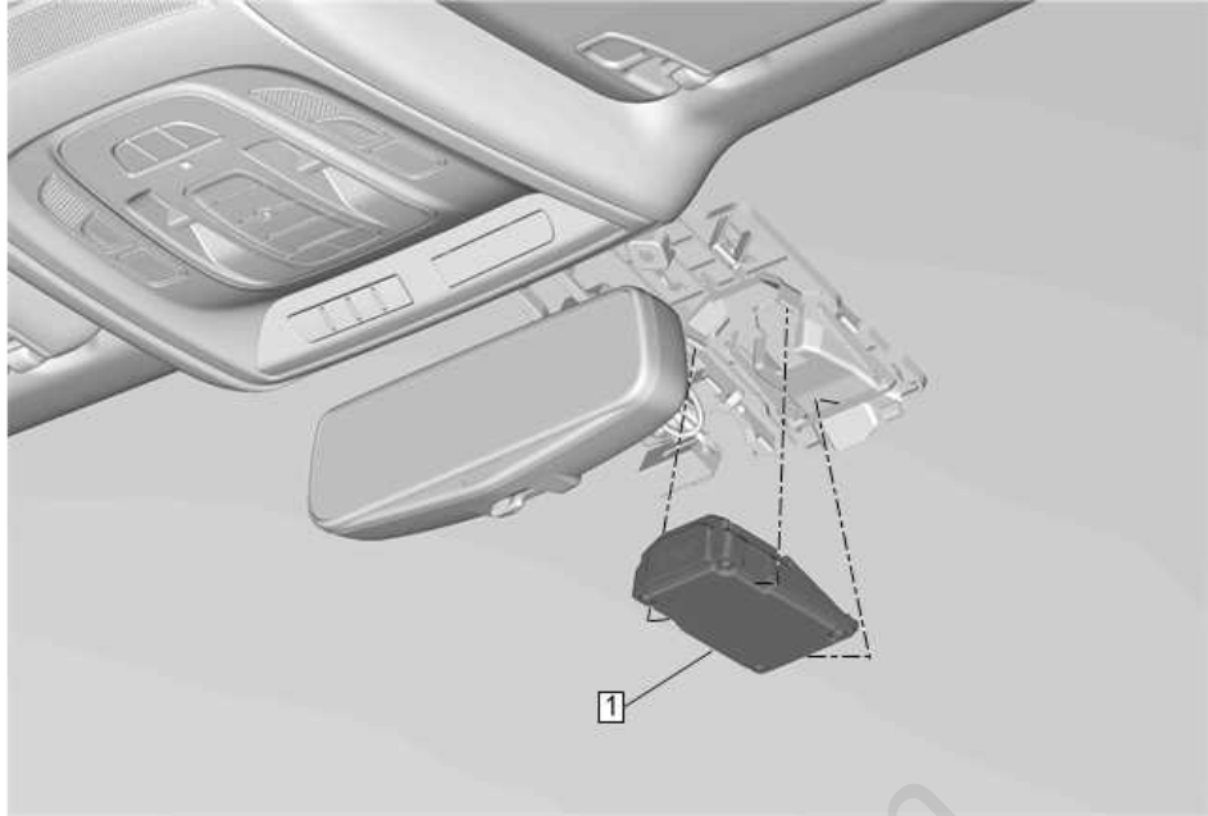


Fig. 17: Front View Camera

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Windshield Multifunction Sensor Mount Bracket Cover Replacement (without UEU) Windshield Multifunction Sensor Mount Bracket Cover Replacement (with UEU)	
1	Front View Camera Procedure 1. Release the retaining tabs. 2. Disconnect the electrical connector. 3. Control Module References for programming and setup information, if required.

FRONT VIEW DRIVER INFORMATION CAMERA REPLACEMENT

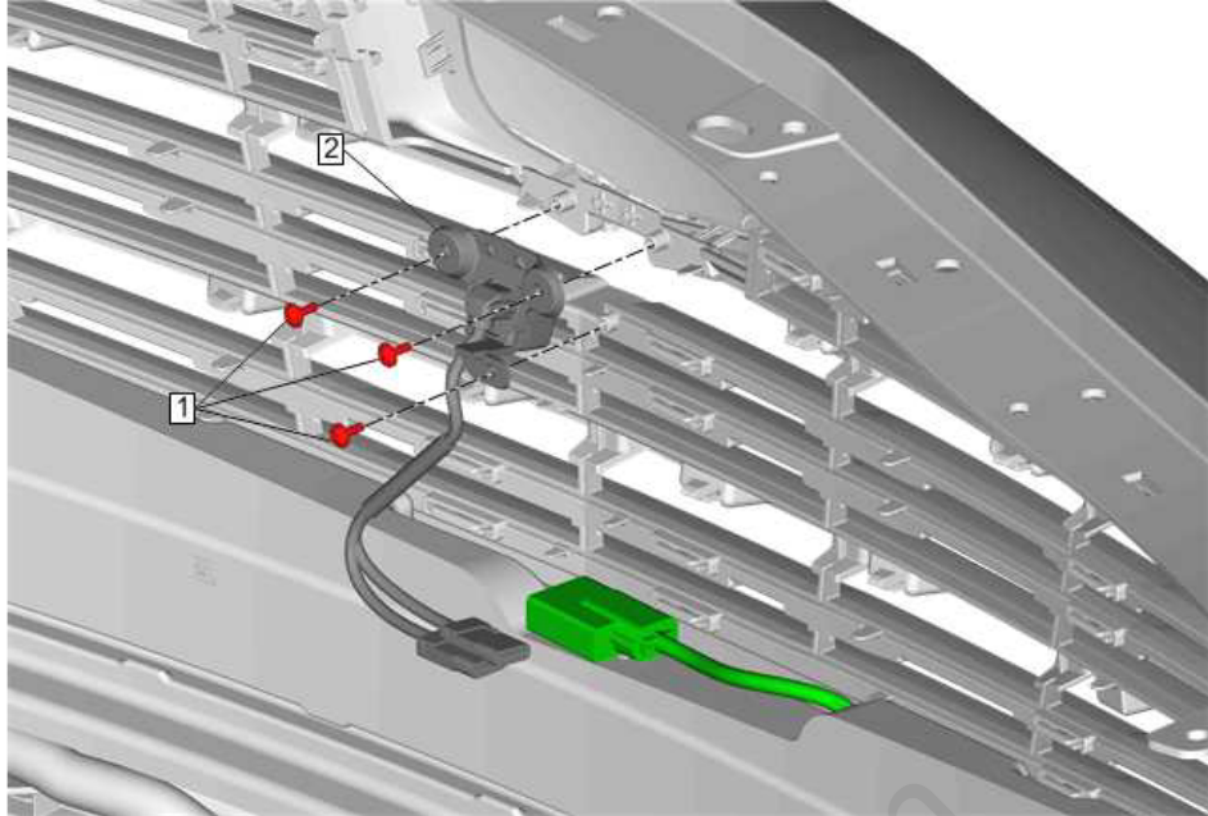


Fig. 18: Front View Driver Information Camera

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Bumper Fascia Replacement (Without UV3)</u> <u>Front Bumper Fascia Replacement (With UV3)</u>	
1	Front Grille Bolt [3x] CAUTION: <u>Fastener Caution</u> . Tighten 2.5 N.m (22 lb in)
2	Front View Driver Information Camera Procedure 1. Disconnect the electrical connector. 2. <u>Video Processing Control Module Calibration</u>

REARVIEW DRIVER INFORMATION CAMERA REPLACEMENT (WITHOUT UVH)

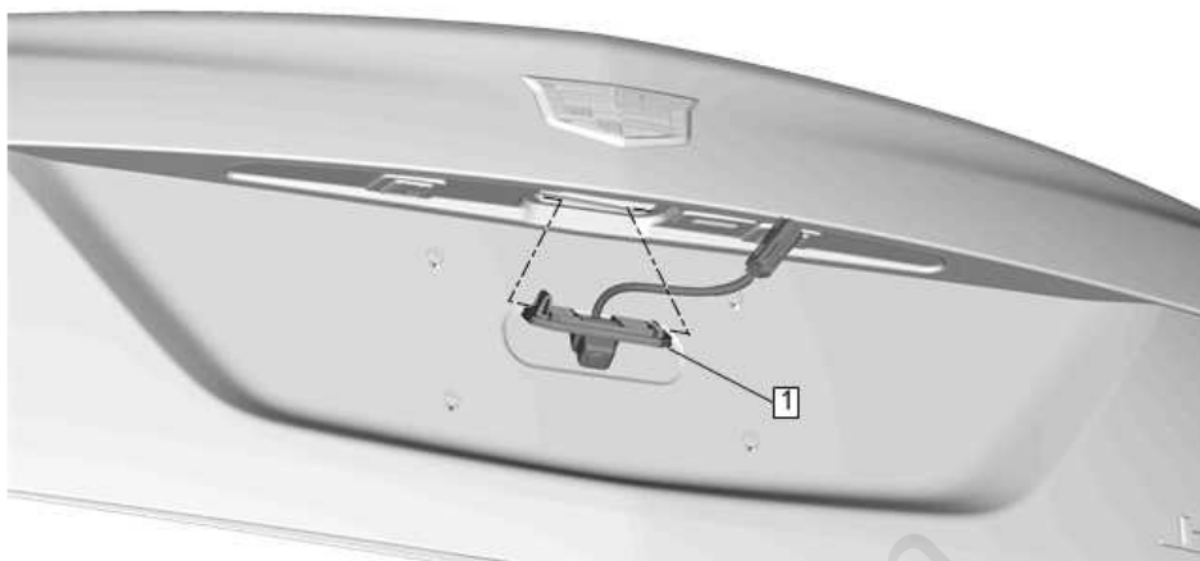


Fig. 19: Rearview Driver Information Camera
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
<u>Rear Compartment Lid Inner Panel Trim Replacement</u>	
1	Rearview Driver Information Camera Procedure 1. Disconnect the electrical connector. 2. Release the retaining tabs.

REARVIEW DRIVER INFORMATION CAMERA REPLACEMENT (WITH UVH)

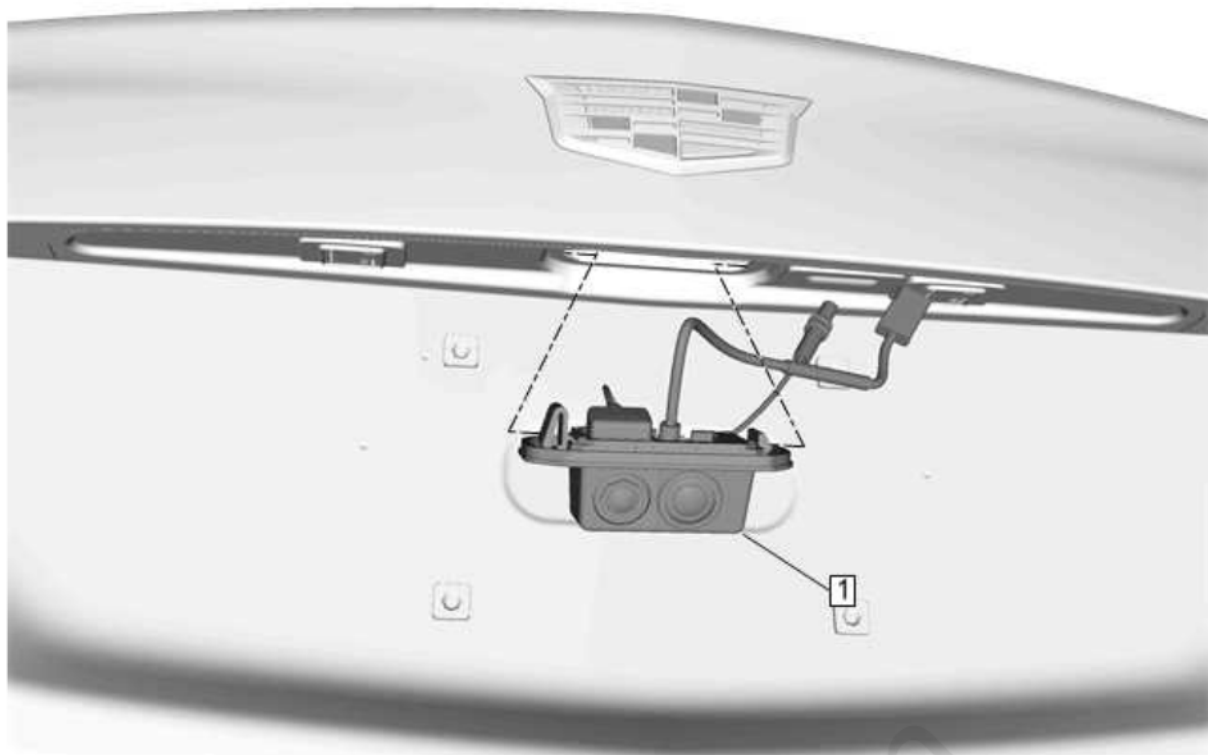


Fig. 20: Rearview Driver Information Camera (With UVH)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
<u>Rear Compartment Lid Inner Panel Trim Replacement</u>	
1	Rearview Driver Information Camera
	Procedure 1. Disconnect the electrical connectors. 2. Release the retaining tabs. 3. <u>Video Processing Control Module Calibration</u>

REARVIEW DRIVER INFORMATION CAMERA REPLACEMENT (WITH DRZ)

