

2010 ACCESSORIES & EQUIPMENT

Object Detection - Equinox & Terrain

SCHEMATIC AND ROUTING DIAGRAMS

OBJECT DETECTION SCHEMATICS

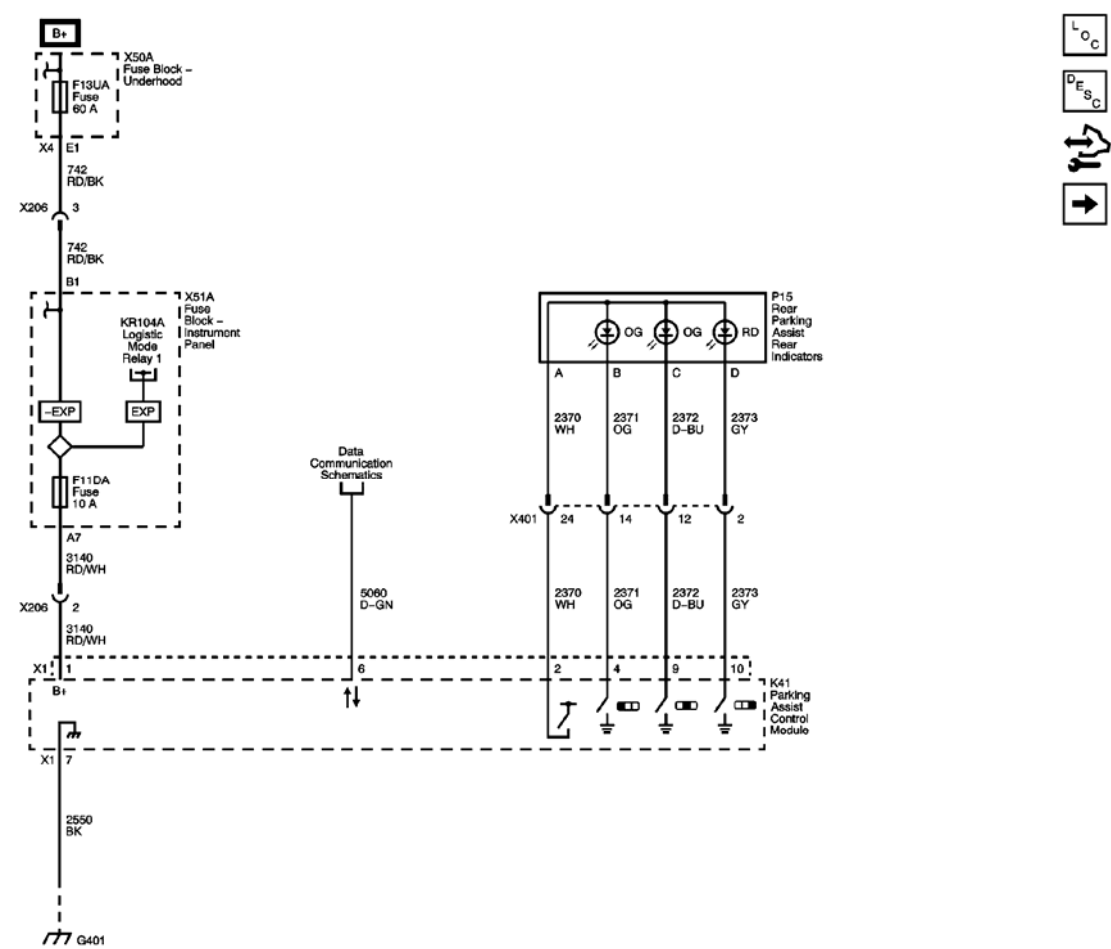


Fig. 1: Module Power, Ground, and Telltale Indicators (UD7)
Courtesy of GENERAL MOTORS CORP.

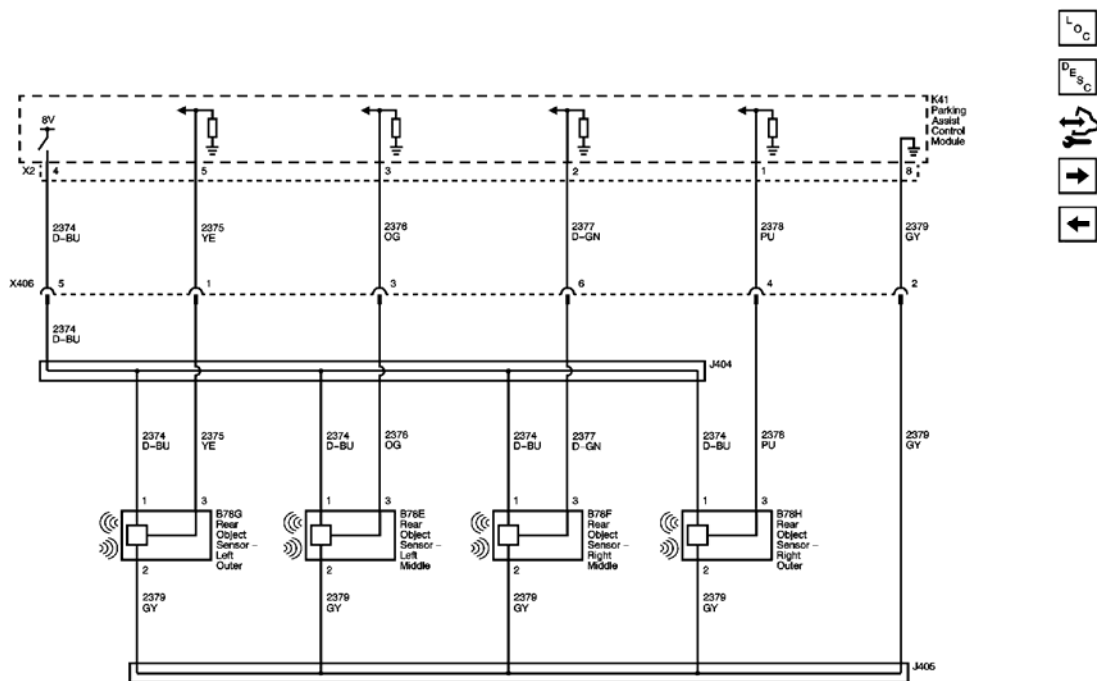


Fig. 2: Rear Object Sensors (UD7)
 Courtesy of GENERAL MOTORS CORP.

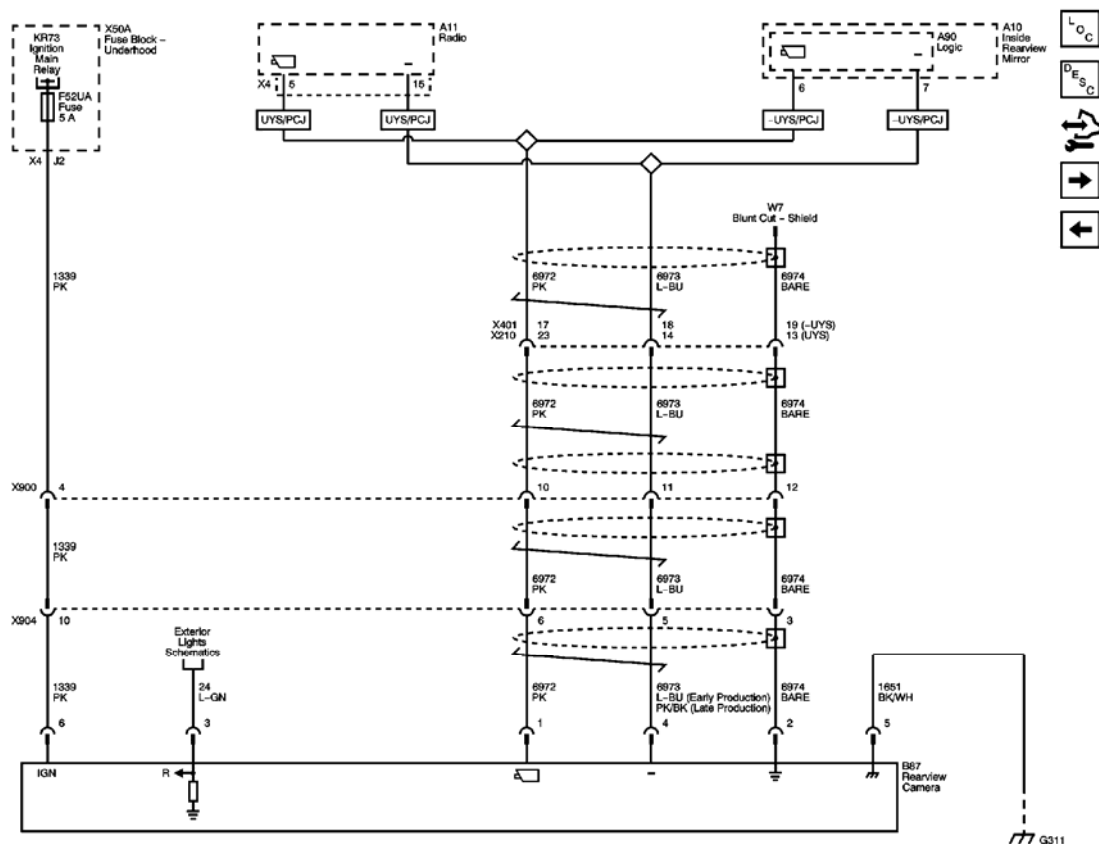


Fig. 3: Rearview Camera (UVC)
Courtesy of GENERAL MOTORS CORP.

