

2017 ACCESSORIES & EQUIPMENT

Cellular, Entertainment, and Navigation - Bolt EV

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

Application	Specification
	Metric (English)
NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Communication Interface Module Battery Bolt	2.5 N.m (22 lb in)
Communication Interface Module Bracket Bolt	2.5 N.m (22 lb in)
Driver Information Display Bolt	2.5 N.m (22 lb in)
Ground Wire Bolt	9 N.m (80 lb in)
Ground Wire Nut	9 N.m (80 lb in)
High Frequency Antenna Fastener	9 N.m (80 lb in)
Radio Antenna Amplifier Bolt	9 N.m (80 lb in)
Radio Assembly Bolt	2.5 N.m (22 lb in)
Radio Control Switch Bolt - Spoke Lower Cover	1.5 N.m (13 lb in)
Radio Control Switch Bolt - Steering Wheel	2.5 N.m (22 lb in)
Radio Front Side Door Speaker Fastener	2.5 N.m (22 lb in)
Radio Function Switch Bolt	2.5 N.m (22 lb in)
Radio Rear Compartment Speaker Fastener	6 N.m (53 lb in)
Radio Rear Side Door Speaker Fastener	2.5 N.m (22 lb in)
Radio Speaker Amplifier Nut	9 N.m (80 lb in)

SCHEMATIC WIRING DIAGRAMS

RADIO/NAVIGATION SYSTEM WIRING SCHEMATICS

Radio Power, Ground, Data, Microphone and Controls

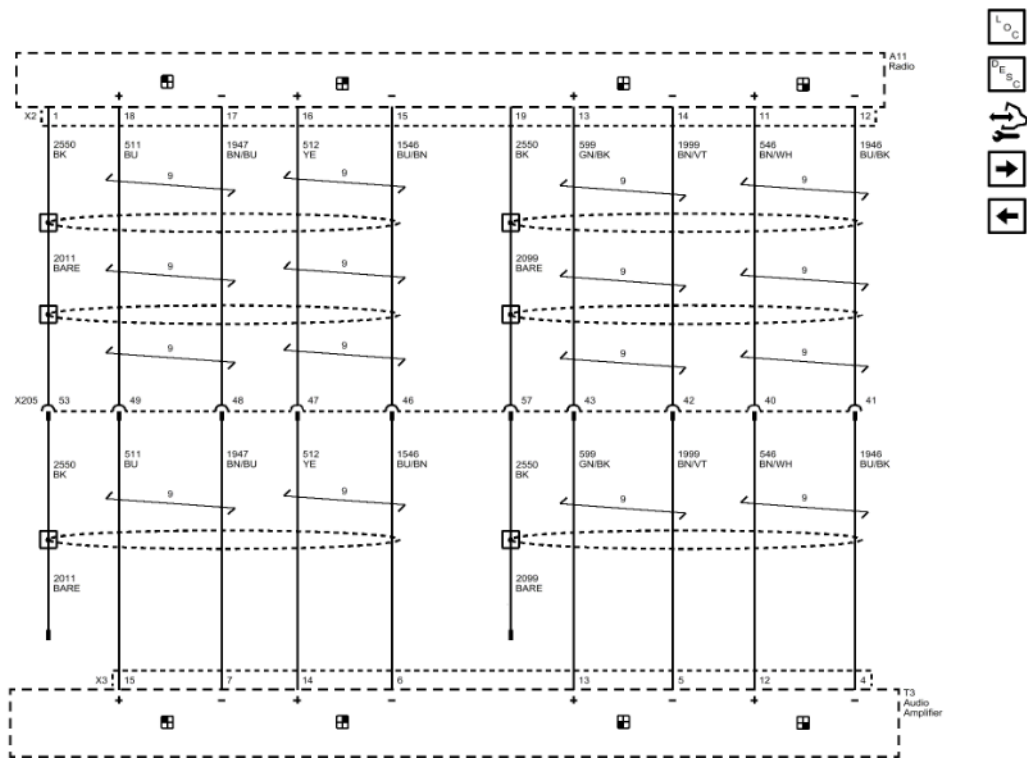


Fig. 3: Radio Speaker Outputs (UQA)
 Courtesy of GENERAL MOTORS COMPANY

Speakers (UQA)

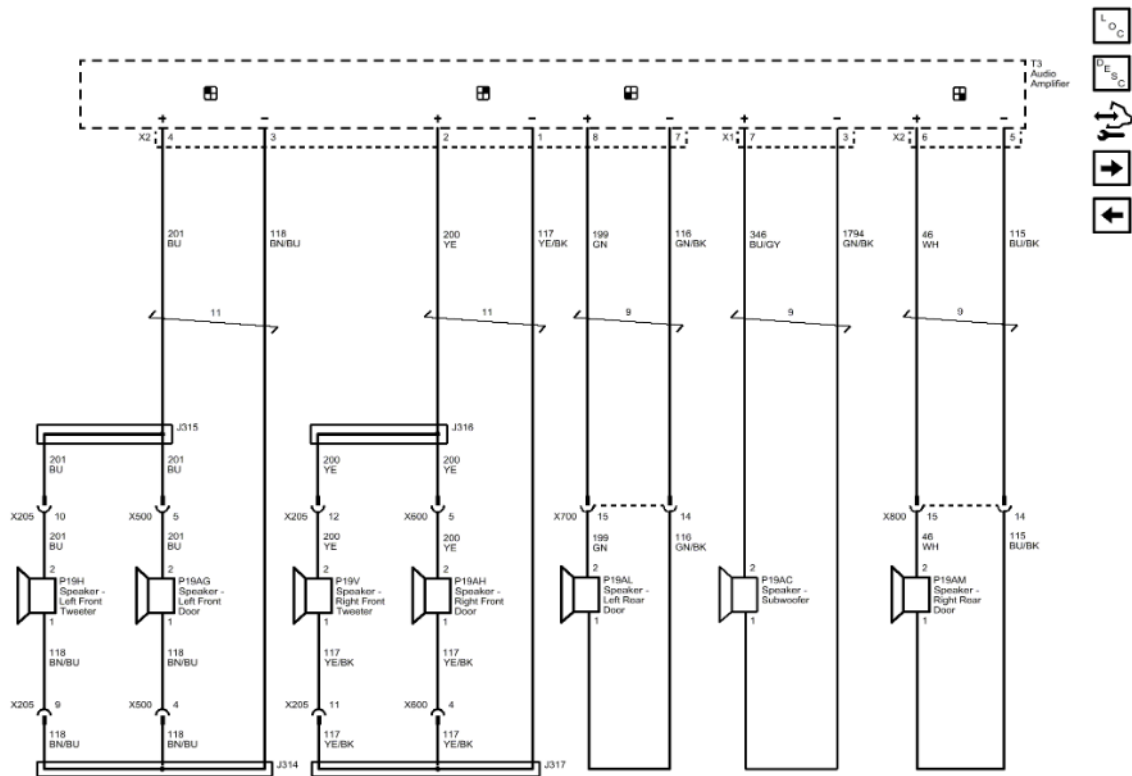


Fig. 4: Speakers (UQA)
 Courtesy of GENERAL MOTORS COMPANY

Amplifier Power, Ground and Data (UQA)

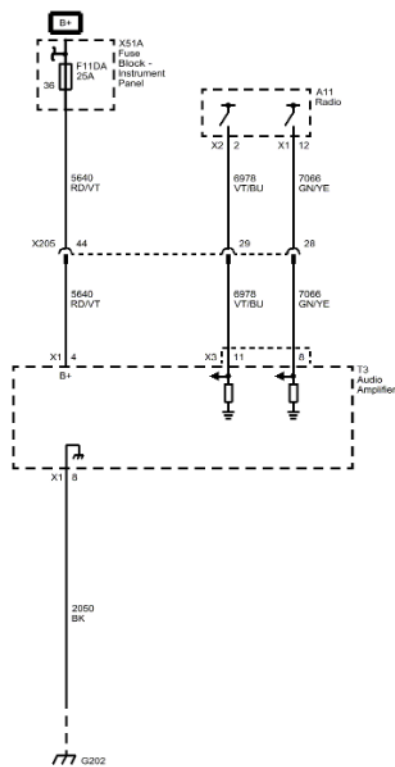


Fig. 5: Amplifier Power, Ground and Data (UQA)
Courtesy of GENERAL MOTORS COMPANY

Antenna Signals (CV3/EF7/Z49)

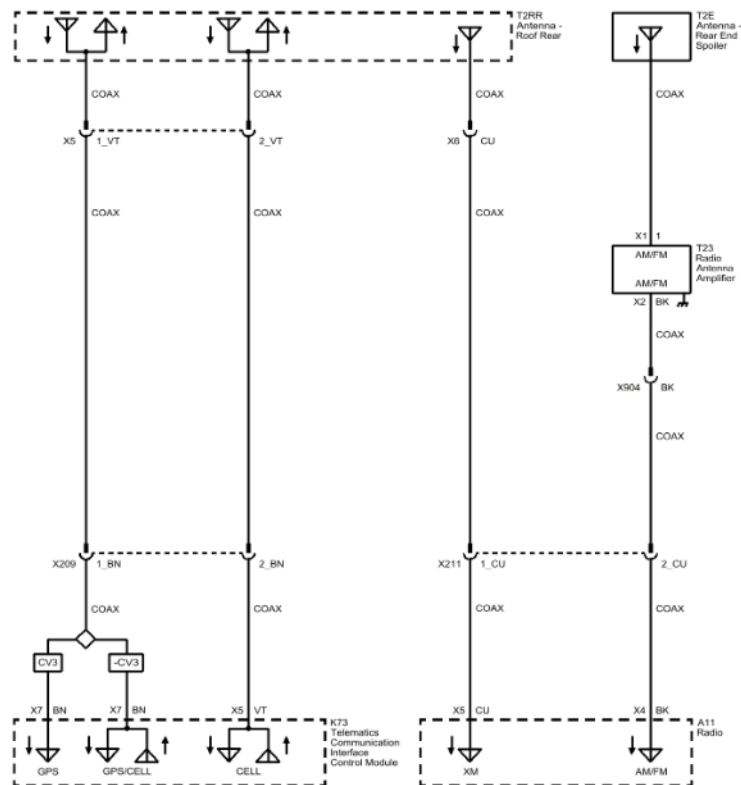


Fig. 6: Antenna Signals (CV3/EF7/Z49)
Courtesy of GENERAL MOTORS COMPANY

Antenna Signals (MBM)

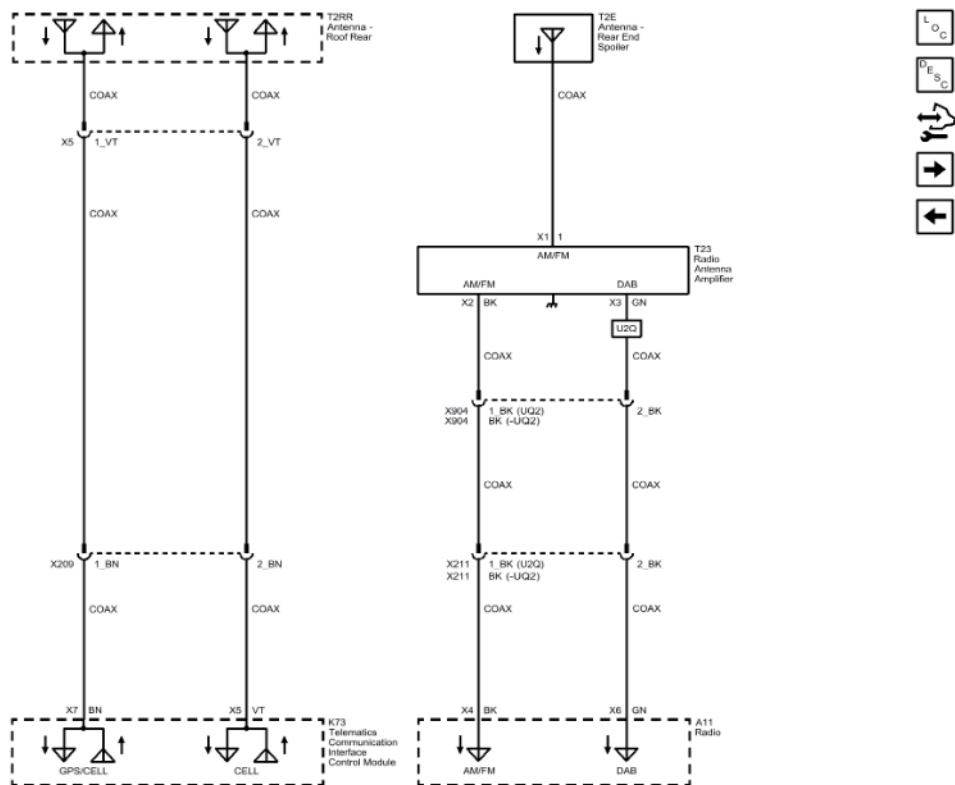


Fig. 7: Antenna Signals (MBM)
 Courtesy of GENERAL MOTORS COMPANY

Antenna Signals (CW1)

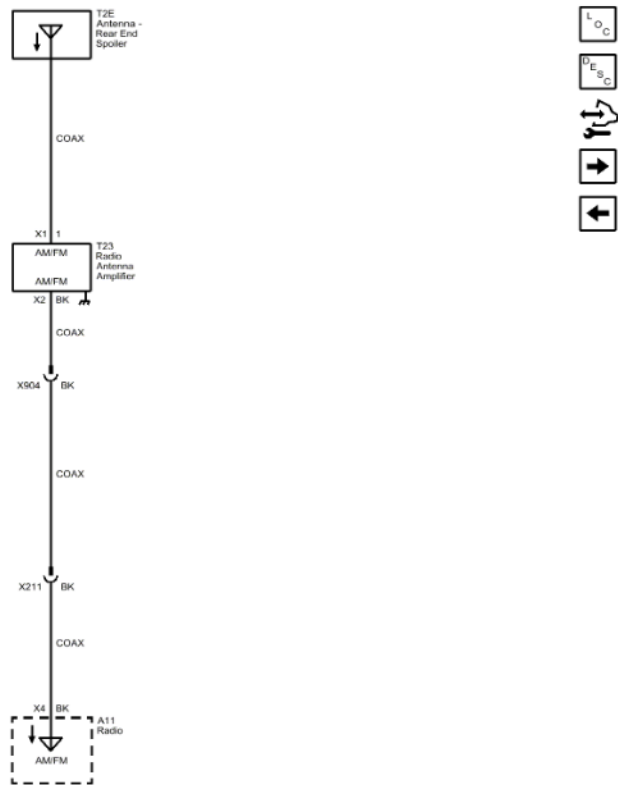


Fig. 8: Antenna Signals (CW1)
 Courtesy of GENERAL MOTORS COMPANY

Auxiliary Input

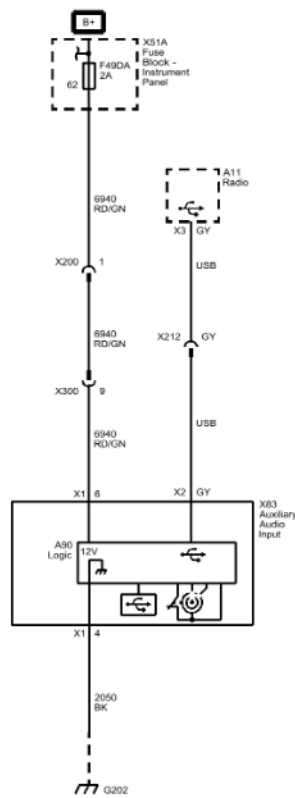


Fig. 9: Auxiliary Input

Courtesy of GENERAL MOTORS COMPANY

ONSTAR/TELEMATICS WIRING SCHEMATICS

Power, Ground, Serial Data and Antennas (UE1)

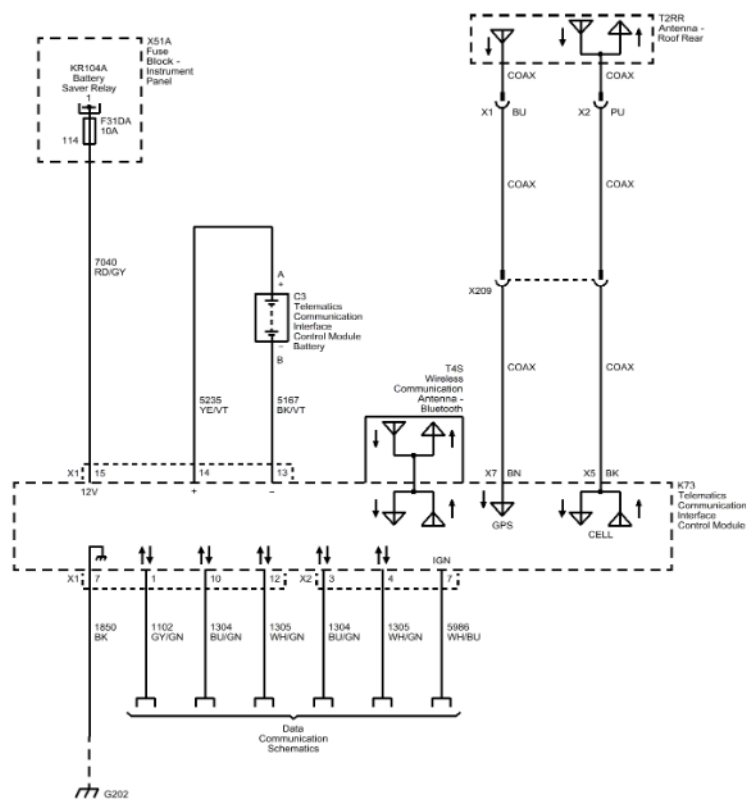


Fig. 10: Power, Ground, Serial Data and Antennas (UE1)

Courtesy of GENERAL MOTORS COMPANY

Controls and Audio Signals (UE1)

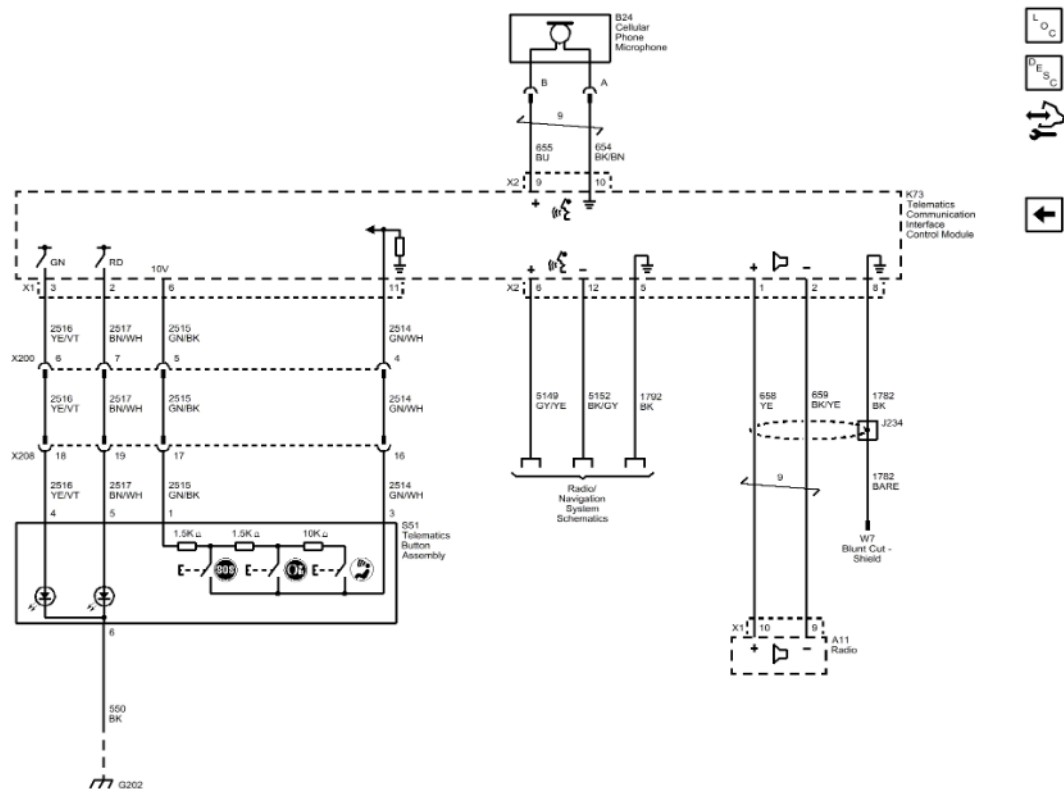


Fig. 11: Controls and Audio Signals (UE1)
 Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B123E: RADIO KEYPAD BUTTON SIGNAL CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC B123E

Radio Keypad Button Signal Circuit

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal Terminal 6	B123E 02	B123E 01	B123E 01	-
Low Reference Terminal 10	-	B123E 01	-	-

Circuit/System Description

The radio controls communicate radio control inputs directly to the radio through a discrete circuit for volume up, volume down and power button. It also uses a series of resistors through a signal circuit when the home, seek up, seek down and phone buttons are pressed. After receiving the message the radio will perform the requested function. Messages communicated between the radio and the radio controls include the following:

- Button presses/knob rotations
- Commands for the state of indicators

- Controls back-lighting

Conditions for Running the DTC

- Vehicle in Service Mode/Ignition is ON or in the ACC position
- The system voltage is 9 - 16 V
- The infotainment system is ON
- The test is run once every 250 ms when the infotainment system is operating

Conditions for Setting the DTC

B123E 01

The radio detects an open/high resistance or short to voltage on the radio keypad button signal circuit

B123E 02

The radio detects a short to ground on the radio keypad button signal circuit

Actions Taken When the DTC Sets

Radio control buttons will be inoperative

Conditions for Clearing the DTC

The condition for setting the DTC is no longer detected for 250 ms.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Radio/Audio 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

Circuit/System Verification

1. Ignition On/vehicle in Service Mode.
2. Verify that each button on the A20 Radio/HVAC Controls operates normally by pressing each button individually.
 - **If none of the buttons operate normally**
Refer to Circuit/System Testing
 - **If some, but not all, of the buttons operate normally**
Test or replace the A20 Radio/HVAC Controls

- If all of the buttons operate normally

3. All OK

Circuit/System Testing

1. Ignition OFF/vehicle OFF and all vehicle systems OFF. Disconnect the harness connector at the A20 Radio/HVAC Controls. 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 10 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the P17 Info Display 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 P17 Info Display Module
 - **If less than 10 Ω**
3. Ignition ON/vehicle in Service Mode.
4. Test for 2.5 - 3.5 V on the signal circuit terminal 6 and ground.
 - **If less than 2.5 V**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the A11 Radio.
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground.
 - 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 A11 Radio.
 - **If greater than 3.5 V**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the A11 Radio.
 2. Ignition ON/vehicle in Service Mode, 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 A11 radio.
 - **If between 2.5 - 3.5 V**
5. Test or replace the A20 Radio/HVAC Controls

Repair Instructions

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

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

DTC B124B: USB 1 CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC B124B

USB 1 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
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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	B124B, 1, 6	1, 5	-	-
Auxiliary Audio Common Signal	-	8	-	-
Auxiliary Detection Signal	7	8	-	-
Left Auxiliary Audio Signal	2	2	2, 4	-
Right Auxiliary Audio Signal	3	3	3, 4	-
USB Cable	B124B	B124B	B124B	-
Ground	-	1	-	-
1. USB port Inoperative 2. No left side audio from device connected to AUX jack 3. No right side audio from device connected to AUX jack 4. Noticeable distortion may be present in affected audio channel 5. Fault may affect one or more components, dependant on fault location 6. Fault affects multiple components, dependant on vehicle equipment 7. Radio does not detect auxiliary device connection, AUX not available as input selection 8. AUX always available as an input selection, with or without auxiliary device connected				

Circuit/System Description

The infotainment system has a auxiliary jack and USB receptacle assembly. The auxiliary jack and USB receptacle assembly receives fused battery voltage and ground from the harness to power the internal hub device as well as providing additional amperage to power USB devices. The internal hub device interfaces directly with the radio via a standard USB cable.

Auxiliary Audio Input Jack

When a portable audio playback device is connected to the 3.5 mm (1/8 in.) auxiliary audio input jack an internal switch opens the detection signal circuit. The radio detects the device and AUX becomes available as an audio source. Audio signals from the device are sent to the radio from the auxiliary input jack via the left, right, and common audio signal circuits.

USB Port

The USB receptacle interfaces directly with the radio via a standard USB cable. A Mini type USB connector is used to connect the cable at the radio and at the auxiliary jack and USB receptacle assembly. USB male to female connections are typically used for connecting USB cables together where an in-line connection is required. An in-line cable connection is typically found between the console and I/P harness.

The USB port allows connectivity to the infotainment system from portable media players or a USB storage device (memory stick/flash drive). When a device is connected to the USB port, the system detects the device and USB becomes available as an audio source. Once connected, the device can be controlled from the radio controls.

Not all portable media player devices or file types are compatible. Refer to the owner's manual for information on USB devices, control, and operation.

Conditions for Running the DTC

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

Conditions for Setting the DTC

The radio detects an excessive current condition on the USB 5 V circuit.

Action Taken When the DTC Sets

The USB port is inoperative while the DTC is current.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- A history DTC will clear once 50 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

Radio/Navigation System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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Radio/Audio System 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

Special Tools

- **EL-50334-20** Multi-Media Interface Tester (MIT)
- **EL-50334-50** USB Cable and Adapter Kit
- **EL-50334-14** Infotainment Test Cable

Circuit/System Verification

1. Verify DTC B124B is not set. Since occurrences of this DTC can be caused by an incompatible or faulty USB device, review with the customer the conditions under which their concern occurred.

- **If DTC B124B is set.**

Refer to Circuit/System testing.

- **If DTC B124B is not set.**

2. Ignition ON/vehicle in Service Mode, infotainment system ON.
3. Connect the EL-50334-20 Multi-Media Interface Tester (MIT) to the X83 Auxiliary Audio Input USB port and select the USB test mode.
4. Verify the audio from the EL-50334-20 Multi-Media Interface Tester (MIT) is heard through the infotainment system while operating the system to play audio from the test tool.

- **If audio is not heard from the test tool**

Refer to Circuit/System Testing.

- **If audio is heard from the test tool**

5. All OK.

Circuit/System Testing

1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the X83 Auxiliary Audio Input.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.

- **If 10 Ω or greater**

1. 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. 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 any 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. Disconnect the vehicle USB cable at the A11 Radio and the X83 Auxiliary Audio Input.
6. Connect the EL-50334-14 Infotainment Test Cable and the EL-50334-2 Type-A Female to Mini-B Male Cable together. Connect the assembled test cable to the A11 Radio and the X83 Auxiliary Audio Input.
7. Ignition ON/vehicle in Service Mode, infotainment system ON.
8. Connect the EL-50334-20 Multi-Media Interface Tester (MIT) to the X83 Auxiliary Audio Input USB port and select the USB test mode.
9. Verify the audio from the EL-50334-20 Multi-Media Interface Tester (MIT) is heard through the infotainment system while operating the system to play audio from the test tool.
 - **If audio is not heard from the test tool**
 1. Replace the X83 Auxiliary Audio Input. Connect all harness connectors.
 2. Connect the EL-50334-20 Multi-Media Interface Tester (MIT) to the X83 Auxiliary Audio Input USB port and select the USB test mode.
 3. Verify the audio from the EL-50334-20 Multi-Media Interface Tester (MIT) is heard through the infotainment system while operating the system to play audio from the test tool.
 - If audio is not heard from the test tool, replace the A11 Radio.
 - If audio is heard from the test tool.
 - 4. All OK.
10. Replace the USB cable assembly.

Repair Instructions

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

- Refer to [Audio Disc Player and USB Receptacle Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming, and setup.

DTC B124F: UNIVERSAL SERIAL BUS (USB) PROGRAMMING

Diagnostic Instructions

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

DTC Descriptor

DTC B124F

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

Circuit/System Description

Certain devices in the entertainment system must be programmed with specific software and other information to operate correctly. This DTC is the result of an unsuccessful USB programming event of the device. The symptom byte information is for engineering reference only. No external circuit diagnosis is involved

Conditions for Running the DTC

Once upon each USB Programming Event.

Conditions for Setting the DTC

The programming event was incomplete, or completed with errors.

Action Taken When the DTC Sets

The entertainment system has limited or no functionality.

Conditions for Clearing the DTC

The programming event completes successfully.

Diagnostic Aids

DTC B124F could set if a programming attempt was made when the module already had the latest update available installed.