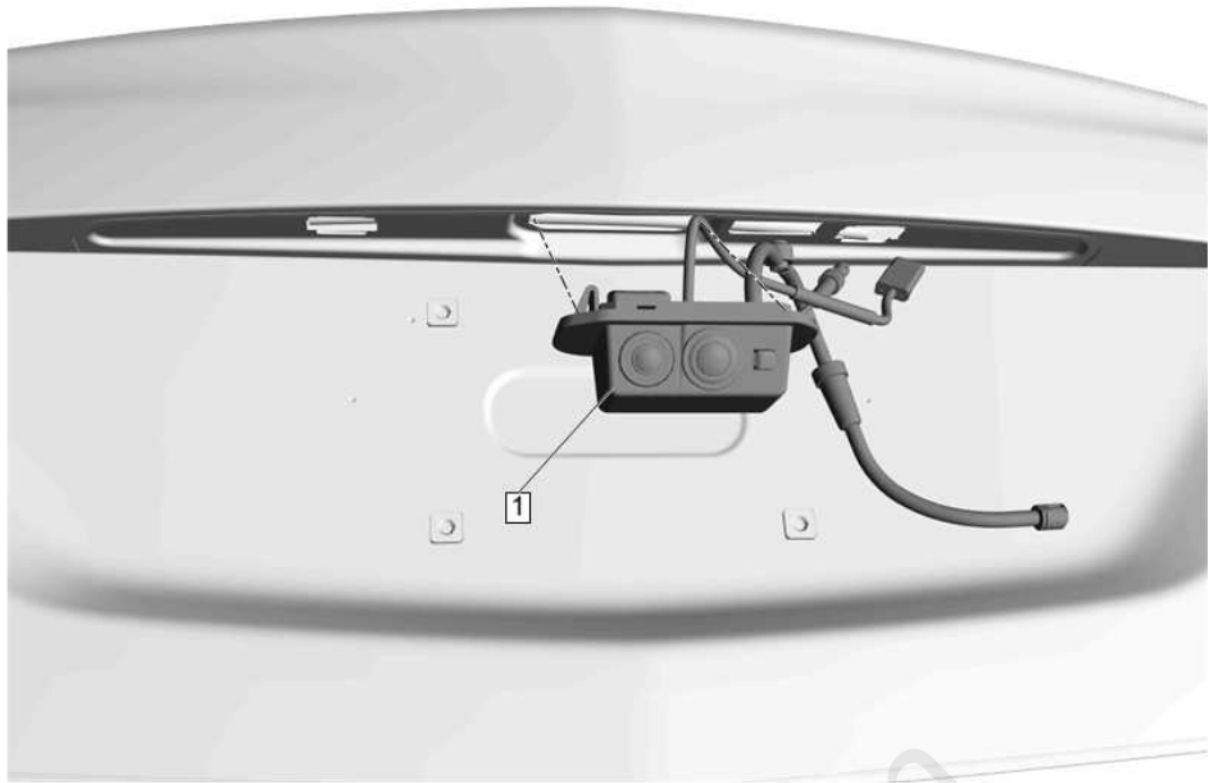


Fig. 21: Rearview Driver Information Camera (With DRZ)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Rear Compartment Lid Inner Panel Trim Replacement</u>	
1	Rearview Driver Information Camera Procedure 1. Disconnect the electrical connectors. 2. Disconnect the rear washer hose. 3. Release the retaining tabs.

FRONT VIEW CAMERA MODULE LEARN (-HP9)

Calibration (without UGN OR UGN non-Escalade)

For North American SPS users, **Calibration will NOT start automatically** and will need to be initiated with GDS2. For European SPS users, **Calibration will start automatically** and will not need to be initiated with GDS2.

The calibration process for the front view camera system is necessary when a front view camera module is replaced by a new one. **This process is required when only replacing the windshield** and the front view camera module has been mounted again properly. This process shall be completed within 3-5 minutes when the correct driving conditions are met. If conditions are not met, 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.

During this time the Lane Departure Warning amber indicator will illuminate.

To calibrate the front camera, operate the vehicle in the following conditions until the calibration is complete:

- Clean windshield.

- Avoid lane changes.
- Maintain vehicle speeds between 56-90 km/h (35-56 MPH).
- Ensure the road contains visible references (well defined lane markings, curbs, etc.).

Calibration Procedure (Required for North American SPS users)

1. Apply the parking brake.

NOTE: It is necessary to have the scan tool connected during the entire process. Do not back out of the screen or press any other buttons.

2. Place the transmission in Park (if applicable)
3. Install scan tool
4. Navigate to the module diagnostics menu
5. Select Frontview Camera Module
6. Select Configuration/ Reset Functions menu Item
7. Select the Frontview Camera Learn procedure and follow the directions displayed on the screen.
8. Do not disconnect the scan tool, drive the vehicle to complete calibration.

Once the procedure is complete, the amber indicator will turn off. Shortly after the green ready to assist light should turn on as long as all conditions are met for normal operation and the system is left ON. The system is then ready to assist.

Calibration (UGN and Escalade)

New modules must be SPS programmed prior to calibration, refer to [Control Module References](#)

The calibration process for the front view camera system is necessary when a front view camera module is replaced by a new one. **This process is required when only replacing the windshield** and the frontview camera module has been mounted again properly. This process shall be completed within 3-5 minutes when the correct driving conditions are met. If conditions are not met, the 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.

To calibrate the front camera, operate the vehicle in the following conditions until the calibration is complete:

- Clean windshield.
- Avoid lane changes.
- Maintain vehicle speeds between 56-90 km/h (35-56 MPH).
- Ensure the road contains visible references (well defined lane markings, curbs, etc.).

Calibration Procedure

1. Apply the parking brake.

NOTE: It is necessary to have the scan tool connected during the entire process. Do not back out of the screen or press any other buttons.

2. Place the transmission in Park (if applicable)
3. Install scan tool

4. Navigate to the module diagnostics menu
5. Select Frontview Camera Module
6. Select Configuration/ Reset Functions menu Item
7. Select the Frontview Camera Learn procedure and follow the directions displayed on the screen.
8. Do not disconnect the scan tool, drive the vehicle to complete calibration.

Once the procedure is complete, the service message will turn off and normal operation will resume. Shortly after the green ready to assist light should turn on as long as all conditions are met for normal operation. The system is then ready to assist.

If Slow to Calibrate

The ideal calibration condition is driving on a 2 lane divided highway with markings on both sides of the lane. One or more of the following conditions may increase the length of time required to complete the self-calibration procedure:

- Heavy traffic
- Stop and go traffic
- Mountain roads
- Curves in roadway
- Poor contrast lane markings
- Botts' Dots type lane markings
- Operating the vehicle speed is greater than 90 km/h (56 MPH)
- Driving through snow or fog or driving directly into the sun
- Camera not properly installed. Verify it is snapped into tabs and is secure. Refer to [Front View Camera Replacement](#).

No Calibration

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](#).

FRONT VIEW CAMERA MODULE LEARN (HP9)

Calibration

For North American SPS users, **Calibration will NOT start automatically** and will need to be initiated with GDS2. For European SPS users, **Calibration will start automatically** and will not need to be initiated with GDS2.

The calibration process for the front view camera system is necessary when a front view camera module is replaced by a new one. **This process is required when only replacing the windshield** and the frontview camera module has been mounted again properly. This process shall be completed within 3-5 minutes when the correct driving conditions are met. If conditions are not met, the 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.

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:

NOTE:

If the front view camera module calibration is not completed during the current ignition cycle, it will restart in next ignition cycle. "Service Front Camera" will be displayed until successful calibration and DTC B1008 4B may be active.

When Lane Departure Warning is on, the indicator is green if Lane Departure Warning is available to warn of a lane departure. If the vehicle crosses a detected lane marking without using the turn signal in that direction, the indicator changes to amber and flashes. To verify if the system is working the indicator on the switch should remain illuminated once pressed and when up to speeds greater than 35 mph (56 km/h), the lane departure indicator will illuminate on the instrument cluster.

The power mode be in ACCY for the calibration process to become enabled by using the scan tool. GDS2 will display a "loss of com" error message when the procedure is attempted in any power mode other than ACCY.

- Clean windshield.
- Avoid lane changes.
- Maintain vehicle speeds between 56-90 km/h (35-56 MPH).
- Ensure the road contains visible references (well defined lane markings, curbs, etc.).

Calibration Procedure (Required for North American SPS users)

1. Apply the parking brake.
2. Place the transmission in Park (if applicable)
3. **Place vehicle in ACCY Power Mode**
4. Install scan tool
5. Navigate to the module diagnostics menu
6. Select Frontview Camera Module
7. Select Configuration/ Reset Functions menu Item
8. Select the Frontview Camera Learn procedure and follow the directions displayed on the screen.
9. Drive the vehicle to complete calibration.

Once the procedure is complete, the amber indicator will turn off. Shortly after the green ready to assist light should turn on as long as all conditions are met for normal operation. The system is then ready to assist.

If Slow to Calibrate

The ideal calibration condition is driving on a 2 lane divided highway with markings on both sides of the lane. One or more of the following conditions may increase the length of time required to complete the self-calibration procedure: :

- Camera not properly installed. Verify it is snapped into tabs and is secure. Refer to [Front View Camera Replacement](#).
- Heavy traffic
- Stop and go traffic
- Mountain roads
- Curves in roadway
- Poor contrast lane markings
- Botts' Dots type lane markings
- Operating the vehicle speed is greater than 90 km/h (56 MPH)
- Driving through snow or fog or driving directly into the sun

No Calibration

Conditions that will prevent completion of the self-calibration procedure:

- Camera not properly installed. Verify it is snapped into tabs and is secure. Refer to [Front View Camera Replacement](#).
- Dirty windshield glass or obstruction on windshield
- Operating the vehicle with speed less than 56 km/h (35 MPH)
- No visible lane markings
- Severe weather where lane markings cannot be seen

RADAR SENSOR MODULE - LONG RANGE LEARN

NOTE: "Adaptive Cruise Temporarily Unavailable" service message may be displayed if this calibration procedure has to be performed. The radar may have become misaligned.

After replacing and programming the Long Range Radar Sensor Module, it is necessary to perform a calibration procedure to align the radar. This is indicated to the technician by DTC B101E 4B. Calibration is performed while driving the vehicle with the scantool connected. Calibration is initialized using a scantool and the scantool must remain connected until calibration is complete. During this time the "Service Driver Assist" service message will be displayed. Once the procedure is complete, the service message will turn off and normal operation will resume.

Calibration is not required if the existing module was reprogrammed only. Calibration needs to be conducted if the module was replaced or removed and re-secured.

If calibration is not successful, it could be due to improper driving environment, module and bracket assembly bent out of position or incorrect module mounting. A typical driving environment is usually sufficient to calibrate the module within 10-30 minutes. The module needs to be mounting properly in the bracket and aimed straight ahead within +/- 3 degrees.

Calibration Procedure

1. Verify no other DTCs except for B101E 4B Electronic Control Unit Software are present.
 - **If other DTCs are present**
Refer to service information and repair as necessary.
 - **If no other DTCs are present**
2. Prior to driving the vehicle make sure the surface in front of the radar (Cadillac emblem) is clean. Also verify the mounting area is not damaged and allows the module to face the intended direction.
3. Prepare scantool to be mobile for Long Range Radar Calibration driving phase. The scantool needs to stay connected during the driving phase of the calibration.
4. Engine running.
5. Initiate calibration using Long Range Radar Sensor Module Learn in the scantool. The driver information display will display "Service Driver Assist" message during calibration.

NOTE: Do not back out of screen or press any other buttons until the calibration is complete.

6. Drive the vehicle within the following conditions for 10-30 minutes or until calibration is complete. The "Service Driver Assist" message will turn off when calibration is complete.
 - Drive at speeds greater than 56 kph (35 mph)
 - Minimize tight curves
 - Avoid extreme acceleration or deceleration
 - Follow one or multiple vehicles. (typical vehicle traffic is sufficient, but vehicles 30 - 50 m (100 - 165 ft) away are most effective at decreasing the calibration time)
 - Drive in an environment that has stationary objects on the side of the road (street signs, guard rails, mail boxes, fences, etc.)

7. Verify proper calibration by observing that the "Service Driver Assist" message turns off within 10-30 minutes of normal driving.

- **If "Service Driver Assist" message fails to turn off**

1. Verify correct operating conditions were met

- If incorrect driving environment, refer to If Slow to Calibrate and repeat calibration procedure following recommended operating conditions.
- If correct driving environment

2. Verify DTC B390C 66 Incorrect Mounting is not set

- If B390C 66 is set

Refer to [**DTC B390C**](#) .

- If B390C 66 is not set

- **If "Service Driver Assist" message turns off**

8. Drive at speeds greater than 40 kph (25 mph) and verify engagement of Adaptive Cruise Control (cruise control icon will change from white to green)

- **If Adaptive Cruise Control will not engage**

Check vehicle for DTCs and correct as required.

- **If Adaptive Cruise Control engages**

9. All OK.

If Slow to Calibrate

The ideal calibration condition is driving on a freeway or two lane road with medium traffic. One or more of the following conditions may increase the length of time required to complete the self-calibration procedure:

- Heavy traffic - following too close behind vehicles for long periods (more than 40 min)
- Stop and go or very slow traffic
- Mountain roads
- Constant sharp curves in roadway
- No traffic - if no traffic is available, may need to add vehicle ahead to support calibration
- Limited or no stationary structures on side of the road - need structures such as street signs, guard rails, mail boxes, parked cars, etc.
- Driving in tunnels

CARD READER RECEPTACLE REPLACEMENT - VIDEO

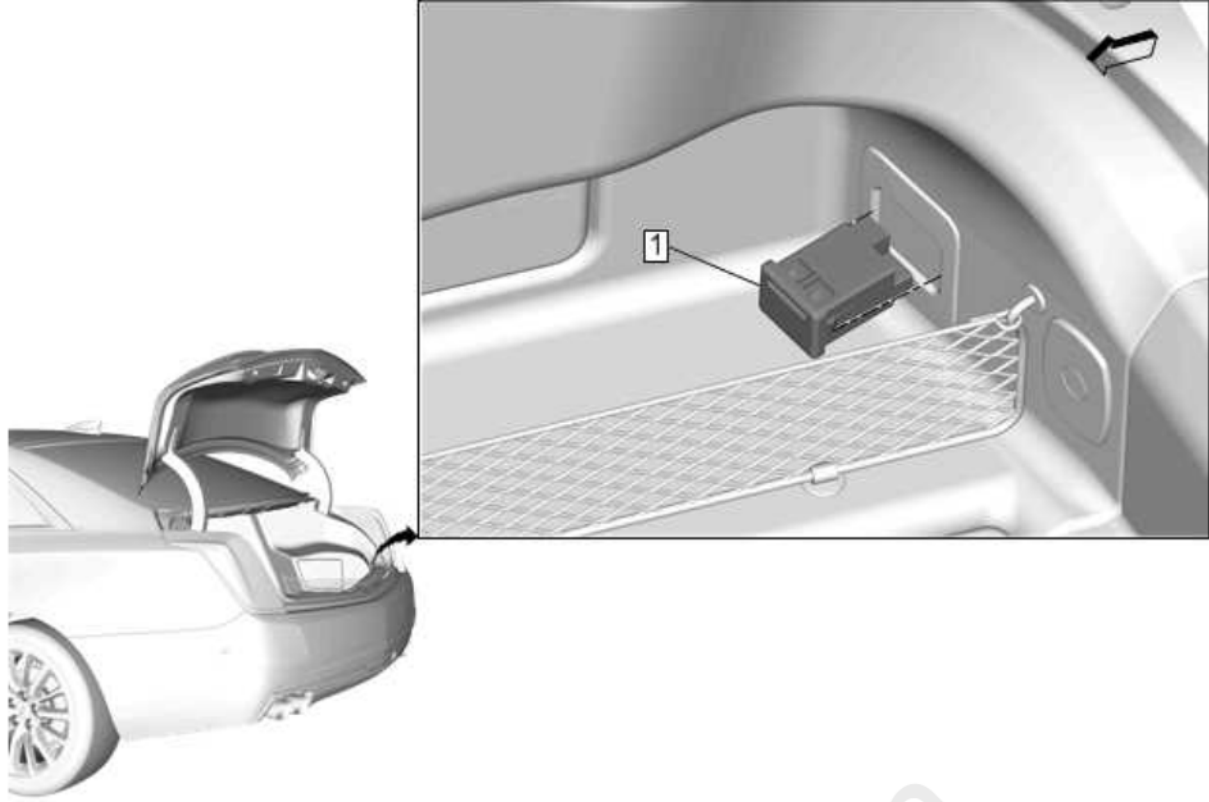


Fig. 22: Card Reader Receptacle - Video
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Card Reader Receptacle Procedure 1. Use a suitable tool. 2. Depress the tabs on the receptacle to remove. 3. Disconnect the electrical connector.