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC B0958, B0959, B0960, or B0961</u>	B0958 01: Parking Aid Rear Sensor Left Corner Circuit Short to Battery B0958 06: Parking Aid Rear Sensor Left Corner Circuit Low Voltage/Open B0958 08: Parking Aid Rear Sensor Left Corner Circuit Performance - Signal Invalid B0958 21: Parking Aid Rear Sensor Left Corner Circuit Incorrect Period B0958 3A: Parking Aid Rear Sensor Left Corner Circuit Incorrect Component Installed B0959 01: Parking Aid Rear Sensor Left Middle Circuit Short to Battery B0959 06: Parking Aid Rear Sensor Left Middle Circuit Low Voltage/Open B0959 08: Parking Aid Rear Sensor Left Middle Circuit Performance -

	Signal Invalid B0959 21: Parking Aid Rear Sensor Left Middle Circuit Incorrect Period B0959 3A: Parking Aid Rear Sensor Left Middle Circuit Incorrect Component Installed B0960 01: Parking Aid Rear Sensor Right Middle Circuit Short to Battery B0960 06: Parking Aid Rear Sensor Right Middle Circuit Low Voltage/Open B0960 08: Parking Aid Rear Sensor Right Middle Circuit Performance - Signal Invalid B0960 21: Parking Aid Rear Sensor Right Middle Circuit Incorrect Period B0960 3A: Parking Aid Rear Sensor Right Middle Circuit Incorrect Component Installed B0961 01: Parking Aid Rear Sensor Right Corner Circuit Short to Battery B0961 06: Parking Aid Rear Sensor Right Corner Circuit Low Voltage/Open B0961 08: Parking Aid Rear Sensor Right Corner Circuit Performance - Signal Invalid B0961 21: Parking Aid Rear Sensor Right Corner Circuit Incorrect Period B0961 3A: Parking Aid Rear Sensor Right Corner Circuit Incorrect Component Installed
<u>DTC B098A-B098F</u>	B098D 01: Parking Aid Rear Display Indicator 1 Circuit Short to Battery B098D 06: Parking Aid Rear Display Indicator 1 Circuit Low Voltage/Open B098E 01: Parking Aid Rear Display Indicator 2 Circuit Short to Battery B098E 06: Parking Aid Rear Display Indicator 2 Circuit Low Voltage/Open B098F 01: Parking Aid Rear Display Indicator 3 Circuit Short to Battery B098F 06: Parking Aid Rear Display Indicator 3 Circuit Low Voltage/Open
<u>DTC B1015</u>	B1015 00: Vehicle Identification Number Information Malfunction
<u>DTC B1395</u>	B1395 02: Control Module Voltage Reference Output Circuit Short to Ground B1395 03: Control Module Voltage Reference Output Circuit Low Voltage B1395 07: Control Module Voltage Reference Output Circuit High Voltage
<u>DTC B138A</u>	B138A 03: Control Module Voltage Reference Output Circuit Low Voltage B138A 07: Control Module Voltage Reference Output Circuit High Voltage
<u>DTC B1405</u>	B1405 02: Control Module Voltage Reference Output 2 Circuit Short to Ground B1405 03: Control Module Voltage Reference Output 2 Circuit Low

DTC B0958, B0959, B0960, OR B0961

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 01

Parking Aid Rear Sensor Left Corner Circuit Short to Battery

DTC B0958 06

Parking Aid Rear Sensor Left Corner Circuit Low Voltage/Open

DTC B0958 08

Parking Aid Rear Sensor Left Corner Circuit Performance - Signal Invalid

DTC B0958 21

Parking Aid Rear Sensor Left Corner Circuit Incorrect Period

DTC B0958 3A

Parking Aid Rear Sensor Left Corner Circuit Incorrect Component Installed

DTC B0959 01

Parking Aid Rear Sensor Left Middle Circuit Short to Battery

DTC B0959 06

Parking Aid Rear Sensor Left Middle Circuit Low Voltage/Open

DTC B0959 08

Parking Aid Rear Sensor Left Middle Circuit Performance - Signal Invalid

DTC B0959 21

Parking Aid Rear Sensor Left Middle Circuit Incorrect Period

DTC B0959 3A

Parking Aid Rear Sensor Left Middle Circuit Incorrect Component Installed

DTC B0960 01

Parking Aid Rear Sensor Right Middle Circuit Short to Battery

DTC B0960 06

Parking Aid Rear Sensor Right Middle Circuit Low Voltage/Open

DTC B0960 08

Parking Aid Rear Sensor Right Middle Circuit Performance - Signal Invalid

DTC B0960 21

Parking Aid Rear Sensor Right Middle Circuit Incorrect Period

DTC B0960 3A

Parking Aid Rear Sensor Right Middle Circuit Incorrect Component Installed

DTC B0961 01

Parking Aid Rear Sensor Right Corner Circuit Short to Battery

DTC B0961 06

Parking Aid Rear Sensor Right Corner Circuit Low Voltage/Open

DTC B0961 08

Parking Aid Rear Sensor Right Corner Circuit Performance - Signal Invalid

DTC B0961 21

Parking Aid Rear Sensor Right Corner Circuit Incorrect Period

DTC B0961 3A

Parking Aid Rear Sensor Right Corner Circuit Incorrect Component Installed

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
8V Reference	B1405 02	B0958 06, B0959 06, B0960 06, B0961 06, B1405 03	B0958 06, B0959 06, B0960 06, B0961 06, B1405 07	-
Rear Object Sensor - Left Outer Signal	B0958 06	B0958 06	B0958 01	B0958 08, B0958 21
Rear Object Sensor - Left Middle Signal	B0959 06	B0959 06	B0959 01	B0959 08, B0959 21
Rear Object Sensor - Right Middle Signal	B0960 06	B0960 06	B0960 01	B0960 08, B0960 21
Rear Object Sensor - Right Outer Signal	B0961 06	B0961 06	B0961 01	B0961 08, B0961 21
Low Reference	-	B0958 06, B0959 06, B0960 06, B0961 06	-	-

Circuit/System Description

The object sensors are 3-wire sensors that are used to determine the distance between the vehicle and an object of interest. The parking assist control module supplies 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
- Transmission in REVERSE

Conditions for Setting the DTC

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

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

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

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

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

The parking assist control module has received an invalid signal.

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

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

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

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Object Detection Description and Operation (UVC) or Object Detection Description and Operation (UD7)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify that DTC B1405 is not present.
 - If DTC is present, refer to **DTC B1405**.
2. Verify that DTC B0958 01, B0959 01, B0960 01 or B0961 01 is not present.
 - If DTC is present, check the appropriate sensor for contamination with mud, ice or snow. If no contamination is diagnosed, refer to Circuit/System Testing.
3. Verify that DTC B0958 21, B0959 21, B0960 21 or B0961 21 is not present.
 - If DTC is present, check the appropriate sensor for contamination with mud, ice or snow. If no contamination is diagnosed, replace the sensor.
4. Verify that DTC B0958 3A, B0959 3A, B0960 3A or B0961 3A is not present.
 - If DTC is present, replace the appropriate sensor with a sensor of correct sensor type.
5. Ignition ON, transmission in REVERSE, verify the scan tool Parking Assist System Status parameter displays Enabled.

Circuit/System Testing

1. Ignition OFF for 30 s, disconnect the harness connector at the appropriate rear object sensor.
2. Test for less than 5 ohms between the low reference circuit terminal 2 and ground.
 - If greater than the specified value, test the low reference circuit for an open/high resistance. If the circuit tests normal, replace the K41 Parking Assist Control Module.
3. Ignition ON, transmission in REVERSE, test for 7.5-9.0 V between the 8 V reference circuit terminal 1 and ground.
 - If less than the specified range, test the 8 V reference circuit for an open/high resistance. If the circuit tests normal, replace the K41 Parking Assist Control Module.
4. Ignition OFF, remove the malfunctioning object sensor and swap locations with another properly functioning rear object sensor. Connect the harness connector at both sensors.
5. Ignition ON, verify the DTC is set for the new location in which the malfunctioning sensor is installed.
 - If the DTC does not set for the new location, test the signal circuit terminal 3 for a short to voltage, short to ground, or an open/high resistance. If the circuit tests normal, replace the K41 Parking Assist Control Module.
6. If the DTC sets for the new location in which the malfunctioning sensor is installed, replace the appropriate rear object sensor.