Circuit/System Verification

1. Ignition ON/vehicle in Service Mode.
2. Verify DTC B124F is not set.
 - **If DTC B124F is set**
 1. Program the device that set the DTC.
 2. Verify the DTC does not set.
 - If DTC is set, replace the device that set the DTC.
 - If the DTC is not set
 3. All OK.
 - **If DTC B124F is not set**
3. All OK

Repair Instructions

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

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

DTC B125A: ANTENNA SIGNAL CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B125A 02

Antenna Signal Circuit Short to Ground

DTC B125A 04

Antenna Signal Circuit Open Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Radio Antenna Coax	B125A 02	B125A 04	1	-
Antenna Module Ground	-	1	-	-
1. May exhibit possible AM/FM interference.				

Circuit/System Description

The antenna amplifier receives both AM and FM signals from the rear glass antenna. The radio antenna amplifier is enabled when the radio is turned on. The radio provides battery voltage to the antenna amplifier using the center conductor of the antenna coaxial cable. When a 12 V signal is seen by the amplifier on the center conductor of the antenna coax, both AM and FM signals are amplified.

Conditions for Running the DTC

- Ignition ON.
- Battery voltage must be between 9 - 16 V.

Conditions for Setting the DTC

B125A 02

The radio detects a short to ground in the antenna signal circuit center conductor.

B125A 04

The radio detects an open in the antenna signal circuit center conductor.

Action Taken When the DTC Sets

Radio reception may be poor or not available.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear after 50 consecutive malfunction-free ignition cycles have occurred.

Diagnostic Aids

Poor AM and FM radio reception may be due to multiple influences, some of which may not be vehicle related. Areas which have high RF traffic or block the signal path may cause a degradation in radio reception. Radio reception may also be influenced by items within the vehicle, but not part of the radio system. Such examples are aftermarket electrical accessories or other items which may generate noise in the vehicle electrical system. Aftermarket window tinting, especially when there is a metallic in the film, may reduce radio reception.

AM reception is highly dependent on the antenna amplifier receiving battery voltage from the radio and being properly grounded. The antenna amplifier boosts both AM and FM reception. When the antenna amplifier does not receive power, AM stations may not be received and FM reception will be limited. If the amplifier is not properly grounded, excessive interference in the signal may occur, or reception may be limited.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Radio/Audio 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 Testing

1. Ignition OFF, disconnect the radio antenna coax cable from the A11 Radio and from the T23 Radio Antenna Amplifier.
2. Verify the antenna coax cable passes the coax cable component test. Refer to Component Testing.
 - **If the coax cable does not pass the test**

Replace the antenna coax cable
 - **If the coax cable passes the test**
3. Connect the antenna coax cable to the A11 Radio. Ignition ON, A11 Radio ON.
4. Verify a test lamp illuminates between the antenna coax cable center terminal and ground at the T23 Radio Antenna Amplifier connector.
 - **If the test lamp does not illuminate**

Replace the A11 Radio.
 - **If the test lamp illuminates**
5. Test or replace the T23 Radio Antenna Amplifier.

Component Testing

CAUTION: Refer to [Test Probe Caution](#) .

NOTE: Before testing the coax cable, check the cable exterior for being pinched, cut, damaged, or having loose connections at the components, which can cause reception issues.

To prevent false reading when testing the center coax terminals, use care not to ground the test probe on the outer housing/shield.

Coax Cable Test

1. Ignition OFF, disconnect the coax cable at both components.
2. Test for less than 5 Ω between coax cable center terminal end to end.
 - **If 5 Ω or greater**

Replace the coax cable
 - **If less than 5 Ω**
3. Test for less than 5 Ω between the coax cable outer shield end to end.
 - **If 5 Ω or greater**

Replace the coax cable
 - **If less than 5 Ω**

4. Test for infinite resistance between the coax cable center terminal and the coax cable outer shield.
 - **If less than infinite resistance**

Replace the coax cable
 - **If infinite resistance**
5. All OK

Repair Instructions

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

- Refer to [Radio Antenna Amplifier Replacement](#)
- Refer to [Control Module References](#) for radio replacement, programming, and setup.

DTC B125C: SATELLITE ANTENNA CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B125C 01

Satellite Antenna Circuit Short to Battery

DTC B125C 02

Satellite Antenna Circuit Short to Ground

DTC B125C 04

Satellite Antenna Circuit Open

Circuit/System Description

The digital radio receiver, located inside the radio, receives digital radio information from the digital radio antenna located on the outside of the vehicle. The digital radio receiver is connected to the digital radio antenna via a shielded coax cable. The digital radio antenna contains an amplifier which is powered by the radio through the coax cable.

Conditions for Running the DTC

This DTC is run every 300 milliseconds.

Conditions for Setting the DTC

The radio detects a circuit fault in the digital radio antenna.

Action Taken When the DTC Sets

The radio displays No XM Signal or Check Antenna.

Conditions for Clearing the DTC

- A current DTC clears when the condition for setting the DTC is no longer present.
- A history DTC clears after 100 malfunction-free ignition cycles.

Diagnostic Aids

The digital radio antenna requires a clear line of sight to the sky to operate properly. Reception may be limited, intermittent, or unavailable inside structures.

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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

Special Tools

EL-48028 Digital Radio Test Antenna

Circuit/System Verification

1. With the vehicle outside in an area with an unobstructed view of the southern sky, tune to XM.
2. Verify DTC B125C is not set as current and the No XM Signal message is not displayed on the radio.
 - **If DTC B125C is set as current or the No XM Signal message is displayed.**

Refer to Circuit/System Testing.

- **If DTC B125C is not set as current and the No XM Signal message is not displayed.**
3. All OK.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF, disconnect the digital radio antenna coax cable from the A11 Radio. Connect the **EL-48028** Digital Radio Test Antenna to the radio and place on the roof of the vehicle.
2. Ignition ON/Vehicle in Service Mode, radio tuned to XM channel 1.
3. Verify DTC B125C is not set as current and XM reception is improved.
 - **If DTC B125C is set as current or XM reception is not improved**
Replace the A11 Radio.
 - **If DTC B125C is not set as current and XM reception is improved**
4. Ignition OFF/Vehicle OFF, disconnect the digital radio antenna coax cable from the T2RR Antenna - Roof Rear.
5. Verify the digital radio antenna coax cable passes the coax cable component test. Refer to Component Testing.
 - **If the coax cable does not pass the test**
Replace the antenna coax cable
 - **If the coax cable passes the test**
6. Test or replace the T2RR Antenna - Roof Rear.

Component Testing

CAUTION: Refer to **Test Probe Caution** .

NOTE: Before testing the coax cable, check the cable exterior for being pinched, cut,

damaged, or having loose connections at the components, which can cause reception issues.

To prevent false reading when testing the center coax terminals, use care not to ground the test probe on the outer housing/shield.

Coax Cable Test

1. Ignition OFF/Vehicle OFF, disconnect the coax cable at both components.
2. Test for less than 5 Ω between coax cable center terminal end to end.

- **If 5 Ω or greater**

Replace the coax cable

- **If less than 5 Ω**

3. Test for less than 5 Ω between the coax cable outer shield end to end.

- **If 5 Ω or greater**

Replace the coax cable

- **If less than 5 Ω**

4. Test for infinite resistance between the coax cable center terminal and the coax cable outer shield.

- **If less than infinite resistance**

Replace the coax cable

- **If infinite resistance**

5. All OK

Repair Instructions

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

- Refer to [High Frequency Antenna Replacement](#)
- Refer to [Control Module References](#) for radio replacement, programming, and setup.

DTC B1265: SWITCHED 14 VOLT PERFORMANCE SHORT TO GROUND

Diagnostic Instructions

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

DTC Descriptor

DTC B1265 02

Switched 14 Volt Performance Short to Ground

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Remote Enable	DTC B1265 02 *	1	2	-
* all components requiring remote enable inoperative 1. fault may affect one or more components, dependant on fault location and vehicle equipment 2. components will not power off with infotainment system				

When the radio is on, a discrete 12 V signal is supplied on the entertainment remote enable circuit to the audio amplifier. This signal is used to control the power state of the component.

Conditions for Running the DTC

- The radio is ON.
- The system voltage is 9 - 16 V

Conditions for Setting the DTC

- The radio detects a short to ground on the entertainment remote enable circuit.
- The above condition is present for greater than 250 mS.

Action Taken When the DTC Sets

- The radio implements a current limiting mode and disables the output on the entertainment remote enable circuit.
- All components connected on the entertainment remote enable circuit will be inoperative.

Conditions for Clearing the DTC

- The condition for setting the DTC no longer exists.
- After the ignition has been OFF for a sufficient amount of time to allow the radio to enter a low power/sleep state, the radio will re-enable the output on the following ignition cycle and the DTC will become history.
- A history DTC clears after 50 malfunction-free ignition cycles.

Diagnostic Aids

- This DTC may be stored as a history DTC without affecting the operation of the radio/infotainment systems.
- The radio's current limiting logic may not re-enable the output on the entertainment remote enable circuit until after the radio performs a full power - down. It may be necessary to wait 5 minutes between each test attempt with the key OFF and retained accessory power OFF.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Radio/Audio 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 Testing

1. Ignition OFF, radio OFF, remove the radio B+ fuse.
2. Disconnect the X3 harness connector at the T3 Audio Amplifier.
3. Install the radio B+ fuse. Ignition ON, A11 Radio ON.

4. Verify that a test lamp illuminates between the control circuit terminal 8 and ground:

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

1. Ignition OFF. Disconnect the X1 harness at the A11 Radio.
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 greater than 2 Ω , repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the A11 Radio.

- **If the test lamp illuminates.**

5. Ignition OFF. Connect the X3 harness connector at the T3 Audio Amplifier.
6. Ignition ON, A11 Radio ON.
7. Verify that DTC B1265 is NOT set.

- **If DTC B1265 is set.**

Replace the T3 Audio Amplifier.

- **If DTC B1265 is not set.**

8. All OK.

Repair Instructions

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

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

DTC B1271: THEFT PROTECTION ACTIVE

Diagnostic Instructions

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

DTC Descriptor

DTC B1271 00

Theft Protection Active

Circuit/System Description

When the radio is initially installed in the vehicle, the radio receives VIN information via serial data. The radio stores a portion of the VIN and compares this sequence to the VIN information received each time the radio powers on. The VIN in the radio is a single one-time learn.

The radio theft deterrent system is intended to disable or limit radio functionality if incorrect vehicle information is received by the radio. The radio disables functionality if the VIN information received by the radio does not match the VIN information that has been learned by the radio. This DTC is generated by the module when the Theft Protection is activated.

Conditions for Running the DTC

This DTC test runs when the radio changes from OFF to ON.

Conditions for Setting the DTC

The radio has learned a correct VIN sequence and the VIN information received via serial data does NOT match the learned VIN sequence.

Action Taken When the DTC Sets

The radio may be disabled or have limited functionality. The radio display will indicate that theft protection is active.

Conditions for Clearing the DTC

The radio receives the correct VIN information via serial data.

Diagnostic Aids

A possible cause of incorrect VIN info could be the radio was originally installed in another vehicle.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

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Description and Operation

Radio/Audio 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. Vehicle in Service Mode, radio ON.
2. Verify DTC B1271 is not set.
 - **If DTC B1271 is set**

Replace the A11 Radio.
 - **If DTC B1271 is not set**
3. All OK.

Repair Instructions

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

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

DTC B1277: CELLULAR PHONE MICROPHONE CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B1277 02

Cellular Phone Microphone Circuit Short to Ground

DTC B1277 04

Cellular Phone Microphone Circuit Open/High Resistance

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	B1277 02	B1277 04	B1277 04	-
Low Reference	B1277 02	B1277 04	B1277 04	-

Circuit/System Description

The radio provides the cellular phone microphone with a supplied voltage on the cellular phone microphone high signal circuit. When the microphone is in use, voice data from the user is sent back to the radio on the cellular microphone low signal circuit.

Conditions for Running the DTC

- The ignition must be in the RUN or ACC position/vehicle in Service Mode.
- The system voltage is at least 9.5 V and no more than 15.5 V.
- All the above conditions are present for greater than 10 s.

Conditions for Setting the DTC

B1277 02

The radio detects a short to ground in the cellular phone microphone high signal circuit for 10 s or greater.

B1277 04

The following conditions will set this DTC:

- The radio detects an open/high resistance in the cellular phone microphone high signal circuit for 10 s or greater.
- The radio detects an open/high resistance in the microphone low signal circuit for 10 s or greater.

Action Taken When the DTC Sets

- The radio will not receive a signal from the cellular phone microphone.
- Calls can be placed but the caller cannot be heard.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Radio/Audio 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 Testing

1. Ignition OFF/vehicle OFF, disconnect the harness connector at the B24 Cellular Phone Microphone, ignition ON/vehicle in Service Mode.
2. Test for 9-11 V between the signal circuit terminal B and ground.
 - **If less than 9 V**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the A11 Radio.
 2. Test for infinite resistance between the signal 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 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 A11 Radio.
 - **If greater than 11 V**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the A11 Radio.
 2. Ignition ON/vehicle in Service Mode, 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 A11 Radio.
3. Test for less than 1 V between the low reference circuit terminal A and ground.
 - **If greater than 1 V**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the A11 Radio.
 2. Ignition ON/vehicle in Service Mode, test for less than 1 V between the low reference circuit and ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the A11 Radio
 - **If less than 1 V**
4. Test for greater than 9 V between the signal circuit terminal B and the low reference circuit terminal A.
 - **If less than 9 V**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the A11 Radio.
 2. Test for infinite resistance between the low reference 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 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 A11 Radio.
 - **If greater than 9 V**
5. Test or replace the B24 Cellular Phone Microphone.

Repair Instructions

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

- Refer to [Mobile Telephone Microphone Replacement](#)
- Refer to [Control Module References](#) for telematics communication interface control module replacement, programming and setup.

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DTC B127E: FRONT VIDEO DISPLAY OUTPUT SIGNAL

Diagnostic Instructions

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

DTC Descriptor

DTC B127 00

Front Video Display Output Signal Malfunction

DTC B127 01

Front Video Display Output Signal Short to Battery

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Radio Display LVDS Lock Signal	B127E 00	-	-	-
Radio Display LVDS Error Signal	B127E 00	-	-	-
LVDS cable	B127E 00	B127E 00	B127E 01	-

Circuit/System Description

The infotainment display and controls are separate components from the radio. The components are supplied battery voltage and ground from the vehicle harness. The radio communicates digital video data for on-screen display through a dedicated cable containing the LVDS data circuits.

If the radio detects the display is not responding to the output on the LVDS circuits, the radio sets the DTC.

Conditions for Running the DTC

- Ignition is ON or in the ACC position
- The system voltage is 9-16 V
- The infotainment system is ON
- The test is run once every 14 ms when the infotainment system is operating

Conditions for Setting the DTC

The radio detects the display is not responding to the output on the LVDS circuits.

Action Taken When the DTC Sets

- The radio sets this DTC
- No images are shown on the info display module

Conditions for Clearing the DTC

- The radio detects a properly synced digital video signal.
- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

[Radio/Navigation System Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Special Tools

- EL-50334-2 Type A female to Mini B male USB Cable
- EL-50334-14 Infotainment Test Cable

Circuit/System Testing

1. Vehicle OFF/Ignition OFF, disconnect the X1 harness connector at the P17 Info Display Module
2. Test for infinite resistance between the signal circuits listed below and ground:
 - Radio display LVDS lock signal circuit terminal 5
 - Radio display LVDS error signal circuit terminal 6
 - **If less than infinite resistance**

Repair the short to ground on the circuit.
 - **If infinite resistance**
3. Reconnect the X1 harness connector at the P17 Info Display Module.
4. Disconnect the LVDS interface cable from the P17 Info Display Module.
5. Connect the EL-50334-2 Type A female to Mini B male USB Cable to the P17 Info Display Module. Connect the EL-50334-14 Infotainment Test Cable to the adapter.
6. Disconnect the LVDS interface cable from the A11 Radio. Connect the EL-50334-14 Infotainment Test cable to the A11 Radio.
7. Ignition ON/Vehicle in Service Mode, infotainment system ON.
8. Verify DTC B127E is not set as current.
 - **If DTC B127E is set as current**
 1. Replace the P17 Info Display Module. Connect all harness connectors.
 2. Ignition ON, infotainment system ON.
 3. Verify DTC B127E is not set as current.
 - If DTC B127E is still set as current, replace the A11 Radio.
 - If DTC B127E is not set.
 4. All OK.
 - **If DTC B127E is not set as current.**
9. Replace the vehicle LVDS interface cable from the P17 Info Display Module to the A11 Radio.

Repair Instructions

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

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

DTC B1287: AMPLIFIER CONTROL SIGNAL CIRCUIT

Diagnostic Instructions

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

- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC B1287 01

Amplifier Control Signal Circuit Short to Battery

DTC B1287 02

Amplifier Control Signal Circuit Short to Ground

DTC B1287 04

Amplifier Control Signal Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Amplifier Control	B1287 02	B1287 04	B1287 01*	-
* No audio output.				

Circuit/System Description

The radio amplifier control circuit provides varying pulse width modulated (PWM) signals to control overall muting of the amplifier. The PWM signals are varying duty cycle percentages ranging from 0 - 100 percent. A low duty cycle unmutes all amplifier channels and a high duty cycle mutes all amplifier channels. The amplifier control circuit will measure less than 1 V when the mute function is OFF, and approximately 8 V when at full mute. The radio monitors the amp control circuit for faults.

Conditions for Running the DTC

- The radio is on.
- The system voltage is 9 - 16 V.
- The radio performs the test once during wakeup.

Conditions for Setting the DTC

The radio detects a fault on the amplifier control circuit 400 ms after radio activates the remote enable circuit.

Action Taken When the DTC Sets

Radio sets the DTC and continues to output correct state.

Conditions for Clearing the DTC

- The condition must no longer be present.
- A history DTC clears after 50 malfunction-free ignition cycles.

Reference Information

Schematic Reference

[Radio/Navigation System Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[Radio/Audio 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 Testing

NOTE: To prevent misdiagnosis, the door chime must be OFF during testing. Ensure the driver door latch is closed during testing.

1. Ignition OFF/vehicle OFF, disconnect the X3 harness connector at the T3 Amplifier. Ignition ON/vehicle in Service Mode, A11 Radio ON, mute ON.
2. Test for 7.5 - 8.5 V between the control circuit terminal 11 and ground.
 - **If greater than 8.5 V**
 1. Ignition OFF/vehicle OFF, disconnect the X2 harness connector at the A11 Radio. Ignition ON/vehicle in Service Mode.
 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 A11 Radio.
 - **If less than 7.5 V**
 1. Ignition OFF/vehicle OFF, disconnect the X2 harness connector at the A11 Radio.
 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 A11 Radio.
 - **If between 7.5 - 8.5 V**
3. A11 Radio ON, mute OFF.
4. Test for less than 1 V between the control circuit terminal 11 and ground.
 - **If 1 V or greater**
Replace the A11 Radio.
 - **If less than 1 V**
5. Test or replace the T3 Amplifier.

Repair Instructions

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

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

DTC B1446 OR B1447: BACKUP POWER SOURCE

Diagnostic Instructions

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

DTC Descriptors

DTC B1446

DTC B1447

Backup Power Source Open 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
Backup Battery B+	B1447 03	B1447 04	-	-
Backup Battery Low Reference	B1447 03	B1447 04	-	-

Circuit/System Description

The backup power source provides voltage to the telematics communication interface control module, to be able to successfully place a call in the event of a main battery disconnect during a collision event.

Conditions for Running the DTC**B1446 03**

- Ignition On/Vehicle in Service Mode.
- System voltage is between 9.5 and 15.5 V.
- DTC B1447 is not set.

B1447 04

- Ignition On/Vehicle in Service Mode.
- System voltage is between 9.5 and 15.5 V.
- The above conditions are present for greater than 10 s.

Conditions for Setting the DTC**B1446 03**

The telematics communication interface control module detects that the backup power source voltage has dropped below the minimum threshold value.

B1447 04

The telematics communication interface control module detects no voltage from the backup power source.

Action Taken When the DTC Sets**B1446 03**

The OnStar[®] status LED turns red.

B1447 04

- The OnStar[®] status LED turns red.
- The telematics communication interface control module will be unable to place a call in the event of a main battery disconnect during a collision event.

Conditions for Clearing the DTC

- A current DTC B1446 will clear when the telematics communication interface control module detects the voltage of the backup power source is above the minimum threshold value.
- A current DTC B1447 will clear when the telematics communication interface control module detects voltage from the backup power source.
- A history DTC clears after 50 malfunction-free ignition cycles.

Diagnostic Aids

- Shorting the backup power source positive voltage circuit to the backup power source ground circuit or chassis ground will activate the internal circuit protection of the backup power source, rendering the backup power source inoperative.
- DTC B1447 may set if the K73 Telematics Communication Interface Control Module has been incorrectly disconnected or serviced. When disconnecting the K73 Telematics Communication Interface Control Module, disconnect the harness connector X1 at the K73 Telematics Communication Interface Control Module prior to disconnecting any other harness connectors. This will ensure the backup power source is preserved when voltage is removed from the K73 Telematics Communication Interface Control Module.

Reference Information

Schematic Reference

OnStar/Telematics Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

OnStar Description and Operation (UE3)OnStar Description and Operation (UE1)

Electrical Information Reference

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

Circuit/System Testing

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for greater than 12.3 V between the B+ circuit terminal 14 and the low reference circuit terminal 13.
 - **If 12.3 V or less**
 1. Disconnect the C3 Telematics Communication Interface Control Module Battery.
 2. Test for infinite resistance between the circuits listed below and ground.
 - B+ circuit terminal 14
 - Low reference circuit terminal 13.
 - 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 circuits end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the C3 Telematics Communication Interface Control Module Battery.
 - **If greater than 12.3 V**
3. Replace the K73 Telematics Communication Interface Control Module.

Repair Instructions

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

- Refer to **Communication Interface Module Battery Replacement**
- Refer to **Control Module References** for telematics communication interface control module replacement, programming and setup.

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DTC B2455: CELLULAR PHONE MICROPHONE CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B2455 02

Cellular Phone Microphone Circuit Short to Ground

DTC B2455 04

Cellular Phone Microphone Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Microphone Signal	B2455 02	B2455 04	B2455 04	-
Microphone Low Signal	B2455 02	B2455 04	B2455 04	-

Circuit/System Description

The telematics communication interface control module provides the cellular phone microphone with a supplied voltage on the cellular phone microphone high signal circuit. When the microphone is in use, voice data from the user is sent back to the telematics communication interface control module on the microphone low signal circuit.

Conditions for Running the DTC

- The Vehicle must be ON or in Service Mode.
- The system voltage is at least 9.5 V and no more than 15.5 V.
- All the above conditions are present for greater than 10 s.

Conditions for Setting the DTC

B2455 02

The telematics communication interface control module detects a short to ground in the cellular phone microphone signal circuit for 10 s or greater.

B2455 04

The following conditions will set this DTC:

- The telematics communication interface control module detects an open/high resistance in the cellular phone microphone signal circuit for 10 s or greater.
- The telematics communication interface control module detects an open/high resistance in the low signal circuit for 10 s or greater.

Action Taken When the DTC Sets

- The OnStar[®] status LED turns red.
- The telematics communication interface control module will not receive a signal from the cellular phone microphone.
- Calls can be placed but the caller cannot be heard.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

[OnStar/Telematics Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[OnStar Description and Operation \(UE3\)](#)[OnStar Description and Operation \(UE1\)](#)

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/Vehicle OFF, disconnect the harness connector at the B24 cellular phone microphone, Ignition ON/Vehicle in Service Mode.
2. Test for 8.0-10.5 V between the signal circuit terminal B and ground.
 - **If less than 8.0 V**
 1. Ignition OFF/Vehicle OFF, disconnect the X2 harness connector at the K73 telematics communication interface control module.
 2. Test for infinite resistance between the signal 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 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 vehicle K73 Telematics Communication Interface Control Module.
 - **If greater than 10.5 V**
 1. Ignition OFF/Vehicle OFF, disconnect the X2 harness connector at the K73 telematics communication interface control module, Ignition ON/Vehicle in Service Mode.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K73 Telematics Communication Interface Control Module.
 - **If between 9.5-10.5 V**
3. Test for less than 1 V between the signal circuit terminal A and ground.
 - **If greater than 1 V**
 1. Ignition OFF/Vehicle OFF, disconnect the X2 harness connector at the K73 telematics communication interface control module, Ignition ON/Vehicle in Service Mode.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, repair the K73 Telematics Communication Interface Control Module.
 - **If less than 1 V**
4. Test for greater than 8 V between the signal circuit terminal B and the signal circuit terminal A.
 - **If less than 8 V**
 1. Ignition OFF/Vehicle OFF, disconnect the connector X2 at the K73 telematics communication interface control module.

2. Test for infinite resistance between the low signal 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 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 vehicle K73 Telematics Communication Interface Control Module.
- **If greater than 8 V**
5. Test or replace the B24 Cellular Phone Microphone.

Repair Instructions

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

- Refer to [Mobile Telephone Microphone Replacement](#)
- Refer to [Control Module References](#) for telematics communication interface control module replacement, programming and setup.

DTC B2462: GLOBAL POSITIONING SYSTEM (GPS) SIGNAL

Diagnostic Instructions

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

DTC Descriptors

DTC B2462 02

Global Positioning System (GPS) Signal Short to Ground

DTC B2462 04

Global Positioning System (GPS) Signal Open Circuit

Circuit/System Description

The Telematics Communication Interface Control Module receives information from the GPS antenna located on the outside of the vehicle. The GPS antenna is connected to the Telematics Communication Interface Control Module via a shielded coaxial cable. The telematics communication interface control module supplies 5 V through the coax cable to power the internal antenna amplifier.

Conditions for Running the DTC

- Ignition is in the RUN or ACC position.
- System voltage is between 9.5 V and 15.5 V.
- The above conditions are present for greater than 1 second.

Conditions for Setting the DTC

B2462 02

The Telematics Communication Interface Control Module detects a short to ground on the GPS antenna signal circuit.

B2462 04

The Telematics Communication Interface Control Module detects an open/high resistance on the GPS antenna signal circuit.

Action Taken When the DTC Sets

- The OnStar[®] status LED turns red.

- The OnStar®, A® Call Center cannot locate the vehicle.

Conditions for Clearing the DTC

- The K73 Telematics Communication Interface Control Module detects the presence of a GPS antenna.
- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

OnStar/Telematics Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

OnStar Description and Operation (UE3)OnStar Description and Operation (UE1)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Special Tools

EL-49903 GM OnStar Antenna Diagnostic Tool Kit

Circuit/System Testing

1. Ignition OFF/vehicle OFF, disconnect the GPS coax cable connector at the K73 Telematics Communication Interface Control Module.
2. Connect the **EL-49903-1** OnStar Test Antenna, Navn-Cell Conn to the K73 Telematics Communication Interface Control Module. Place the test antenna on the roof of the vehicle, ignition ON/vehicle in Service Mode.
3. Verify DTC B2462 is not set or that the OnStar advisor can locate the vehicle.
 - **If DTC B2462 is set or the advisor can not locate the vehicle**
Replace the K73 Telematics Communication Interface Control Module.
 - **If DTC B2462 is not set or that the OnStar advisor can locate the vehicle.**
4. Ignition OFF/vehicle OFF, disconnect the **EL-49903-1** OnStar Test Antenna, Navn-Cell Conn from the K73 Telematics Communication Interface Control Module
5. Disconnect the GPS coax cable at the T2RR Antenna - Roof Rear.
6. Test the coax cable between the K73 Telematics Communication Interface Control Module and the T2RR Antenna - Roof Rear. Refer to component testing.
 - **If the coax cable does not pass the test**
Replace the coax cable.
 - **If the coax cable passes the test**
7. Test or replace the T2RR Antenna - Roof Rear.

Component Testing

NOTE:

- Before testing the coax cable, check the cable exterior for being pinched, cut, damaged, or having loose connections at the components, which can cause reception issues.
- To prevent false readings when testing the center coax terminals, use care not to ground the test probe on the outer housing/shield.

Coax Cable Test

1. Ignition OFF, disconnect the coax cable at both components.
2. Test for less than 5 Ω between the coax cable center terminal end to end.
 - **If 5 Ω or greater**
Replace the coax cable.
 - **If less than 5 Ω**
3. Test for greater than 5 Ω between the coax cable outer shield end to end.
 - **If 5 Ω or greater**
Replace the coax cable.
 - **If less than 5 Ω**
4. Test for infinite resistance between the coax cable center terminal and the coax cable outer shield.
 - **If less than infinite resistance**
Replace the coax cable.
 - **If infinite resistance**
5. All OK.

Repair Instructions

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

- Refer to [High Frequency Antenna Replacement](#)
- Refer to [Control Module References](#) for Telematics Communication Interface Control Module replacement, programming and setup.