VIDEO PROCESSING MODULE REPLACEMENT

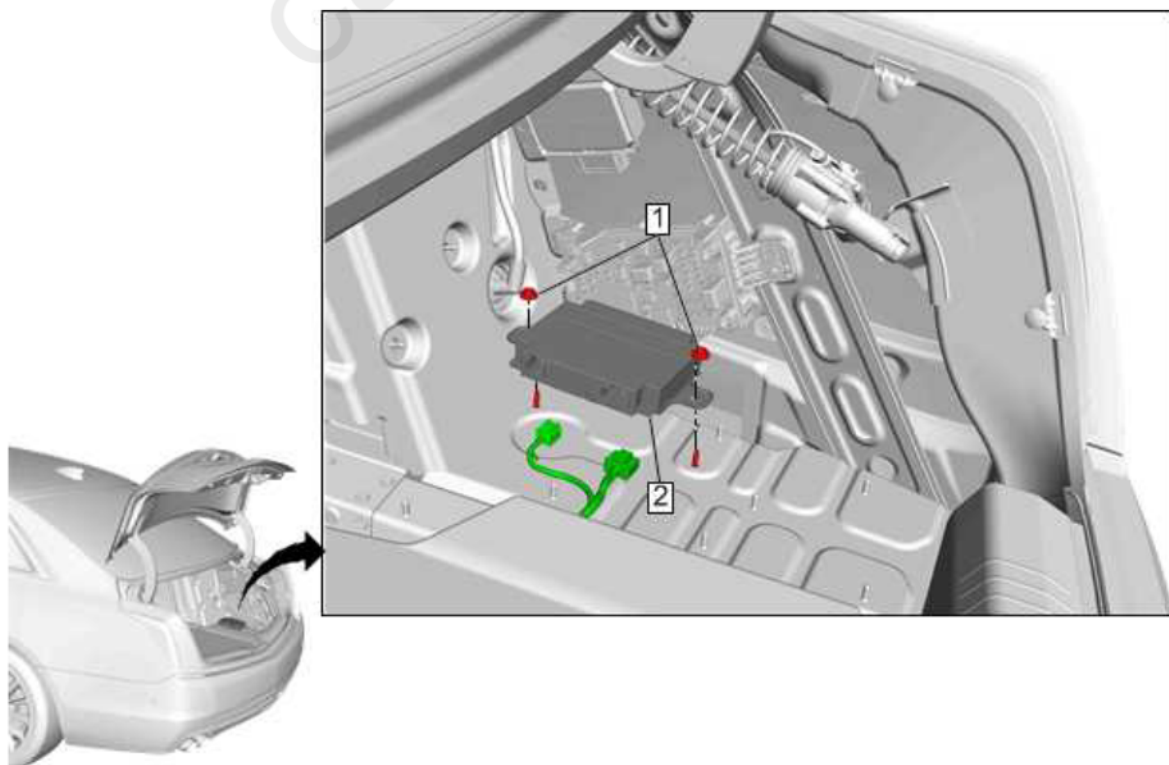


Fig. 23: Video Processing Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Rear Compartment Side Trim Replacement - Right Side (Without HP9)</u> <u>Rear Compartment Side Trim Replacement - Right Side (With HP9)</u>	
1	Video Processing Module Nut [2x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)
2	Video Processing Module Procedure 1. Disconnect the electrical connectors. 2. <u>Control Module References</u> for programming and setup information, if required.

VIDEO PROCESSING CONTROL MODULE CALIBRATION

NOTE: Image will be slightly distorted at all times, the camera(s) lens is a fish-eye lens meant to capture as much as possible.

The calibration procedure is to have the Video Processing Control Module learn the new cameras and their positions. The calibration does not start automatically or if manual initialization is desired, calibration can be initiated by selecting Video Processing Control Module Camera Learn in the scantool.

Radio Display Prompt Example

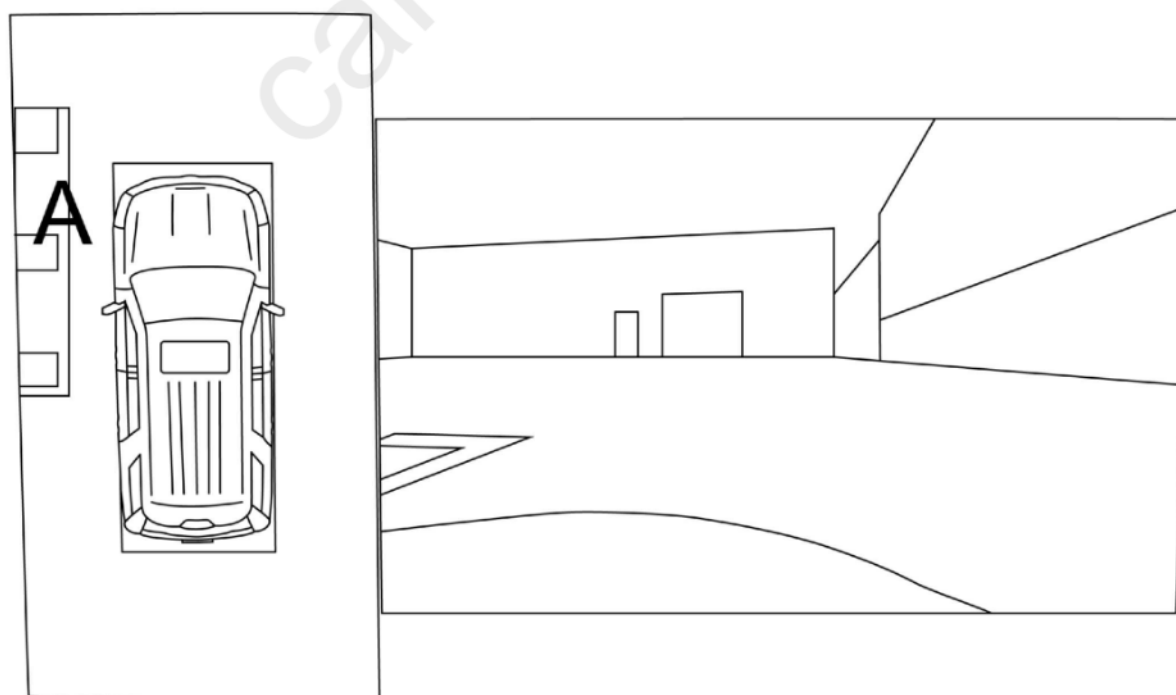


Fig. 24: Radio Display Prompt Example
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Only ONE EL-51372 Camera Calibration Mat is required for calibration.

The left side of the screen will display where the **EL-51372** Camera Calibration Mat should be located for each step. The right side of the display is the view from the camera that is being learned during that step.

Mat Position Reference

- Position A is the left front
- Position B is the right front
- Position C is the left rear
- Position D is the right rear

Diagnostic Aids

- If any one of the cameras is replaced on the Surround Vision Camera System, the displayed image may not be correctly stitched due to a change in the location or orientation of the camera. The only way to correct an incorrectly stitched image is to perform the calibration procedure.
- Tires must be inflated properly
- Vehicle must be on a level surface
- Mirrors must be folded out
- It is a good practice to wipe camera lens' clean prior to alignment
- Interfering objects or glare from overhead lighting will fail an alignment
- All points of access to the inside of the vehicle **Must** be closed, including hood.
- **Finalize** is the very last step, this saves all the data from the alignment

Calibration

NOTE: Diagnostic Aids **MUST** be followed prior to Calibration

This is the calibration process for the Surround Vision Camera system. When the Video Processing Control Module is replaced, calibration must be performed. If the following occurs, calibration is recommended but not required:

- If a camera is replaced
- If mirrors or fascias are replaced, removed or physically adjusted

To calibrate the cameras, operate the vehicle in the following conditions until the calibration is complete:

- Clean camera lenses.
- Follow the on screen instructions with regards to EL-51372 camera mat placement
- Vehicle must be ignition ON or Vehicle ON

1. Using the scan tool, select the desired camera to calibrate or all cameras if necessary.

NOTE:

- **Camera Calibration Mat location is very critical for the cameras to learn. If the image displayed is heavily distorted, the mat position was not correct. For correct mat location, refer to the box EL-51372 came in. Place the mat 50 cm from the vehicle when performing calibration or camera learn. For Fore/Aft alignment, place the mat so the distance from the closest edge of the center square, to the bumper, is 70 cm.**
- **Camera Calibration Mat must be as flat as possible. Wrinkles in the matt will cause a distorted view for the camera.**
- **When an exclamation (!) is seen on the radio display, camera learn was not completed or there was an error. To clear this, press Retry**

- At any point where the Calibration is stuck and radio display does not show any camera images, clicking Cancel from the scan tool learn screen will resolve the issue and will return to previous learn position
- If at any point in the calibration procedure the alignment process is interrupted, clicking Retry from the scan tool learn screen will cancel the current learn process and can be procedure can be restarted
- **DO NOT Click Finalize prior to step 7**

2. Click Initiate on the scan tool learn screen. This starts the calibration process.
3. The radio display will show the desired **EL-51372** camera calibration mat position.
4. Place the **EL-51372** camera mat in the position shown on the display. Use the box **EL-51372** came as a ruler to align the mat with the vehicle correctly.

NOTE: **Mat must be flat on the floor**

5. Once the mat is correctly positioned, Click **Capture** on the scan tool learn screen. This captures the image.

NOTE: **In an event of an error, click the Retry button to reset the image and try a new capture. DO NOT Click Finalize until step 7**

- If a red "X" is displayed, correct the **EL-51372** camera mat position
 - If a green checkmark is displayed, the image was accepted.
6. Leave the **EL-51372** camera mat in that position until the camera display prompts for it to be moved to the next position or if calibration is complete.
 7. Once the last camera image has been capture, click Finalize on the scan tool learn screen. This completes the learn.

Sequence of Camera Alignment

Left Camera Alignment Learn

1. Captures an image at Position C
2. Captures an image at Position A

Right Camera Alignment Learn

1. Captures an image at Position D
2. Captures an image at Position B

Front Camera Alignment Learn

1. Captures an image at Position A
2. Captures an image at Position B

Rear Camera Alignment Learn

1. Captures an image at Position D
2. Captures an image at Position C

All Cameras Alignment Learn

1. Captures an image at Position A
2. Captures an image at Position B
3. Captures an image at Position C
4. Captures an image at Position D

Error Codes During Alignment

Error Code	Cause	Possible Repair
0101 Front Camera 0103 Front Camera 0201 Right Camera 0203 Right Camera 0301 Rear Camera 0303 Rear Camera 0401 Left Camera 0403 Left Camera	Lighting Issue, Obstructed View of Target, Target Position out of Range, Poor Camera installation	Correct Lighting, Reposition Target, Verify Camera correctly installed and clean.
0102 Front 0202 Right 0302 Rear 0402 Left	Lighting Issue, Obstructed View of Target, Target Position out of Range	Correct Lighting, Reposition Target, Verify Camera is clean.
0104 Front 0204 Right 0304 Rear 0404 Left	Camera Position incorrect	Correct camera position
0120 Front 0220 Right 0320 Rear 0420 Left	NTSC error detected	Verify camera electrical connection
FFF0 Passenger Door FFF1 Left Rear Door FFF2 Right Rear Door FFF3 Driver Door FFF4 Trunk FFF5 Hood FFF6 Liftglass	Hood, Door, Liftgate, Trunk or other part of car OPEN	Close all doors, Hood, Liftgate and Trunk

NIGHT VISION MODULE REPLACEMENT

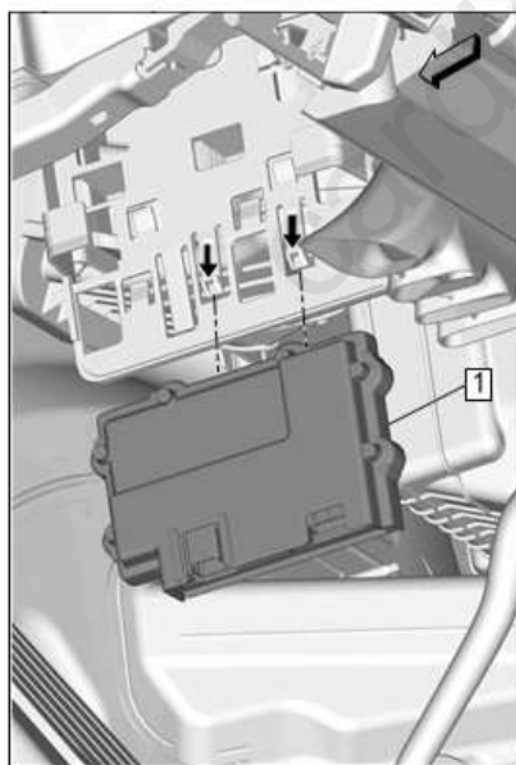


Fig. 25: Night Vision Module

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Instrument Panel Lower Trim Panel Insulator Replacement - Left Side	

Callout	Component Name
1	Night Vision Module Procedure 1. Disconnect the electrical connectors. 2. Release the retaining tabs. 3. Control Module References for programming and setup information, if required.