Repair Procedures

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

- **Rear Object Sensor Replacement**
- **Control Module References** for parking assist control module replacement, setup and programming

DTC B098A-B098F

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 B098D 01

Parking Aid Rear Display Indicator 1 Circuit Short to Battery

DTC B098D 06

Parking Aid Rear Display Indicator 1 Circuit Low Voltage/Open

DTC B098E 01

Parking Aid Rear Display Indicator 2 Circuit Short to Battery

DTC B098E 06

Parking Aid Rear Display Indicator 2 Circuit Low Voltage/Open

DTC B098F 01

Parking Aid Rear Display Indicator 3 Circuit Short to Battery

DTC B098F 06

Parking Aid Rear Display Indicator 3 Circuit Low Voltage/Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Parking Assist Indicator B+	B098D 06, B098E 06, B098F 06, B1395 02	B098D 06, B098E 06, B098F 06, B1395 03	B1395 07	-
Parking Assist Indicator 1 (Outer Amber) Control	B098D 06	B098D 06	B098D 01	-
Parking Assist Indicator 2 (Middle Amber) Control	B098E 06	B098E 06	B098E 01	-
Parking Assist Indicator 3 (Red) Control	B098F 06	B098F 06	B098F 01	-

Circuit/System Description

The parking assist indicator is located in the interior rear of the vehicle. The indicator contains three LEDs: two amber and one red. The parking assist control module controls these three LEDs as a visual indicator of how close the vehicle bumper is to an object. The parking assist control module supplies voltage to each of the LEDs and commands each LED on by supplying an individual ground.

Conditions for Running the DTC

- Ignition ON
- Transmission in REVERSE

Conditions for Setting the DTC

B098D 01, B098E 01 or B098F 01

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

B098D 06, B098E 06 or B098F 06

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Object Detection Description and Operation (UVC) or Object Detection Description and Operation (UD7)

Electrical Information Reference

- **Circuit Testing**

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

Scan Tool Reference

Control Module References

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the P24 Park Assist Display.
2. Ignition ON, test for greater than 11 V between the B+ circuit terminal A and ground.
 - If less than the specified value, test the B+ circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K41 Parking Assist Control Module.
3. Ignition OFF, disconnect the X1 harness connector at the K41 Parking Assist Control Module.
4. Ignition ON, test for less than 0.3 V between the K41 Parking Assist Control Module control circuit terminals listed below and ground:
 - Terminal 4 X1
 - Terminal 9 X1
 - Terminal 10 X1
 - If greater than the specified value, test the control circuit for a short to voltage.
5. Ignition OFF, test for infinite resistance between the K41 Parking Assist Control Module control circuit terminals listed below and ground:
 - Terminal 4 X1
 - Terminal 9 X1
 - Terminal 10 X1
 - If less than the specified value, test control circuit for a short to ground.
6. Test for less than 5 ohms between the control circuit terminals listed below:
 - K41 Parking Assist Control Module terminal 4 X1 and P24 Park Assist Display terminal B
 - K41 Parking Assist Control Module terminal 9 X1 and P24 Park Assist Display terminal C
 - K41 Parking Assist Control Module terminal 10 X1 and P24 Park Assist Display terminal D
 - If greater than the specified value, test the control circuit for an open/high resistance.
7. If all circuits test normal, connect the X1 harness connector to the K41 Parking Assist Control Module, replace the P24 Park Assist Display and verify the DTC does not reset.
 - If the DTC resets, replace the K41 Parking Assist Control Module.

Repair Procedures

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

- **Information Center Telltale Assembly Replacement**

- **Control Module References** for parking assist control module replacement, setup and programming

DTC B1015

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 00

Vehicle Identification Number Information Malfunction

Circuit/System Description

When the ignition is turned ON, the parking assist control module receives the vehicle identification number (VIN) from the body control module. The parking assist 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 VIN stored in the parking assist control module does not match the received VIN.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Object Detection Description and Operation (UVC) or **Object Detection Description and Operation (UD7)**

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

Ignition ON, program the K41 Parking Assist Control Module and verify the DTC does not reset.

- If the DTC is reset, replace the K41 Parking Assist Control Module

Repair Procedures

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

Control Module References for parking assist control module replacement, setup and programming

DTC B1395

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 B1395 02

Control Module Voltage Reference Output Circuit Short to Ground

DTC B1395 03

Control Module Voltage Reference Output Circuit Low Voltage

DTC B1395 07

Control Module Voltage Reference Output Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Parking Assist Indicator B+	B098D 06, B098E 06, B098F 06, B1395 02	B098D 06, B098E 06, B098F 06, B1395 03	B1395 07	-
Parking Assist Indicator 1 (Outer Amber) Control	B098D 06	B098D 06	B098D 01	-
Parking Assist Indicator 2 (Middle Amber) Control	B098E 06	B098E 06	B098E 01	-
Parking Assist Indicator 3 (Red) Control	B098F 06	B098F 06	B098F 01	-

Circuit/System Description

The parking assist indicator is located in the interior rear of the vehicle. The indicator contains three LEDs: two amber and one red. The parking assist control module controls these three LEDs as a visual indicator of how close the vehicle bumper is to an object. The parking assist control module supplies voltage to each of the LEDs and commands each LED on by supplying an individual ground.

Conditions for Running the DTC

- Ignition ON
- Transmission in REVERSE

Conditions for Setting the DTC

B1395 02

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

B1395 03

The parking assist control module detects the sensor reference voltage out of range. The reference voltage is less than 9V.

B1395 07

The parking assist control module detects the sensor reference voltage out of range. The reference voltage is

greater than 13V.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Object Detection Description and Operation (UVC) or Object Detection Description and Operation (UD7)

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Verification

Ignition ON, perform the scan tool LED Test. Each of the three LEDs should illuminate during the test cycle.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the P24 Park Assist Display.
2. Ignition ON, test for 9-13V between the B+ circuit terminal A and ground.
 - If less than the specified range, test the B+ circuit for a short to ground or an open/high resistance.

If the circuit tests normal, replace the K41 Parking Assist Control Module.

- If greater than the specified range, test the B+ circuit for a short to voltage. If the circuit tests normal, replace the K41 Parking Assist Control Module.

3. If all circuits test normal, replace the P24 Park Assist Display.

Repair Procedures

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

- **Information Center Telltale Assembly Replacement**
- **Control Module References** for parking assist control module replacement, setup and programming

DTC B138A

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 B138A 03

Control Module Voltage Reference Output Circuit Low Voltage

DTC B138A 07

Control Module Voltage Reference Output Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
8V Reference	B0958 06, B0959 06, B0960 06, B0961 06, B138A 03	B0958 06, B0959 06, B0960 06, B0961 06	B0958 06, B0959 06, B0960 06, B0961 06, B138A 07	-
Rear Object Sensor - Left Outer Signal	B0958 06	B0958 06	B0958 01	B0958 08, B0958 21
Rear Object Sensor - Left Middle Signal	B0959 06	B0959 06	B0959 01	B0959 08, B0959 21
Rear Object Sensor - Right Middle Signal	B0960 06	B0960 06	B0960 01	B0960 08, B0960 21

Rear Object Sensor - Right Outer Signal	B0961 06	B0961 06	B0961 01	B0961 08, B0961 21
Low Reference	-	B0958 06, B0959 06, B0960 06, B0961 06	-	-

Circuit/System Description

The object sensors are 3-wire sensors that are used to determine the distance between the vehicle and an object of interest. The parking assist control module supplies 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 parking assist is activated. The activation takes place through putting in the reverse gear.

Conditions for Setting the DTC

B138A 03

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

B138A 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

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Object Detection Description and Operation (UVC) or Object Detection Description and Operation (UD7)

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Verification

Ignition ON, activate the parking assist, observe the scan tool Park Assist Sensor Reference Voltage parameter. The reading should be between 7.2-9.2 V.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at each of the object sensors.
2. Ignition ON, activate the park assist, test for 7.5-9.0 V between the 8 V reference circuit terminal 1 at the B78G Rear Object Sensor - Left Outer harness connector and ground.
 - If less than the specified range, test the 8 V reference circuit for a short to ground. If the circuit tests normal, replace the K41 Parking Assist Control Module.
 - If greater than the specified range, test the 8 V reference circuit for a short to voltage. If the circuit tests normal, replace the K41 Parking Assist Control Module.
3. Install each object alarm sensor harness connector one at a time, checking DTCs after each sensor is connected. Verify DTC B138A is not set as current.
 - If the DTC is set, replace the object alarm sensor that was connected immediately before the DTC set.
4. If all circuits test normal, replace the K41 Parking Assist Control Module.

Repair Procedures

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

- **Rear Object Sensor Replacement**
- **Control Module References**

DTC B1405

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 02

Control Module Voltage Reference Output 2 Circuit Short to Ground

DTC B1405 03

Control Module Voltage Reference Output 2 Circuit Low Voltage

DTC B1405 07

Control Module Voltage Reference Output 2 Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
8V Reference	B1405 02	B0958 06, B0959 06, B0960 06, B0961 06, B1405 03	B0958 06, B0959 06, B0960 06, B0961 06, B1405 07	-
Left Rear Object Sensor Signal	B0958 06	B0958 06	B0958 01	B0958 08, B0958 21
Left Middle Rear Object Sensor Signal	B0959 06	B0959 06	B0959 01	B0959 08, B0959 21
Right Middle Rear Object Sensor Signal	B0960 06	B0960 06	B0960 01	B0960 08, B0960 21
Right Rear Object Sensor Signal	B0961 06	B0961 06	B0961 01	B0961 08, B0961 21
Low Reference	-	B0958 06, B0959 06, B0960 06, B0961 06	-	-

Circuit/System Description

The object sensors are 3-wire sensors that are used to determine the distance between the vehicle and an object of interest. The parking assist control module supplies 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
- Transmission in REVERSE

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 6.3 V.