DTC B2470: CELLULAR PHONE ANTENNA CIRCUIT MALFUNCTION

Diagnostic Instructions

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

DTC Descriptors

DTC B2470 02

Cellular Phone Antenna Circuit Malfunction Short to Ground

DTC B2470 04

Cellular Phone Antenna Circuit Malfunction Open Circuit

Circuit/System Description

The primary cellular phone antenna element is connected to the telematics communication interface control module (violet connector) via a shielded coaxial cable. Cellular communication takes place on both the primary cellular

antenna signal circuit and the GPS/secondary cellular antenna signal circuit. This diagnostic only applies to the primary cellular antenna signal circuit. Internal to the antenna on the cellular antenna signal circuit resistance is used to apply a load, which the telematics communication interface control module uses to detect the presence of the antenna.

Conditions for Running the DTC

- Ignition in the RUN or ACC position.
- System voltage is between 9.5 V and 15.5 V.
- The above conditions are present for greater than 1 s.

Conditions for Setting the DTC

B2470 02

The telematics communication interface control module detects a short to ground on the primary cellular antenna signal circuit.

B2470 04

- The telematics communication interface control module detects an open or high resistance on the primary cellular antenna signal circuit.
- The above conditions are present for greater than 1 s.

Action Taken When the DTC Sets

The OnStar[®] status LED turns red.

Conditions for Clearing the DTC

- The telematics communication interface control module detects the presence of a cellular antenna.
- A history DTC clears after 50 malfunction-free ignition cycles.

Reference Information

Schematic Reference

OnStar/Telematics Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

OnStar Description and Operation (UE3)OnStar Description and Operation (UE1)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Special Tools

EL-49903-1 Test Antenna Navn-Cell Comm

Circuit/System Testing

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NOTE:

- The vehicle may be equipped with sectioned coax. Test each section and replace only the faulty section, not the entire length of coax.
- The following verification requires the vehicle to be outside with an unobstructed view of the southern sky. Allow 5 min after turning the ignition ON for the GPS satellites to acquire vehicle signal.

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the violet primary cellular coax cable connector at the K73 Telematics Communication Interface Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Using the **EL-49903-1** Test Antenna Navn-Cell Conn connect the violet coax cable to the K73 Telematics Communication Interface Control Module. Place the test antenna on the roof of the vehicle, ignition ON/vehicle in Service Mode.
3. Verify the DTC does not set or a call can be completed to the OnStar Call Center while operating the vehicle within the conditions for running the DTC.

- **If the DTC sets or a call can not be completed to the OnStar Call Center**

Replace the K73 Telematics Communications Interface Control Module.

- **If the DTC does not set or a call can be completed to the OnStar Call Center**

4. Ignition OFF/Vehicle OFF.
5. Disconnect the **EL-49903-1** Test Antenna Navn-Cell Conn from the K73 Telematics Communication Interface Control Module
6. Test the coax cable. Refer to Component Testing.
 - **If the coax cable does not pass the test**
Replace the coax cable.
 - **If the coax cable passes the test**
7. Test or replace the T2RR Antenna - Roof Rear.

Component Testing

CAUTION: Refer to [Test Probe Caution](#)

NOTE:

- Before testing the coax cable, check the cable exterior for being pinched, cut, damaged, or having loose connections at the components, which can cause reception issues.
- To prevent false readings when testing the center coax terminals, use care not to ground the test probe on the outer housing/shield.

Coax Cable Test

1. Test for less than 5 Ω between the coax cable center terminal end to end.
 - **If 5 Ω or greater**
Replace the coax cable.
 - **If less than 5 Ω**
2. Test for greater than 5 Ω between the coax cable outer shield end to end.
 - **If 5 Ω or greater**
Replace the coax cable.
 - **If less than 5 Ω**
3. Test for infinite resistance between the coax cable center terminal and the coax cable outer shield.
 - **If less than infinite resistance**

Replace the coax cable.

- **If infinite resistance**

4. All OK.

Repair Instructions

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

- Refer to [High Frequency Antenna Replacement](#)
- Refer to [Control Module References](#) for telematics communication interface control module replacement, setup, and programming

DTC B2476 OR B2482: CELLULAR PHONE SELECT SERVICE 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptor

DTC B2476 or B2482

Cellular Phone Select Service Switch

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
10 V Reference	B2476 02	B2476 04	B2476 04	-
Signal	1	1	B2476 59	B2476 59, B2482 00
Ground	-	B2476 04	-	-
1. OnStar [®] Buttons Inoperative				

Circuit/System Description

The OnStar[®] button assembly consists of 3 buttons: Call/Answer, OnStar[®] Call Center, and OnStar[®] Emergency. The telematics communication interface control module supplies the OnStar[®] button assembly with 10 V via the 10 V reference circuit. Each of the buttons, when pressed, completes the circuit across a resistor allowing a specific voltage to be returned to the telematics communication interface control module over the keypad signal circuit. Depending upon the voltage range returned, the telematics communication interface control module is able to identify which button has been pressed.

Conditions for Running the DTC

- Ignition ON/vehicle in Service Mode.
- Battery voltage must be between 9 - 16 V.

Conditions for Setting the DTC

B2476 02

The telematics communication interface control module detects a short to ground on the 10 V reference circuit

B2476 04

The telematics communication interface control module detects an open/high resistance on the keypad supply voltage circuit or the ground circuit.

The telematics communication interface control module detects a valid signal on the keypad signal circuit for longer than 15 s. If one of the OnStar[®] buttons is held or stuck for 15 s or greater, the telematics communication interface control module will set this DTC.

Action Taken When the DTC Sets

- The OnStar[®] status LED turns red.
- No calls can be placed.
- The telematics communication interface control module will ignore all inputs from the OnStar[®] button assembly.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

OnStar/Telematics Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

OnStar Description and Operation (UE3)OnStar Description and Operation (UE1)

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: **Contact the OnStar[®] Call Center first before pressing the emergency button in order to notify them of the test.**

1. Ignition ON/vehicle in Service Mode.
2. Verify that each button of the S51 Telematics Button Assembly operates normally by pressing each button individually.
 - **If none of the buttons operate normally**
Refer to Circuit/System testing
 - **If some, but not all, of the buttons operate normally**
Test or replace the S51 Telematics Button Assembly
 - **If all of the buttons operate normally**
3. All OK.

Circuit/System Testing

1. Ignition OFF/vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S51 Telematics Button Assembly. 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 6 and ground.
 - **If 10 Ω or greater**
 1. 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/vehicle in Service Mode.
4. Test for 8.0 - 10.5 V between the 10 V reference circuit terminal 1 and the ground circuit terminal 6.
 - **If less than 8.0 V**
 1. Ignition OFF/vehicle OFF, disconnect the harness connector at the K73 Telematics Communication Interface Control Module.
 2. Test for infinite resistance between the 10 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 10 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 K73 Telematics Communication Interface Control Module.
 - **If greater than 10.5 V**
 1. Ignition OFF/vehicle OFF, disconnect the harness connector at the K73 Telematics Communication Interface Control Module, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the 10 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 K73 Telematics Communication Interface Control Module.
 - **If between 8.0 - 10.5 V**
5. Ignition OFF/vehicle OFF.
6. Test for 500 - 900 Ω between the signal circuit terminal 3 and the ground circuit terminal 6.
 - **If less than 500 Ω**
 1. Disconnect the X1 harness connector at the K73 Telematics Communication Interface 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, replace the K73 Telematics Communication Interface Control Module.
 - **If greater than 900 Ω**
 1. Disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF/vehicle 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 K73 Telematics Communication Interface Control Module.
 - **If between 500 - 900 Ω**
7. Test or replace the S51 Telematics Button Assembly.

Repair Instructions

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

- Refer to [Communication Center Call Switch Replacement](#)

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

SYMPTOMS - CELLULAR COMMUNICATION

NOTE: The following steps must be completed before using the symptom table.

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 [OnStar Description and Operation \(UE3\)](#) [OnStar Description and Operation \(UE1\)](#).

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Radio/Audio System. Refer to [Checking Aftermarket Accessories](#).
- Inspect for easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

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

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- [Bluetooth Malfunction](#)
- [No Global Positioning System \(GPS\) Reception](#)
- [OnStar Microphone Malfunction](#)
- [OnStar Audio Malfunction](#)
- [OnStar Button LED Malfunction](#)
- [OnStar Call Center Remote Function Requests Malfunction](#)
- [OnStar Button Malfunction](#)
- [Unable to Contact OnStar Call Center](#)
- [OnStar Voice Recognition Malfunction](#)
- [OnStar Steering Wheel Control Functions Malfunction](#)

SYMPTOMS - ENTERTAINMENT

IMPORTANT: The following steps must be completed before using the symptom table.

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 [Radio/Audio System Description and Operation](#).

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Radio/Audio System. Refer to [Checking Aftermarket Accessories](#).
- Inspect for easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

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Intermittent

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

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- [Auxiliary Audio Input Malfunction](#)
- [Bluetooth Malfunction](#)
- [Digital Radio Poor or No Reception](#)
- [Radio Controls Malfunction](#)
- [Radio Information Display Malfunction](#)
- [Radio Poor Reception](#)
- [Speaker Malfunction \(UQA\)Speaker Malfunction \(without UQA\)](#)

AUXILIARY AUDIO INPUT MALFUNCTION

Diagnostic Instructions

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

DTC Descriptor

DTC B124B

USB 1 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
B+	B124B, 1, 6	1, 5	-	-
Auxiliary Audio Common Signal	-	8	-	-
Auxiliary Detection Signal	7	8	-	-
Left Auxiliary Audio Signal	2	2	2, 4	-
Right Auxiliary Audio Signal	3	3	3, 4	-
USB Cable	B124B	B124B	B124B	-
Ground	-	1	-	-
1. USB port Inoperative 2. No left side audio from device connected to AUX jack 3. No right side audio from device connected to AUX jack 4. Noticeable distortion may be present in affected audio channel 5. Fault may affect one or more components, dependant on fault location 6. Fault affects multiple components, dependant on vehicle equipment 7. Radio does not detect auxiliary device connection, AUX not available as input selection 8. AUX always available as an input selection, with or without auxiliary device connected				

Circuit/System Description

The infotainment system has a auxiliary jack and USB receptacle assembly. The auxiliary jack and USB receptacle assembly receives fused battery voltage and ground from the harness to power the internal hub device as well as providing additional amperage to power USB devices. The internal hub device interfaces directly with the radio via a standard USB cable.

Auxiliary Audio Input Jack

When a portable audio playback device is connected to the 3.5 mm (1/8 in.) auxiliary audio input jack an internal switch opens the detection signal circuit. The radio detects the device and AUX becomes available as an audio

source. Audio signals from the device are sent to the radio from the auxiliary input jack via the left, right, and common audio signal circuits.

USB Port

The USB receptacle interfaces directly with the radio via a standard USB cable. A Mini type USB connector is used to connect the cable at the radio and at the auxiliary jack and USB receptacle assembly. USB male to female connections are typically used for connecting USB cables together where an in-line connection is required. An in-line cable connection is typically found between the console and I/P harness.

The USB port allows connectivity to the infotainment system from portable media players or a USB storage device (memory stick/flash drive). When a device is connected to the USB port, the system detects the device and USB becomes available as an audio source. Once connected, the device can be controlled from the radio controls.

Not all portable media player devices or file types are compatible. Refer to the owner's manual for information on USB devices, control, and operation.

Conditions for Running the DTC

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

Conditions for Setting the DTC

The radio detects an excessive current condition on the USB 5 V circuit.

Action Taken When the DTC Sets

The USB port is inoperative while the DTC is current.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- A history DTC will clear once 50 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

Radio/Navigation System Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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Control Module References for scan tool information

- **EL-50334-20** Multi-Media Interface Tester (MIT)
- **EL-50334-50** USB Cable and Adapter Kit
- **EL-50334-14** Infotainment Test Cable

Circuit/System Verification

1. Verify DTC B124B is not set. Since occurrences of this DTC can be caused by an incompatible or faulty USB device, review with the customer the conditions under which their concern occurred.
 - **If DTC B124B is set.**

Refer to Circuit/System testing.
 - **If DTC B124B is not set.**
2. Ignition ON/vehicle in Service Mode, infotainment system ON.
3. Connect the EL-50334-20 Multi-Media Interface Tester (MIT) to the X83 Auxiliary Audio Input USB port and select the USB test mode.
4. Verify the audio from the EL-50334-20 Multi-Media Interface Tester (MIT) is heard through the infotainment system while operating the system to play audio from the test tool.
 - **If audio is not heard from the test tool**

Refer to Circuit/System Testing.
 - **If audio is heard from the test tool**
5. All OK.

Circuit/System Testing

1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the X83 Auxiliary Audio Input.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 1. 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. 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 any 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. Disconnect the vehicle USB cable at the A11 Radio and the X83 Auxiliary Audio Input.
6. Connect the EL-50334-14 Infotainment Test Cable and the EL-50334-2 Type-A Female to Mini-B Male Cable together. Connect the assembled test cable to the A11 Radio and the X83 Auxiliary Audio Input.
7. Ignition ON/vehicle in Service Mode, infotainment system ON.
8. Connect the EL-50334-20 Multi-Media Interface Tester (MIT) to the X83 Auxiliary Audio Input USB port and select the USB test mode.
9. Verify the audio from the EL-50334-20 Multi-Media Interface Tester (MIT) is heard through the infotainment system while operating the system to play audio from the test tool.

- **If audio is not heard from the test tool**

1. Replace the X83 Auxiliary Audio Input. Connect all harness connectors.
2. Connect the EL-50334-20 Multi-Media Interface Tester (MIT) to the X83 Auxiliary Audio Input USB port and select the USB test mode.
3. Verify the audio from the EL-50334-20 Multi-Media Interface Tester (MIT) is heard through the infotainment system while operating the system to play audio from the test tool.
 - If audio is not heard from the test tool, replace the A11 Radio.
 - If audio is heard from the test tool.
4. All OK.

- **If audio is heard from the test tool**

10. Replace the USB cable assembly.

Repair Instructions

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

- Refer to [Audio Disc Player and USB Receptacle Replacement](#)
- Refer to [Control Module References](#) for control module replacement, programming, and setup.

BLUETOOTH MALFUNCTION

Diagnostic Instructions

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

Circuit/System Description

Bluetooth™ wireless technology is a short-range communications technology intended to replace the cables connecting portable and/or fixed devices while maintaining high levels of security. The operating range of the signal is approximately 30 feet.

The available features and functions are determined by the type of device and the software within the devices being used. For a feature or function to operate, it must be supported in both devices.

The Bluetooth™ hardware is internal to the radio. The radio supports interfacing with cellular phones for hands-free features.

Refer to the vehicle owner manual, supplements, and the device manufacturer's information for information on devices, control, operation, and pairing instructions.

Diagnostic Aids

- Verify the mobile device is properly configured for the feature being used. Refer to the device manufacturer's information.
- Verify the function/feature that is being used is supported by the mobile device.
- The device must be paired to the radio to use the available Bluetooth™ feature(s). The pairing process must only be performed once for each device, unless that device's information is deleted.
- The system can store pairing information for multiple devices, but can only be actively connected to one at any given time.

Reference Information

Schematic Reference

[Radio/Navigation System Schematics](#)

Connector End View Reference

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Radio/Audio System Description and Operation

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

Scan Tool Reference

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

Special Tools

EL-50334-20 Multi-Media Interface Tester (MIT)

For equivalent regional tools, refer to [Special ToolsSpecial Tools \(MIT Tool Instructions\)](#).

Circuit/System Verification

1. Verify no DTCs are present.

- **If any DTCs are present**

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

- **If no DTCs are present**

2. Verify the A11 Radio calibrations are current.

- **If the radio calibrations are not current**

Reprogram the A11 Radio and re-evaluate the concern.

- **If no update calibrations are available**

NOTE: The MIT tool can be used to test either cellular phone or streaming audio functions. Refer to the tool instructions, and perform the appropriate test(s) related to the customers concern in the following steps.

3. Ignition ON, infotainment system ON.

4. Verify the infotainment system successfully pairs with the MIT tool.

- **If the infotainment system does not successfully pair with the MIT tool.**

Replace the A11 Radio.

- **If the infotainment system successfully pairs with the MIT tool.**

5. Verify the infotainment system successfully completes the desired feature test using the MIT tool.

- **If the feature test is not successful**

Replace the A11 Radio.

- **If the feature test is successful**

6. All OK. Refer to Diagnostic Aids.

Repair Instructions

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

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

DIGITAL RADIO POOR OR NO RECEPTION

Diagnostic Instructions

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

DTC Descriptors

DTC B125C 01

Satellite Antenna Circuit Short to Battery

DTC B125C 02

Satellite Antenna Circuit Short to Ground

DTC B125C 04

Satellite Antenna Circuit Open

Circuit/System Description

The digital radio receiver, located inside the radio, receives digital radio information from the digital radio antenna located on the outside of the vehicle. The digital radio receiver is connected to the digital radio antenna via a shielded coax cable. The digital radio antenna contains an amplifier which is powered by the radio through the coax cable.

Conditions for Running the DTC

This DTC is run every 300 milliseconds.

Conditions for Setting the DTC

The radio detects a circuit fault in the digital radio antenna.

Action Taken When the DTC Sets

The radio displays No XM Signal or Check Antenna.

Conditions for Clearing the DTC

- A current DTC clears when the condition for setting the DTC is no longer present.
- A history DTC clears after 100 malfunction-free ignition cycles.

Diagnostic Aids

The digital radio antenna requires a clear line of sight to the sky to operate properly. Reception may be limited, intermittent, or unavailable inside structures.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

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Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

- **Circuit Testing**

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

Special Tools

EL-48028 Digital Radio Test Antenna

Circuit/System Verification

1. With the vehicle outside in an area with an unobstructed view of the southern sky, tune to XM.
2. Verify DTC B125C is not set as current and the No XM Signal message is not displayed on the radio.
 - **If DTC B125C is set as current or the No XM Signal message is displayed.**
Refer to Circuit/System Testing.
 - **If DTC B125C is not set as current and the No XM Signal message is not displayed.**
3. All OK.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF, disconnect the digital radio antenna coax cable from the A11 Radio. Connect the **EL-48028** Digital Radio Test Antenna to the radio and place on the roof of the vehicle.
2. Ignition ON/Vehicle in Service Mode, radio tuned to XM channel 1.
3. Verify DTC B125C is not set as current and XM reception is improved.
 - **If DTC B125C is set as current or XM reception is not improved**
Replace the A11 Radio.
 - **If DTC B125C is not set as current and XM reception is improved**
4. Ignition OFF/Vehicle OFF, disconnect the digital radio antenna coax cable from the T2RR Antenna - Roof Rear.
5. Verify the digital radio antenna coax cable passes the coax cable component test. Refer to Component Testing.
 - **If the coax cable does not pass the test**
Replace the antenna coax cable
 - **If the coax cable passes the test**
6. Test or replace the T2RR Antenna - Roof Rear.

Component Testing

CAUTION: Refer to [Test Probe Caution](#) .

NOTE: Before testing the coax cable, check the cable exterior for being pinched, cut, damaged, or having loose connections at the components, which can cause reception issues.

To prevent false reading when testing the center coax terminals, use care not to ground the test probe on the outer housing/shield.

Coax Cable Test

1. Ignition OFF/Vehicle OFF, disconnect the coax cable at both components.
2. Test for less than 5 Ω between coax cable center terminal end to end.
 - **If 5 Ω or greater**
Replace the coax cable
 - **If less than 5 Ω**
3. Test for less than 5 Ω between the coax cable outer shield end to end.

- If 5 Ω or greater

Replace the coax cable

- If less than 5 Ω

4. Test for infinite resistance between the coax cable center terminal and the coax cable outer shield.

- If less than infinite resistance

Replace the coax cable

- If infinite resistance

5. All OK

Repair Instructions

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

- Refer to [High Frequency Antenna Replacement](#)
- Refer to [Control Module References](#) for radio replacement, programming, and setup.

ONSTAR MICROPHONE MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Microphone High Signal Terminal 9	B2455 02	B2455 04	B2455 04	-
Microphone Low Signal Terminal 10	B2455 02	B2455 04	B2455 04	-
Cellular Telephone Voice Signal Terminal 6	2	1	2	-
Cellular Telephone Voice Low Signal Terminal 12	-	2	2	-
1. Voice Cannot be Heard by Telephone Conversation Partner 2. Customer Voice may be distorted for Telephone Conversation Partner				

Circuit/System Description

The telematics communication interface control module provides the Cellular Phone Microphone with a supplied voltage on the cellular phone microphone signal circuit. When the cellular phone microphone is in use, voice data from the user is sent back to the telematics communication interface control module on the signal circuit.

Reference Information

Schematic Reference

[OnStar/Telematics Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[OnStar Description and Operation \(UE3\)OnStar Description and Operation \(UE1\)](#)

- [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: It is necessary to have the vehicle in a quiet, open outside area where a cellular call can be successfully placed and GPS data can be received from satellites.

1. Vehicle in Service Mode.
2. Verify that DTC B2455 is not set.
 - **If DTC B2455 is set**
Refer to [DTC B2455](#).
 - **If DTC B2455 is not set**
3. Verify that a successful OnStar voice command can be made.
 - **If your voice can not be heard clearly**
Refer to Circuit/System Testing - Microphone Malfunction.
 - **If your voice can be heard clearly**
4. Verify that your voice is heard clearly by the OnStar Call Center after completing a blue button press.
 - **If your voice can not be heard clearly**
Refer to Circuit/System Testing - Cellular Telephone Voice Malfunction.
 - **If your voice can be heard clearly**
5. All OK.

Circuit/System Testing

Microphone Malfunction

1. Vehicle OFF, disconnect the harness connector at the B24 Cellular Phone Microphone, vehicle in Service Mode.
2. Test for 8.0-10.5 V between the signal circuit terminal B and ground.
 - **If less than 8.0 V**
 1. Vehicle OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module.
 2. Test for infinite resistance between the signal 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 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 vehicle K73 Telematics Communication Interface Control Module.
 - **If greater than 10.5 V**
 1. Vehicle OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module, vehicle in Service Mode.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.

- If less than 1 V, replace the K73 Telematics Communication Interface Control Module.

- **If between 8.0-10.5 V**

3. Test for less than 1 V between the signal circuit terminal A and ground.

- **If greater than 1 V**

1. Vehicle OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module, vehicle in Service Mode.

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

- If 1 V or greater, repair the short to voltage in the circuit.
- If less than 1 V, repair the K73 Telematics Communication Interface Control Module.

- **If less than 1 V**

4. Test for greater than 8 V between the signal circuit terminal B and the signal circuit terminal A.

- **If less than 8 V**

1. Vehicle OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module.

2. Test for infinite resistance between the signal 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 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 vehicle K73 Telematics Communication Interface Control Module.

- **If greater than 9 V**

5. Test or replace the B24 Cellular Phone Microphone.

Cellular Telephone Voice Malfunction

1. Vehicle OFF and vehicle systems OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module and the X4 harness connector at the A11 Radio, vehicle in Service Mode.

2. Test for less than 1 V between the signal circuits listed below and ground.

- K73 Telematics Communication Interface Control Module signal circuit Terminal 6
- K73 Telematics Communication Interface Control Module signal circuit Terminal 12

- **If greater than 1 V**

Repair the short to voltage in the circuit.

- **If less than 1 V**

3. Vehicle OFF.

4. Test for infinite resistance between the signal circuits listed below and ground.

- K73 Telematics Communication Interface Control Module signal circuit Terminal 6
- K73 Telematics Communication Interface Control Module signal circuit Terminal 12

- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **If infinite resistance**

5. Test for less than 2 Ω in the signal circuits listed below end to end.

- K73 Telematics Communication Interface Control Module signal circuit Terminal 6
- K73 Telematics Communication Interface Control Module signal circuit Terminal 12

- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

- **If less than 2 Ω**

6. Replace the K73 Telematics Communication Interface Control Module.

7. Verify that your voice is heard clearly by the OnStar Call Center after completing a blue button press.

- If your voice can not be heard clearly

Replace the A11 Radio.

- If your voice can be heard clearly

8. All OK.

Repair Instructions

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

- Refer to [Mobile Telephone Microphone Replacement](#)
- Refer to [Control Module References](#) for telematics communication interface control module replacement, programming, and setup

ONSTAR AUDIO MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Audio Signal	1	1	1	-
Audio Common Signal	-	1	-	-
1. No or noisy OnStar [®] audio				

Circuit/System Description

When an OnStar[®] keypress is made, a serial data message is sent to the audio system to mute all radio functions and output OnStar[®] originated audio. After the audio system is muted, the telematics communication interface control module transmits signals to the audio system on the audio signal and audio common circuits.

Reference Information

Schematic Reference

- [OnStar/Telematics Schematics](#)
- [Radio/Navigation System Schematics](#)

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

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

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Circuit/System Verification

1. Ignition ON/vehicle in Service Mode, radio ON.
2. Verify that audio is heard clearly through all speaker channels when tuning radio to a known good station.
 - **If audio is not heard clearly**

Refer to [Speaker Malfunction \(UQA\)](#)[Speaker Malfunction \(without UQA\)](#)
 - **If audio is heard clearly**
3. Verify that the Connecting to OnStar[®] message is heard clearly through the audio system when the OnStar[®] blue button is pressed.
 - **If OnStar message is noisy or distorted**

Refer to Circuit/System Testing
 - **If OnStar message is heard clearly**
4. All OK.

Circuit/System Testing

1. Ignition OFF/Vehicle OFF, disconnect the X1 harness connector at the A11 Radio and the X2 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON/vehicle in Service Mode.
2. Test for less than 1 V between the signal circuit terminals listed below and ground:
 - K73 Telematics Communication Interface Control Module signal circuit terminal 1 X2
 - K73 Telematics Communication Interface Control Module signal circuit terminal 2 X2
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **If less than 1 V**
3. Ignition OFF/Vehicle OFF.
4. Test for infinite resistance between the signal circuits listed below and ground:
 - K73 Telematics Communication Interface Control Module signal circuit terminal 1 X2
 - K73 Telematics Communication Interface Control Module signal circuit terminal 2 X2
 - **If less than infinite resistance**

Repair the short to ground on the circuit.
 - **If infinite resistance**
5. Test for less than 2 Ω between the signal circuit terminals listed below:
 - K73 Telematics Communication Interface Control Module signal circuit terminal 1 X2 and the A11 Radio signal circuit terminal 10 X1
 - K73 Telematics Communication Interface Control Module signal circuit terminal 2 X2 and the A11 Radio signal circuit terminal 9 X1
 - **If 2 Ω or greater**

Repair the open/high resistance in the circuit.
 - **If less than 2 Ω**
6. Replace the K73 Telematics Communication Interface Control Module.
7. Verify that the Connecting to OnStar[®] message is heard clearly through the audio system when the OnStar[®] blue button is pressed.
 - **If audio is not heard clearly**

Replace the A11 Radio.
 - **If audio is heard clearly**
8. All OK.

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

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

NO GLOBAL POSITIONING SYSTEM (GPS) RECEPTION

Diagnostic Instructions

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

DTC Descriptors

DTC B2462 02

Global Positioning System (GPS) Signal Short to Ground

DTC B2462 04

Global Positioning System (GPS) Signal Open Circuit

Circuit/System Description

The Telematics Communication Interface Control Module receives information from the GPS antenna located on the outside of the vehicle. The GPS antenna is connected to the Telematics Communication Interface Control Module via a shielded coaxial cable. The telematics communication interface control module supplies 5 V through the coax cable to power the internal antenna amplifier.

Conditions for Running the DTC

- Ignition is in the RUN or ACC position.
- System voltage is between 9.5 V and 15.5 V.
- The above conditions are present for greater than 1 second.

Conditions for Setting the DTC

B2462 02

The Telematics Communication Interface Control Module detects a short to ground on the GPS antenna signal circuit.

B2462 04

The Telematics Communication Interface Control Module detects an open/high resistance on the GPS antenna signal circuit.

Action Taken When the DTC Sets

- The OnStar[®] status LED turns red.
- The OnStar[®] Call Center cannot locate the vehicle.

Conditions for Clearing the DTC

- The K73 Telematics Communication Interface Control Module detects the presence of a GPS antenna.
- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

OnStar/Telematics Schematics

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

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

Special Tools

EL-49903 GM OnStar Antenna Diagnostic Tool Kit

Circuit/System Testing

1. Ignition OFF/vehicle OFF, disconnect the GPS coax cable connector at the K73 Telematics Communication Interface Control Module.
2. Connect the **EL-49903-1** OnStar Test Antenna, Navn-Cell Conn to the K73 Telematics Communication Interface Control Module. Place the test antenna on the roof of the vehicle, ignition ON/vehicle in Service Mode.
3. Verify DTC B2462 is not set or that the OnStar advisor can locate the vehicle.
 - **If DTC B2462 is set or the advisor can not locate the vehicle**

Replace the K73 Telematics Communication Interface Control Module.
 - **If DTC B2462 is not set or that the OnStar advisor can locate the vehicle.**
4. Ignition OFF/vehicle OFF, disconnect the **EL-49903-1** OnStar Test Antenna, Navn-Cell Conn from the K73 Telematics Communication Interface Control Module
5. Disconnect the GPS coax cable at the T2RR Antenna - Roof Rear.
6. Test the coax cable between the K73 Telematics Communication Interface Control Module and the T2RR Antenna - Roof Rear. Refer to component testing.
 - **If the coax cable does not pass the test**

Replace the coax cable.
 - **If the coax cable passes the test**
7. Test or replace the T2RR Antenna - Roof Rear.