NIGHT VISION CAMERA REPLACEMENT

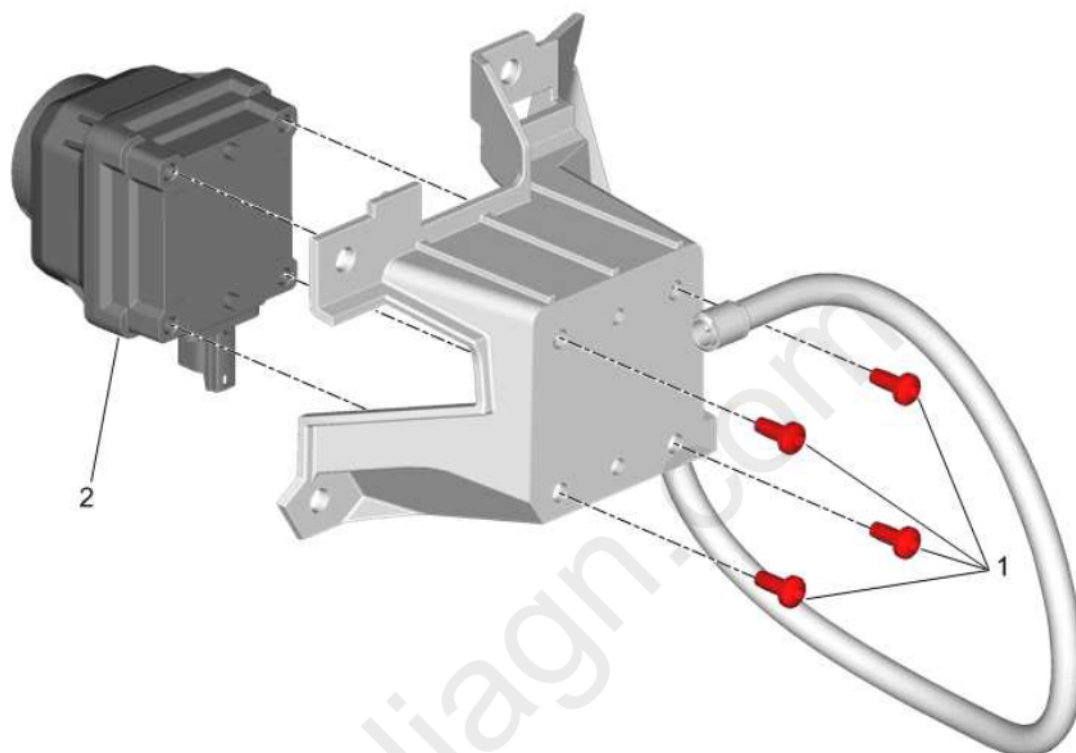


Fig. 26: Night Vision Camera

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Night Vision Camera Bracket Replacement	
1	Night Vision Camera Bolt [4x] CAUTION: Fastener Caution Tighten 3.75-7.5 N.m (33-66 lb in)
2	Night Vision Camera Procedure 1. Perform the necessary programming and setup procedure: Control Module References 2. Calibrate the night vision camera. Refer to Night Vision Camera Control Module Learn

NIGHT VISION CAMERA BRACKET REPLACEMENT

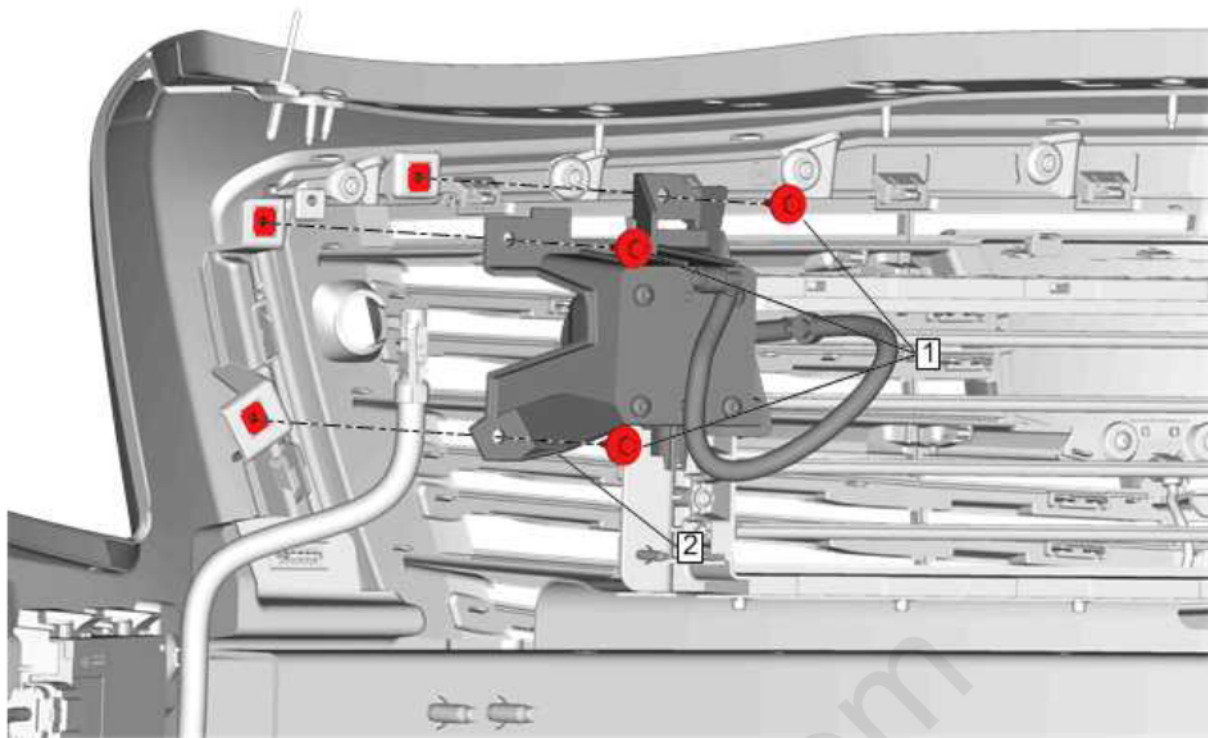


Fig. 27: Night Vision Camera Bracket

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Front Bumper Fascia Replacement (Without UV3) Front Bumper Fascia Replacement (With UV3)	
1	Night Vision Camera Bracket Bolt [3x] CAUTION: Fastener Caution Tighten 11 N.m (97 lb in)
2	Night Vision Camera Bracket Procedure 1. Disconnect the electrical connector. 2. Transfer components as necessary. 3. Calibrate the night vision camera. Refer to Night Vision Camera Control Module Learn

NIGHT VISION CAMERA CONTROL MODULE LEARN

Service Alignment is needed when the following occurs:

- The B276 Night Vision Camera has been replaced
- The B276 Night Vision Camera has been removed and reinstalled
- The front fascia has been removed and/or replaced
- The vehicle height has been significantly changed from its factory position
- If directed to from a diagnostic procedure

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Night Vision Camera Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Special Tools

Special Tools

Diagnostic Aids

- **Do not use the display to aim the target** , when calibration is required, the display will not be centered correctly.
- The camera has a fixed mounting position, it does not require adjustment. The camera calibration adjusts the aim of the camera electronically.
- Incorrect or inaccurate alignment will cause distorted, skewed or poorly aimed images.
- The target fixture is difficult to fine tune, adjusting the feet of the tripod to the bubble levels on the target is best.
- The laser included with the tool is used only to help aim the target, it must be removed from the target prior to calibration.
- Masking tape and a tape measure may be used during alignment.
- Be sure to make as square as possible measurements.
- Having the vehicle and the target level are very important for this calibration.
- Failed calibration attempts may set DTC B391E 66

Target Details

- A target with a heating element is required at the dealership to insure the technician can properly align the grill mounted infra-red camera after service has been performed.
- The target consists of a heating element with a ceramic housing mounted on a height adjustable tripod.
- A laser pointer is temporarily placed on the center of the target face which guides the technician to move the tripod and target assembly laterally and vertically to accurately align the center of the target with the camera lens in the vehicle grill. It is the reference point for the position of the camera, which will then be adjusted to the service information specification using on-board vehicle software.

Aiming Procedure

1. Remove any snow, ice or mud from the vehicle.

2. Align the vehicles left tires with a reference line from the back tires extending 4.5 ft (1.5 m) beyond the front of the vehicle to the **EL-51470** . If a line is not available, running a tape measure resting against the tires from the rear tires to 4.5 ft (1.5 m) beyond the front of the car works as well.



Fig. 28: View Of Night Vision Camera Alignment Procedure

Courtesy of GENERAL MOTORS COMPANY

3. Verify that the tires are inflated to the proper tire pressure and the vehicle is on a level surface.
4. Measure from the reference line on the floor to the night vision camera. Place the **EL-51470** the same distance from the reference line as the night vision camera is from the line. This will align the camera left-to-right with the car.

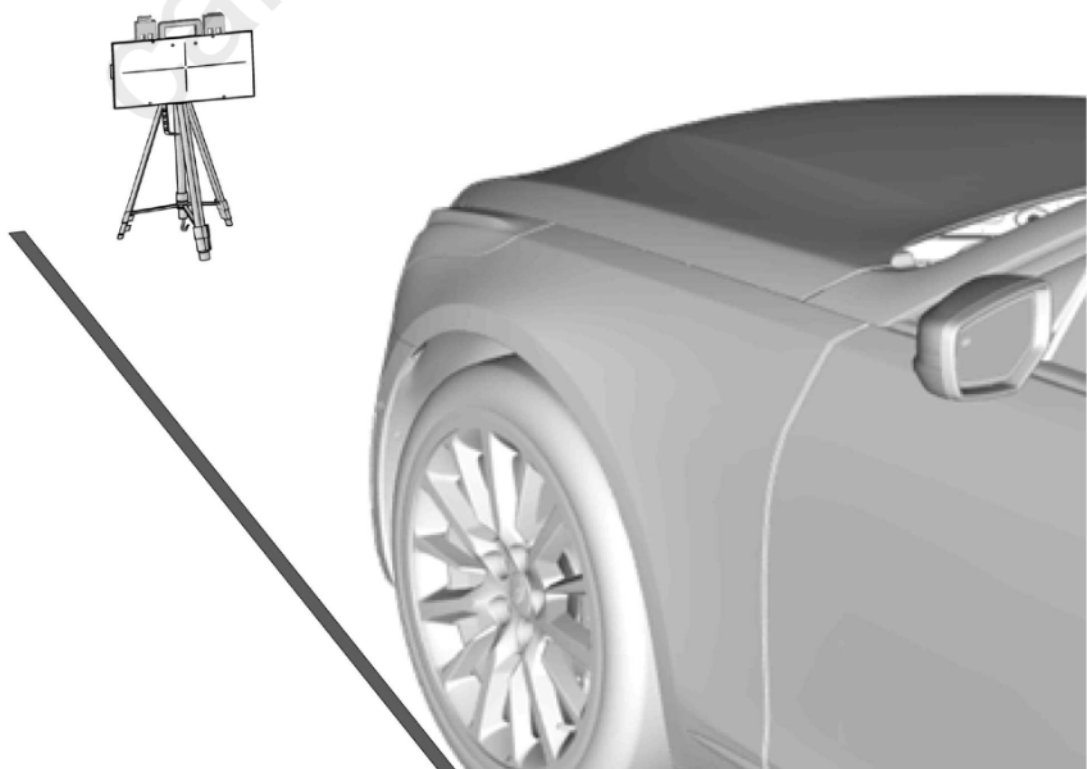


Fig. 29: Night Vision Camera Calibration

Courtesy of GENERAL MOTORS COMPANY

5. Measure the distance from the center of the camera to the floor and raise the target crosshairs to this height. The tripod has a crank on the rear of it to raise the target, adjusting the feet of the tripod is mainly used to level it.
6. Turn the adjusting screws and place the **EL-51470** level and as square to the vehicle.
7. Using Service Programming System (SPS), select Night Vision Control Module and then select Setup to enable Night Vision Calibration.
8. Verify the scan tool information Night Vision Camera Alignment Status is OK.
 - If status is not OK, perform calibration
 - If OK is displayed
9. All OK.