B1405 07

The parking assist control module has detected the 8 V reference circuit is greater than 10.4 V.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

The condition for setting the DTC is no longer present.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Object Detection Description and Operation (UVC) or Object Detection Description and Operation (UD7)

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

Ignition ON, transmission in REVERSE, observe the scan tool Park Assist Sensors Reference Voltage parameter. The reading should be between 6.3-10.4 V.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at each of the object sensors.
2. Ignition ON, transmission in REVERSE, test for 6.3-10.4 V between the 8 V reference circuit terminal 1 at the B78G Rear Object Sensor - Left Outer harness connector and ground.
 - If less than the specified range, test the 8 V reference circuit for a short to ground. If the circuit tests normal, replace the K41 Parking Assist Control Module.
 - If greater than the specified range, test the 8 V reference circuit for a short to voltage. If the circuit tests normal, replace the K41 Parking Assist Control Module.
3. Install each object alarm sensor harness connector one at a time, checking DTCs after each sensor is connected. Verify DTC B1405 is not set as current.
 - If the DTC is set, replace the object alarm sensor that was connected immediately before the DTC set.
4. If all circuits test normal, replace the K41 Parking Assist Control Module.

Repair Procedures

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

- **Rear Object Sensor Replacement**
- **Control Module References** for parking assist control module replacement, setup and programming

SYMPTOMS - OBJECT DETECTION

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

1. Perform the **Diagnostic System Check - Vehicle** before using the Symptom Tables in order to verify that all of the following are true:

- There are no DTCs set.
 - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to **Object Detection Description and Operation (UVC)** or **Object Detection Description and Operation (UD7)**.

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 rear bumper are clear. Remove any snow, mud or ice that is blocking the sensors.
- Make sure the rear vision camera is clear. Remove any snow, mud or ice that is blocking the rear vision camera.

Intermittent

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

Symptom List

- **Parking Assist System Malfunction**
- **Parking Assist Indicator Malfunction**
- **Rear Vision Camera System Malfunction (with UYS)** or **Rear Vision Camera System Malfunction (without UYS)**

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.

Circuit/System Description

The ultrasonic parking assist system is designed to identify and notify the driver of an object in the vehicle's path when 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 bumper. The parking assist system will notify the driver using the parking assist indicators and an audible signal through the radio.

The parking assist indicator is located in the interior rear of the vehicle. The indicator contains three LEDs: two amber and one red. The parking assist control module controls these three LEDs as a visual indicator of how

close the vehicle bumper is to an object. The parking assist control module supplies voltage to each of the LEDs and commands each LED on by supplying an individual ground.

Diagnostic Aids

The scan tool Park Assist Disable History parameters are a list of the seven previous reasons the parking assist system was disabled. These parameters may help in the diagnosis of an intermittent concern or a customer concern which is the result of normal system operation. 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 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, object hanging out of tailgate, lowered tailgate, or a bicycle rack may cause this concern. If the customer does have a ball mount attached to the factory hitch, then refer to Owners Manual and "Vehicle Personalization" to enable "Towbar" option. 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).
- **Reverse 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'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

Description and Operation

Object Detection Description and Operation (UVC) or Object Detection Description and Operation (UD7)

Electrical Information Reference

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

Scan Tool Reference

Control Module References

Circuit/System Testing

1. Ignition ON, command each of the park assist indicator LEDs ON and OFF with a scan tool. Each of the LEDs should turn ON and OFF as commanded.
 - If any of the LEDs do not turn ON and OFF, refer to **Parking Assist Indicator Malfunction**
2. Transmission in REVERSE, verify the scan tool Park Assist System Status parameter displays 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 not the specified values, refer to Diagnostic Aids and the scan tool Park Assist Disable History parameters to determine the cause of the inhibit.
3. If all tests normal, replace the K41 Parking Assist Control Module.

Repair Procedures

Perform the **Diagnostic Repair Verification**

- **Information Center Telltale Assembly Replacement**
- **Control Module References**

PARKING ASSIST INDICATOR 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
Parking Assist Indicator B+	B098D 06, B098E 06, B098F 06, B1395 02	B098D 06, B098E 06, B098F 06, B1395 03	B1395 07	-
Parking Assist Indicator 1 (Outer Amber) Control	B098D 06	B098D 06	B098D 01	-
Parking Assist Indicator 2 (Middle Amber) Control	B098E 06	B098E 06	B098E 01	-
Parking Assist Indicator 3 (Red) Control	B098F 06	B098F 06	B098F 01	-

Circuit/System Description

The parking assist indicator is located in the interior rear of the vehicle. The indicator contains 3 LEDs: 2 amber and 1 red. The parking assist control module controls these 3 LEDs as a visual indicator of how close the vehicle bumper is to an object. The parking assist control module supplies voltage to each of the LEDs and commands each LED on by supplying an individual ground.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Object Detection Description and Operation (UVC) or **Object Detection Description and Operation (UD7)**

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 harness connector at the P24 Park Assist Display.
2. Ignition ON, test for greater than 11 V between the B+ circuit terminal A and ground.
 - If less than the specified value, test the B+ circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K41 Parking Assist Control Module.
3. Ignition OFF, disconnect the X1 harness connector at the K41 Parking Assist Control Module.
4. Ignition ON, test for less than 0.3 V between the K41 Parking Assist Control Module control circuit terminals listed below and ground:
 - Terminal 4 X1
 - Terminal 9 X1
 - Terminal 10 X1
 - If greater than the specified value, test the control circuit for a short to voltage.
5. Ignition OFF, test for infinite resistance between the K41 Parking Assist Control Module control circuit terminals listed below and ground:
 - Terminal 4 X1
 - Terminal 9 X1
 - Terminal 10 X1
 - If less than the specified value, test control circuit for a short to ground.
6. Connect the harness connector at the K41 Parking Assist Control Module.
7. Ignition ON, command the appropriate LED ON with the scan tool and verify a test lamp illuminates between the appropriate control circuit terminal listed below and ground:
 - Amber 1 LED - terminal B
 - Amber 2 LED - terminal C
 - Red LED - terminal D
 - If the test lamp does not illuminate, test the control circuit for an open/high resistance. If all circuits test normal, K41 Parking Assist Control Module.
8. If all circuits test normal, replace the P24 Park Assist Display.

Repair Procedures

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

- **Information Center Telltale Assembly Replacement**
- **Control Module References** for parking assist control module replacement, setup, and programming

REAR VISION CAMERA SYSTEM MALFUNCTION (WITH UYS)

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

When the transmission is placed into REVERSE, 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.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Object Detection Description and Operation (UVC) or **Object Detection Description and Operation (UD7)**

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. Inspect the rearview camera and verify there are no debris on the lens and that the bezel or bezel seal is not damaged.
 - If debris are found on the lens, clean the lens. If the lens, bezel, or bezel seal are damaged, replace as necessary.
2. Ignition ON, vehicle in PARK, verify the backup lamps are off.
 - If the backup lamps are illuminated, refer to **Backup Lamps Malfunction** .
3. Transmission in REVERSE, verify the backup lamps are on.
 - If the backup lamps are not illuminated, refer to **Backup Lamps Malfunction** .
4. Engine running, transmission in REVERSE, verify a clear rear vision image is displayed on the radio.
 - If a clear image is not displayed, refer to Circuit/System Testing.

Circuit/System Testing

NOTE: **Circuit/System Verification must be performed before Circuit/System Testing.**

1. Ignition OFF, disconnect the harness connector at the rearview camera.
2. Test for less than 5 ohms between the ground circuit terminal 5 and ground.
 - If greater than the specified value, test the ground circuit for an open/high resistance.
3. Ignition ON, verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
 - If the test lamp does not illuminate, test the ignition circuit for a short to ground or an open/high resistance.
4. Engine running, park brake applied, transmission in REVERSE, test for greater than 11 V between the control circuit terminal 3 and ground.
 - If less than the specified value, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K9 Body Control Module.
5. Ignition OFF, disconnect the X4 harness connector at the A11 Radio.
6. Ignition ON, test for less than 0.3 V between the following signal circuit terminals at the rearview camera harness connector and ground:
 - Signal (+) circuit terminal 1
 - Signal (-) circuit terminal 4
 - If greater than the specified value, test the signal circuit for a short to voltage.
7. Test for infinite resistance between the following circuit terminals at the rearview camera harness connector and ground:
 - Signal (+) circuit terminal 1
 - Signal (-) circuit terminal 4
 - If not the specified value, test the circuit for a short to ground.
8. Test for less than 5 ohms between the signal (+) circuit terminal 1 at the rearview camera harness

connector and the signal (+) circuit terminal 5 X4 at the A11 Radio harness connector.

- If greater than the specified value, test the signal circuit for an open/high resistance.

9. Test for less than 5 ohms between the signal (-) circuit terminal 4 at the rearview camera harness connector and the signal (-) circuit terminal 15 X4 at the A11 Radio harness connector.

- If greater than the specified value, test the signal circuit for an open/high resistance.

10. If all circuits test normal, replace the rearview camera.

11. Engine running, transmission in REVERSE, verify a clear rear vision image is displayed on the radio.

- If a clear rear vision image is not displayed, replace the A11 Radio.