Component Testing

CAUTION: Refer to [Test Probe Caution](#)

NOTE:

- Before testing the coax cable, check the cable exterior for being pinched, cut, damaged, or having loose connections at the components, which can cause reception issues.
- To prevent false readings when testing the center coax terminals, use care not to ground the test probe on the outer housing/shield.

Coax Cable Test

1. Ignition OFF, disconnect the coax cable at both components.
2. Test for less than 5 Ω between the coax cable center terminal end to end.
 - **If 5 Ω or greater**

Replace the coax cable.

- **If less than 5 Ω**

3. Test for greater than 5 Ω between the coax cable outer shield end to end.

- **If 5 Ω or greater**

Replace the coax cable.

- **If less than 5 Ω**

4. Test for infinite resistance between the coax cable center terminal and the coax cable outer shield.

- **If less than infinite resistance**

Replace the coax cable.

- **If infinite resistance**

5. All OK.

Repair Instructions

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

- Refer to [High Frequency Antenna Replacement](#)
- Refer to [Control Module References](#) for Telematics Communication Interface Control Module replacement, programming and setup.

ONSTAR BUTTON LED MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control Terminal 4	1	1	2	-
Control Terminal 5	1	1	2	-
Ground	-	B2476 04	-	-
1. OnStar [®] Indicator Inoperative 2. Indicator Illuminated At All Times				

Circuit Description

The OnStar[®] status Indicators are located in the button assembly. The Green Indicator is illuminated when the system is ON and operating normally. When the Green Indicator is green and flashing, it is an indication that a call is in progress. When the Red Indicator is illuminated, a system malfunction is present. In the event there is a system malfunction and the OnStar[®] system is still able to make a call, the Indicator will flash red during the call. The OnStar[®] Indicators are controlled by the telematics communication interface control module via the keypad Green Indicator control circuit and the keypad Red Indicator control circuit.

Reference Information

Schematic Reference

[OnStar/Telematics Schematics](#)

Connector End View Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE: If the green LED is off with the ignition ON and the LED does not function when commanded with the scan tool, contact the OnStar Center to confirm the vehicle has a current subscription.

1. Ignition ON/vehicle in Service Mode.
2. Verify no DTCs are set.
 - **If any DTCs are set**

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**
 - **If no DTCs are set**
3. Verify that the Green Indicator turns ON and OFF when commanding the Green Indicator ON and OFF with a scan tool.
 - **If the Green Indicator does not turn ON and OFF**

Refer to Circuit/System Testing - Green Indicator Test
 - **If the Green Indicator turns ON and OFF**
4. Verify that the Red Indicator turns ON and OFF when commanding the Red Indicator ON and OFF with a scan tool.
 - **If the Red Indicator does not turn ON and OFF**

Refer to Circuit/System Testing - Red Indicator Test
 - **If the Red Indicator turns ON and OFF**
5. All OK.

Circuit/System Testing

Green Indicator Test

1. Ignition OFF/vehicle OFF, and all vehicle systems OFF, disconnect the harness connector at the S51 Telematics Button Assembly. 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 6 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON/vehicle in Service Mode.
4. Test for less than 1 V between the control circuit terminal 4 and ground while commanding the Green Indicator OFF with a scan tool.
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 - **If 1 V or greater**

1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON/vehicle in Service Mode.
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 K73 Telematics Communication Interface Control Module.
- **If less than 1 V**
5. Test for greater than 8 V between the control circuit terminal 4 and ground while commanding the Green Indicator ON with a scan tool.
 - **If 8 V or less**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K73 Telematics Communication Interface Control Module.
 - **If greater than 8 V**
6. Test or replace the S51 Telematics Button Assembly.

Red Indicator Test

1. Ignition OFF/vehicle OFF, and all vehicle systems OFF, disconnect the harness connector at the S51 Telematics Button Assembly. 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 6 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON/vehicle in Service Mode.
4. Test for less than 1 V between the control circuit terminal 5 and ground while commanding the Red Indicator OFF with a scan tool.
 - **If 1 V or greater**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON/vehicle in Service Mode.
 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 K73 Telematics Communication Interface Control Module.
 - **If less than 1 V**
5. Test for greater than 8 V between the control circuit terminal 5 and ground while commanding the Red Indicator ON with a scan tool.
 - **If 8 V or less**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K73 Telematics Communication Interface Control Module.

- If greater than 8 V

6. Test or replace the S51 Telematics Button Assembly.

Repair Instructions

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

- Refer to [Communication Center Call Switch Replacement](#)
- Refer to [Control Module References](#) for telematics communication interface control module replacement, programming and setup.

ONSTAR CALL CENTER REMOTE FUNCTION REQUESTS MALFUNCTION

Diagnostic Instructions

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

Circuit/System Description

The telematics communication interface control module has the capability of commanding the horn, initiating door lock/unlock, or operating the exterior lamps using the serial data circuits. These functions are commanded by the OnStar[®] Call Center per a customer request.

Diagnostic Aids

The customer concern may have been due to a lack of cellular service in a given area, or a failure in the National Cellular Network infrastructure that has since been corrected.

Reference Information

Schematic Reference

[OnStar/Telematics 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:

- It is necessary to inform the OnStar[®] Call Center advisor that this call is for vehicle diagnostic purposes.
- It is necessary to have the vehicle in an open outside area where a cellular call can be successfully placed and GPS data can be received from satellites.

1. Vehicle in Service Mode.
2. Verify that the horn, lights, and the door locks on the vehicle operate properly.
 - **If an applicable vehicle system does not operate properly**

Refer to [Diagnostic System Check - Vehicle](#) .

- **If all applicable vehicle systems operate properly**
3. Verify that a call can be successfully placed to the OnStar Call Center by pressing the blue OnStar button.
 - **If unable to contact the OnStar®,® call center**

Refer to [Unable to Contact OnStar Call Center](#)

- **If able to contact the OnStar Call Center**
4. Verify with the OnStar advisor that all remote functions (door locks, lights, and horn) work.
 - **If the remote functions do not operate when requested**

Replace the K73 telematics communication interface control module

- **If the remote functions operate when requested**
5. All OK.

Repair Instructions

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

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

ONSTAR BUTTON MALFUNCTION

Diagnostic Instructions

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

DTC Descriptor

DTC B2476 or B2482

Cellular Phone Select Service Switch

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
10 V Reference	B2476 02	B2476 04	B2476 04	-
Signal	1	1	B2476 59	B2476 59, B2482 00
Ground	-	B2476 04	-	-
1. OnStar®,® Buttons Inoperative				

Circuit/System Description

The OnStar®,® button assembly consists of 3 buttons: Call/Answer, OnStar®,® Call Center, and OnStar®,® Emergency. The telematics communication interface control module supplies the OnStar®,® button assembly with 10 V via the 10 V reference circuit. Each of the buttons, when pressed, completes the circuit across a resistor allowing a specific voltage to be returned to the telematics communication interface control module over the keypad signal circuit. Depending upon the voltage range returned, the telematics communication interface control module is able to identify which button has been pressed.

Conditions for Running the DTC

- Ignition ON/vehicle in Service Mode.
- Battery voltage must be between 9 - 16 V.

Conditions for Setting the DTC

B2476 02

The telematics communication interface control module detects a short to ground on the 10 V reference circuit

B2476 04

The telematics communication interface control module detects an open/high resistance on the keypad supply voltage circuit or the ground circuit.

B2482 and B2476 59

The telematics communication interface control module detects a valid signal on the keypad signal circuit for longer than 15 s. If one of the OnStar[®] buttons is held or stuck for 15 s or greater, the telematics communication interface control module will set this DTC.

Action Taken When the DTC Sets

- The OnStar[®] status LED turns red.
- No calls can be placed.
- The telematics communication interface control module will ignore all inputs from the OnStar[®] button assembly.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

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OnStar/Telematics Schematics

Connector End View Reference

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Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE: Contact the OnStar[®] Call Center first before pressing the emergency button in order to notify them of the test.

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1. Ignition ON/vehicle in Service Mode.
2. Verify that each button of the S51 Telematics Button Assembly operates normally by pressing each button individually.
 - **If none of the buttons operate normally**

Refer to Circuit/System testing
 - **If some, but not all, of the buttons operate normally**

Test or replace the S51 Telematics Button Assembly
 - **If all of the buttons operate normally**
3. All OK.

Circuit/System Testing

1. Ignition OFF/vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S51 Telematics Button Assembly. 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 6 and ground.
 - **If 10 Ω or greater**
 1. 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/vehicle in Service Mode.
4. Test for 8.0 - 10.5 V between the 10 V reference circuit terminal 1 and the ground circuit terminal 6.
 - **If less than 8.0 V**
 1. Ignition OFF/vehicle OFF, disconnect the harness connector at the K73 Telematics Communication Interface Control Module.
 2. Test for infinite resistance between the 10 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 10 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 K73 Telematics Communication Interface Control Module.
 - **If greater than 10.5 V**
 1. Ignition OFF/vehicle OFF, disconnect the harness connector at the K73 Telematics Communication Interface Control Module, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the 10 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 K73 Telematics Communication Interface Control Module.
 - **If between 8.0 - 10.5 V**
5. Ignition OFF/vehicle OFF.
6. Test for 500 - 900 Ω between the signal circuit terminal 3 and the ground circuit terminal 6.
 - **If less than 500 Ω**
 1. Disconnect the X1 harness connector at the K73 Telematics Communication Interface 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, replace the K73 Telematics Communication Interface Control Module.
 - **If greater than 900 Ω**
 1. Disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.

- If less than 1 V
3. Ignition OFF/vehicle 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 K73 Telematics Communication Interface Control Module.
 - **If between 500 - 900 Ω**
 7. Test or replace the S51 Telematics Button Assembly.

Repair Instructions

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

- Refer to [Communication Center Call Switch Replacement](#)
- Refer to [Control Module References](#) for telematics communication interface control module replacement, programming and setup

ONSTAR STEERING WHEEL CONTROL FUNCTIONS MALFUNCTION

Some vehicles equipped with the OnStar[®] system have the capability of accessing voice mailboxes and other automated phone systems by means of the steering wheel controls, while the OnStar[®] Personal Calling feature is in use. If the "Talk" or "Mute" button (depending upon the vehicle) on the steering wheel controls is depressed during an OnStar[®] Personal Calling call, the telematics communication interface control module receives the message on the serial data bus from either the radio or body control module. This message is interpreted as a request to turn any spoken numbers into dual tone multi-frequency tones to be delivered over the airwaves to the phone system the user is communicating with. Complete instructions for operation of these features can be found in the information provided to the customer with the OnStar[®] system.

The steering wheel controls are a resistor network that consist of multiple momentary contact switches and a series of resistors. The switches and resistor network are arranged so that each switch has a different resistance value. When a switch is pressed, a voltage drop occurs in the resistor network, which produces a specific voltage value unique to the switch selected, to be interpreted by either the radio or BCM. In the event the OnStar[®] steering wheel control functions are inoperative, technicians should refer to [Steering Wheel Controls Malfunction](#), to begin diagnosis of the steering wheel control concern.

RADIO CONTROLS MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal terminal 6	B123E 02, 1	B123E 01, 1	B123E 01, 1	-
Signal terminal 5	2	2	2	-
Signal terminal 7	3	3	3	-
signal terminal 8	3	3	3	-
Low Reference terminal 10	-	4	-	-
1. Home, Seek Up, Seek Down, and/or Phone button will not function 2. Power Button will not function 3. Unable to adjust volume 4. All Radio Control buttons may not function				

Circuit/System Description

The radio info display module, radio controls and radio are all separate components. The radio controls communicate radio control inputs directly to the radio through a discrete circuit for volume up, volume down and power ON button. It also uses a series of resistors through a single signal circuit when the home, seek up, seek down

and phone buttons are pressed. After receiving the message the radio will perform the requested function. The info display module receives digital video data from the radio for on-screen display information through the LVDS (Low Voltage Differential Signal) cable. The radio communicates with the info display module over the radio display touch interrupt request signal for touch screen inputs.

Reference Information

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Radio/Navigation System Schematics

Connector End View Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTC B123E is not set.
 - **If DTC B123E is set.**
 - Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**
 - **If DTC B123E is not set**
2. Ignition ON/vehicle in Service Mode, A11 Radio ON.
3. Verify that all radio controls operate and perform the correct function.
 - **If all or some of the radio controls are inoperative**

Refer to Circuit/System Testing.

- **If all radio controls operate and perform the correct function.**
4. All OK.

Circuit/System Testing

1. Ignition OFF/vehicle OFF, disconnect the harness connector at the A20 Radio/HVAC Controls.
2. Test for less than 10 Ω between the following low reference circuit terminal 10 and ground.
 - **If 10 Ω or greater**
 1. Disconnect the X1 harness connector at the P17 Info Display 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 P17 Info Display Module.
 - **If less than 10 Ω**
3. Ignition ON/vehicle in Service Mode, test for 2.5 - 3.5 V between the following signal circuit terminals and ground:
 - Terminal 5 @ A20 Radio/HVAC Controls Harness
 - Terminal 6 @ A20 Radio/HVAC Controls Harness
 - Terminal 7 @ A20 Radio/HVAC Controls Harness

- Terminal 8 @ A20 Radio/HVAC Controls Harness

• **If less than 2.5 V**

1. Ignition OFF/vehicle OFF, disconnect the X1 & X2 harness connectors at the A11 Radio.
2. Test for infinite resistance between the following signal circuits and ground:
 - Terminal 5 @ A20 Radio/HVAC Controls Harness
 - Terminal 6 @ A20 Radio/HVAC Controls Harness
 - Terminal 7 @ A20 Radio/HVAC Controls Harness
 - Terminal 8 @ A20 Radio/HVAC Controls Harness
 - If less than infinite resistance repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω between the following test points:
 - Terminal 5 @ A20 Radio/HVAC Controls Harness & Terminal 3 X2 @ A11 Radio Harness
 - Terminal 6 @ A20 Radio/HVAC Controls Harness & Terminal 8 X1 @ A11 Radio Harness
 - Terminal 7 @ A20 Radio/HVAC Controls Harness & Terminal 8 X2 @ A11 Radio Harness
 - Terminal 8 @ A20 Radio/HVAC Controls Harness & Terminal 9 X2 @ A11 Radio Harness
 - If 2 Ω or greater repair the open/high resistance in the circuit.
 - If less than 2 Ω replace the A11 Radio.

• **If greater than 3.5 V**

1. Ignition OFF/vehicle OFF, disconnect the X1 & X2 harness connectors at the A11 Radio.
2. Test for less than 1 V between the following signal circuits and ground:
 - Terminal 5 @ A20 Radio/HVAC Controls Harness
 - Terminal 6 @ A20 Radio/HVAC Controls Harness
 - Terminal 7 @ A20 Radio/HVAC Controls Harness
 - Terminal 8 @ A20 Radio/HVAC Controls Harness
 - If greater than 1 V repair the short to voltage in the circuit.
 - If less than 1 V replace the A11 Radio.

• **If between 2.5 - 3.5 V**

4. Replace the A20 Radio/HVAC Controls

Repair Instructions

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

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

RADIO INFORMATION DISPLAY MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V reference 3 X1	1	-	-	-
Signal terminal 1 X1	1, 2	1, 2	-	-
Signal terminal 7 X1	2	2	2	-
Signal LVDS X2	B127E 00	B127E 00	B127E 00	-
Ground terminal 9 X1	-	1	-	-
Ground terminal 10 X1	-	1	-	-
1. Display blank 2. Touch screen does not function				

Circuit/System Description

The radio info display module, radio controls and radio are all separate components. The radio controls communicate radio control inputs directly to the radio through a discrete circuit for volume up, volume down and power ON button. It also uses a series of resistors through a single signal circuit when the home, seek up, seek down and phone buttons are pressed. After receiving the message the radio will perform the requested function. The info display module receives digital video data from the radio for on-screen display information through the LVDS (Low Voltage Differential Signal) cable. The radio communicates with the info display module over the radio display touch interrupt request signal for touch screen inputs.

Diagnostic Aids

Malfunctions may include a blank screen

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTC B127E is not set.

- **If DTC B127E is set.**

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

- **If DTC B127E is not set.**

2. Ignition ON/vehicle in Service Mode, A11 Radio ON.

3. Verify the P17 Info Display Module turns on and information is shown on the display.

- **If the P17 Info Display Module does not turn on, or information is not shown in the display.**

Refer to Circuit/System Testing- Blank Screen

- **If the P17 Info Display Module turns on and information is shown on the display.**

4. Verify the touch screen feature functions by touching a selection on the display.

- **If the display does not respond to the touch screen selection**

Refer to Circuit/System Testing- Touch Screen

- **If the display responds to the touch screen selection**

5. All OK.

Circuit/System Testing

Blank Screen

1. Ignition OFF/vehicle OFF and all vehicle systems OFF, disconnect the X1 harness connector @ P17 Info Display Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the following signal ground circuit terminals and ground:
 - terminal 9
 - terminal 10
 - **If 10 Ω or greater**
 1. Test for less than 2 Ω in the signal ground circuits 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/vehicle in Service Mode.
4. Test for 5 V or greater between control circuit terminal 1 X1 and ground.
 - **If less than 5 V**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the A11 Radio.
 2. Test for infinite resistance between the control circuit terminal 1 X1 @ P17 Info Display Module harness 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 between the test points: control circuit terminal 1 X1 @ P17 Info Display Module harness & terminal 3 X1 @ A11 Radio harness.
 - If 2 Ω or greater repair the open/high resistance in the circuit.
 - If less than 2 Ω replace the A11 Radio.
 - **If 5 V or greater**
5. Test for 4.7-5.3 V between the P17 Info Display Module harness terminal 3 X1 and ground.
 - **If less than 4.7 V**
6. Disconnect the harness connector at the A20 Radio/HVAC Controls.
 1. Test for infinite resistance between the P17 Info Display Module harness terminal 3 X1 and ground.
 - If less than infinite resistance repair the short to ground on the circuit.
 - If infinite resistance.
 2. Test for less than 2 Ω between the test points: voltage reference circuit terminal 3 X1 @ P17 Info Display Module harness & terminal 1 @ A20 Radio/HVAC Controls harness.
 - If 2 Ω or greater repair the open/high resistance in the circuit.
 - If less than 2 Ω
 3. Replace the A20 Radio/HVAC Controls.
 - **If greater than 5.3 V**
7. Disconnect the harness connector at the A20 Radio/HVAC Controls.
 1. Test for less than 1 V between terminal 3 X1 @ the P17 Info Display Module harness & ground.
 - If greater than 1 V repair the short to voltage in the circuit
 - If less than 1 V replace the A20 Radio/HVAC Controls
 - **If between 4.7-5.3 V**
8. Test or replace the P17 Info Display Module

Touch Screen

1. Ignition OFF/vehicle OFF and all vehicle systems OFF, disconnect the X1 harness connector @ P17 Info Display Module. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the following signal ground circuit terminals and ground:
 - terminal 9
 - terminal 10
 - **If 10 Ω or greater**

1. Test for less than 2 Ω in the signal ground circuits 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/vehicle in Service Mode.

4. Test for 1.5 - 2 V between the signal circuit terminal 7 and ground.

- **If less than 1.5 V**

1. Ignition OFF/vehicle OFF, disconnect the X2 harness connector at the A11 radio.
2. Test for infinite resistance between the signal circuit terminal 7 X1 @ the P17 Info Display Module harness 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 between the test points: signal circuit terminal 7 X1 @ P17 Info Display Module harness & terminal 6 X2 @ A11 Radio harness.
 - If 2 Ω or greater repair the open/high resistance in the circuit.
 - If less than 2 Ω replace the A11 Radio.

- **If greater than 2 V**

1. Ignition OFF/vehicle OFF, disconnect the X2 harness connector at the A11 Radio.
2. Test for less than 1 V between the signal circuit signal circuit terminal 7 X1 @ the P17 Info Display Module harness and ground.
 - If greater than 1 V repair the short to voltage in the circuit.
 - If less than 1 V replace the A11 Radio.

- **If between 1.5 - 2 V**

5. Replace the P17 Info Display Module

Repair Instructions

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

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

RADIO POOR RECEPTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Radio Antenna Coax	B125A 02	B125A 04	1	-
Antenna Module Ground	-	1	-	-

1. May exhibit possible AM/FM interference.

Circuit/System Description

The antenna amplifier receives both AM and FM signals from the antenna. The radio antenna amplifier is enabled when the radio is turned on. The radio provides battery voltage to the antenna amplifier using the center conductor of the antenna coaxial cable. When a 12 V signal is seen by the amplifier on the center conductor of the antenna coax, both AM and FM signals are amplified.

Diagnostic Aids

Poor AM and FM radio reception may be due to multiple influences, some of which may not be vehicle related. Areas which have high RF traffic or block the signal path may cause a degradation in radio reception. Radio

reception may also be influenced by items within the vehicle, but not part of the radio system. Such examples are aftermarket electrical accessories or other items which may generate noise in the vehicle electrical system. Aftermarket window tinting, especially when there is a metallic in the film, may reduce radio reception.

AM reception is highly dependent on the antenna amplifier receiving battery voltage from the radio and being properly grounded. The antenna amplifier boosts both AM and FM reception. When the antenna amplifier does not receive power, AM stations may not be received and FM reception will be limited. If the amplifier is not properly grounded, excessive interference in the signal may occur, or reception may be limited.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

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- [Wiring Repairs](#)

Scan Tool Reference

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

Circuit/System Testing

1. Ignition OFF/Vehicle OFF, disconnect the radio antenna coax cable from the A11 Radio and from the T23 Radio Antenna Amplifier.
2. Verify the antenna coax cable passes the coax cable component test. Refer to Component Testing.
 - **If the coax cable does not pass the test**

Replace the antenna coax cable
 - **If the coax cable passes the test**
3. Connect the antenna coax cable to the A11 Radio. Ignition ON/Vehicle in Service Mode, A11 Radio ON.
4. Verify a test lamp illuminates between the antenna coax cable center terminal and ground at the T23 Radio Antenna Amplifier connector.
 - **If the test lamp does not illuminate**

Replace the A11 Radio.
 - **If the test lamp illuminates**
5. Test or replace the T23 Radio Antenna Amplifier.
6. Verify radio reception has improved.
 - **If radio reception has not improved**

Test or replace the T2E Antenna - Rear End Spoiler
 - **If radio reception has improved**
7. All OK

Component Testing

CAUTION: Refer to [Test Probe Caution](#).

NOTE: Before testing the coax cable, check the cable exterior for being pinched, cut, damaged, or having loose connections at the components, which can cause reception issues.

To prevent false reading when testing the center coax terminals, use care not to ground the test probe on the outer housing/shield.

Coax Cable Test

1. Ignition OFF, disconnect the coax cable at both components.
2. Test for less than 5 Ω between coax cable center terminal end to end.

- If 5 Ω or greater

Replace the coax cable

- If less than 5 Ω

3. Test for less than 5 Ω between the coax cable outer shield end to end.

- If 5 Ω or greater

Replace the coax cable

- If less than 5 Ω

4. Test for infinite resistance between the coax cable center terminal and the coax cable outer shield.

- If less than infinite resistance

Replace the coax cable

- If infinite resistance

5. All OK

Repair Instructions

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

- Refer to [Rear End Spoiler Replacement](#)
- Refer to [Radio Antenna Amplifier Replacement](#)
- Refer to [Control Module References](#) for radio replacement, programming, and setup.

SPEAKER REPLACEMENT REFERENCE

Component	Repair Instruction
Front Speakers	Radio Front Side Door Speaker Replacement
Front Tweeter Speakers	Radio Windshield Side Garnish Molding Speaker Replacement
Rear Speakers	Radio Rear Side Door Speaker Replacement
Rear Subwoofer	Radio Rear Compartment Speaker Replacement

SPEAKER MALFUNCTION (UQA)

Diagnostic Instructions

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

Diagnostic Fault Information

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

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Amplifier B+	1	1	-	-
LF Audio Signal	2	2	2, 3	2
LR Audio Signal	2	2	2, 3	2
RF Audio Signal	2	2	2, 3	2
RR Audio Signal	2	2	2, 3	2
Subwoofer Audio Signal	2	2	2, 3	2
Remote Enable Signal	1	1, 4	-	-
Amplifier Ground	-	1	-	-
1. Audio inoperative, no sound from all speakers. 2. No or reduced audio from speaker(s) on the affected audio circuit. 3. Noticeable audio distortion may be present. 4. Fault may affect one or more components, dependant on vehicle equipment.				

Circuit/System Description

Each of the audio output channel circuits (+) and (-), at the radio and audio amplifier have a DC bias voltage that is approximately one half of battery voltage. When using a DMM, each of the audio output channel circuits will measure approximately 6.5 V DC. The audio being played on the system is produced by a varying AC voltage that is centered around the DC bias voltage on the same circuit. The AC voltage is what causes the speaker cone to move and produce sound. The frequency (Hz) of the AC voltage signal is directly related to the frequency of the input (audio source playing) to the audio system. Both the DC bias voltage and the AC voltage signals are needed for the audio system to properly produce sound.

Diagnostic Aids

- Improper speaker mounting or loose trim may cause an audible buzz or distortion. Inspect the appropriate speaker and the surrounding interior trim for proper and secure mounting.

The EL-50334-6 Audio System Diagnostic CD contains audio tracks that can be used to duplicate and isolate such concerns. Tracks 11 and 12 contain audio sweep tones for testing for speaker and grill rattles.

If the speaker or surrounding interior trim is found to be loose or improperly secured, correctly secure the item.

- The test tones on the CD may be copied to a USB drive or other device to use during testing.
- When equipped with an amplifier, it is possible for some individual circuit faults to affect more than one speakers operation. Perform diagnostic tests in the sequence listed to avoid misdiagnosis.
- On the base 6 speaker system, the subwoofer is not used for reproducing audio. The subwoofer is used only for producing the cancellation tones for the active noise cancellation system.

On the uplevel speaker system, the subwoofer is used for both reproducing audio and the active noise cancellation system tones.

Reference Information

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

Scan Tool Reference

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

Special Tools

EL-50334-50 USB Cable and Adapter Kit

Circuit/System Verification

1. Ignition ON/vehicle in Service Mode, A11 Radio ON, mute OFF.
2. Verify clear audio is heard from each speaker, adjusting fade and balance controls to test each speaker individually.
 - **If audio is inoperative from one or more speakers, or the audio emitted is not clear**
Refer to Circuit/System Testing.
 - **If clear audio is heard from all speakers**
3. All OK.

Circuit/System Testing

NOTE: In the following tests, audio signal frequencies (Hz) will be tested. To prevent misdiagnosis, the door chime must be OFF during testing. Ensure the driver door latch is closed during testing.

1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the T3 Audio Amplifier.
2. Test for less than 10 Ω between the ground circuit terminal 8 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Verify that a test lamp illuminates between the B+ circuit terminal 4 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/vehicle OFF.
 2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , refer to [Power Mode Mismatch](#).
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/vehicle OFF.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the T3 Audio Amplifier.
 - **If the test lamp illuminates**
4. Ignition OFF/vehicle OFF, disconnect the X3 harness connector at the T3 Audio Amplifier.

NOTE: In the following tests, audio signal frequencies (Hz) will be tested. To prevent misdiagnosis, the door chime must be OFF during testing. Ensure the driver door latch is closed during testing.