NIGHT VISION CAMERA CLEANING HOSE REPLACEMENT

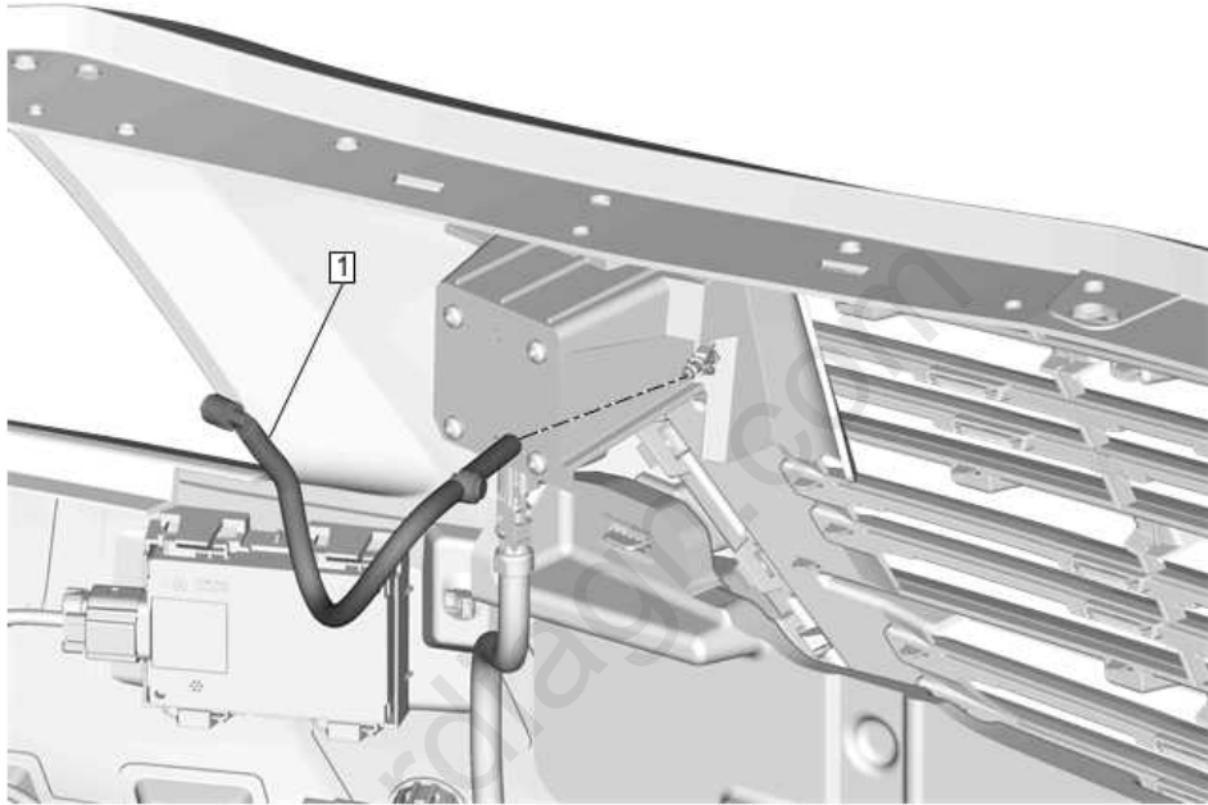


Fig. 30: Night Vision Camera Cleaning Hose
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Bumper Fascia Replacement (Without UV3)</u> <u>Front Bumper Fascia Replacement (With UV3)</u>	
1	Night Vision Camera Cleaning Hose

NIGHT VISION CAMERA CLEANING NOZZLE REPLACEMENT

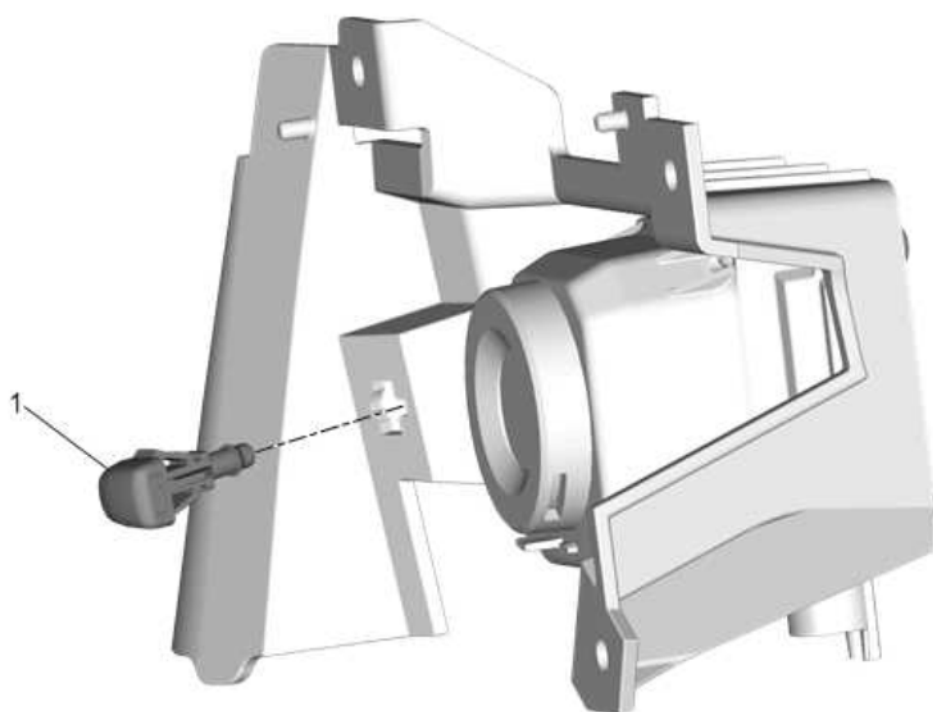
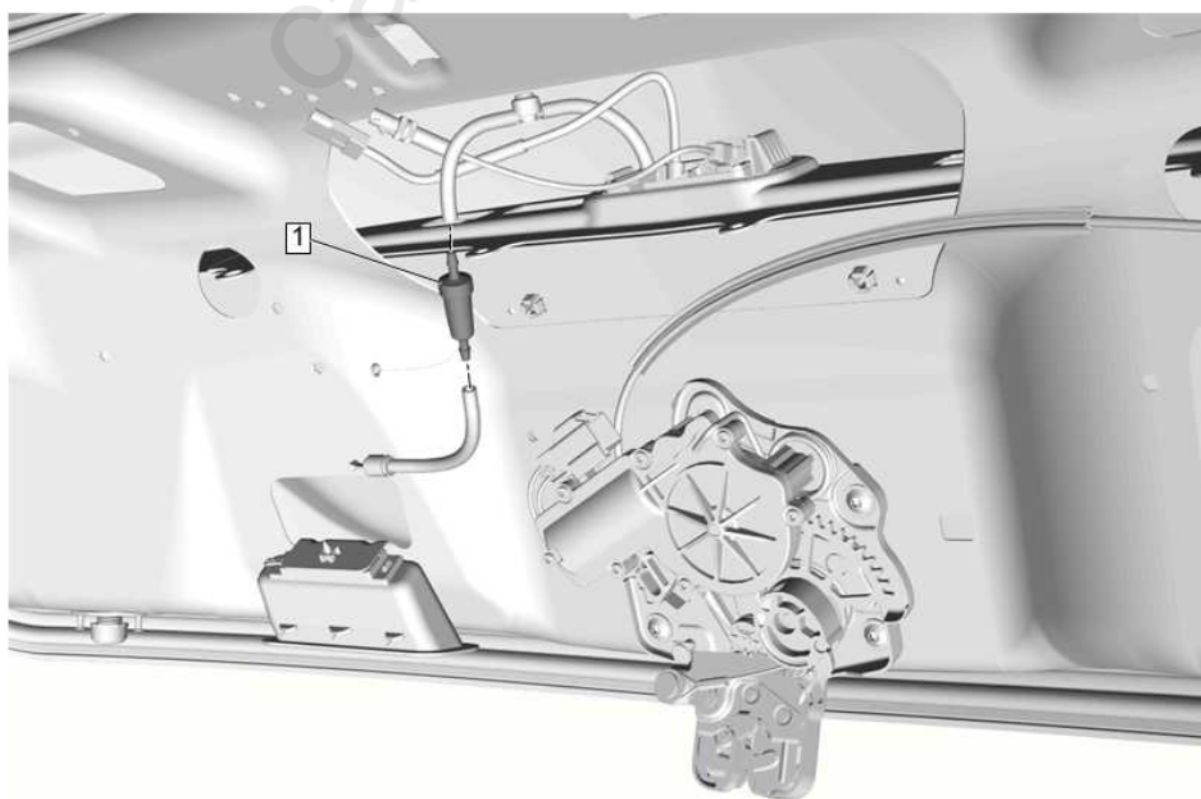


Fig. 31: Night Vision Camera Cleaning Nozzle
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. <u>Night Vision Camera Bracket Replacement</u> 2. <u>Night Vision Camera Cleaning Hose Replacement</u>	
1	Night Vision Camera Cleaning Nozzle Procedure Release the retaining tabs.

VIDEO DISPLAY INSIDE REARVIEW MIRROR CAMERA FILTER REPLACEMENT



Callout	Component Name
Preliminary Procedure <u>Rear Compartment Lid Inner Panel Trim Replacement</u>	
1	Video Display Inside Rearview Mirror Camera Filter Procedure Disconnect the rear washer hose.

2017 ACCESSORIES & EQUIPMENT

Object Detection and Pedestrian Protection - Schematic Wiring Diagrams - Object Detection Wiring Schematics - CT6

SCHEMATIC WIRING DIAGRAMS

OBJECT DETECTION WIRING SCHEMATICS

Park Assist - Module Power, Ground and Serial Data

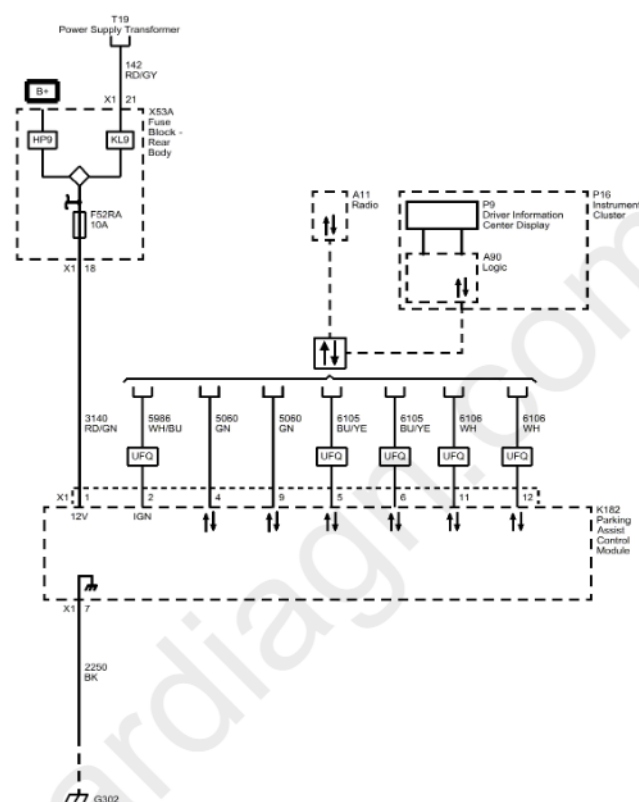


Fig. 1: Park Assist - Module Power, Ground and Serial Data
Courtesy of GENERAL MOTORS COMPANY