Repair Procedures

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

- **Rearview Camera Image Display Module Replacement**
- **Control Module References** for body control module or radio replacement, setup and programming

REAR VISION CAMERA SYSTEM MALFUNCTION (WITHOUT UYS)

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

When the transmission is placed into REVERSE, a 12 V signal is sent to the inside rearview mirror and rearview camera indicating that camera operation is requested. Ignition voltage and ground are supplied to the rearview camera. The inside rearview mirror is supplied a common ignition voltage and ground source that is shared with other mirror operations. The rearview camera sends video information to the inside rearview mirror 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.

Reference Information

Schematic Reference

Object Detection Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Object Detection Description and Operation (UVC) or Object Detection Description and Operation (UD7)

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. Inspect the rearview camera and verify there are no debris on the lens and that the bezel or bezel seal is not damaged.
 - If debris are found on the lens, clean the lens. If the lens, bezel, or bezel seal are damaged, replace as necessary.
2. Ignition ON, vehicle in PARK, verify the backup lamps are off.
 - If the backup lamps are illuminated, refer to **Backup Lamps Malfunction** .
3. Transmission in REVERSE, verify the backup lamps are on.
 - If the backup lamps are not illuminated, refer to **Backup Lamps Malfunction** .
4. Engine running, transmission in REVERSE, verify a clear rear vision image is displayed on the inside rearview mirror.
 - If a clear image is not displayed, refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the rearview camera.
2. Test for less than 5 ohms between the ground circuit terminal 5 and ground.
 - If greater than the specified value, test the ground circuit for an open/high resistance.
3. Ignition ON, verify a test lamp illuminates between the ignition circuit terminal 6 and ground.
 - If the test lamp does not illuminate, test the ignition circuit for a short to ground or an open/high resistance.
4. Engine running, park brake applied, transmission in REVERSE, test for greater than 11 V between the control circuit terminal 3 and ground.

- If less than the specified value, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K9 Body Control Module.
- 5. Ignition OFF, disconnect the harness connector at the A10 Inside Rearview Mirror.
- 6. Test for less than 5 ohms between the ground circuit terminal 8 and ground.
 - If greater than the specified value, test the ground circuit for an open/high resistance.
- 7. Ignition ON, verify a test lamp illuminates between the ignition circuit terminal 13 and ground.
 - If the test lamp does not illuminate, test the ignition circuit for a short to ground or an open/high resistance.
- 8. Park brake applied, transmission in REVERSE, test for greater than 11 V between the control circuit terminal 9 and ground.
 - If less than the specified value, test the control circuit for an open/high resistance. If the circuit tests normal, replace the K9 Body Control Module.
- 9. Test for less than 0.3 V between the following signal circuit terminals at the rearview camera harness connector and ground:
 - Signal (+) circuit terminal 1
 - Signal (-) circuit terminal 4
 - If greater than the specified value, test the signal circuit for a short to voltage.
- 10. Ignition OFF, test for infinite resistance between the following circuit terminals at the rearview camera harness connector and ground:
 - Signal (+) circuit terminal 1
 - Signal (-) circuit terminal 4
 - If not the specified value, test the circuit for a short to ground.
- 11. Test for less than 5 ohms between the shield ground circuit terminal 2 and ground.
 - If greater than the specified value, test the shield ground circuit for an open/high resistance.
- 12. Test for less than 5 ohms between the signal (+) circuit terminal 1 at the rearview camera harness connector and the signal (+) circuit terminal 6 at the A10 Inside Rearview Mirror harness connector.
 - If greater than the specified value, test the signal circuit for an open/high resistance.
- 13. Test for less than 5 ohms between the signal (-) circuit terminal 4 at the rearview camera harness connector and the signal (-) circuit terminal 7 at the A10 Inside Rearview Mirror harness connector.
 - If greater than the specified value, test the signal circuit for an open/high resistance.
- 14. If all circuits test normal, connect the harness connector to the A10 Inside Rearview Mirror and replace the rearview camera.
- 15. Ignition ON, transmission in REVERSE, verify a clear rear vision image is displayed on the inside rearview mirror.
 - If a clear rear vision image is not displayed, replace the A10 Inside Rearview Mirror.

Repair Procedures

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

- **Rearview Camera Image Display Module Replacement**

- Control Module References for body control module replacement, setup, and programming

REPAIR INSTRUCTIONS

REAR OBJECT ALARM MODULE REPLACEMENT

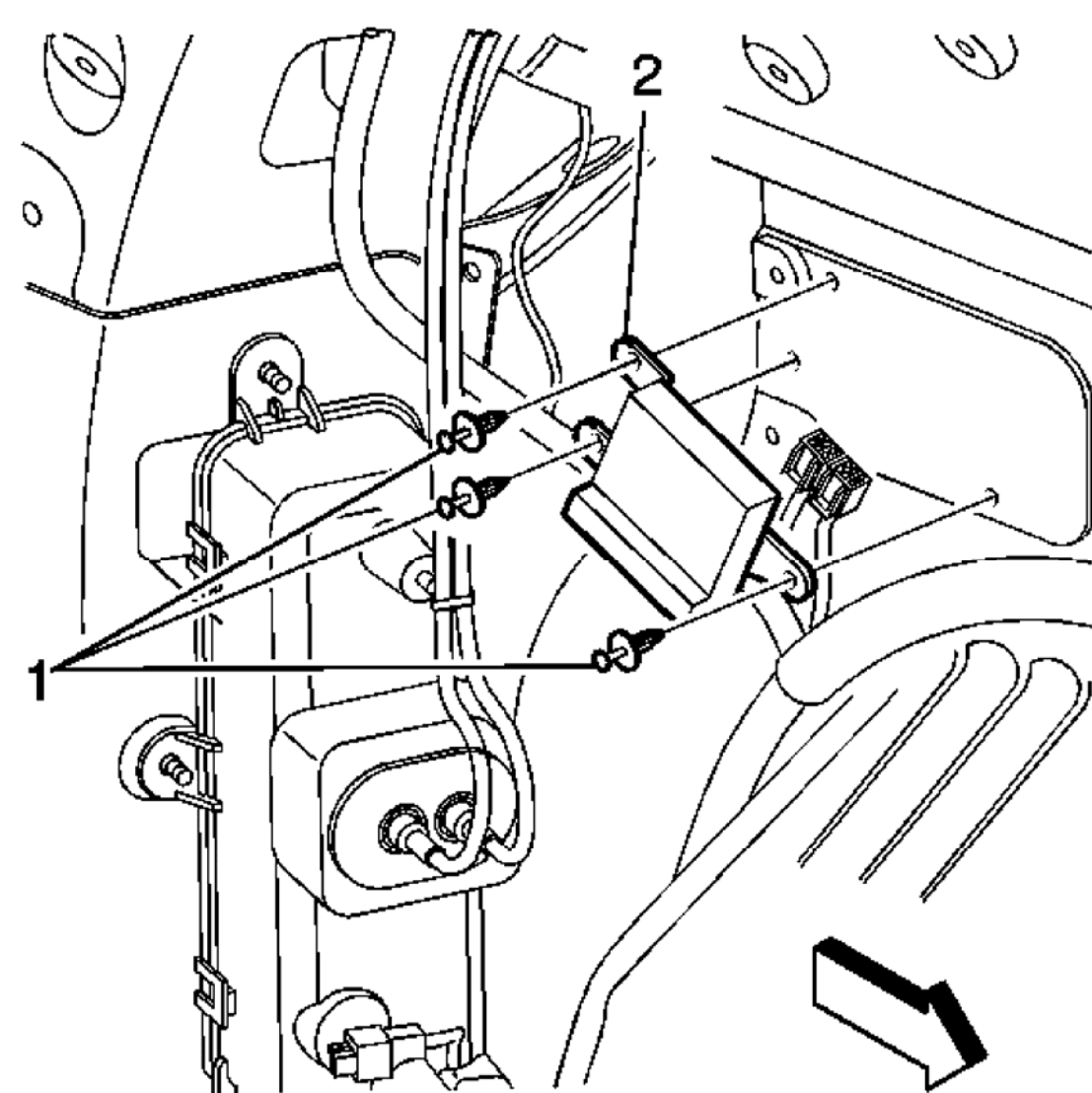


Fig. 4: Rear Object Alarm Module
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the left body side trim panel. Refer to <u>Body Side Trim Panel Replacement - Left Side</u> .	
1	Rear Object Alarm Module Retainers (Qty: 3)