5. Verify a test lamp does not illuminate between the control circuit terminal 8 and ground. cardiagn.com
 - **If the test lamp illuminates**

1. Disconnect the X1 harness at the A11 Radio.
2. Verify a test lamp does not illuminate between the control circuit and ground.
 - If the test lamp illuminates, repair the short to voltage on the circuit.
 - If the test lamp does not illuminate, replace the A11 Radio.
- **If the test lamp does not illuminate**
6. Ignition ON/vehicle in Service Mode, A11 Radio ON.
7. Verify a test lamp illuminates between the control circuit terminal 8 and ground.
 - **If the test lamp does not illuminate**
 1. Ignition OFF/vehicle OFF. Disconnect the X1 harness at the A11 Radio.
 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 , replace the A11 Radio.
 - **If the test lamp illuminates**
8. Radio ON, mute ON.
9. Test for 7.5 - 8.5 V between the control circuit terminal 11 and ground.
 - **If greater than 8.5 V**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the A11 Radio. Ignition ON/vehicle in Service Mode.
 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 A11 Radio.
 - **If less than 7.5 V**
 1. Ignition OFF/vehicle OFF, disconnect the X1 harness connector at the A11 Radio.
 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 A11 Radio.
 - **If between 7.5 - 8.5 V**
10. Radio ON, mute OFF.
11. Test for less than 1 V between the control circuit terminal 11 and ground.
 - **If greater than 1 V**

Replace the A11 Radio.
 - **If less than 1 V**
12. Test for 5 - 7 V between the signal circuit terminals listed below and ground:
 - Left front speaker signal (+) terminal 15
 - Left front speaker signal (-) terminal 7
 - Right front speaker signal (+) terminal 14
 - Right front speaker signal (-) terminal 6
 - Left rear speaker signal (+) terminal 13
 - Left rear speaker signal (-) terminal 5
 - Right rear speaker signal (+) terminal 12
 - Right rear speaker signal (-) terminal 4
 - **If less than 5 V**
 1. Ignition OFF/vehicle OFF, disconnect the X2 harness connector at the A11 Radio.
 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 A11 Radio.
- **If greater than 7 V**
1. Ignition OFF/vehicle OFF, disconnect the X2 harness connector at the A11 Radio. Ignition ON/vehicle in Service Mode.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the A11 Radio.
- **If between 5 - 7 V**
13. Play track number three (50 Hz bass test tone) from the **EL-50344-6** Audio Test CD.
14. Test for 49 - 51 Hz AC between the audio signal circuit terminals listed below and ground:
 - Left front speaker signal (+) terminal 15
 - Left front speaker signal (-) terminal 7
 - Right front speaker signal (+) terminal 14
 - Right front speaker signal (-) terminal 6
 - Left rear speaker signal (+) terminal 13
 - Left rear speaker signal (-) terminal 5
 - Right rear speaker signal (+) terminal 12
 - Right rear speaker signal (-) terminal 4
- **If not between 49 - 51 Hz AC**
- Replace the A11 Radio.
- **If between 49 - 51 Hz AC**
15. Ignition OFF/vehicle OFF, connect all harness connectors.
16. Disconnect the harness connector at the appropriate P19 Speaker. Ignition ON/vehicle in Service Mode, A11 Radio ON.
17. Test for 5 - 7 V between the appropriate P19 Speaker circuits listed below and ground:
 - Speaker signal (-) circuit terminal 1
 - Speaker signal (+) circuit terminal 2
- **If less than 5 V**
1. Ignition OFF/vehicle OFF, disconnect the X1 and X2 harness connector at the T3 Audio Amplifier.
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 T3 Audio Amplifier.
- **If greater than 7 V**
1. Ignition OFF/vehicle OFF, disconnect the X1 and X2 harness connector at the T3 Audio Amplifier. Ignition ON/vehicle in Service Mode.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the T3 Audio Amplifier.
- **If between 5 - 7 V**
18. Mute OFF, play track number three (50 Hz bass test tone) from the test CD.
19. Test for 49 - 51 Hz AC between the appropriate P19 Speaker circuits listed below and ground:
 - Speaker signal (-) circuit terminal 1
 - Speaker signal (+) circuit terminal 2
- **If not between 49 - 51 Hz AC**

Replace the T3 Audio Amplifier.

- If between 49 - 51 Hz AC

20. Test or replace the P19 Speaker.

Repair Instructions

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

- Refer to [Speaker Replacement Reference](#)
- Refer to [Control Module References](#) for amplifier or radio replacement, programming, and setup

SPEAKER MALFUNCTION (WITHOUT UQA)

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Speaker Output Signal	1	1	1, 2	-
Right Front Speaker Output Signal	1	1	1, 2	-
Left Rear Speaker Output Signal	1	1	1, 2	-
Right Rear Speaker Output Signal	1	1	1, 2	-
1. No or reduced audio from speaker(s) on the affected audio circuit. 2. Noticeable audio distortion may be present.				

Circuit/System Description

Each of the audio output channel circuits (+) and (-), at the radio have a DC bias voltage that is approximately one half of battery voltage. When using a DMM, each of the audio output channel circuits will measure approximately 6.5 V DC. The audio being played on the system is produced by a varying AC voltage that is centered around the DC bias voltage on the same circuit. The AC voltage is what causes the speaker cone to move and produce sound. The frequency (Hz) of the AC voltage signal is directly related to the frequency of the input (audio source playing) to the audio system. Both the DC bias voltage and the AC voltage signals are needed for the audio system to properly produce sound.

Diagnostic Aids

- Improper speaker mounting or loose trim may cause an audible buzz or distortion. Inspect the appropriate speaker and the surrounding interior trim for proper and secure mounting.
- The EL-50334-6 Audio System Diagnostic CD contains audio tracks that can be used to duplicate and isolate such concerns. Tracks 11 and 12 contain audio sweep tones for testing for speaker and grill rattles.
- The test tones on the CD may be copied to a USB drive or other device to use during testing.
- If the speaker or surrounding interior trim is found to be loose or improperly secured, correctly secure the item.
- If equipped with an Active Noise Cancellation system that utilizes an ANC module, the module acts as a pass-through for the high level audio signals from the radio to the speakers.

Reference Information

Schematic Reference

[Radio/Navigation System Schematics](#)

Connector End View Reference

Description and Operation

Radio/Audio 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/vehicle in Service Mode, A11 Radio ON, mute OFF.
2. Verify clear audio is heard from each speaker, adjusting fade and balance controls to test each speaker individually.
 - **If audio is inoperative from one or more speakers, or the audio emitted is not clear.**

Refer to Circuit/System Testing.
 - **If clear audio is heard from all speakers.**
3. All OK.

Circuit/System Testing

NOTE: Some circuits supply audio signals to more than one speaker. It may be necessary to disconnect all speakers on the affected audio circuit when performing circuit tests.

1. Ignition OFF/vehicle OFF, disconnect the harness connector at the appropriate P19 Speaker. Ignition ON, A11 Radio ON, mute OFF.
2. Test for 5 - 7 V between each audio signal circuit terminal 1 and terminal 2 and ground.
 - **If less than 5 V**
 1. Ignition OFF/vehicle OFF, disconnect the appropriate speaker harness connector at the A11 Radio.
 2. Test for infinite resistance between the signal circuits 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 A11 Radio.
 - **If greater than 7 V**
 1. Ignition OFF/vehicle OFF, disconnect the appropriate speaker harness connector at the A11 Radio. Ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the A11 Radio.
 - **If between 5 - 7 V**
3. Test or replace the P19 Speaker.

Repair Instructions

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

- Refer to [Speaker Replacement Reference](#)
- Refer to [Control Module References](#) for radio replacement, programming, and setup.

UNABLE TO CONTACT ONSTAR CALL CENTER

Diagnostic Instructions

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

DTC Descriptors

DTC B2470 02

Cellular Phone Antenna Circuit Malfunction Short to Ground

DTC B2470 04

Cellular Phone Antenna Circuit Malfunction Open Circuit

Circuit/System Description

The primary cellular phone antenna element is connected to the telematics communication interface control module (violet connector) via a shielded coaxial cable. Cellular communication takes place on both the primary cellular antenna signal circuit and the GPS/secondary cellular antenna signal circuit. This diagnostic only applies to the primary cellular antenna signal circuit. Internal to the antenna on the cellular antenna signal circuit resistance is used to apply a load, which the telematics communication interface control module uses to detect the presence of the antenna.

Conditions for Running the DTC

- Ignition in the RUN or ACC position.
- System voltage is between 9.5 V and 15.5 V.
- The above conditions are present for greater than 1 s.

Conditions for Setting the DTC

B2470 02

The telematics communication interface control module detects a short to ground on the primary cellular antenna signal circuit.

B2470 04

- The telematics communication interface control module detects an open or high resistance on the primary cellular antenna signal circuit.
- The above conditions are present for greater than 1 s.

Action Taken When the DTC Sets

The OnStar[®] status LED turns red.

Conditions for Clearing the DTC

- The telematics communication interface control module detects the presence of a cellular antenna.
- A history DTC clears after 50 malfunction-free ignition cycles.

Reference Information

Schematic Reference

[OnStar/Telematics Schematics](#)

Connector End View Reference

Description and Operation

[OnStar Description and Operation \(UE3\)](#)[OnStar Description and Operation \(UE1\)](#)

Electrical Information Reference

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

Scan Tool Reference

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

Special Tools

EL-49903-1 Test Antenna Navn-Cell Conn

Circuit/System Testing

NOTE:

- **The vehicle may be equipped with sectioned coax. Test each section and replace only the faulty section, not the entire length of coax.**
- **The following verification requires the vehicle to be outside with an unobstructed view of the southern sky. Allow 5 min after turning the ignition ON for the GPS satellites to acquire vehicle signal.**

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the violet primary cellular coax cable connector at the K73 Telematics Communication Interface Control Module. It may take up to 2 min for all vehicle systems to power down.
2. Using the **EL-49903-1** Test Antenna Navn-Cell Conn connect the violet coax cable to the K73 Telematics Communication Interface Control Module. Place the test antenna on the roof of the vehicle, ignition ON/vehicle in Service Mode.
3. Verify the DTC does not set or a call can be completed to the OnStar Call Center while operating the vehicle within the conditions for running the DTC.

- **If the DTC sets or a call can not be completed to the OnStar Call Center**

Replace the K73 Telematics Communications Interface Control Module.

- **If the DTC does not set or a call can be completed to the OnStar Call Center**

4. Ignition OFF/Vehicle OFF.
5. Disconnect the **EL-49903-1** Test Antenna Navn-Cell Conn from the K73 Telematics Communication Interface Control Module
6. Test the coax cable. Refer to Component Testing.

- **If the coax cable does not pass the test**

Replace the coax cable.

- **If the coax cable passes the test**

7. Test or replace the T2RR Antenna - Roof Rear.

Component Testing

CAUTION: Refer to [Test Probe Caution](#)

NOTE:

- **Before testing the coax cable, check the cable exterior for being pinched, cut, damaged, or having loose connections at the components, which can cause**

reception issues.

- To prevent false readings when testing the center coax terminals, use care not to ground the test probe on the outer housing/shield.

Coax Cable Test

1. Test for less than 5 Ω between the coax cable center terminal end to end.
 - **If 5 Ω or greater**
Replace the coax cable.
 - **If less than 5 Ω**
2. Test for greater than 5 Ω between the coax cable outer shield end to end.
 - **If 5 Ω or greater**
Replace the coax cable.
 - **If less than 5 Ω**
3. Test for infinite resistance between the coax cable center terminal and the coax cable outer shield.
 - **If less than infinite resistance**
Replace the coax cable.
 - **If infinite resistance**
4. All OK.

Repair Instructions

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

- Refer to [High Frequency Antenna Replacement](#)
- Refer to [Control Module References](#) for telematics communication interface control module replacement, setup, and programming

ONSTAR VOICE RECOGNITION MALFUNCTION

Diagnostic Instructions

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

Circuit/System Description

The telematics communication interface control module is capable of interpreting voice commands received over the cellular microphone circuits. Speech recognition allows the user to speak to one computer in the vehicle, and one reached over the cellular communication network. The module attempts to understand the users command, and responds by speaking back, or by taking the appropriate action, e.g. dialing the phone.

Reference Information

Schematic Reference

[OnStar/Telematics Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Description and Operation

[OnStar Description and Operation \(UE3\)](#)[OnStar Description and Operation \(UE1\)](#)

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

Circuit/System Verification

NOTE:

- It is necessary to have the vehicle in an open outside area where a cellular call can be successfully placed and GPS data can be received from satellites.
- The vehicle should be located in a quiet area.

1. Vehicle in Service Mode.
2. Verify that your voice is heard clearly by the OnStar Call center.

- If your voice can not be heard clearly

Refer to [OnStar Microphone Malfunction](#)

- If your voice can be heard clearly

3. Verify that the system responds appropriately to all voice commands by pressing the voice command button and attempting to operate the system using multiple voice commands.

- If the OnStar system does not respond to any voice commands

Replace the K73 Telematics Communication Interface Control Module

- If the OnStar system responds to some, but not all voice commands

Refer to [OnStar Description and Operation \(UE3\)](#)[OnStar Description and Operation \(UE1\)](#) for tips on proper pronunciation

- If the OnStar system responds to all voice commands

4. All OK.

Repair Instructions

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

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

REPAIR INSTRUCTIONS

MOBILE TELEPHONE MICROPHONE REPLACEMENT

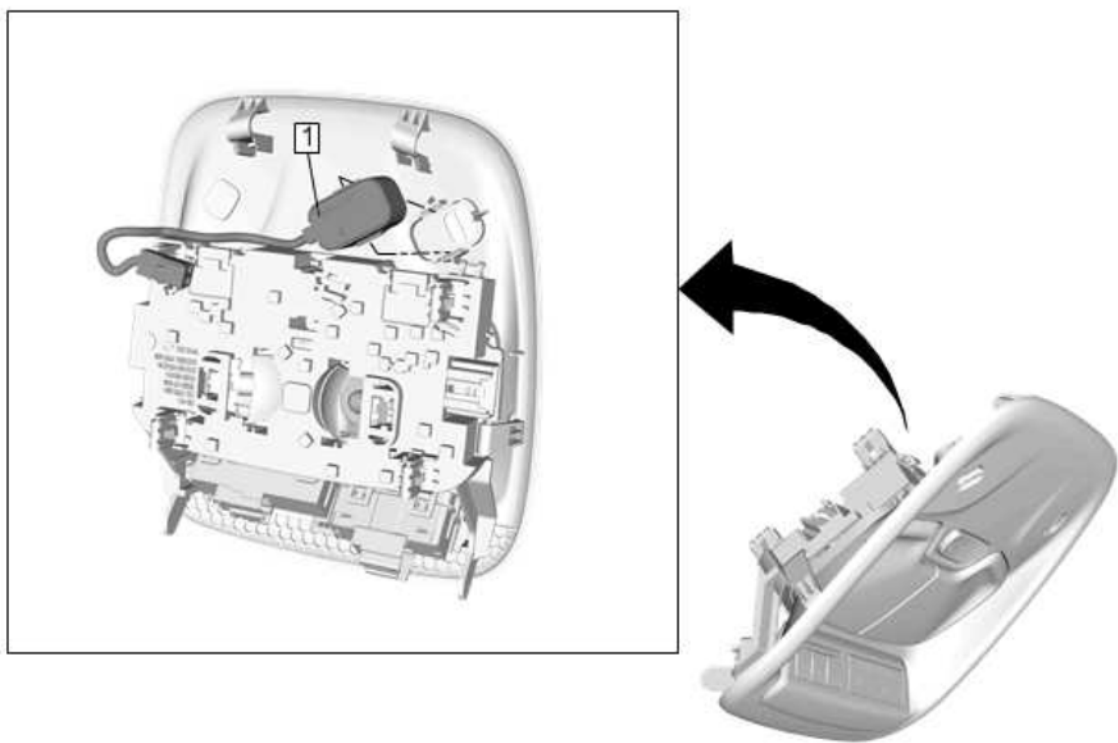


Fig. 12: Mobile Telephone Microphone

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Roof Console. Refer to Roof Console Replacement	
1	Mobile Telephone Microphone Procedure Release the retaining tabs.

COMMUNICATION CENTER CALL SWITCH REPLACEMENT

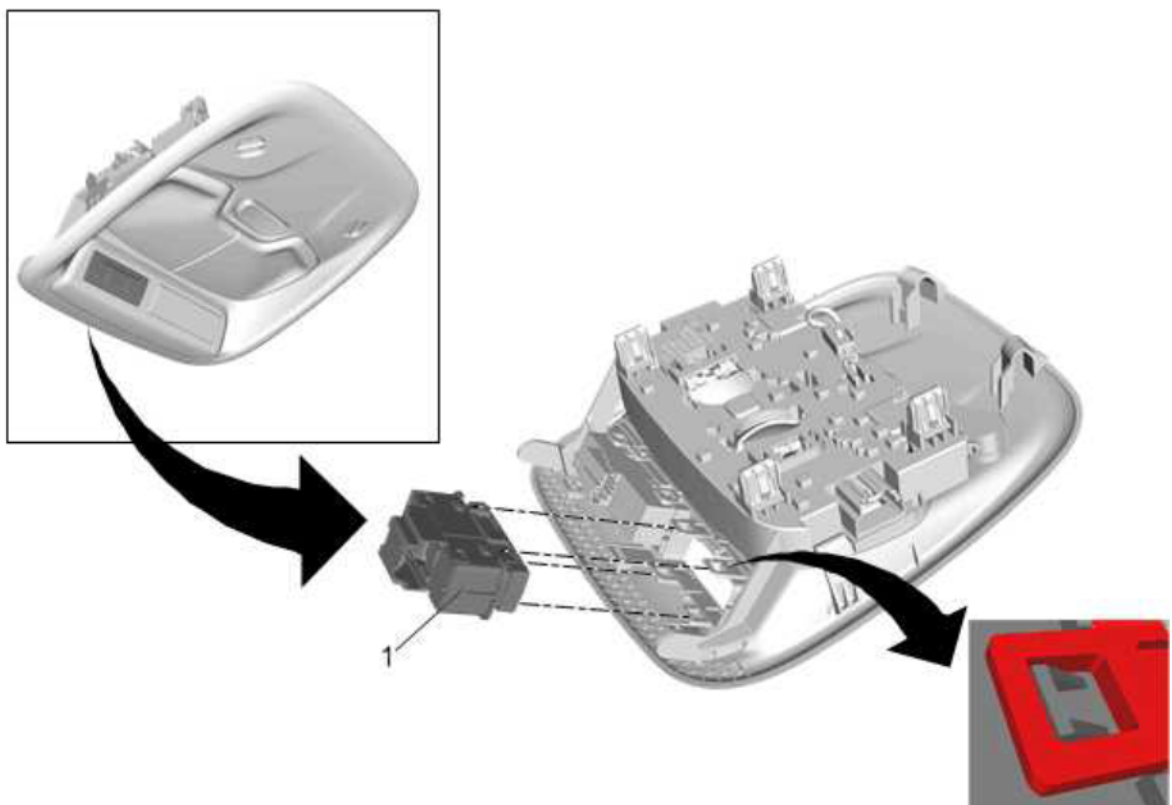


Fig. 13: Communication Center Call Switch

Courtesy of GENERAL MOTORS COMPANY

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Callout	Component Name
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Callout	Component Name
Preliminary Procedures 1. Disconnect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection 2. Remove Roof Console. Refer to Roof Console Replacement	
1	Communication Center Call Switch Procedure 1. Use a flat bladed plastic tool to remove. 2. Release tabs and remove the switch from the roof console. 3. Connect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection

COMMUNICATION INTERFACE MODULE REPLACEMENT

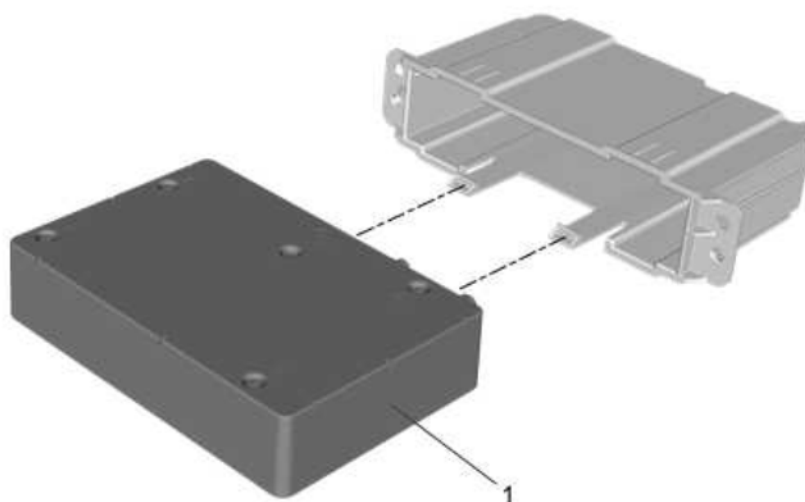


Fig. 14: Communication Interface Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Communication Interface Module Bracket. Refer to Communication Interface Module Bracket Replacement	
1	Communication Interface Module Procedure 1. Push the retaining tabs (Qty: 2) outward and slide the module upward. 2. Refer to Control Module References for programming and setup information, if required.

COMMUNICATION INTERFACE MODULE BATTERY REPLACEMENT

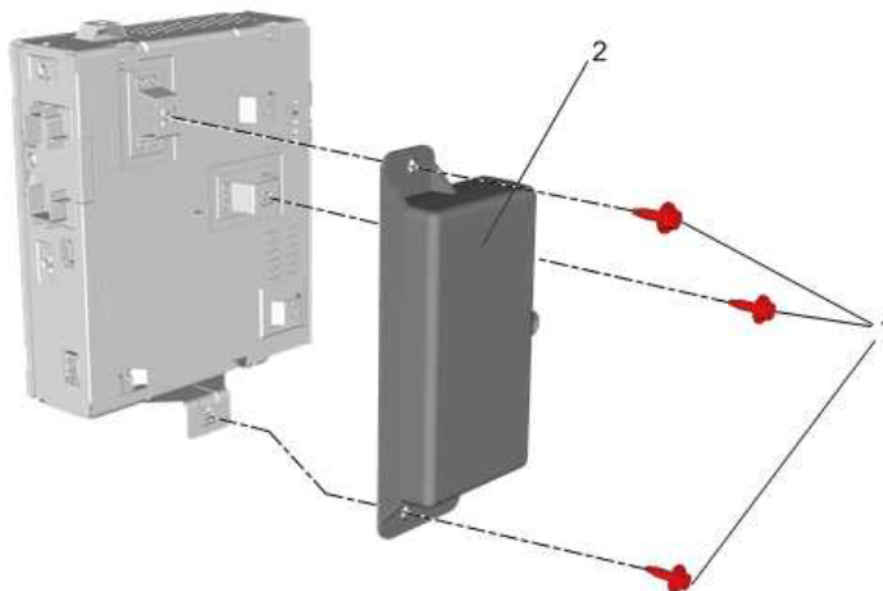


Fig. 15: Communication Interface Module Battery

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the radio. Refer to Radio Replacement	
1	Communication Interface Module Battery Bolt (Qty: 3) CAUTION: Refer to Fastener Caution Tighten 2.5 N.m (22 lb in)
2	Communication Interface Module Battery

COMMUNICATION INTERFACE MODULE BRACKET REPLACEMENT

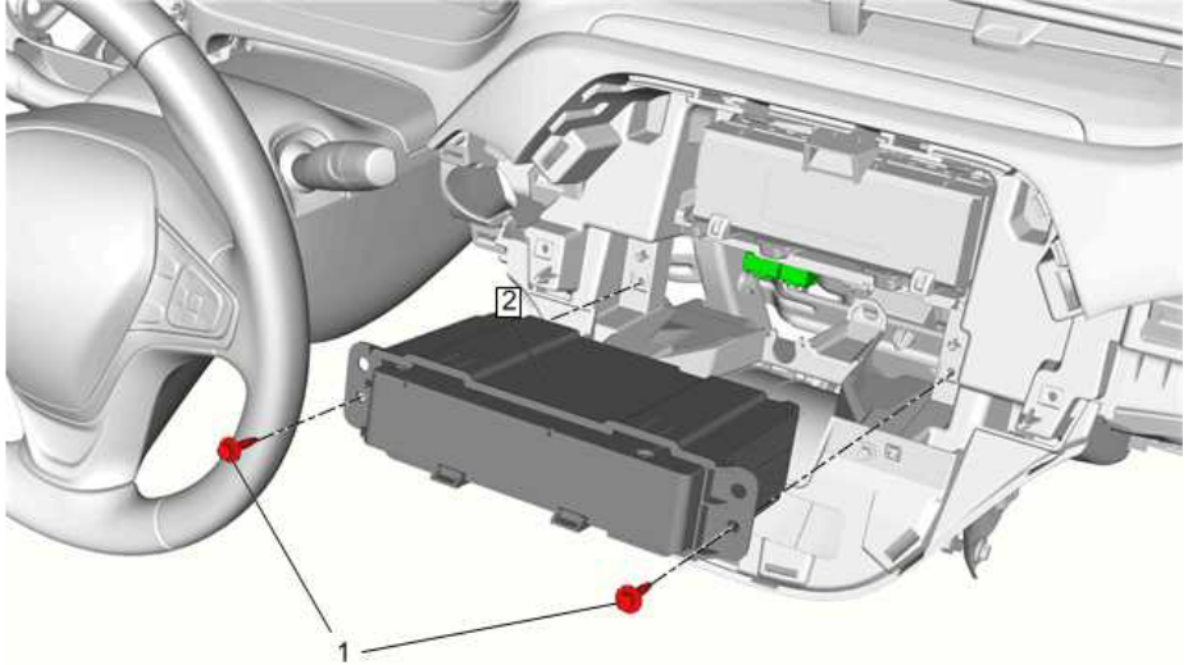


Fig. 16: Communication Interface Module Bracket

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Instrument Panel Trim Plate. Refer to Instrument Panel Trim Plate Replacement	
1	Communication Interface Module Bracket Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Communication Interface Module Bracket Procedure 1. Disconnect all electrical connectors. 2. Transfer components as necessary.