Park Assist - Front Sensors

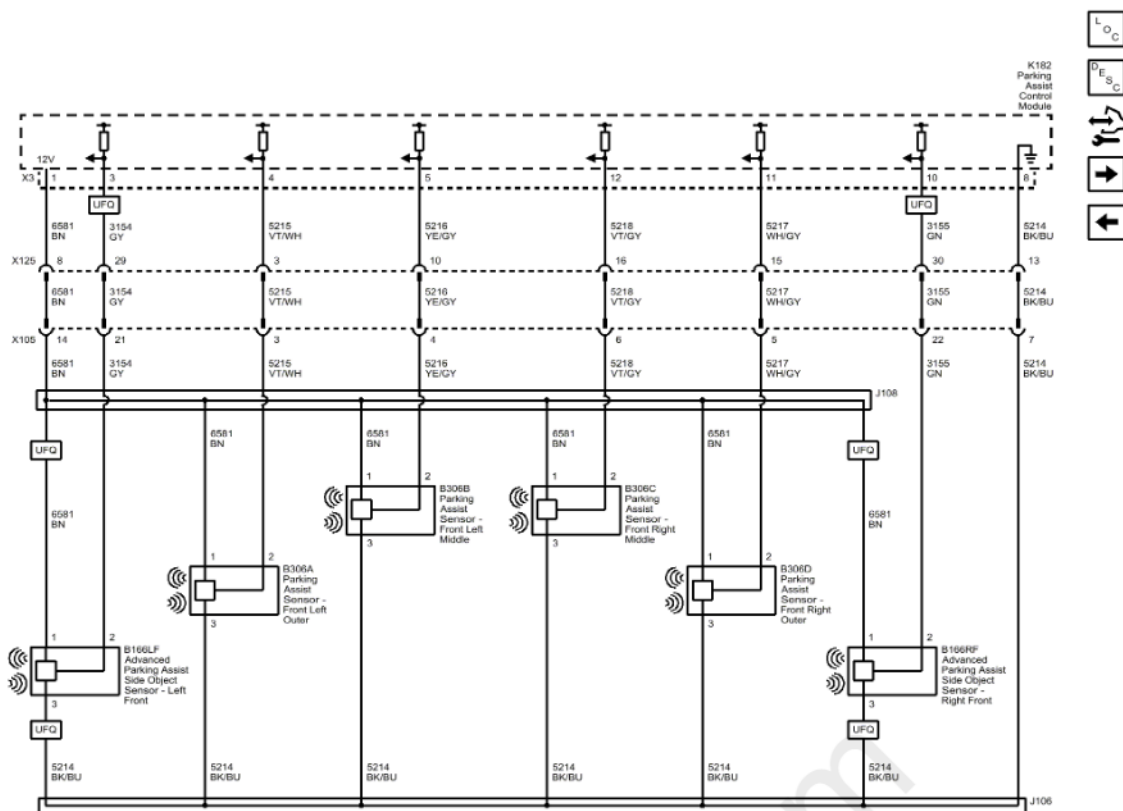


Fig. 2: Park Assist - Front Sensors
Courtesy of GENERAL MOTORS COMPANY

Park Assist - Rear Sensors

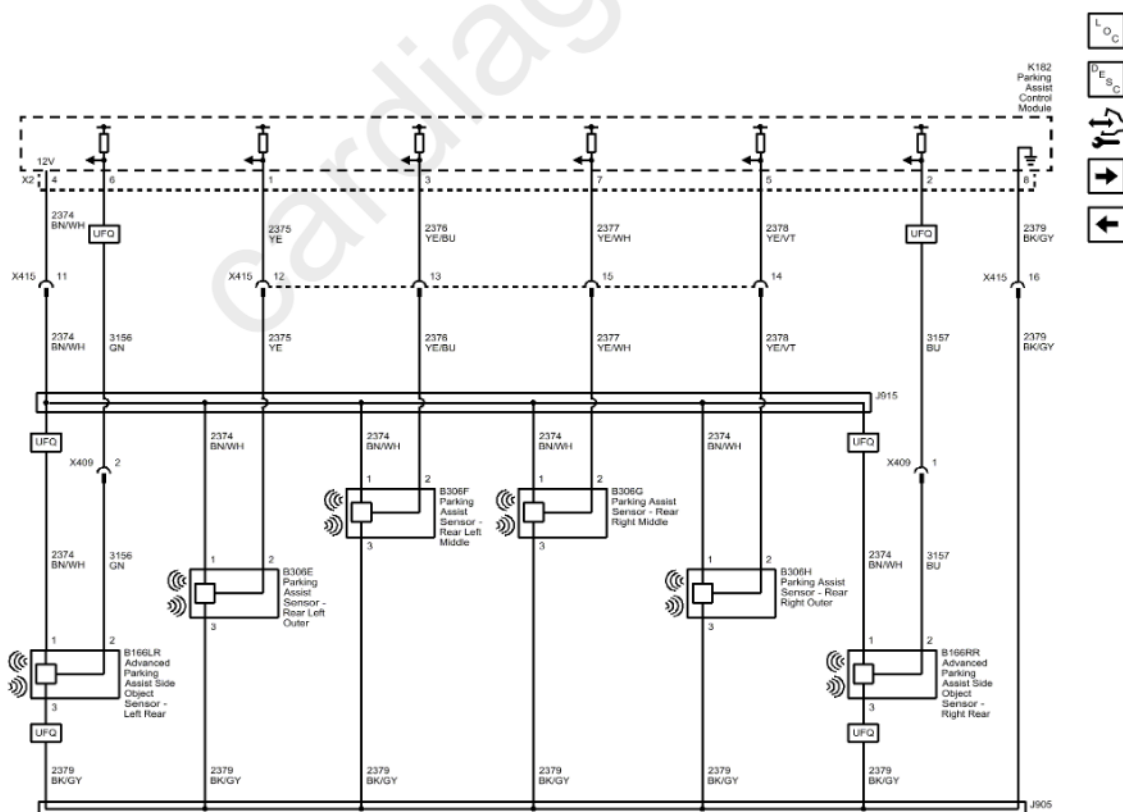


Fig. 3: Park Assist - Rear Sensors
Courtesy of GENERAL MOTORS COMPANY

Park Assist - Indicator and Controls

Collision Alert Indicators and Safety Seat (UEU/UHX)

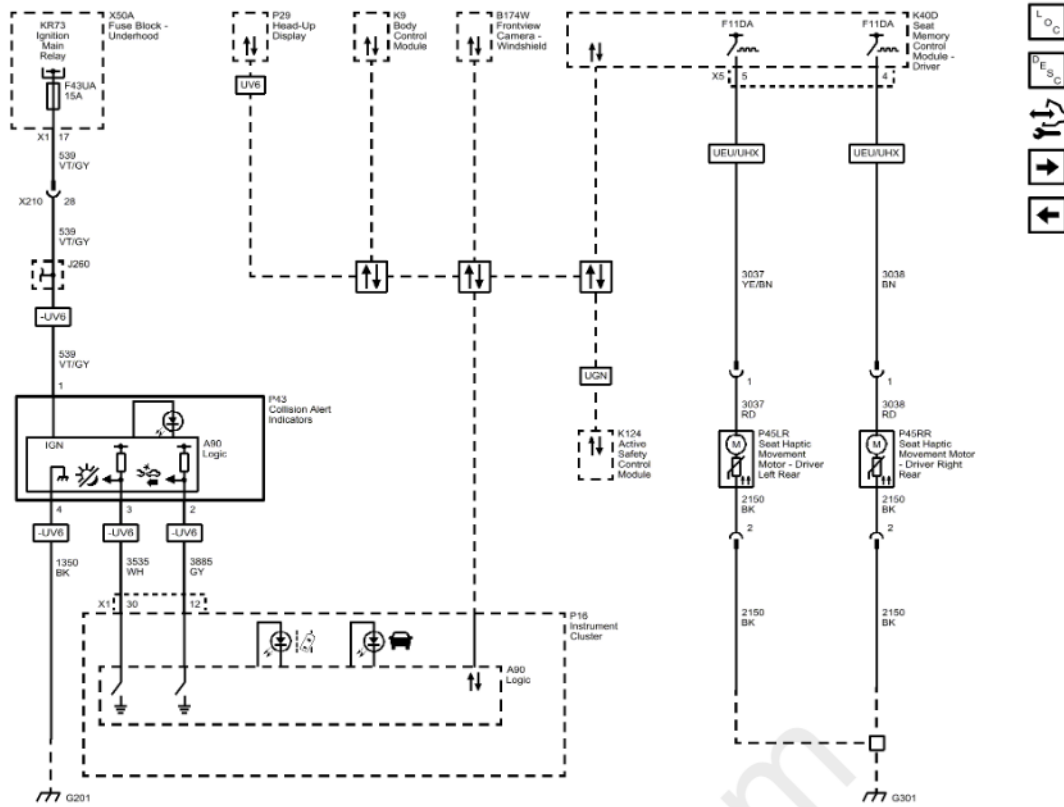


Fig. 8: Collision Alert Indicators and Safety Seat (UEU/UHX)
Courtesy of GENERAL MOTORS COMPANY

Collision Avoidance - Module Power, Ground and Serial Data (UGN/UVZ)

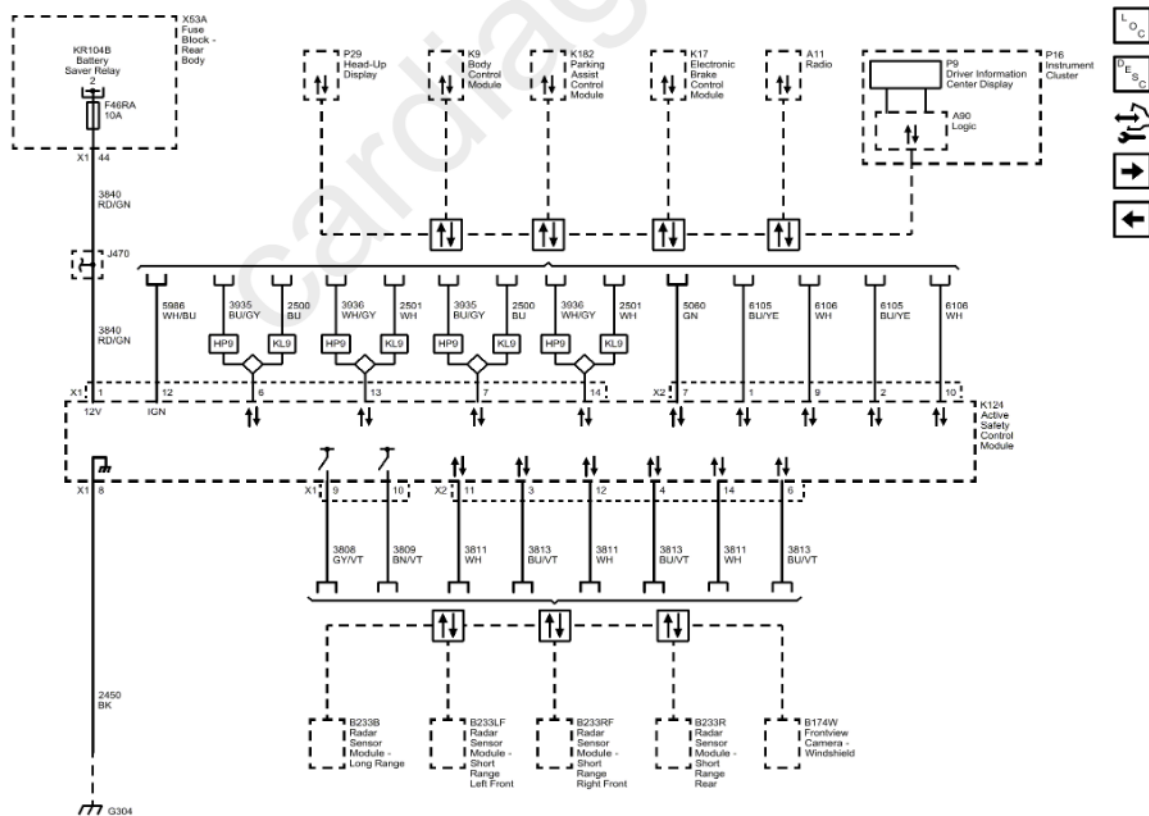


Fig. 9: Collision Avoidance - Module Power, Ground, and Serial Data (UGN/UVZ)
Courtesy of GENERAL MOTORS COMPANY

Collision Avoidance - Left Front and Right Front Short Range Radars (UGN/UVZ)

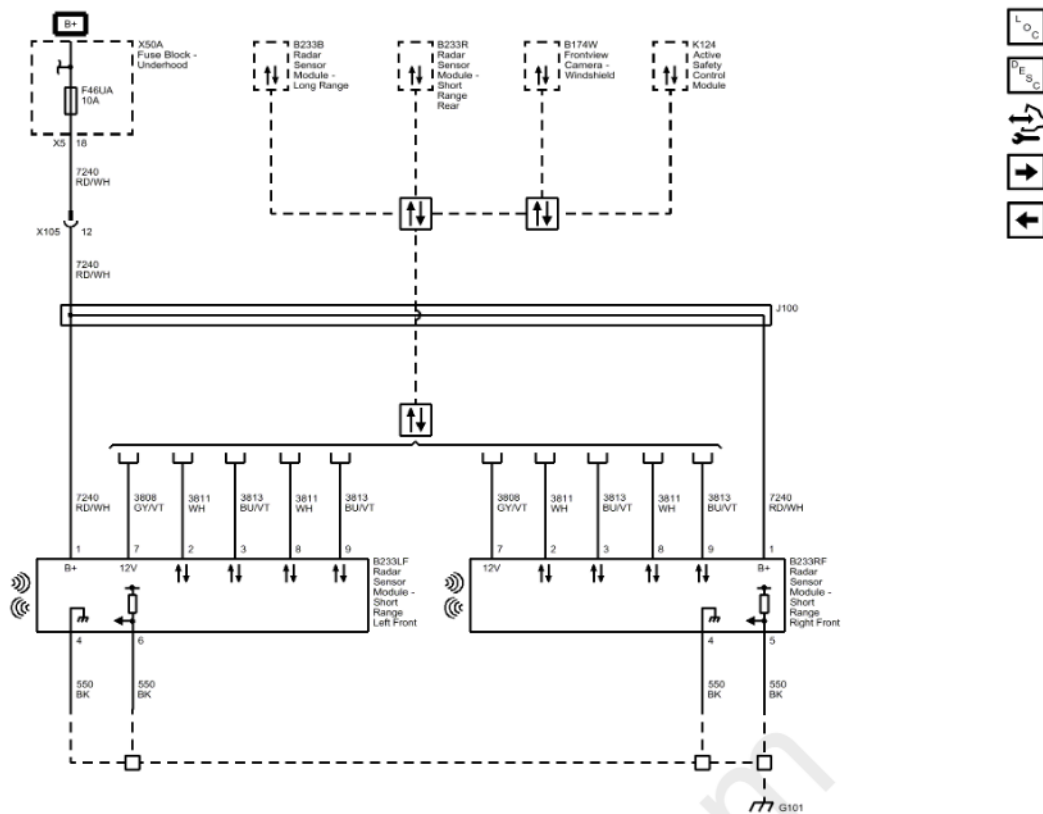


Fig. 10: Collision Avoidance - Left Front and Right Front Short Range Radars (UGN/UVZ)
Courtesy of GENERAL MOTORS COMPANY

Collision Avoidance - Long Range and Rear Short Range Radars (UGN/UVZ)

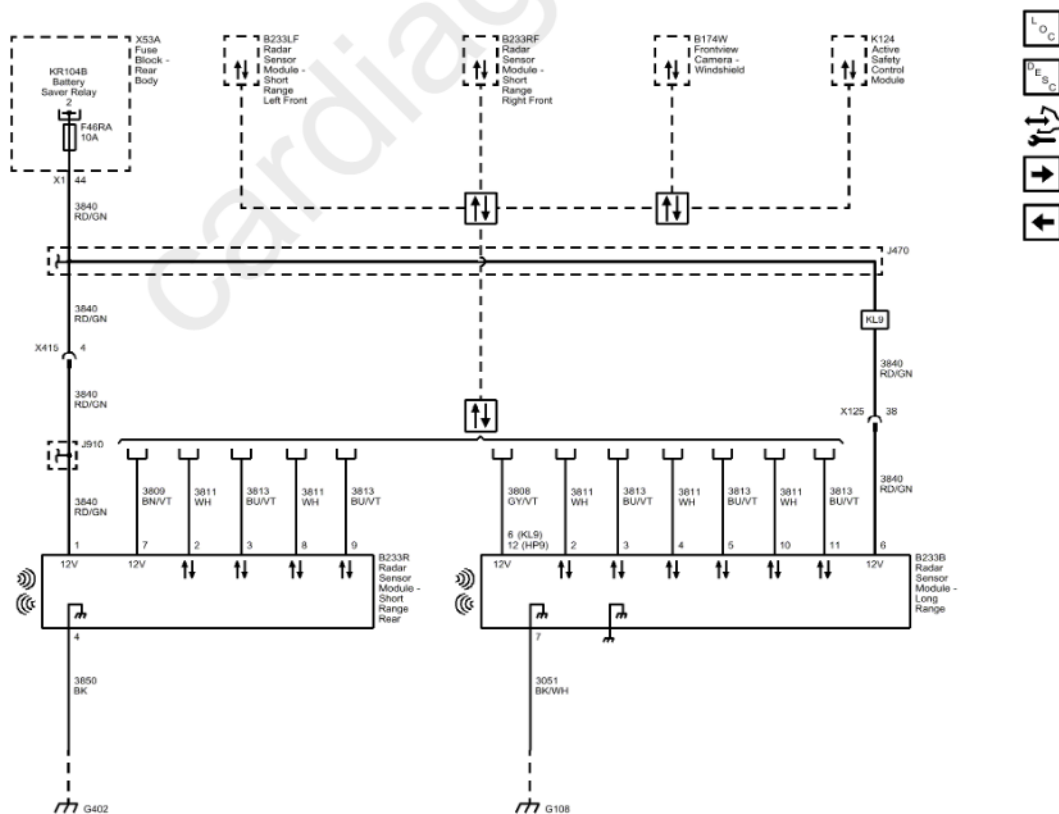


Fig. 11: Collision Avoidance - Long Range and Rear Short Range Radars (UGN/UVZ)
Courtesy of GENERAL MOTORS COMPANY