Procedure

1. Disconnect the electrical connectors.
2. For programming and set up, refer to **Control Module References**

INFORMATION CENTER TELLTALE ASSEMBLY REPLACEMENT

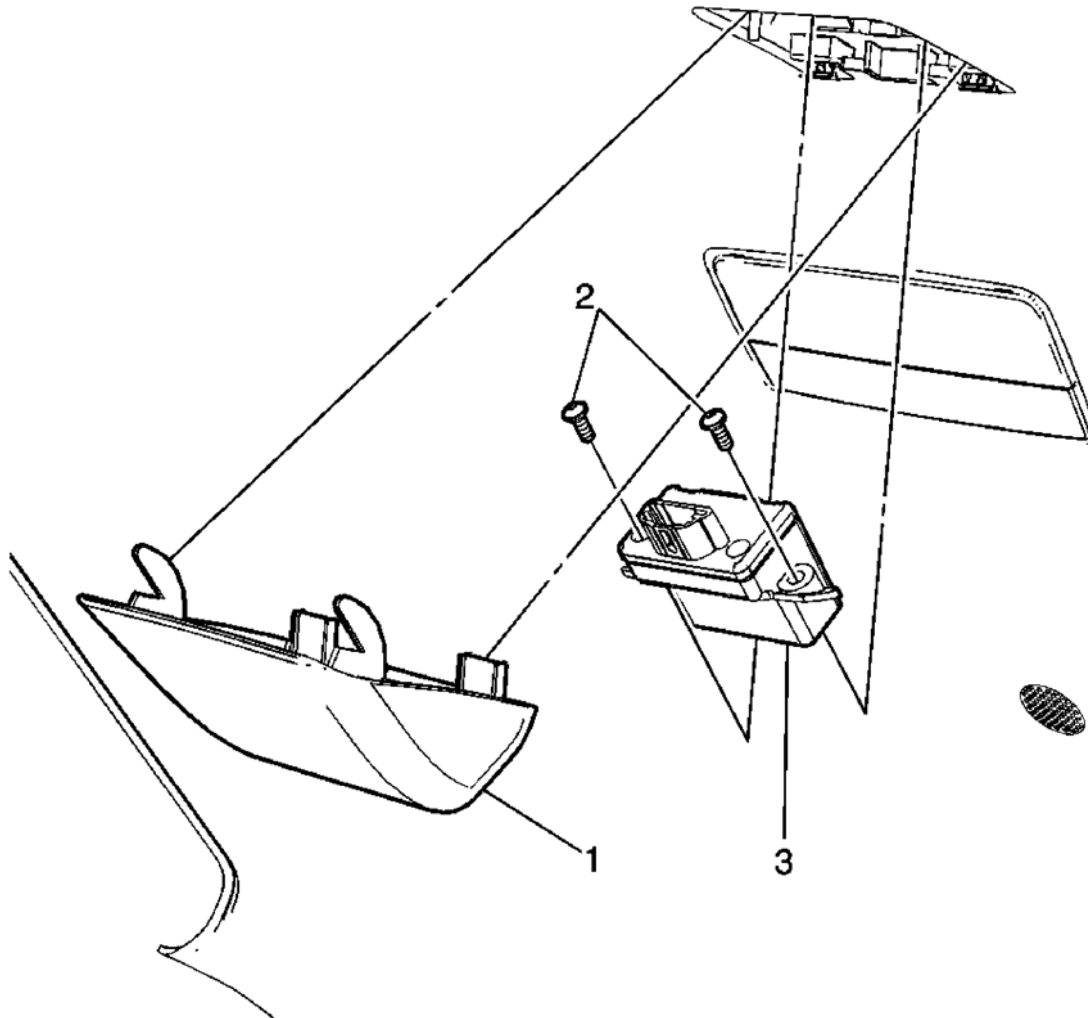


Fig. 5: Information Center Telltale Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Information Center Telltale Bezel
	Information Center Telltale Assembly Screws (Qty: 2)

2	CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2 N.m (18 lb in)
3	Information Center Telltale Assembly Procedure: Disconnect the electrical connector.

REAR OBJECT SENSOR REPLACEMENT

Removal Procedure

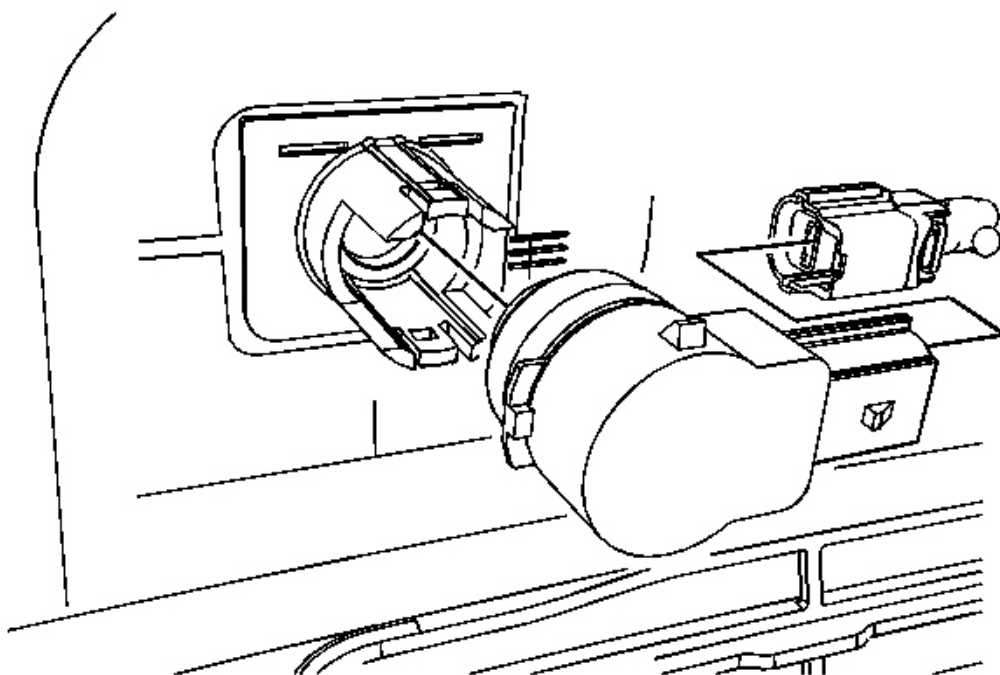


Fig. 6: View Of Rear Object Sensor
Courtesy of GENERAL MOTORS CORP.

1. Remove rear bumper fascia. Refer to **Rear Bumper Fascia Replacement** .
2. Disconnect electrical from the rear object sensor.
3. Lift the locking tabs on the housing and remove the rear object sensor.

Installation Procedure

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

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

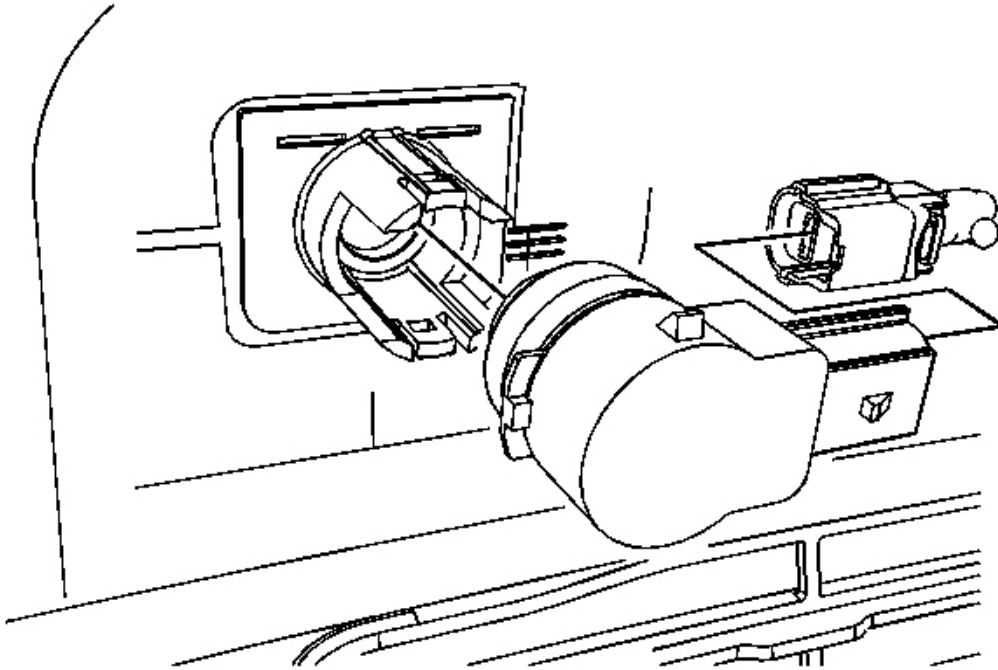


Fig. 7: View Of Rear Object Sensor
Courtesy of GENERAL MOTORS CORP.