RADIO REPLACEMENT

Removal Procedure

1. Disconnect Battery Negative Cable. Refer to [Battery Negative Cable Disconnection and Connection](#)

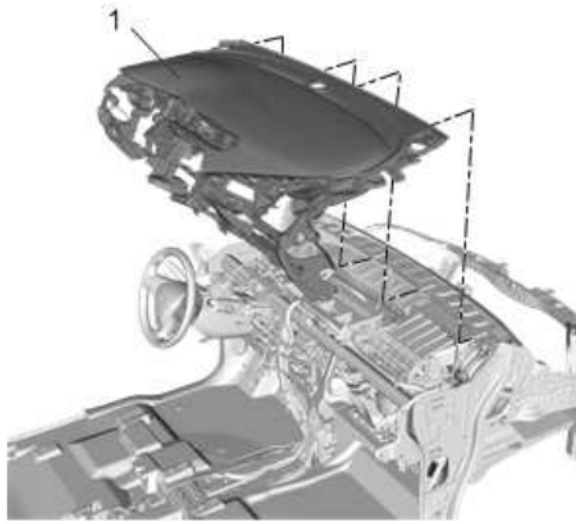


Fig. 17: Instrument Panel Assembly

Courtesy of GENERAL MOTORS COMPANY

2. Remove Instrument Panel Assembly (1). Refer to [**Instrument Panel Assembly Replacement**](#)

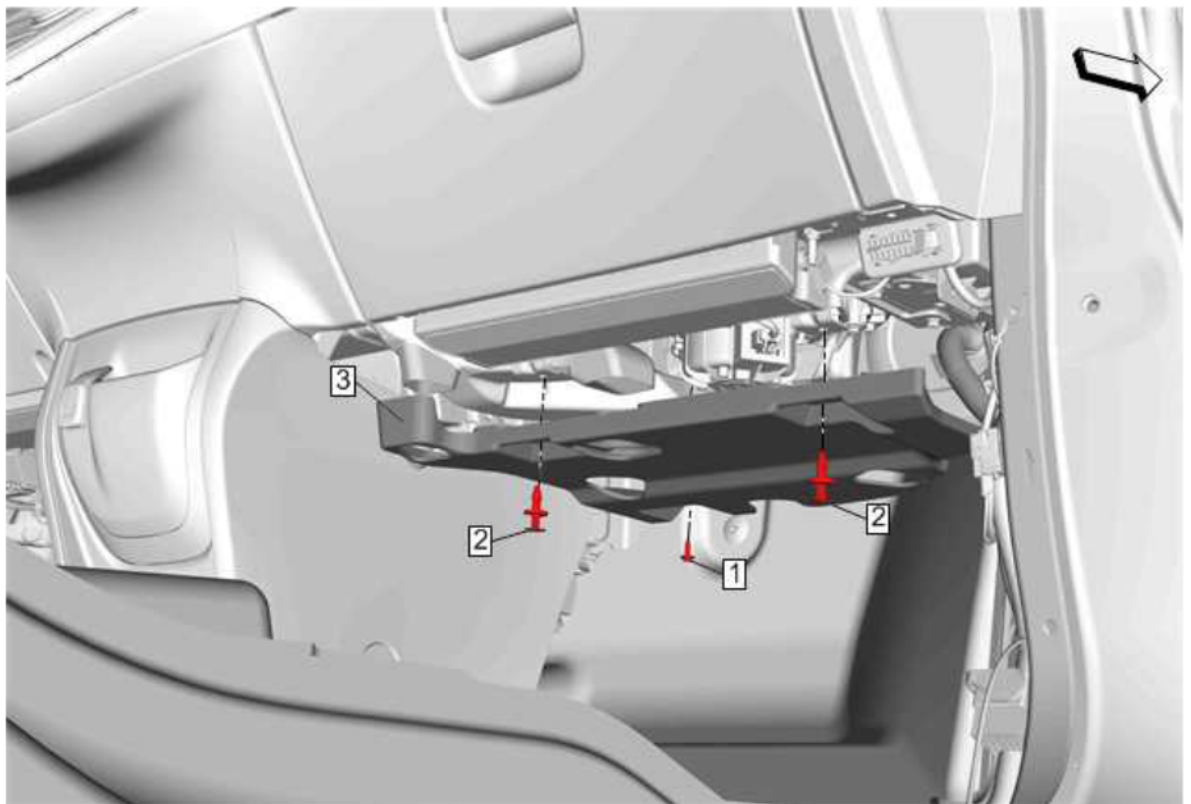


Fig. 18: Instrument Panel Lower Trim Panel Insulator

Courtesy of GENERAL MOTORS COMPANY

3. Remove Instrument Panel Lower Trim Panel Insulator (3). Refer to [**Instrument Panel Lower Trim Panel Insulator Replacement**](#)

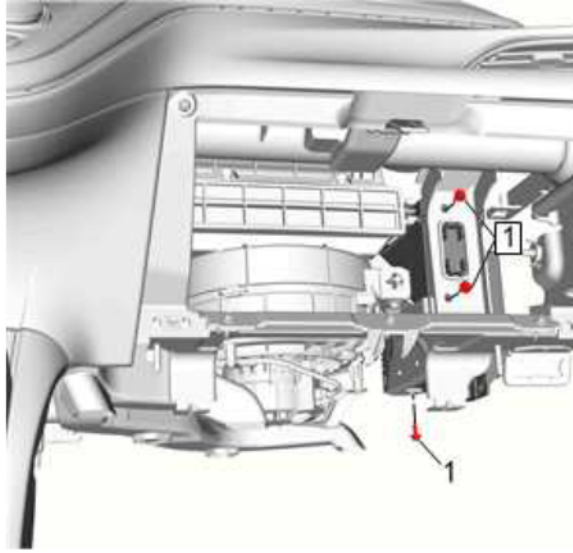


Fig. 19: Radio Assembly Bolts

Courtesy of GENERAL MOTORS COMPANY

4. Remove Radio Assembly Bolts (1)

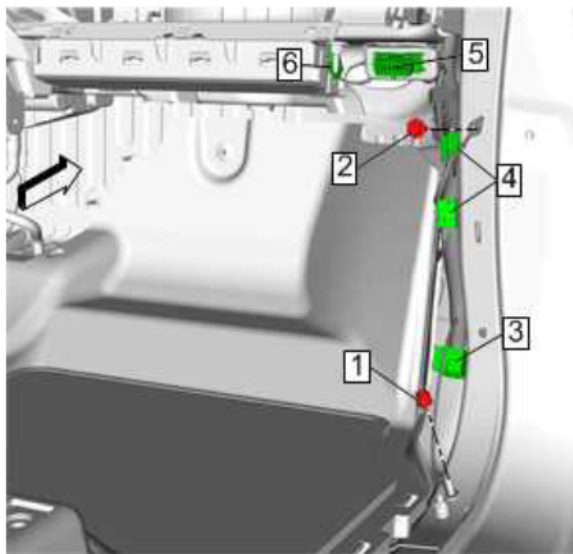


Fig. 20: Ground Nut, Bolt And Connectors

Courtesy of GENERAL MOTORS COMPANY

5. Remove the ground nut (1) and ground wire.
6. Remove the ground bolt (2) and ground wire.
7. Unclip and disconnect the I/P main harness connector (3).
8. Disconnect the coax antenna connectors (4).
9. Unclip the passenger side DLC connector (5).
10. Disconnect the passenger side airbag connector (6).

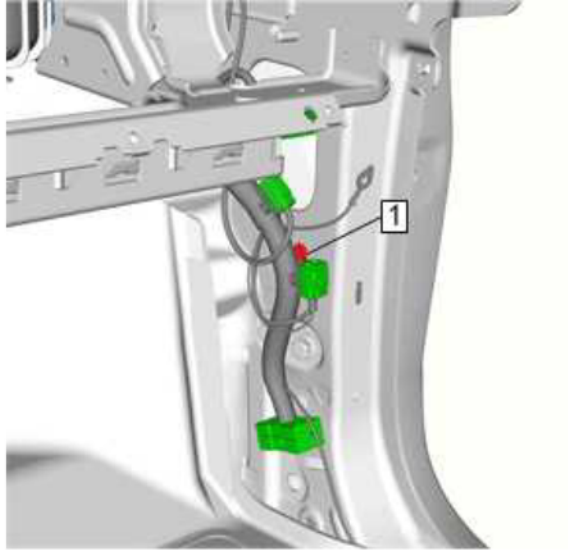


Fig. 21: Harness Retainer

Courtesy of GENERAL MOTORS COMPANY

11. Unclip the harness retainer (1).

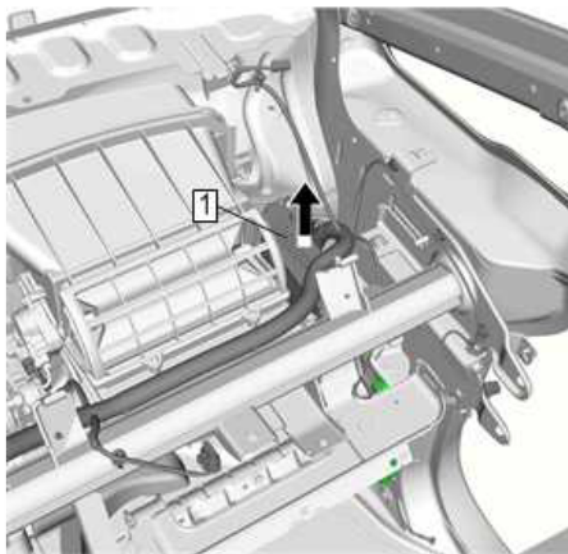


Fig. 22: Radio Module Assembly

Courtesy of GENERAL MOTORS COMPANY

12. Pull the radio assembly (1) upward with the harness.

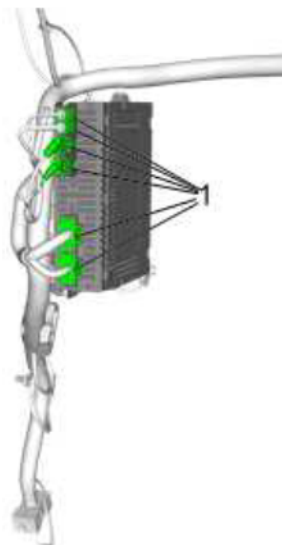


Fig. 23: Radio Assembly Connectors

Courtesy of GENERAL MOTORS COMPANY

13. Position the radio and harness assembly toward the interior of the vehicle.

14. Disconnect the electrical connectors (1).
15. Detach the wiring harness securing clips.
16. Remove the radio from the vehicle.

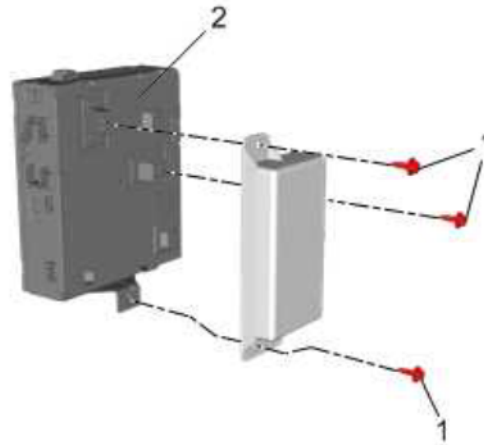


Fig. 24: Radio Assembly And Bolts

Courtesy of GENERAL MOTORS COMPANY

17. Remove Bolts (1)
18. Remove Communication Interface Module Battery @ Radio Assembly (2)

Installation Procedure

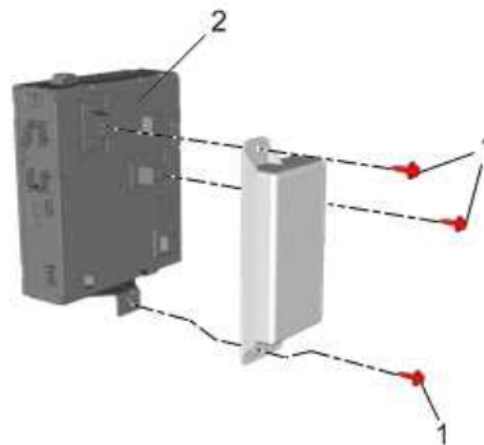


Fig. 25: Radio Assembly And Bolts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution**

1. Install Communication Interface Module Battery @ Radio Assembly (2)
2. Install and tighten Radio Assembly Bolts (1) (Qty: 3) to 2.5 N.m (22 lb in)

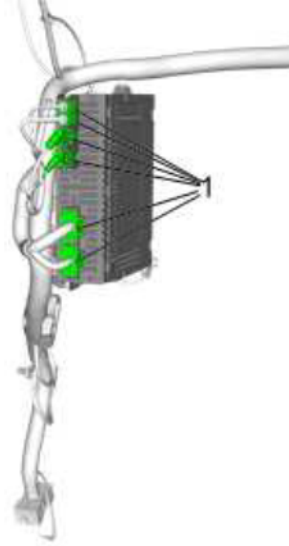


Fig. 26: Radio Assembly Connectors

Courtesy of GENERAL MOTORS COMPANY

3. Connect the electrical connectors. (1)
4. Attach the wiring harness securing clips.

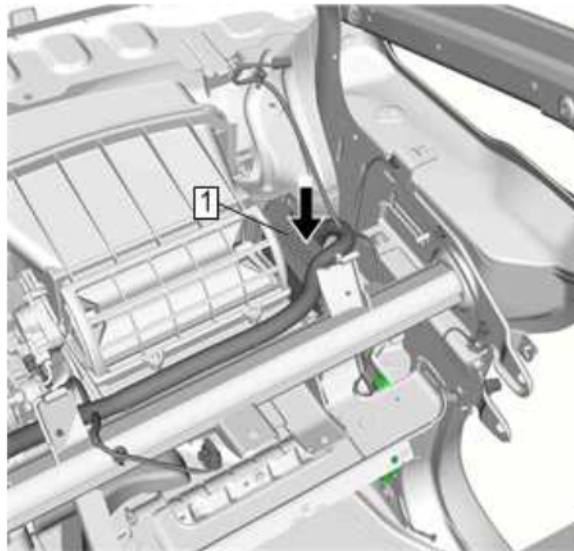


Fig. 27: Radio Module Assembly

Courtesy of GENERAL MOTORS COMPANY

5. Position the radio module (1) and harness assembly into the bracket.

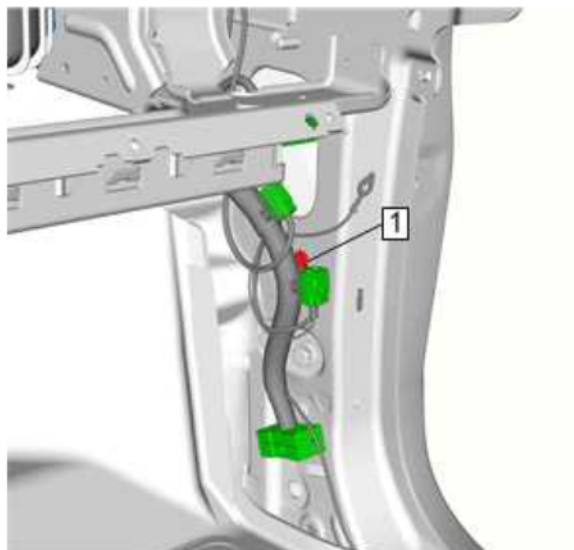


Fig. 28: Harness Retainer

Courtesy of GENERAL MOTORS COMPANY

6. Clip the harness retainer (1).

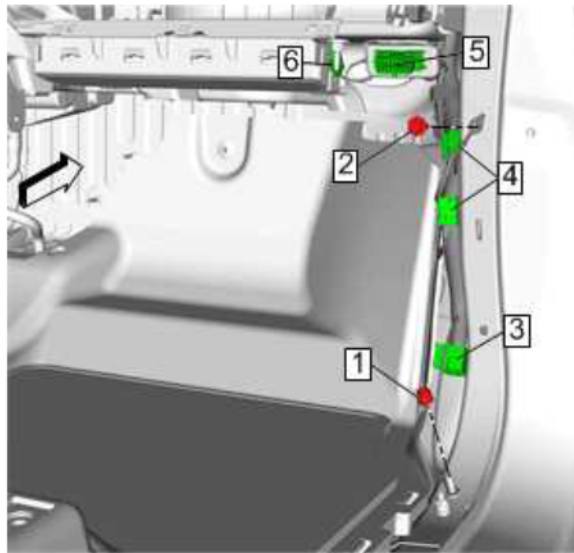


Fig. 29: Ground Nut, Bolt And Connectors

Courtesy of GENERAL MOTORS COMPANY

7. Install the ground nut (1) and ground wire. Tighten the fastener to 9 N.m (80 lb in).
8. Install the ground bolt (2) and ground wire. Tighten the fastener to 9 N.m (80 lb in).
9. Clip and Connect the I/P main harness connector (3).
10. Connect the coax antenna connectors (4).
11. Clip the passenger side DLC connector (5).
12. Connect the passenger side airbag connector (6).

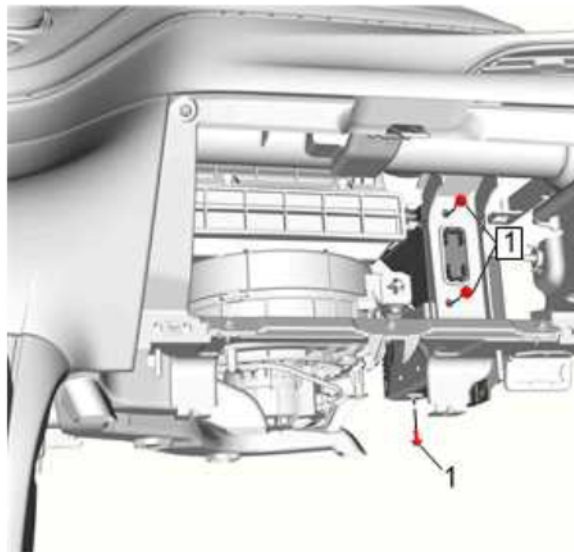


Fig. 30: Radio Assembly Bolts

Courtesy of GENERAL MOTORS COMPANY

13. Install and tighten Radio Assembly Bolts (1) to 2.5 N.m (22 lb in)

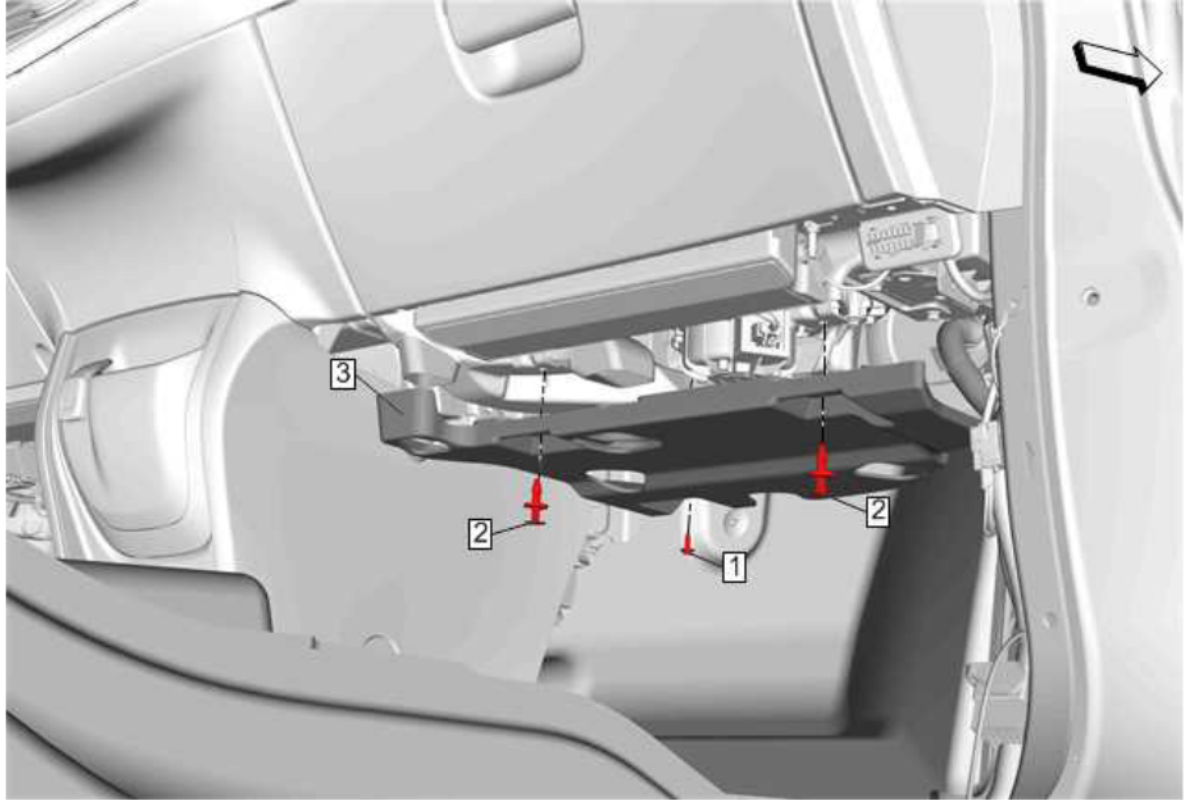


Fig. 31: Instrument Panel Lower Trim Panel Insulator

Courtesy of GENERAL MOTORS COMPANY

14. Install Instrument Panel Lower Trim Panel Insulator (3). Refer to [Instrument Panel Lower Trim Panel Insulator Replacement](#)

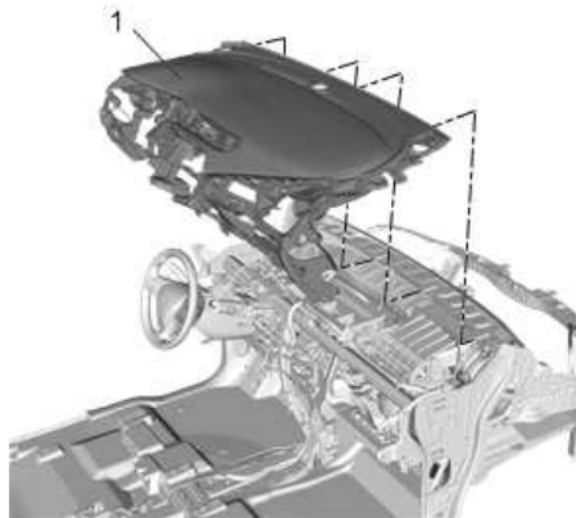


Fig. 32: Instrument Panel Assembly

Courtesy of GENERAL MOTORS COMPANY

15. Install Instrument Panel Assembly (1). Refer to [Instrument Panel Assembly Replacement](#)
16. Connect Battery Negative Cable. Refer to [Battery Negative Cable Disconnection and Connection](#)

DRIVER INFORMATION DISPLAY REPLACEMENT

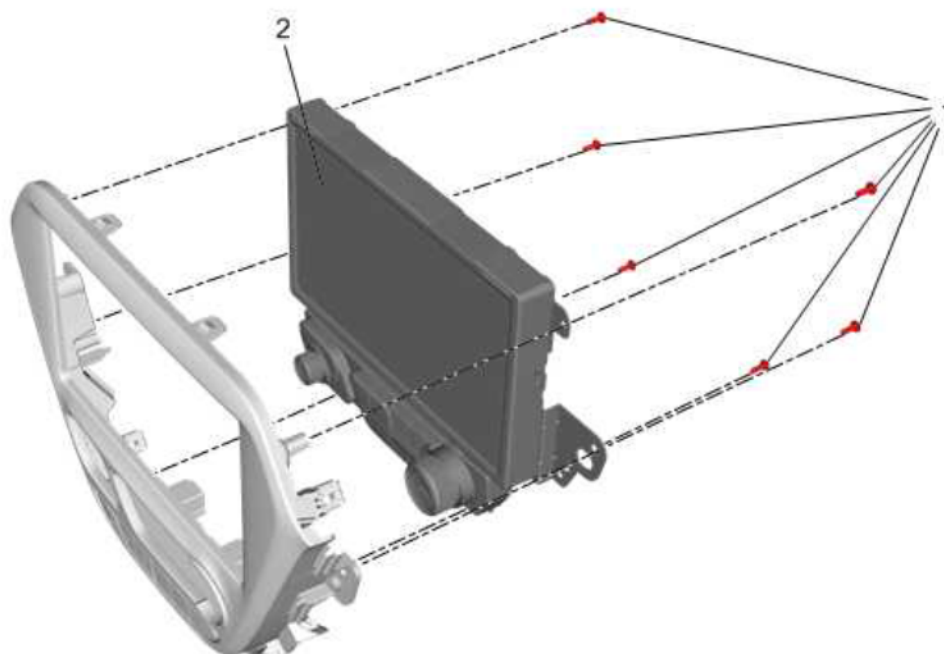


Fig. 33: Driver Information Display
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Instrument Panel Trim Plate. Refer to Instrument Panel Trim Plate Replacement	
1	Driver Information Display Bolt (Qty: 6) CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Driver Information Display Procedure 1. Transfer components as necessary. 2. Refer to Control Module References for programming and setup procedures, if required.

AUDIO DISC PLAYER AND USB RECEPTACLE REPLACEMENT

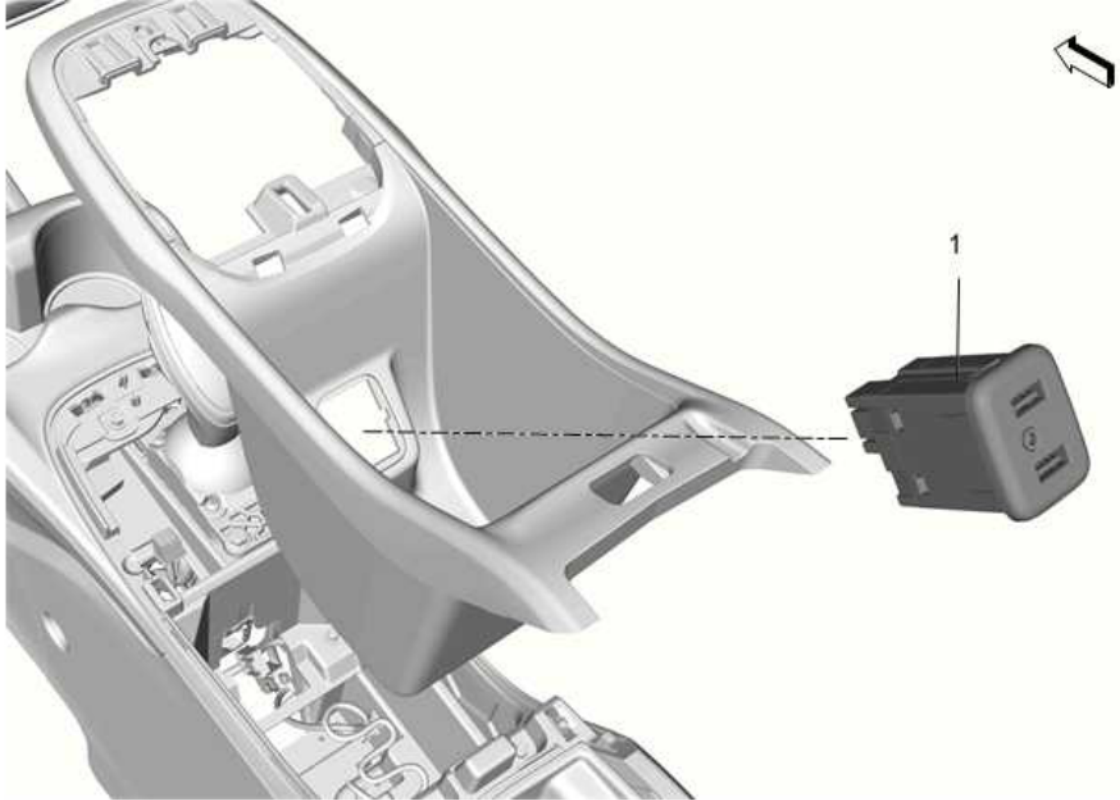


Fig. 34: Audio Disc Player and USB Receptacle

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Rear Floor Console Stowage Tray. Refer to Rear Floor Console Stowage Tray Replacement (without K4C) Rear Floor Console Stowage Tray Replacement (with K4C)	
1	Audio Disc Player and USB Receptacle Procedure Use a flat bladed plastic trim tool.

RADIO SPEAKER AMPLIFIER REPLACEMENT

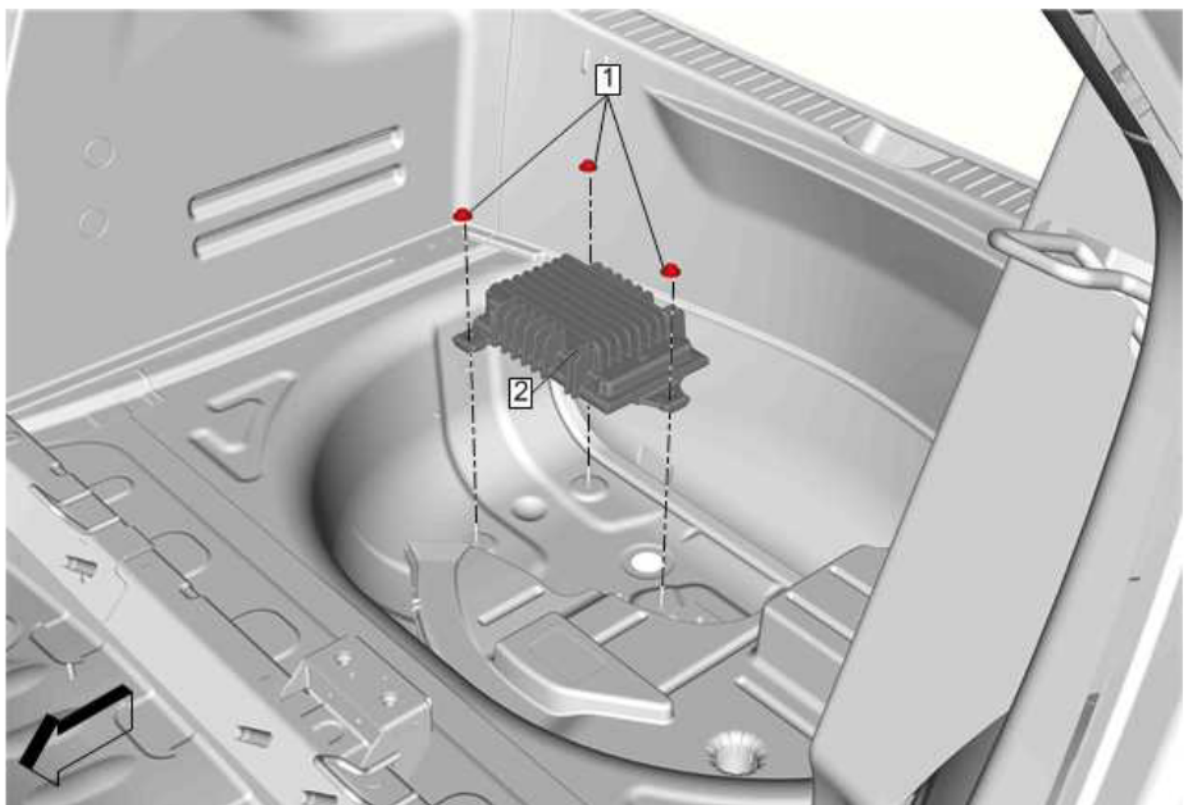


Fig. 35: Radio Speaker Amplifier

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Load Floor Trim Panel. Refer to Load Floor Trim Panel Replacement	
1	Radio Speaker Amplifier Nut (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
2	Radio Speaker Amplifier Procedure 1. Disconnect all electrical connectors. 2. Refer to Control Module References for programming and setup information, if required.