360 Degree Vision - Memory Card Receptacle (XVR) and Module Power, Ground, Serial Data, and Camera Signals (UVH)

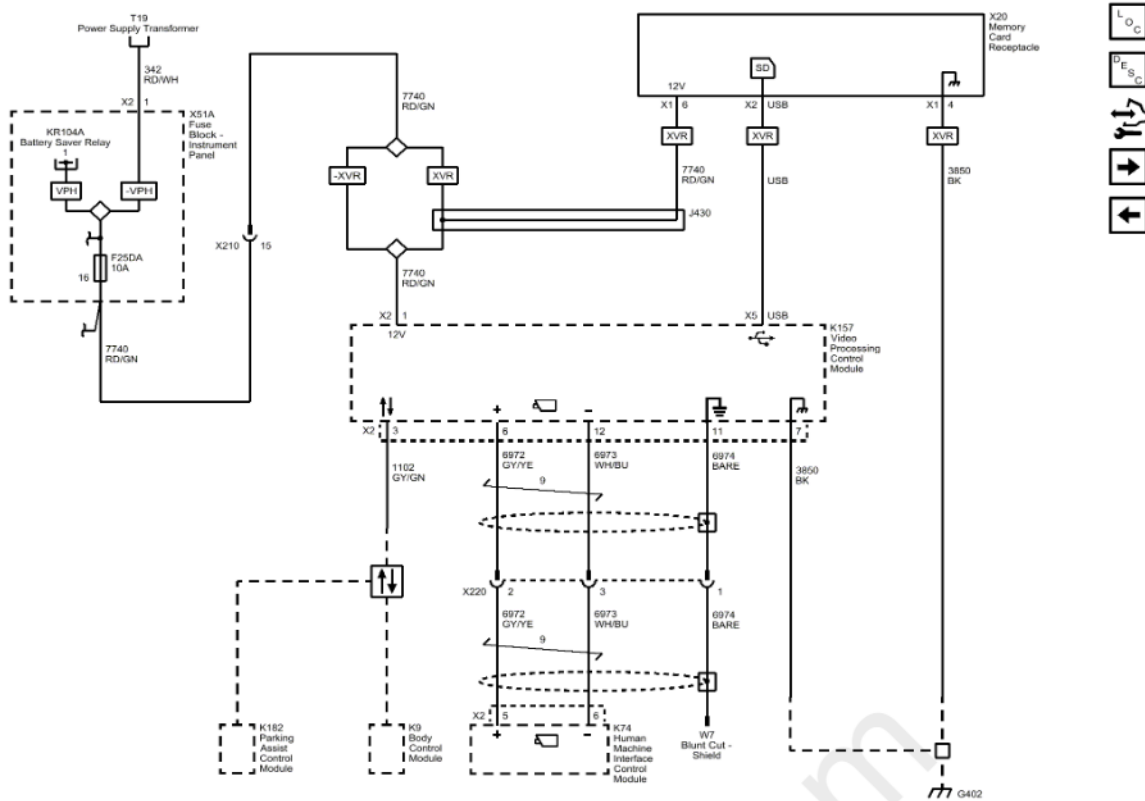


Fig. 12: 360 Degree Vision - Memory Card Receptacle (XVR) and Module Power, Ground, Serial Data and Camera Signals (UVH)

Courtesy of GENERAL MOTORS COMPANY

360 Degree Vision - Front and Rear Cameras (UVH+KL9)

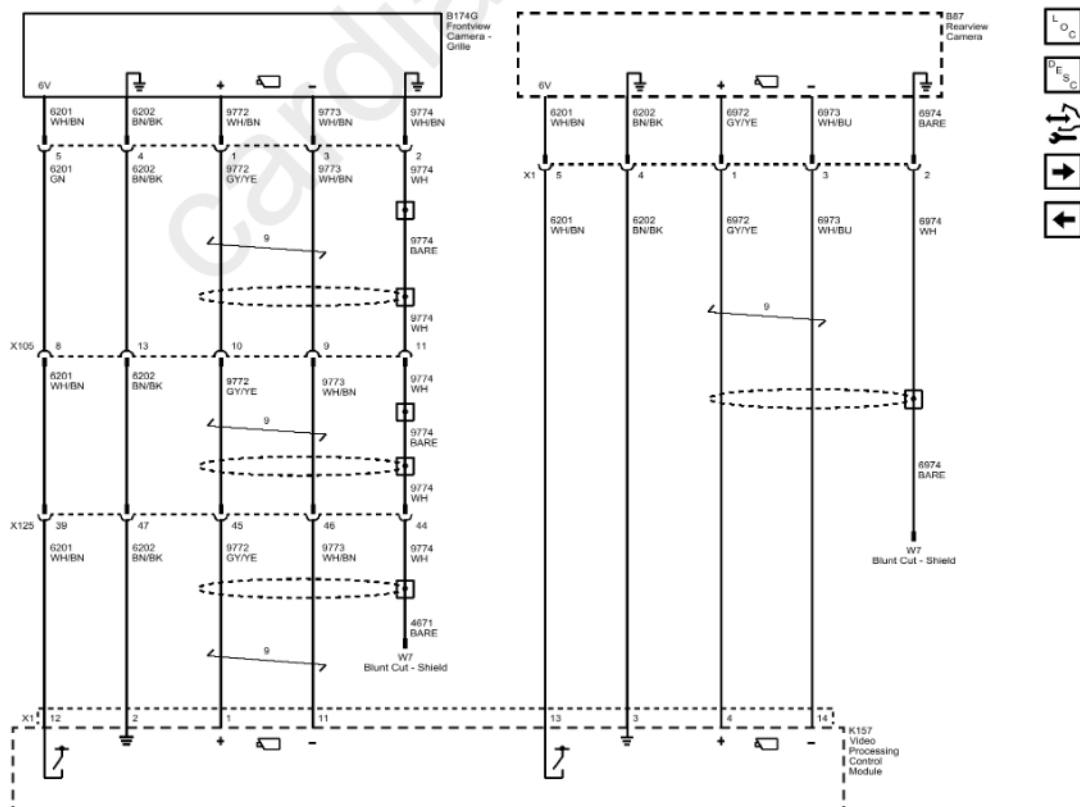


Fig. 13: 360 Degree Vision - Front and Rear Cameras (UVH+KL9)

Courtesy of GENERAL MOTORS COMPANY

360 Degree Vision - Front and Rear Cameras (UVH+HP9)

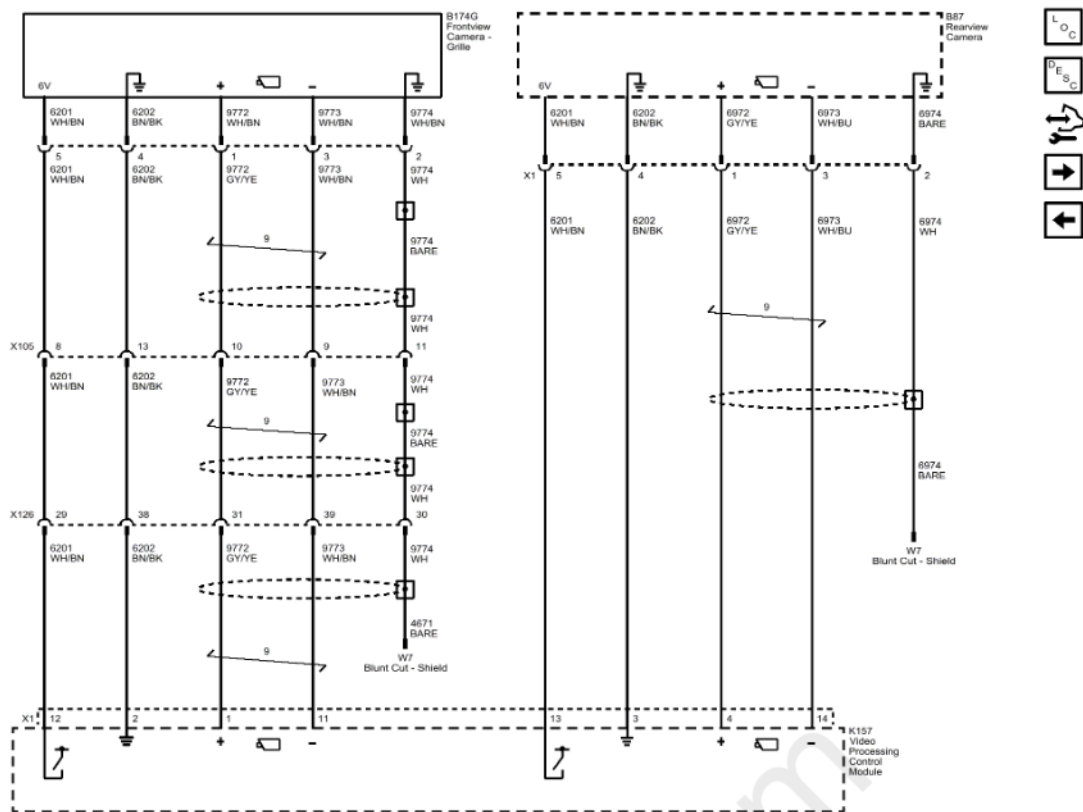


Fig. 14: 360 Degree Vision - Front and Rear Cameras (UVH+HP9)
 Courtesy of GENERAL MOTORS COMPANY

360 Degree Vision - Side Vision Cameras (UVH)

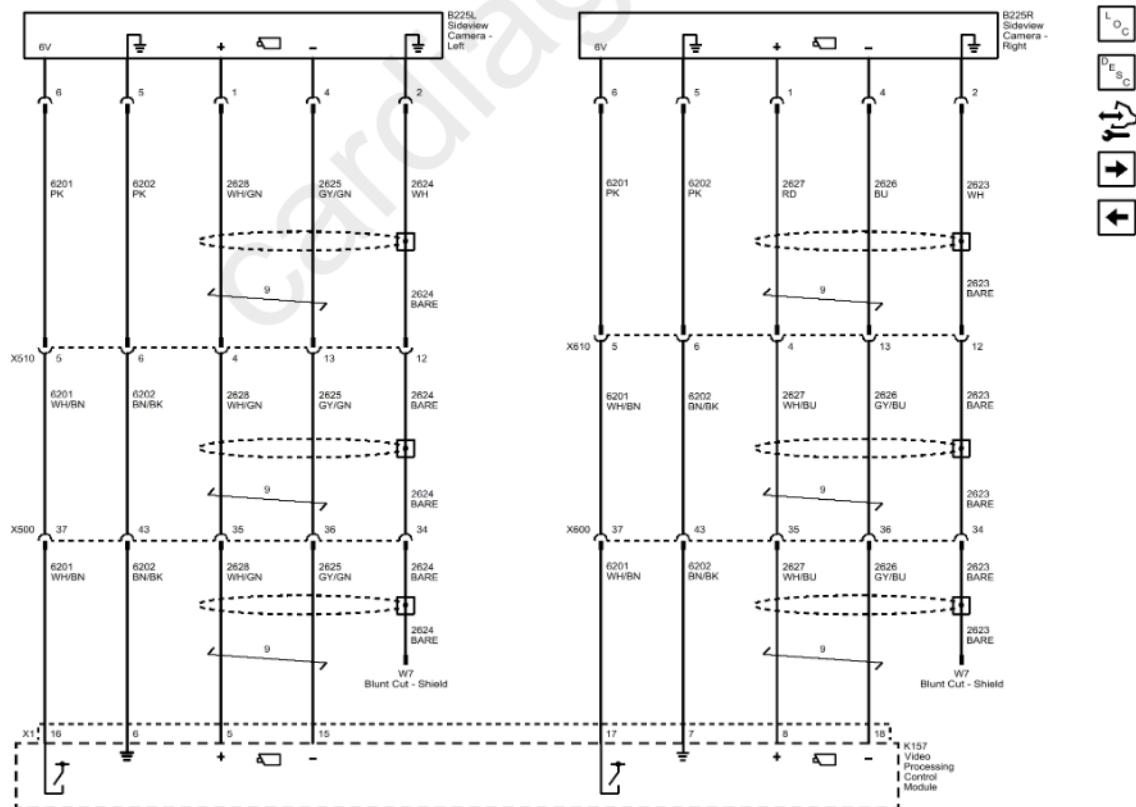


Fig. 15: 360 Degree Vision - Side Vision Cameras (UVH)
 Courtesy of GENERAL MOTORS COMPANY

Pedestrian Impact Detection System (B3T)

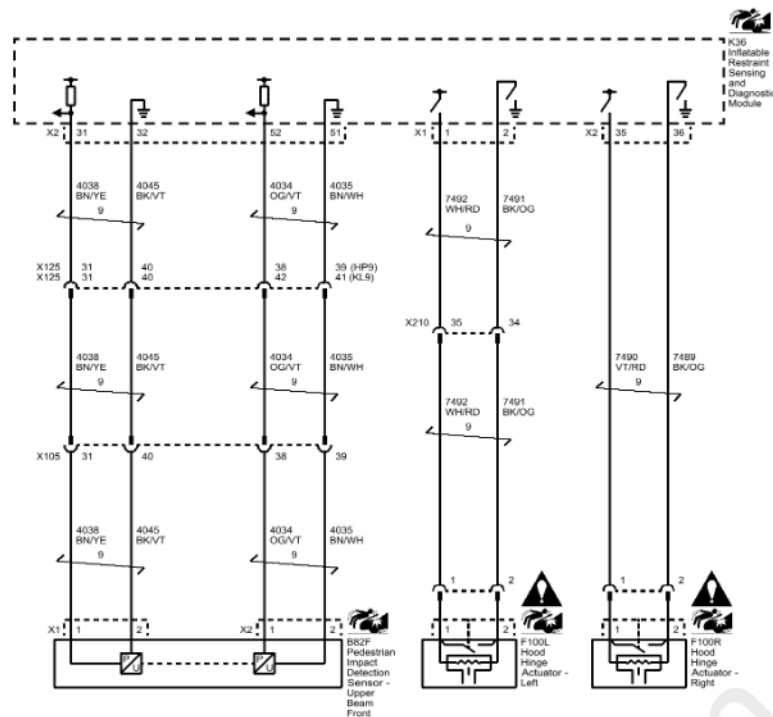


Fig. 16: Pedestrian Impact Detection System (B3T)
Courtesy of GENERAL MOTORS COMPANY