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

REAR OBJECT SENSOR HOUSING REPLACEMENT

1. Remove the rear fascia. Refer to **Rear Bumper Fascia Replacement** .

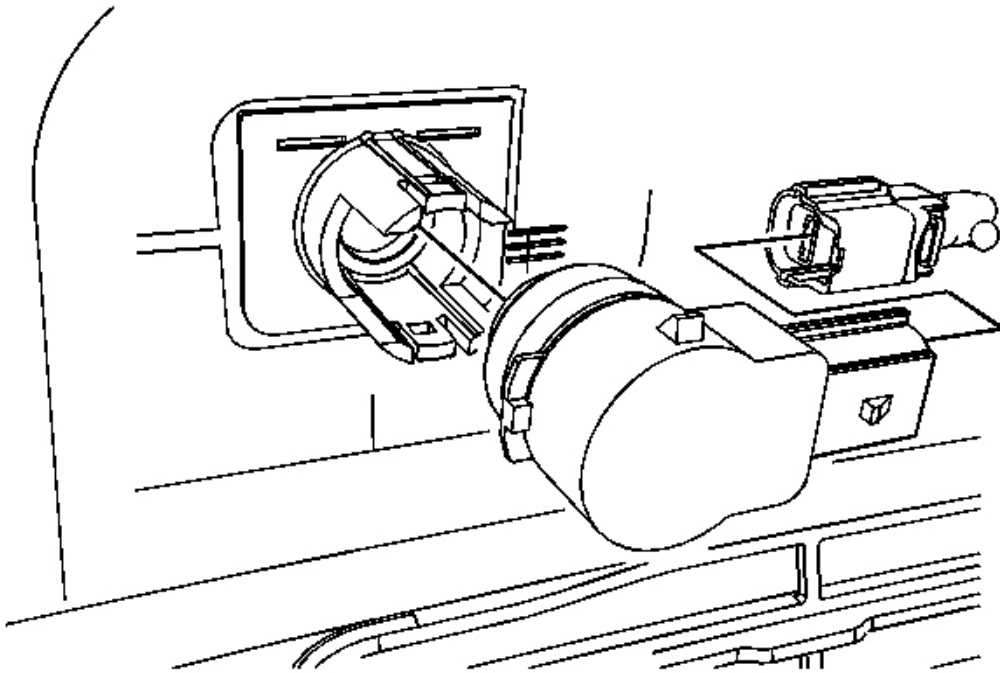


Fig. 8: View Of Rear Object Sensor
Courtesy of GENERAL MOTORS CORP.

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

The sensor housing must be painted if replaced. If reinstalled, painting will not be necessary.

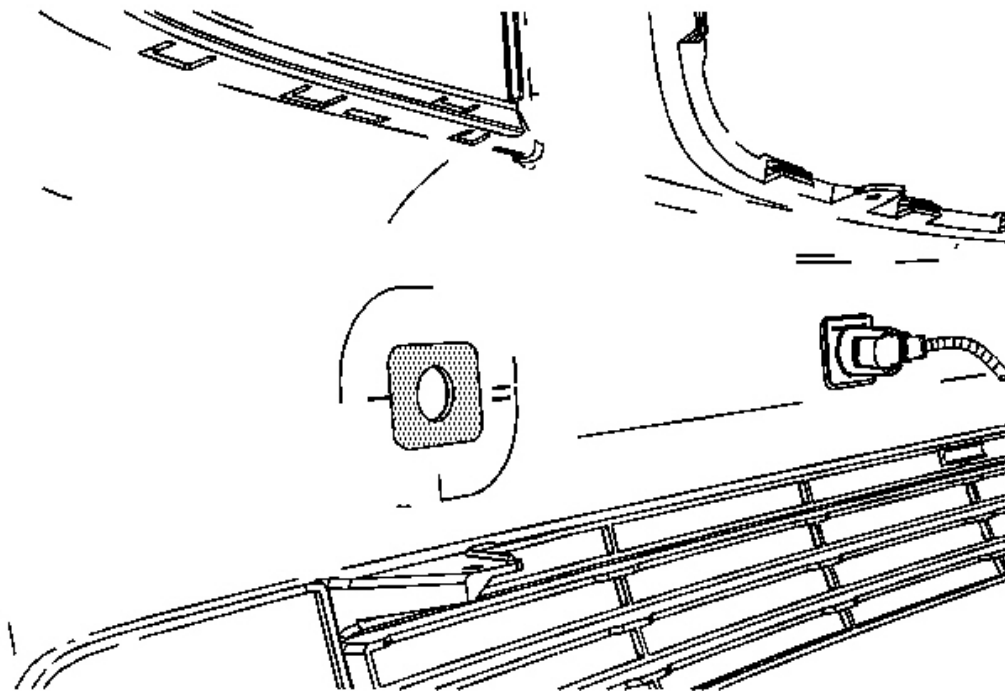


Fig. 9: Sanding/Grinding Sonic Weld Plastic Residue From Fascia
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do Not grind off alignment tabs.

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

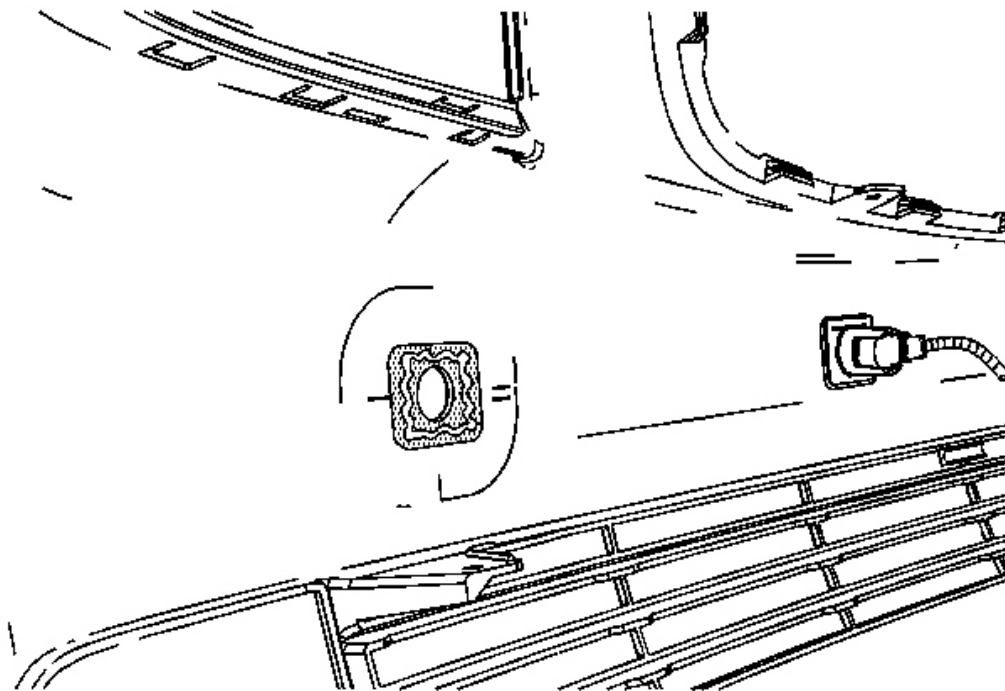


Fig. 10: Applying Structural Adhesive Epoxy To Fascia
Courtesy of GENERAL MOTORS CORP.

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

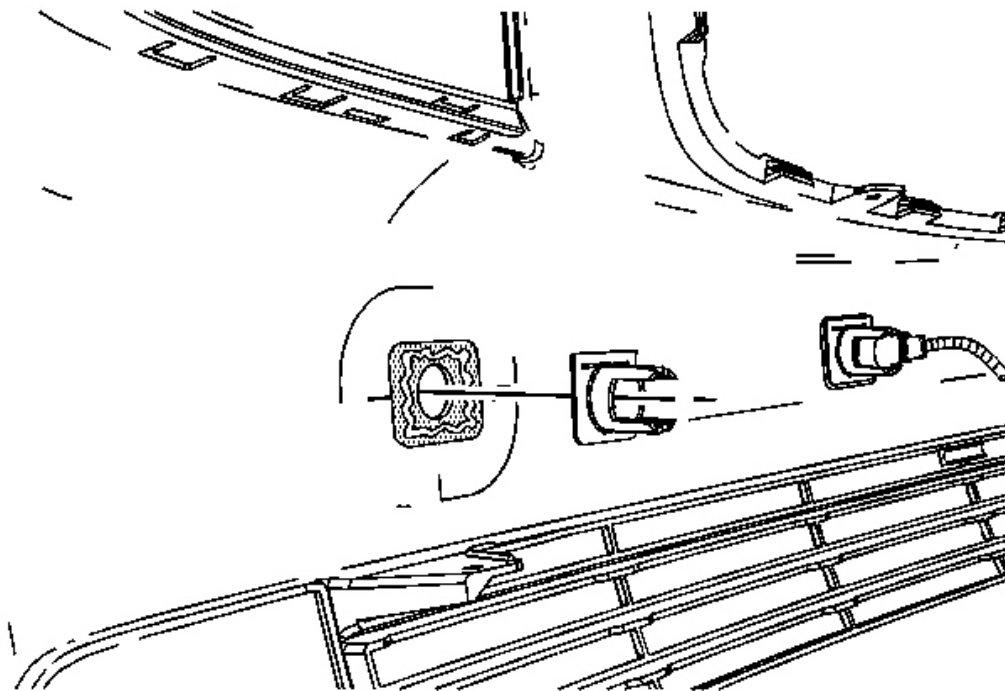


Fig. 11: Identifying Sensor Housing & Tabs
Courtesy of GENERAL MOTORS CORP.