RADIO ANTENNA AMPLIFIER REPLACEMENT

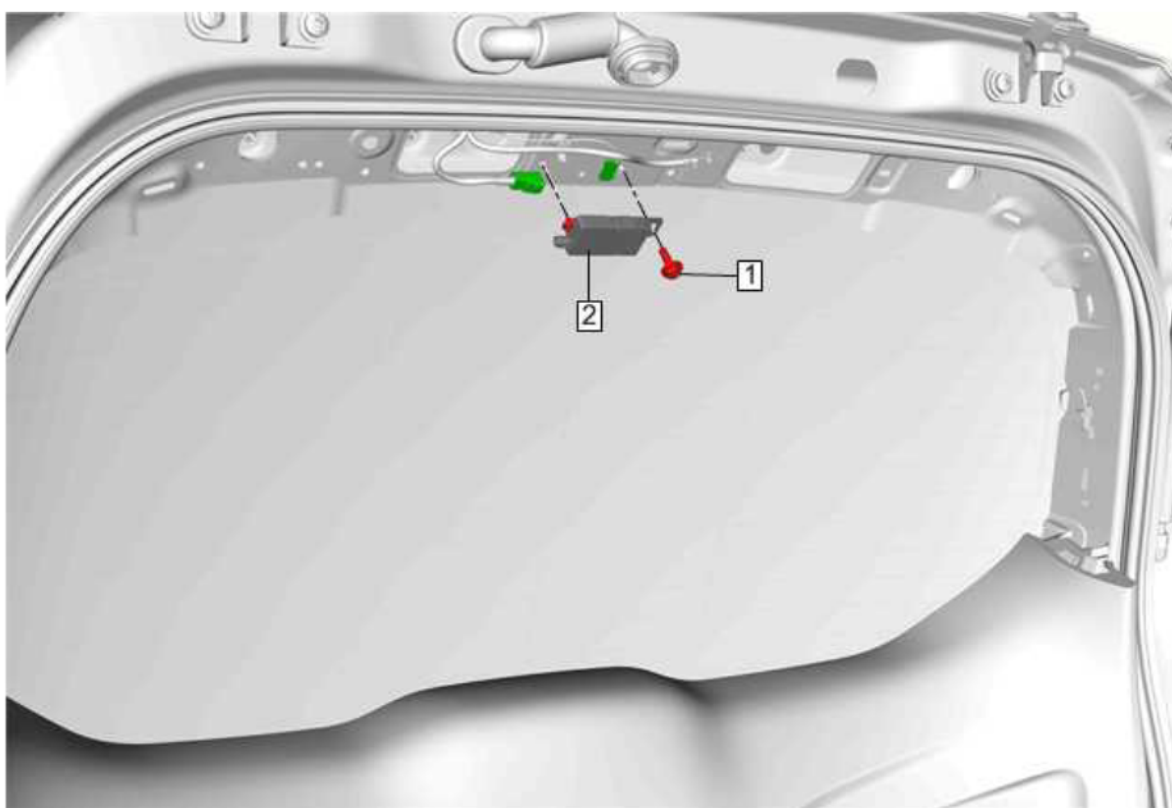


Fig. 36: Radio Antenna Amplifier

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Liftgate Upper Center Trim Finish Panel. Refer to Liftgate Upper Center Trim Finish Panel Replacement	
1	Radio Antenna Amplifier Bolt CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
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Callout	Component Name
2	Radio Antenna Amplifier
	Procedure 1. Disconnect the electrical connectors. 2. Release the integral retainer using an appropriate trim tool.

ROOF ACCESSORY RADIO ANTENNA CABLE REPLACEMENT

Removal Procedure

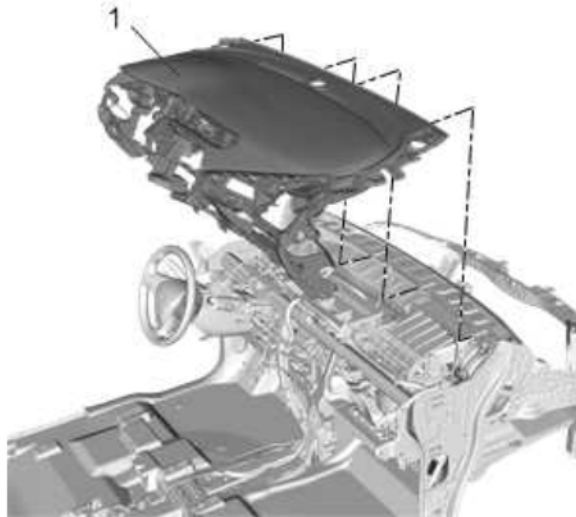


Fig. 37: Instrument Panel Assembly

Courtesy of GENERAL MOTORS COMPANY

1. Remove Instrument Panel Assembly (1). Refer to [Instrument Panel Assembly Replacement](#)

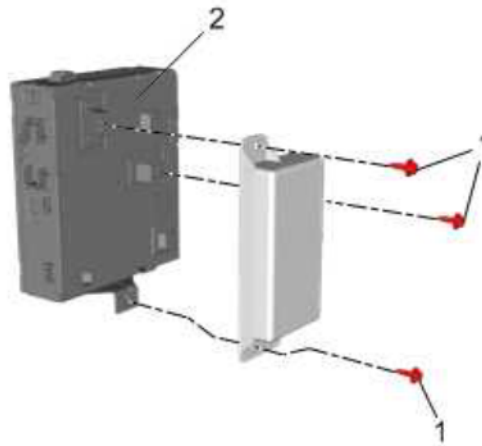


Fig. 38: Radio Assembly And Bolts

Courtesy of GENERAL MOTORS COMPANY

2. Remove Radio (2). Refer to [Radio Replacement](#)

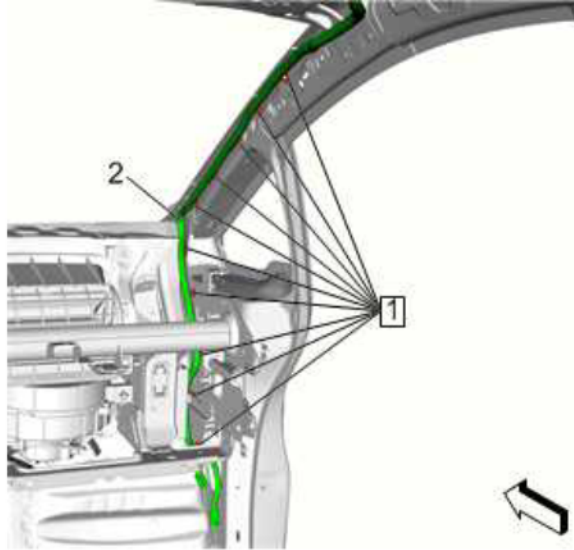


Fig. 39: Roof Accessory Radio Antenna Cable And Retaining Clips
 Courtesy of GENERAL MOTORS COMPANY

3. Detach the cable retaining clips (1) from the vehicle.
4. Remove the roof accessory radio antenna cable (2).

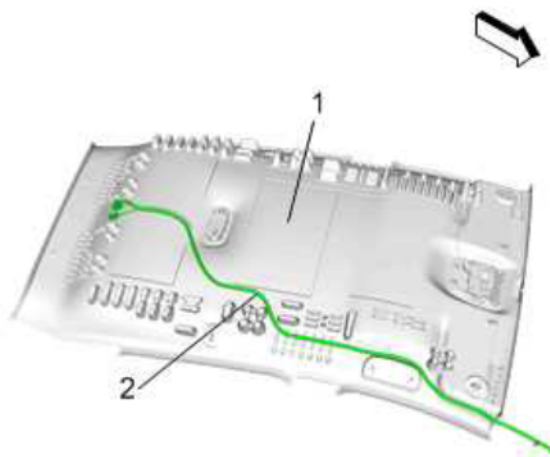


Fig. 40: Roof Accessory Radio Antenna Cable And Headlining Trim Panel
 Courtesy of GENERAL MOTORS COMPANY

5. Lower Headlining Trim Panel (1). Refer to [Headlining Trim Panel Replacement](#)
6. Detach the antenna cable (2) from the headlining trim panel.

Installation Procedure

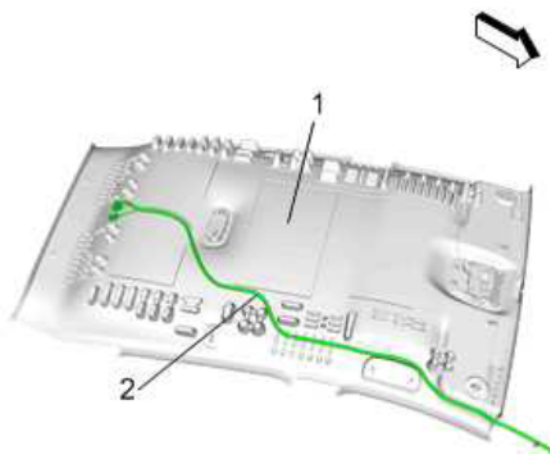


Fig. 41: Roof Accessory Radio Antenna Cable And Headlining Trim Panel
Courtesy of GENERAL MOTORS COMPANY

1. Attach the antenna cable (2) to the headlining trim panel using the glue.
2. Install Headlining Trim Panel (1). Refer to [Headlining Trim Panel Replacement](#)

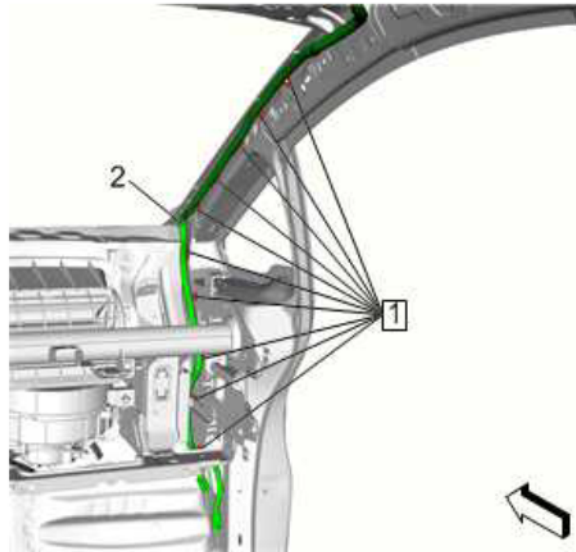


Fig. 42: Roof Accessory Radio Antenna Cable And Retaining Clips
Courtesy of GENERAL MOTORS COMPANY

3. Install the roof accessory radio antenna cable (2).
4. Attach the cable retaining clips (1) to the vehicle.

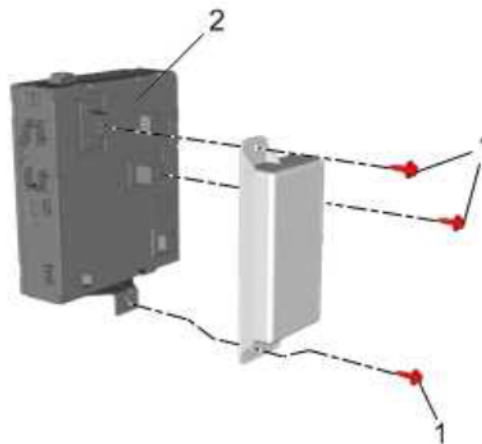


Fig. 43: Radio Assembly And Bolts
Courtesy of GENERAL MOTORS COMPANY

5. Install Radio (2). Refer to [Radio Replacement](#)

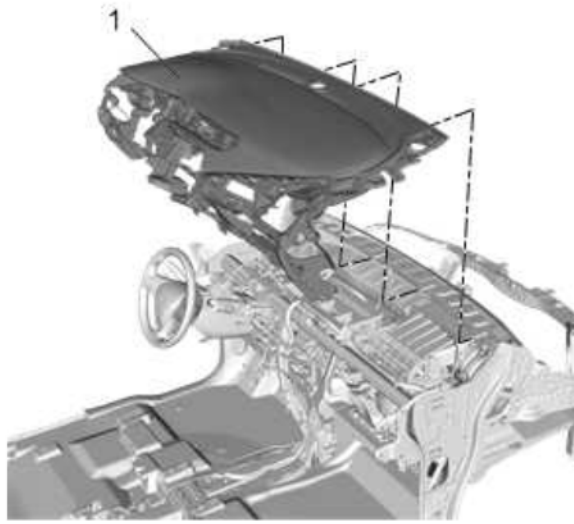


Fig. 44: Instrument Panel Assembly
 Courtesy of GENERAL MOTORS COMPANY

6. Install Instrument Panel Assembly (1). Refer to [Instrument Panel Assembly Replacement](#)

RADIO FRONT SPEAKER GRILLE REPLACEMENT

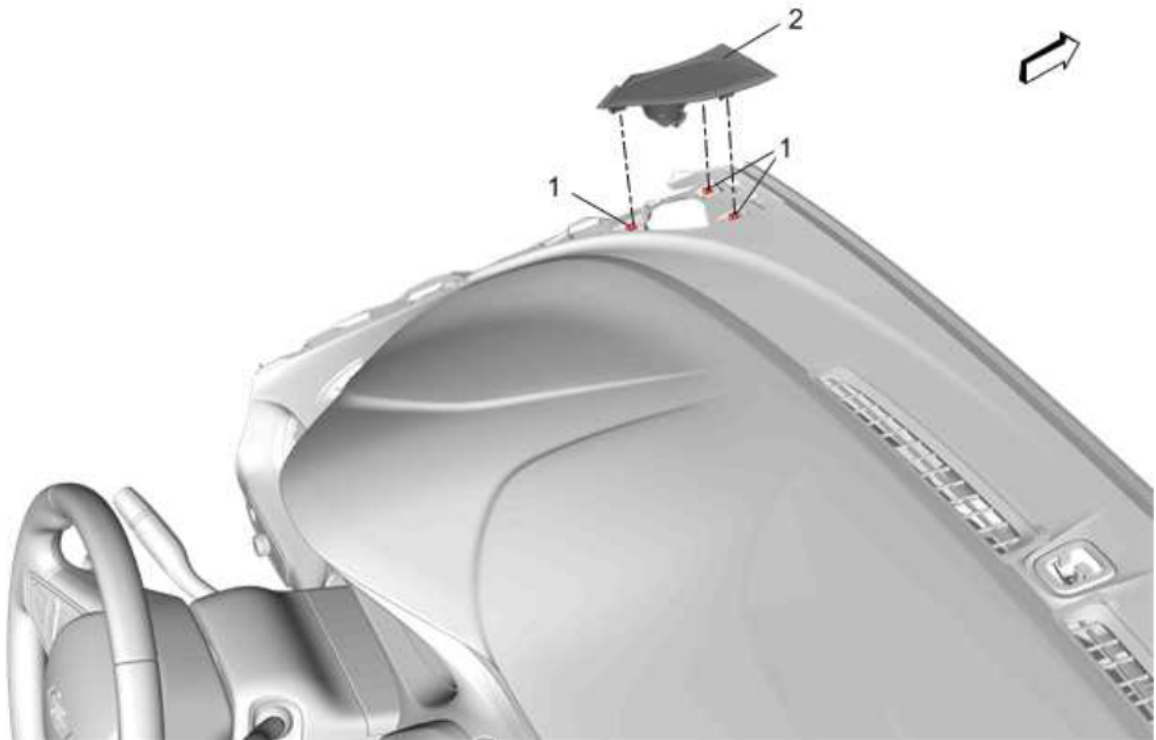


Fig. 45: Radio Front Speaker Grille
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove Windshield Garnish Molding. Refer to Windshield Garnish Molding Replacement	
1	Radio Front Speaker Grille Clip (Qty: 3)
2	Radio Front Speaker Grille
	Procedure
	1. Use a flat bladed plastic tool to remove.
	2. Disconnect the electrical connector.
	3. Transfer components as necessary.

RADIO WINDSHIELD SIDE GARNISH MOLDING SPEAKER REPLACEMENT



Fig. 46: Radio Windshield Side Garnish Molding Speaker

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove Radio Front Speaker Grille. Refer to Radio Front Speaker Grille Replacement	
1	Radio Windshield Side Garnish Molding Speaker Procedure 1. Use a flat bladed plastic trim tool. 2. Release the retaining tabs.

HIGH FREQUENCY ANTENNA REPLACEMENT

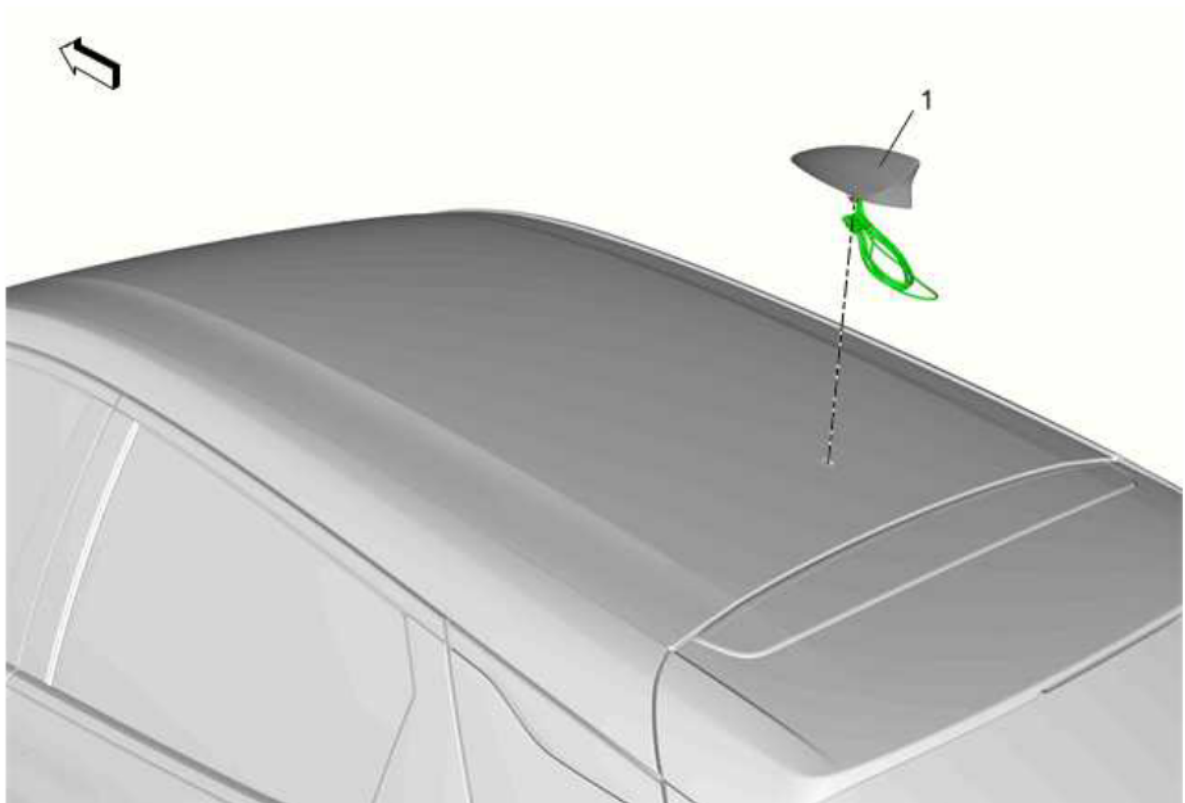


Fig. 47: High Frequency Antenna

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Lower the headlining trim panel. Refer to Headlining Trim Panel Replacement	
NOTE: Only perform those steps that will lower the headlining trim panel enough to gain access to the part.	
1	High Frequency Antenna CAUTION: Refer to Fastener Caution . Procedure 1. Remove the bolt. 2. Disconnect the electrical connectors. 3. Disconnect the antenna cables. 4. Release the retaining features and feed the wiring and cable up through the hole in the roof panel. 5. Ensure that the antenna is straight while tightening. Tighten 9 N.m (80 lb in)

RADIO FRONT SIDE DOOR SPEAKER REPLACEMENT

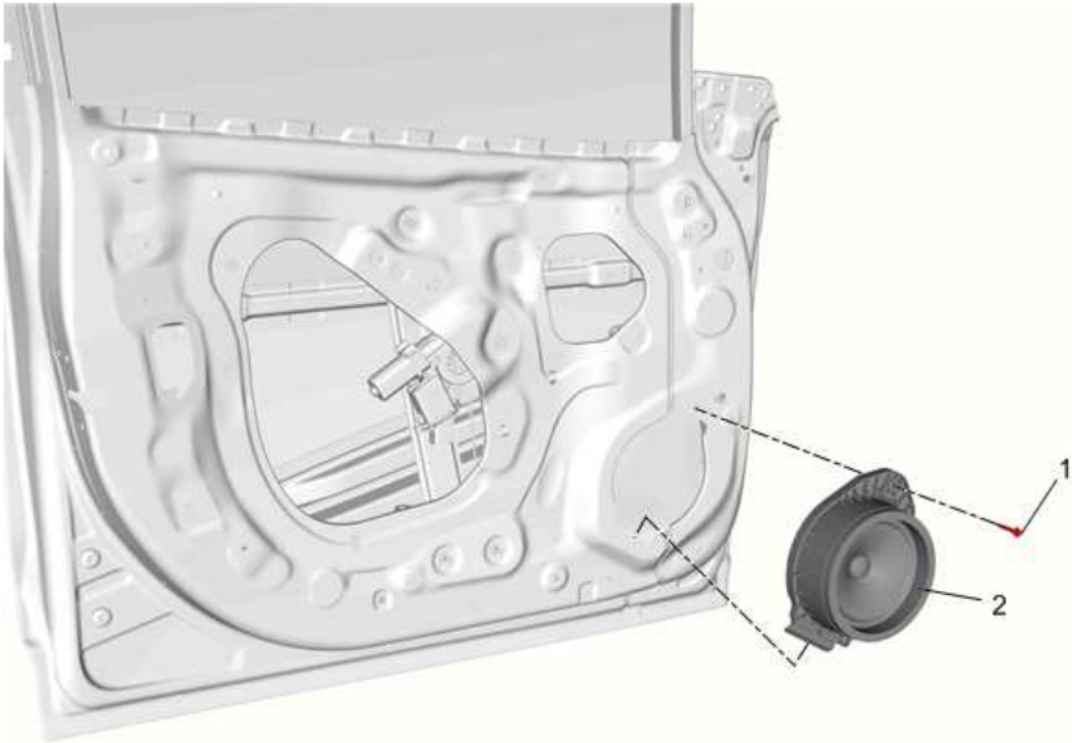


Fig. 48: Radio Front Side Door Speaker
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Front Side Door Trim. Refer to Front Side Door Trim Replacement	
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Callout	Component Name
1	Radio Front Side Door Speaker Fastener CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Radio Front Side Door Speaker Procedure 1. Disconnect the electrical connector. 2. Unclip and reposition the wiring harness.

RADIO CONTROL SWITCH REPLACEMENT - STEERING WHEEL (LEFT SIDE LOWER)

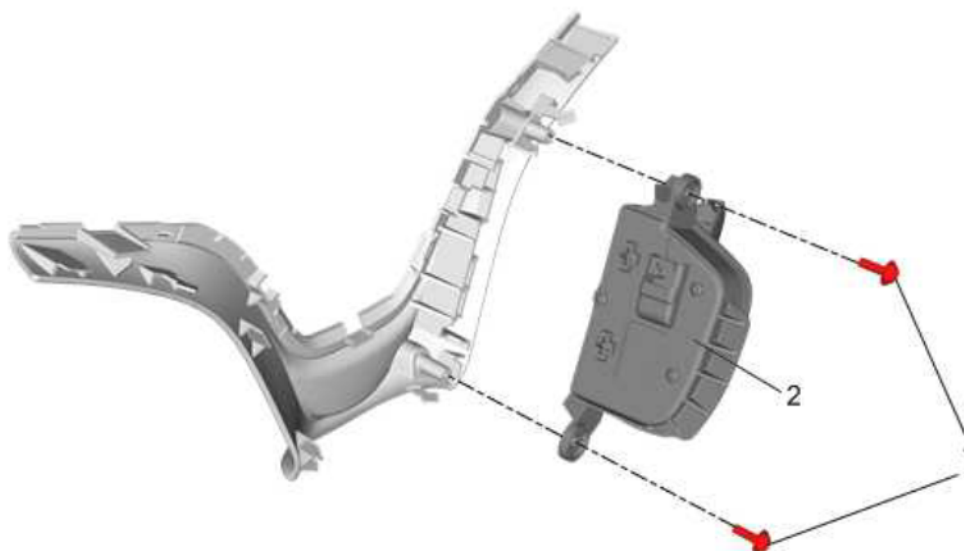


Fig. 49: Radio Control Switch - Steering Wheel (Left Side Lower)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove Steering Wheel Spoke Cover. Refer to Steering Wheel Spoke Cover Replacement 2. Remove Steering Wheel Spoke Lower Cover. Refer to Steering Wheel Spoke Lower Cover Replacement	
1	Radio Control Switch Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 1.5 N.m (13 lb in)
2	Radio Control Switch

RADIO CONTROL SWITCH REPLACEMENT - STEERING WHEEL (LEFT SIDE REAR)

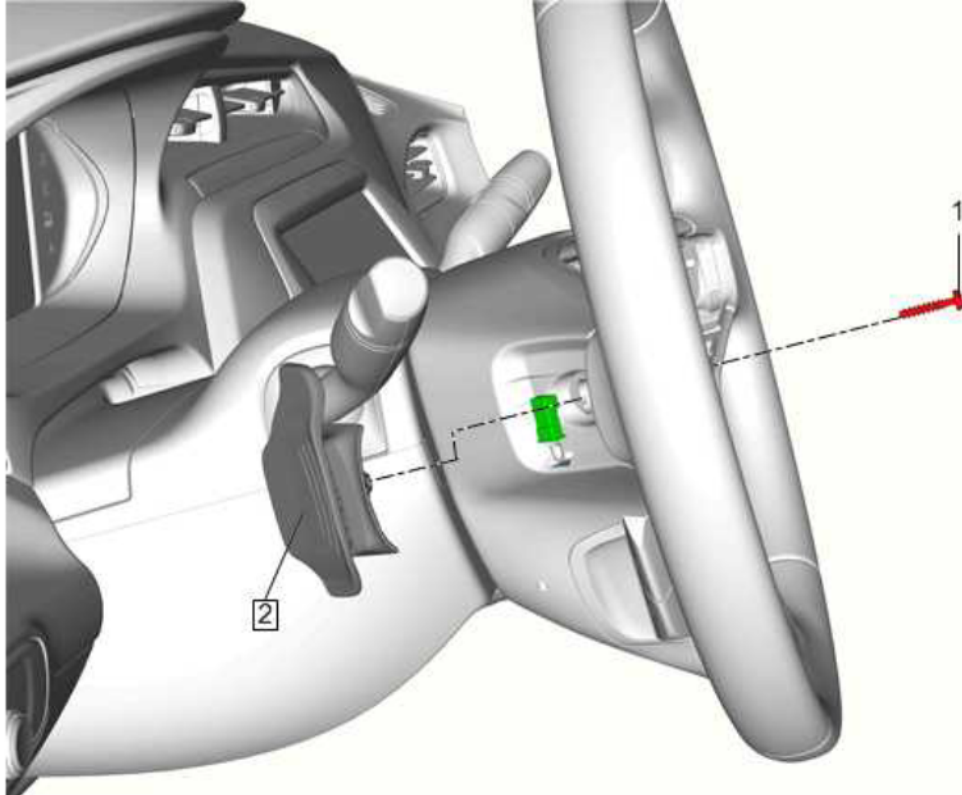


Fig. 50: Radio Control Switch - Steering Wheel (Left Side Rear)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Steering Wheel Spoke Cover. Refer to Steering Wheel Spoke Cover Replacement	
1	Radio Control Switch Bolt CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Radio Control Switch Procedure Disconnect the electrical connector.

RADIO CONTROL SWITCH REPLACEMENT - STEERING WHEEL (RIGHT SIDE FRONT)

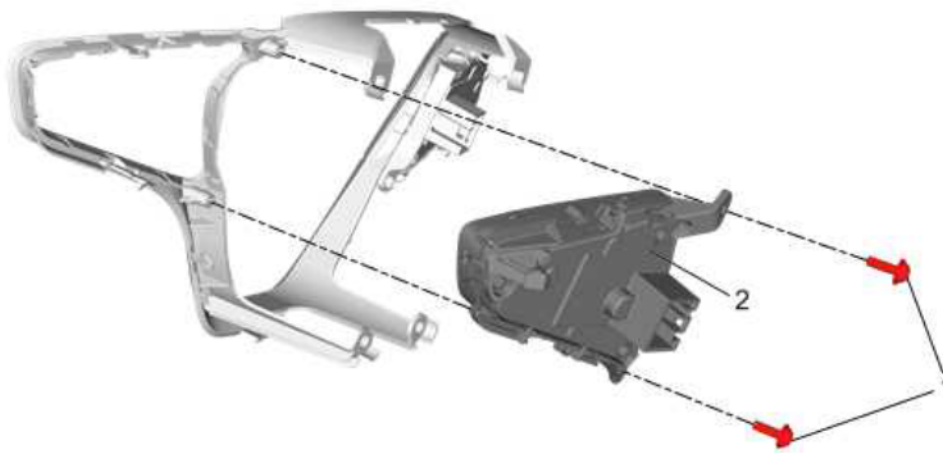


Fig. 51: Radio Control Switch - Steering Wheel (Right Side Front)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Steering Wheel Spoke Cover. Refer to Steering Wheel Spoke Cover Replacement	
1	Radio Control Switch Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 1.5 N.m (13 lb in)
2	Radio Control Switch Procedure Remove the radio control switch from the steering wheel spoke cover.