Night Vision Camera (UV3)

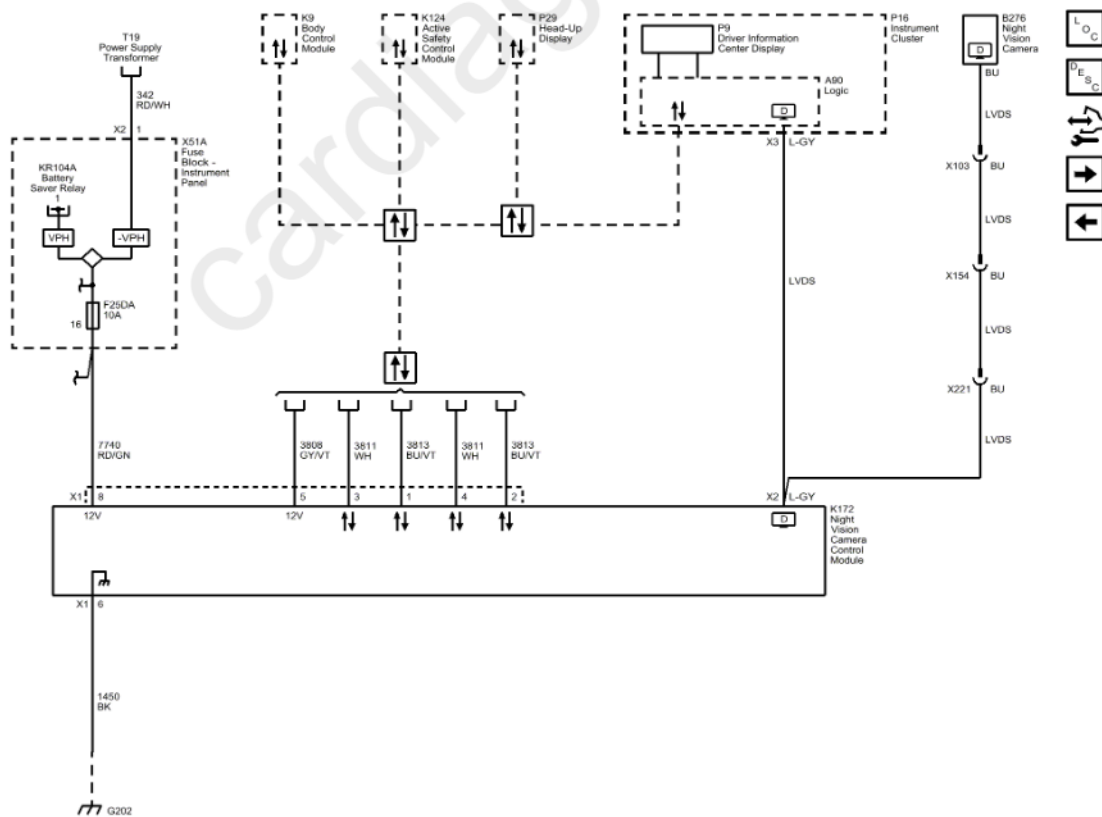


Fig. 17: Night Vision Camera (UV3)
Courtesy of GENERAL MOTORS COMPANY

Rearview Camera (UVC)

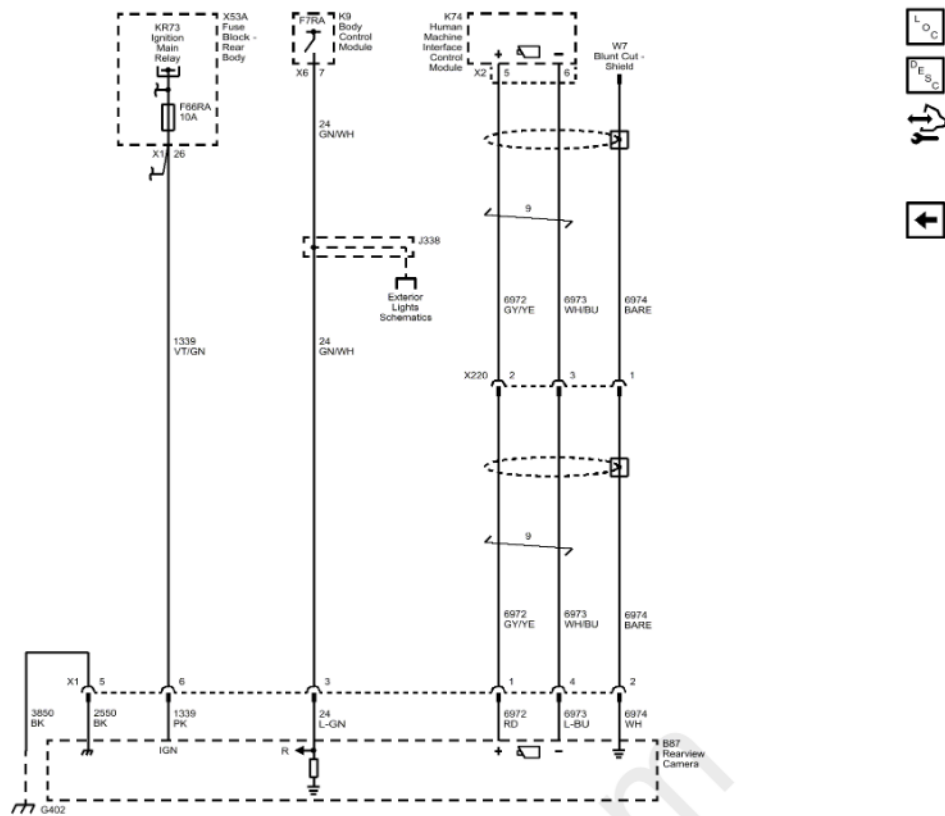


Fig. 18: Rearview Camera (UVC)

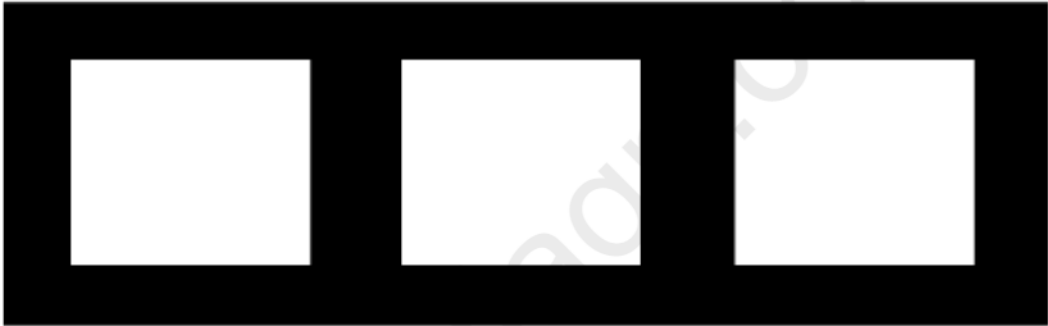
Courtesy of GENERAL MOTORS COMPANY

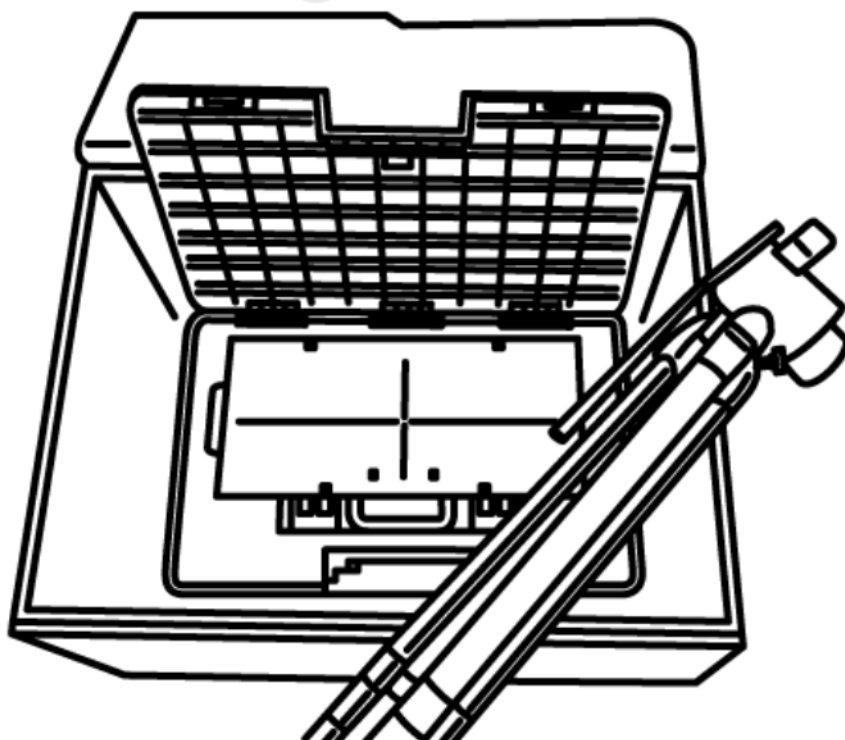
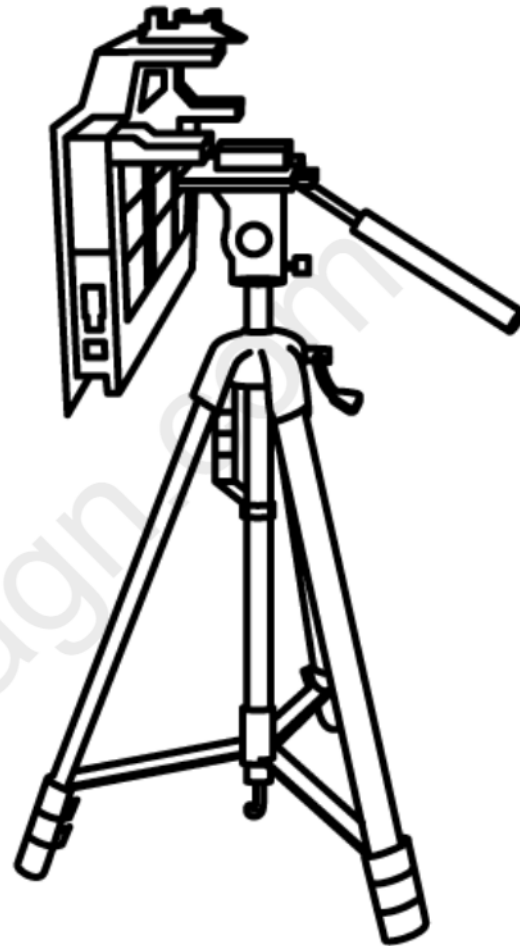
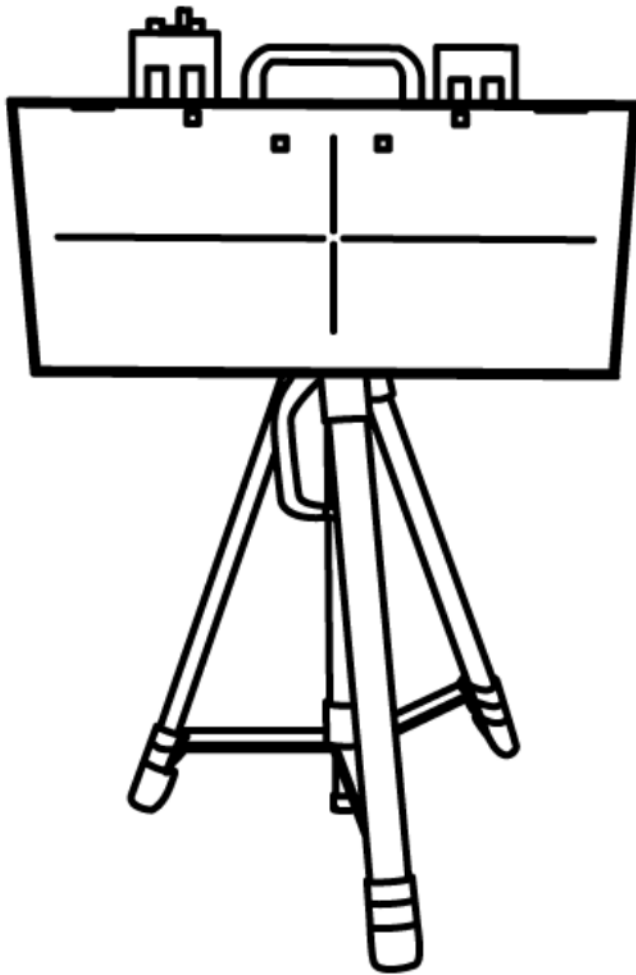
2017 ACCESSORIES & EQUIPMENT

Object Detection and Pedestrian Protection - Special Tools and Equipment - Special Tools - CT6

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustrations	Tool Number/Description
	EL-51372 Camera Calibration Mat
	EL-51470 Target, Nightvision Camera Alignment



cardiagn.com

2017 ACCESSORIES & EQUIPMENT

Object Detection and Pedestrian Protection - Specifications - Fastener Specifications - CT6

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Active Safety Control Module Bracket Nut	9 N.m (80 lb in)
Forward Collision Alert Display Bolt	2.5 N.m (22 lb in)
Forward Range Radar Sensor Fastener	9 N.m (80 lb in)
Front Grille Bolt	2.5 N.m (22 lb in)
Night Vision Camera Bolt	3.75-7.5 N.m (33-66 lb in)
Night Vision Camera Bracket Bolt	11 N.m (97 lb in)
Parking Assist Alarm Control Module Bolt	2.5 N.m (22 lb in)
Rear Bumper Fascia Bolt	2.5 N.m (22 lb in)
Side View Driver Information Camera Bolt	2.5 N.m (22 lb in)
Video Processing Module Nut	9 N.m (80 lb in)