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

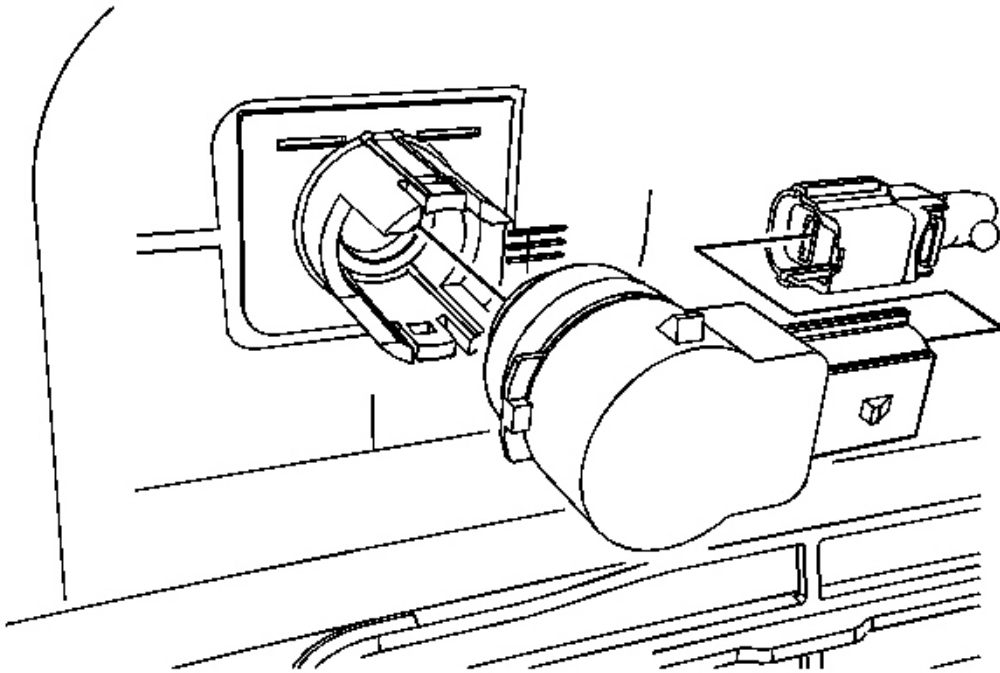


Fig. 12: View Of Rear Object Sensor
Courtesy of GENERAL MOTORS CORP.

8. Install the sensor to the sensor housing.
9. Connect the electrical harness.
10. Install the rear fascia. Refer to **Rear Bumper Fascia Replacement** .

REARVIEW CAMERA IMAGE DISPLAY MODULE REPLACEMENT

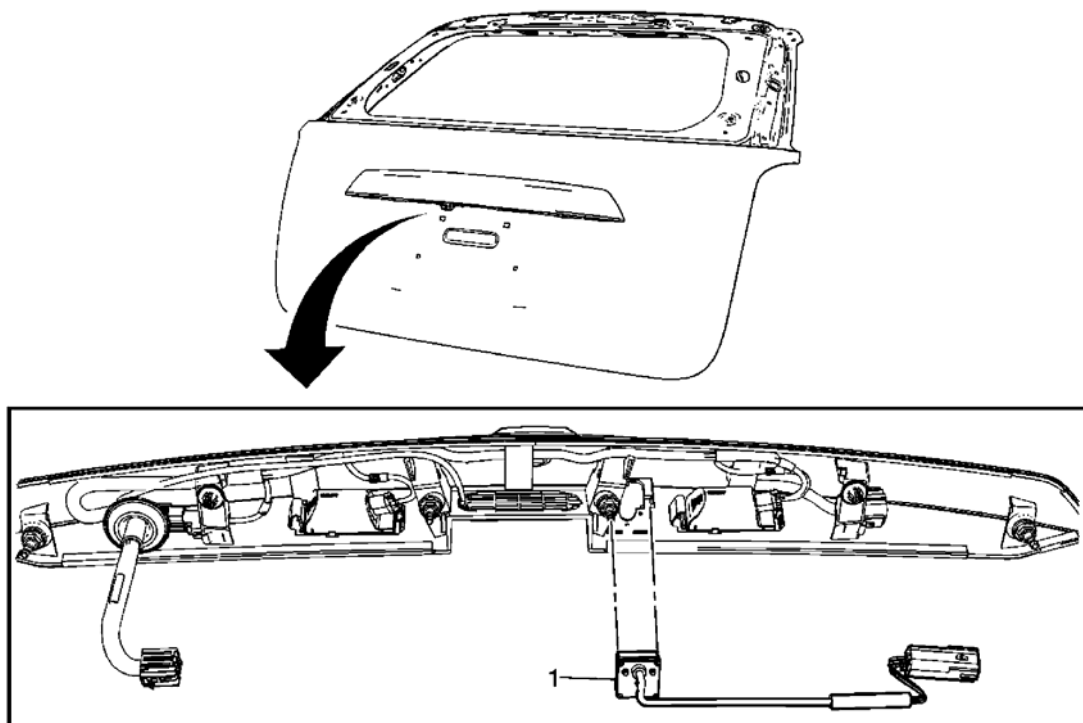


Fig. 13: Rearview Camera Image Display Module
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the liftgate applique. Refer to <u>Liftgate Applique Replacement (Equinox w/UVC)</u> or <u>Liftgate Applique Replacement (Equinox wo/UVC)</u> or <u>Liftgate Applique Replacement (Terrain)</u> .	
1	Rearview Camera Procedure 1. Disconnect the electrical connector. 2. Depress the clip fingers and push outward to remove the rearview camera from the applique.

DESCRIPTION AND OPERATION

OBJECT DETECTION DESCRIPTION AND OPERATION (UVC)

Rear Vision Camera System Operation (without UYS)

The rear vision camera system consists of a video camera located at the rear of the vehicle and a 3.5 inch LCD display integral to the inside rearview mirror (ISRVM).

When the transmission is placed into REVERSE, a 12 volt signal is sent to the rear vision camera by the body control module (BCM). This signal indicates to the camera that the vehicle is in reverse and image display is requested. The rear vision camera receives ignition voltage and a constant ground to power the camera. Video signal + and video signal - circuits carry the video image from the rear vision camera to the LCD display in the inside rearview mirror. Additionally, the video signal circuits are shielded to prevent any interference which may lead to a loss of video signal resolution and a degraded video image. The shield is provided a ground path by the rear vision camera.

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

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

Rear Vision Camera System Operation (with UYS)

The rear vision camera system consists of a video camera located at the rear of the vehicle and the navigation radio.

When the transmission is placed into REVERSE, a 12 volt signal is sent to the rear vision camera by the body control module (BCM). This signal indicates to the camera that the vehicle is in reverse and image display is requested. The rear vision camera receives ignition voltage and a constant ground to power the camera. Video signal + and video signal - circuits carry the video image from the rear vision camera to the navigation radio. Additionally, the video signal circuits are shielded to prevent any interference which may lead to a loss of video signal resolution and a degraded video image. The shield is provided a ground path by the rear vision camera.

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

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

If a malfunction is detected in the system, Service Rear Vision Camera may be displayed on the navigation radio as an indicator to the customer that a problem exists that requires service.

OBJECT DETECTION DESCRIPTION AND OPERATION (UD7)

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

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

- Parking assist control module
- Rear object alarm sensors
- Parking assist indicator

Parking Assist Control Module

The parking assist control module provides an 8 V reference and a low reference to the four rear parking assist 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 illuminate the appropriate LED on the parking assist indicator and send a serial data message to the radio requesting an audible alert.

Rear Object Alarm Sensors

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

Parking Assist Indicator

The parking assist indicator is located in the interior rear of the vehicle and is visible through the inside rearview mirror. The indicator contains three LEDs: two amber and one red. The parking assist control module controls these three LEDs as a visual indicator of how close the vehicle bumper is to an object. The parking assist control module supplies voltage to each of the LEDs and commands each LED on by supplying an individual ground.

Rear Parking Assist Operation

When the vehicle is first placed into reverse, the rear parking assist system performs a bulb check. During the bulb check, the all three LED located in the parking assist indicator will illuminate for approximately 2 s to indicate that the system is working.

When backing up at speed of less than 8 km/h (5 MPH), the system is constantly monitoring for object of interest located behind the vehicle. The rear parking assist system can detect objects greater than 7.6 cm (3 in) wide and 25.4 cm (10 in) tall. The system cannot detect objects below the bumper, underneath the vehicle. If an object is detected, one of the following will occur:

- If the object is 1-2.5 m (3.3-8.2 ft) away from the vehicle, the amber outside indicator will illuminate and a single chime will sound when the object is first detected.
- If the object is 0.6-1.0 m (2-3.3 ft) away from the vehicle, the amber outside and the amber middle indicators will illuminate.
- If the object is 0.3-0.6 m (1-2 ft) away from the vehicle, the amber outside, amber middle, and red outside

indicators will illuminate and the chime sounds continuously.

- If the object is less than 0.3 m (1 ft) away from the vehicle, the amber outside, amber middle, and red outside indicators will flash and the chime sounds continuously.

If the rear parking assist system detects a malfunction, a DTC will be stored and the parking assist control module will send a serial data message to the instrument panel cluster to display the SERVICE PARK ASSIST message on the driver information center. The red LED on the parking assist indicator will be illuminated as a notification to the driver that a malfunction exists and the system is disabled.

Towbar Enabling

If the vehicle has a factory Trailer Hitch installed and the owner uses a factory ball mount package there is a personalization option available to allow the Rear Park Assist system to work with the factory Trailer Hitch.

This option can be selected using the Vehicle Personalization in the Radio and selecting Collision/Detection Systems. Press the MENU/SELECT knob when Park Assist is highlighted. Turn the knob to select Tow Bar. Press the knob to confirm and go back to the last menu.

Rear Parking Assist System Driver Information Center Messages

SERVICE PARK ASSIST

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

PARK ASSIST OFF

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

- The rear parking assist system is manually disabled by the vehicle operator through the audio system personalization menu.
- 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.