RADIO CONTROL SWITCH REPLACEMENT - STEERING WHEEL (RIGHT SIDE REAR)

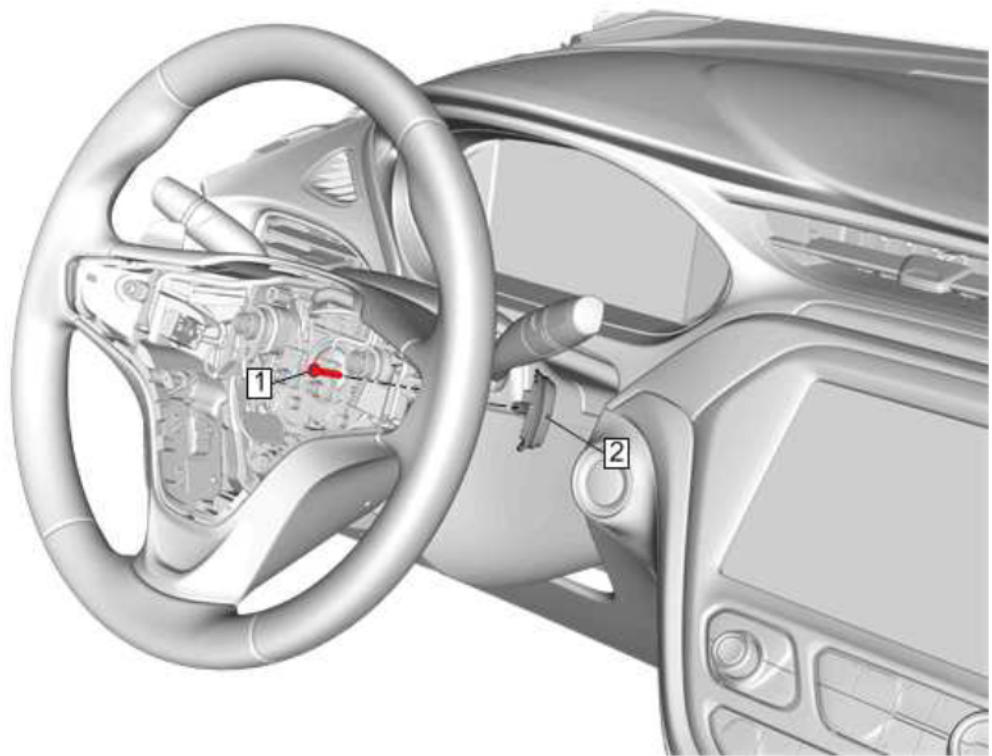


Fig. 52: Radio Control Switch - Steering Wheel (Right Side Rear)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Steering Wheel Spoke Cover. Refer to Steering Wheel Spoke Cover Replacement	
1	Radio Control Switch Bolt CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Radio Control Switch Procedure Disconnect the electrical connector.

RADIO REAR SIDE DOOR SPEAKER REPLACEMENT

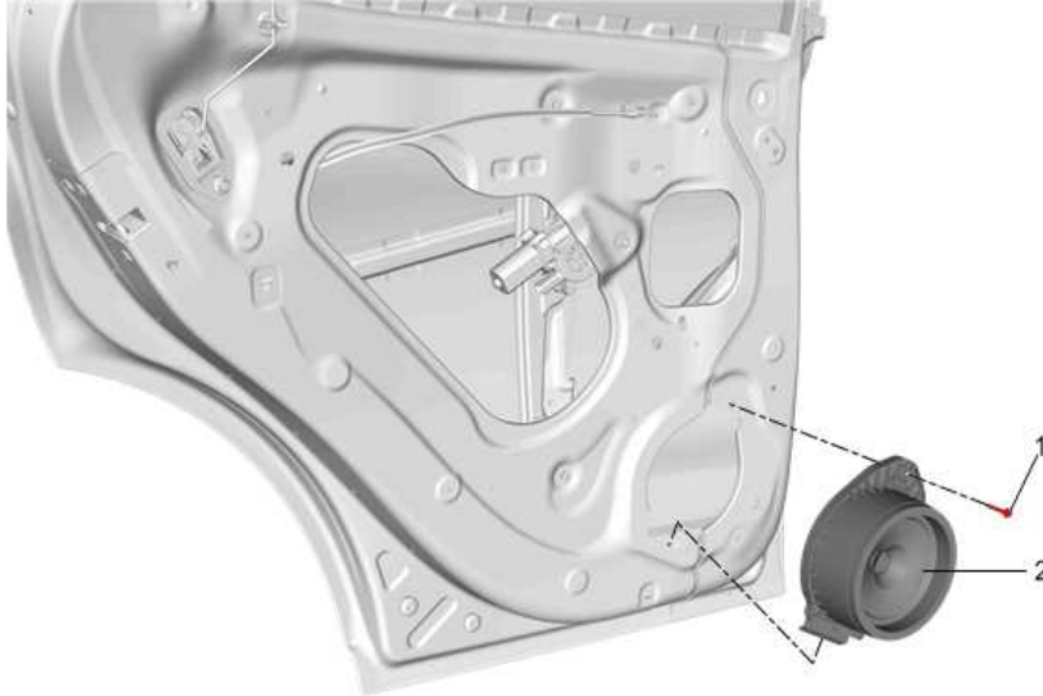


Fig. 53: Radio Rear Side Door Speaker

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Rear Side Door Trim. Refer to Rear Side Door Trim Replacement	
1	Radio Rear Side Door Speaker Fastener CAUTION: Refer to Fastener Caution . Tighten 2.5 N.m (22 lb in)
2	Radio Rear Side Door Speaker Procedure Disconnect the electrical connector.

RADIO REAR COMPARTMENT SPEAKER REPLACEMENT

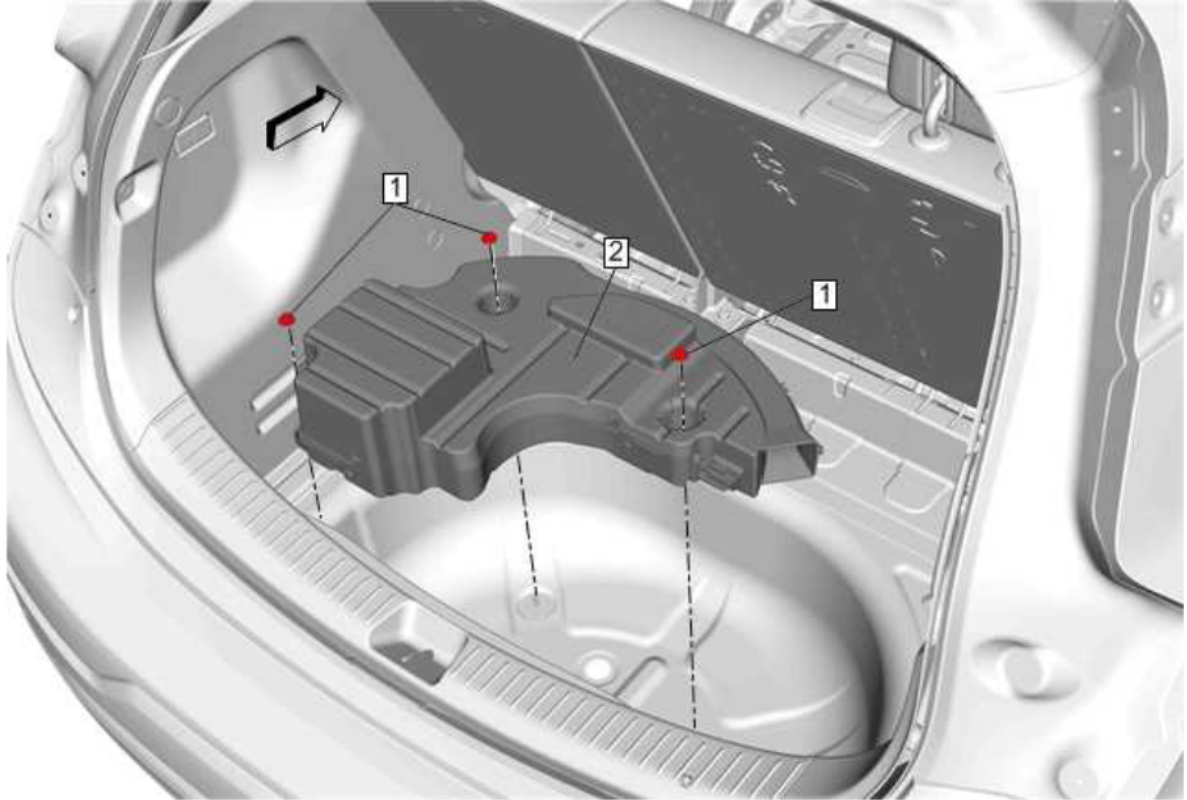


Fig. 54: Radio Rear Compartment Speaker
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Load Floor Trim Panel. Refer to Load Floor Trim Panel Replacement	
1	Radio Rear Compartment Speaker Fastener (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 6 N.m (53 lb in)
2	Radio Rear Compartment Speaker Procedure 1. Unclip the wiring harness. 2. Disconnect the electrical connector. 3. Transfer components as necessary.

INSTRUMENT PANEL CENTER ACCESSORY FUNCTION SWITCH REPLACEMENT

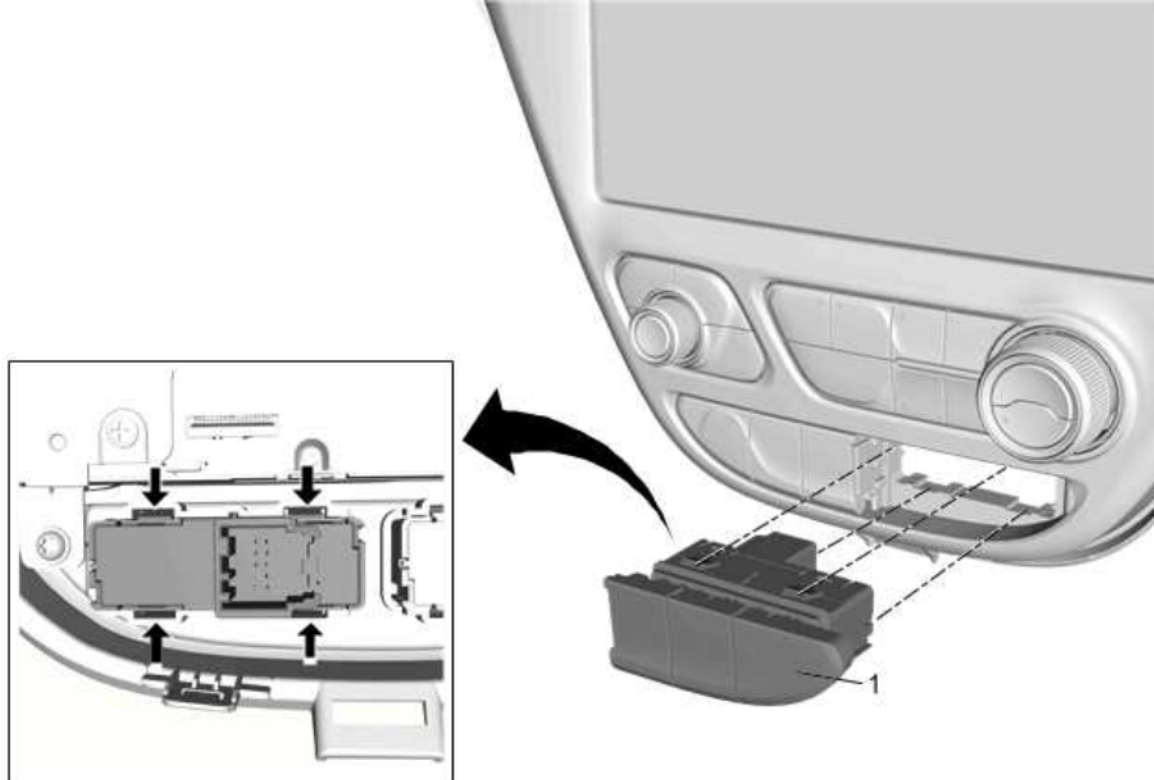


Fig. 55: Instrument Panel Center Accessory Function Switch

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Remove Instrument Panel Trim Plate. Refer to Instrument Panel Trim Plate Replacement	
1	Instrument Panel Center Accessory Function Switch Procedure Release the tabs and remove the switch.

DESCRIPTION AND OPERATION

ONSTAR DESCRIPTION AND OPERATION (UE3)

This OnStar[®] system consists of the following components:

- Telematics communication interface control module
- OnStar[®] three button assembly
- Microphone
- Cellular antenna
- Navigation antenna
- Back up battery (If equipped)

This system also interfaces with the factory installed vehicle audio system.

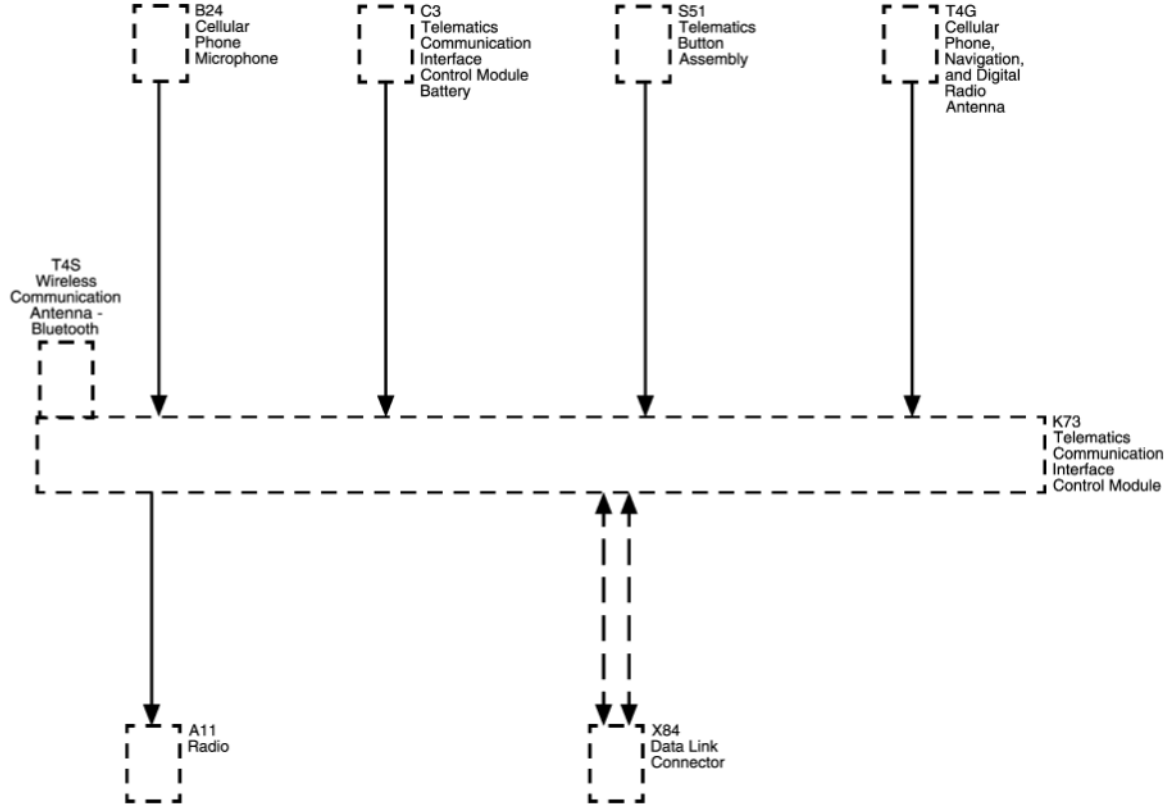


Fig. 56: OnStar System Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
B24	B24 Cellular Phone Microphone
C3	C3 Telematics Communication Interface Control Module Battery
S51	S51 Telematics Button Assembly
T4G	T4G Cellular Phone, Navigation, and Digital Radio Antenna
T4S	T4S Wireless Communication Antenna - Bluetooth
K73	K73 Telematics Communication Interface Control Module
A11	A11 Radio
X84	X84 Data Link Connector

Telematics Communication Interface Control Module

The telematics communication interface control module is a cellular device that allows the user to communicate data and voice signals over the national cellular network. Power is provided by a dedicated, fused B+ circuit. Ground is provided through the vehicle wiring harness attached to the module. The ignition state is determined by the telematics communication interface control module through serial data messaging.

Dedicated circuits are used to connect the telematics communication interface control module to a microphone, the button assembly, and to command the status LED. The telematics communication interface control module communicates with the rest of the vehicle over the serial data bus.

The module houses 2 technology systems, one to process GPS data, and another for cellular information. The cellular system connects the OnStar[®] system to the cellular carrier's communication system by interacting with the national cellular infrastructure. The module sends and receives all cellular communications over the cellular antenna and cellular antenna coax. GPS satellites orbiting earth are constantly transmitting signals of their current location. The OnStar[®] system uses the GPS signals to provide location on demand.

The module also has the capability of activating the horn, initiating door lock/unlock, or activating the exterior lamps using the serial data circuits. These functions can be commanded by the OnStar[®] Call Center per a customer request.

OnStar[®] Three Button Assembly

The OnStar[®] button assembly may be part of the rearview mirror, or a separate, stand alone unit. The button assembly is comprised of 3 buttons and a status LED. The buttons are defined as follows:

- The answer/end call button, which is black with a white phone icon, allows the user to answer and end calls or initiate speech recognition.
- The blue OnStar[®] call center button, which displays the OnStar[®] logo, allows the user to connect to the OnStar[®] call center.
- The emergency button, which displays a white cross with a red background, sends a high priority emergency call to the OnStar[®] call center when pressed.

The telematics communication interface control module supplies 10 volts to the OnStar[®] button assembly on the keypad supply voltage circuit. When pressed, each button completes a circuit across a resistor allowing a specific voltage to be returned to the telematics communication interface control module on the keypad signal circuit. Depending upon the voltage range returned the telematics communication interface control module is able to identify which button has been pressed.

The OnStar[®] status LED is located with the button assembly. The LED is green when the system is ON and operating normally. When the status LED is green and flashing, it is an indication that a call is in progress. When the LED is red, this indicates a system malfunction is present. In the event there is a system malfunction and the OnStar[®] system is still able to make a call, the LED will flash red during the call.

If the LED does not illuminate, this may indicate that the customers OnStar[®] subscription is not active or has expired. Push the blue OnStar button to connect to an advisor who can then verify the account status.

Each LED is controlled by the telematics communication interface control module over dedicated LED signal circuits. Ground for the LED is provided by the wiring harness attached to the button assembly.

Secondary OnStar[®] Controls

Some vehicles may have an additional button that when pushed can engage the OnStar[®] system. The button may be a symbol of a face with sound waves, or may say MUTE, or be a symbol of a radio speaker with a slash through it.

By engaging the OnStar[®] system with this feature, the user can interact with the system by use of voice commands. A complete list of these commands is supplied in the information provided to the customer. If the information is not available for reference, at any command prompt the user can say "HELP" and the telematics communication interface control module will return an audible list of available commands.

OnStar[®] Microphone

The OnStar[®], or cellular microphone, can be a part of the rearview mirror assembly, or on some vehicle lines, a separate, stand alone unit. In either case, the telematics communication interface control module supplies approximately 10 volts to the microphone on the cellular microphone signal circuit, and voice data from the user is sent back to the telematics communication interface control module over the same circuit. A cellular microphone low reference circuit or a drain wire provides a ground for the microphone.

Cellular and GPS Antennas

This vehicle will be equipped with one of the following types of antennas:

- A combination cellular and navigation antenna, which brings the functions of both into a single part
- A cellular, GPS, and digital radio receiver antenna, which also incorporates the functionality of the digital radio receiver satellite antenna (XM).
- A cellular, GPS, and digital radio receiver antenna, which also incorporates the AM/FM antenna.

The cellular antenna is the component that allows the OnStar[®] system to send and receive data over airwaves by means of cellular technology. The antenna is connected at the base to a coax cable that plugs directly into the telematics communication interface control module.

The GPS antenna is used to collect the signals of the orbiting GPS satellites. Within the antenna is housed a low noise amplifier that allows for a more broad and precise reception of this data. The antenna is connected at the base to a coax cable that plugs directly into the telematics communication interface control module. The cable also provides a path for DC current for powering the antenna.

The OnStar[®] Call Center also has the capability of communicating with the vehicle during an OnStar[®] call to retrieve the latest GPS location and transmit it to the OnStar[®] Call Center. A history location of the last

recorded position of the vehicle is stored in the module and marked as aged, for as long as the module power is not removed. Actual GPS location may take up to 10 minutes to register in the event of a loss of power.

OnStar® RemoteLink

OnStar® RemoteLink is a mobile app to link mobile devices to a vehicle for limited diagnostics and feature controls. After downloading the app and registering the device, vehicle owners with an eligible vehicle can use their mobile devices to access real-time data from their vehicle and perform specific commands remotely.

All communication between the app and the vehicle is powered by OnStar's® advanced connected vehicle technology. An active OnStar® account as well as a valid OnStar® username and password are required to use the app. The remote commands must be enabled by logging into the user's OnStar® account prior to using the app.

Vehicle Control Features

- Lock/Unlock doors
- Start vehicle remotely
- Activate your Horn & Lights
- Contact an OnStar Advisor, Roadside Assistance or your Preferred Dealer

Available Vehicle Data:

- Real-time fuel information, including fuel range, fuel remaining, and lifetime MPG
- Lifetime mileage
- Remaining oil life
- Current tire pressure information
- OnStar® account information

Compass Heading

The telematics communication interface module has a compass feature to calculate vehicle direction which is displayed via the instrument panel cluster or designated display. The compass heading is determined by dead reckoning until the GPS 3d fix is established. The dead reckoning is accomplished by using the yaw rate sensors and wheel ticks to determine heading changes from a GPS known heading. The GPS 3d fix heading is determined by the deferential of two locations.

Back-up Battery (If Equipped)

IMPORTANT: Do not disconnect the main vehicle battery or remove the OnStar® fuse with the ignition key in any position other than OFF. Disconnecting power to the OnStar® module in any way while the ignition is ON or with retained accessory power activated may cause activation of the OnStar® Back-Up Battery. This action is per design as the back-up battery is designed to provide power to the telematics communication interface control module so an emergency notification call can be made after an event where the main battery is disabled. Once the Back-Up Battery is activated it will stay on until the power is restored back to the telematics communication interface control module. The telematics communication interface control module naturally chooses the main supply voltage as it's default supply, but if the main supply is removed or lost for any reason the OnStar® module will use the Back-Up Battery as a power supply as long as the default supply can not be detected. The back-up battery is not rechargeable and once discharged below 9.5 volts the back-up battery must be replaced.

Certain OnStar® equipped vehicles may also be equipped with a back-up battery. The back-up battery is a non-rechargeable, lithium battery intended to provide an auxiliary power source for the telematics communication interface control module in the event where power from the main vehicle battery is lost.

The back-up battery is intended to have a limited life span of approximately 4 years and is designed to maintain an open circuit voltage between 16 V and 9 V throughout this period. This allows the battery to power the basic functions of the telematics communication interface control module for least one 200 second (5 minute) call at the end of the 4 year span, should the main vehicle battery be lost. In the case of a vehicle losing vehicle battery power, OnStar will switch over to the backup battery based on an internal algorithm. It will look for an air-bag deploy, or near-deploy, messages from the SDM. If there are no messages the OnStar module will stay wake for a few minutes longer and monitor the buttons in the mirror. If not pressed, the modules will power down and shut off completely.

The back-up battery is connected to the telematics communication interface control module through the back-up battery positive voltage circuit and back-up battery ground circuit and is protected from a short circuit by means of an internal fuse. In the event the back-up battery, battery positive voltage circuit is shorted to the back-up battery ground circuit or chassis ground, the fuse will open and render the back-up battery permanently inoperable. The status of the back-up battery and its associated wiring is monitored by the telematics communication interface control module.

Audio System Interface

When the OnStar[®] requires audio output, a serial data message is sent to the audio system to mute all radio functions and transmit OnStar[®] originated audio. The OnStar[®] audio is transmitted to the vehicle audio system by a dedicated signal circuit and a low reference circuit.

The audio system will mute and an audible ring will be heard through the speakers if the vehicle receives a call with the radio ON.

On some vehicles, the HVAC blower speed may be reduced when the OnStar[®] system is active to aid in reducing interior noise. When the system is no longer active, the blower speed will return to its previous setting.

OnStar[®] Sleep Cycle

The OnStar[®] system uses a unique sleep cycle to allow the system to receive cellular calls while the ignition is in the OFF position and retained accessory power mode has ended. This cycle enables the telematics communication interface control module to perform remote functions, such as door unlock, as commanded over the air by the OnStar[®] Call Center, and to continue to maintain an acceptable level of battery electrical drain.

The OnStar[®] system uses 4 states of readiness, depending upon the type of cellular market the vehicle is in when the ignition is put into the OFF state:

- High power
- Low power
- Sleep
- Digital standby

The high power state is in effect whenever the ignition is in the ON or RUN position, or retained accessory power is enabled, and the OnStar[®] system is sending or receiving calls or when the system is performing a remote function.

The low power state is in effect when the OnStar[®] system is idle with the ignition in the ON or RUN position, or with retained accessory power enabled.

The sleep state is entered after the vehicle has been shut off and the retained accessory power has timed out while in an analog cellular area. At a predetermined time recorded within the telematics communication interface control module, the system re-enters the low power state to listen for a call from the OnStar[®] Call Center for 1 minute. After this interval, the system will again return to the sleep state for 9 minutes. If a call is sent during the 1 minute interval, the OnStar[®] system will receive the call and immediately go into the high power mode to perform any requested functions. If no call is received during the 1 minute interval, the system will go back into the sleep mode for another 9 minutes. This process will continue for up to 48 hours, after which the OnStar[®] system will turn off until the ignition is turned to the ON or RUN position.

The digital standby power state is entered after the vehicle has been shut off and the retained accessory power has timed out while in a digital cellular area. When in digital standby mode, the OnStar[®] module is able to perform all remote functions as commanded by an OnStar[®] advisor at any time, for a continuous 120 hours. After 120 hours, the OnStar[®] module will go into sleep mode until a wake up signal from the vehicle is seen by the telematics communication interface control module. If the OnStar module loses the digital cellular signal it will revert to analog mode and follow the standard sleep state (9 minutes OFF, 1 minute standby) based on the time of the GPS signals, this will continue until a digital cellular signal is again received.

If the OnStar[®] system loses battery power while the system is in a standby or sleep mode, the system will remain OFF until battery power is restored and the ignition is turned to the ON or RUN position.

Features

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OnStar[®] Personal Calling

The hands free, OnStar[®] personal calling cellular phone feature is an additional feature of the OnStar[®] system. This feature is embedded within the telematics communication interface control module; however it must be activated by an OnStar[®] advisor. OnStar[®] personal calling operates similar to most hand held cellular phones in that the availability for its usage is based on minutes or units. The customer must have a current OnStar[®] subscription, as this feature cannot be utilized without it. To use OnStar[®] personal calling, the customer must also purchase units (minutes) as outlined in the owners guide provided with the OnStar[®] system. Units begin to deplete, 1 unit is equal to 1 minute, as the customer makes outbound phone calls, answers inbound phone calls, or while connected to the OnStar[®] virtual advisor. In addition, units may also have an expiration date, depending upon the type of units purchased.

Customers have the ability to store telephone numbers within the module, referenced by a nametag for the convenience of frequently dialed numbers. After storing a nametag, the user can dial this number by initiating the OnStar[®] personal calling feature, speaking the word "call," and repeating the nametag assigned.

Turn by Turn Navigation

Turn by Turn Navigation allows the driver to contact OnStar[®] to obtain directions for driving from a current location to a desired location. The Turn by Turn Navigation system stores your planned route and continually checks your position along that route, when you deviate from the planned route, the system will recognize this and prompt the driver with verbal prompts for how to proceed. The driver then responds verbally to direct the system to continue the current routing or to recalculate the route because of a missed turn.

Advisor Record Feature

The Advisor Record Feature allows the user to store any information given during a call with an OnStar[®] Advisor. Recording is activated by pressing the blue OnStar button during a call; pressing the button a second time stops the recording. The stored information can be played back by pressing the phone button on the three button assembly and using the voice command "Advisor Playback".

Deactivated OnStar[®] Accounts

In the event a customer has not renewed their OnStar[®] account after expiration or the account was never activated, OnStar[®] will make a discrete cellular call to the vehicle to deactivate the OnStar[®] system. Before taking this action, customers are notified that the OnStar[®] system in their vehicle will be deactivated unless they elect to renew the account. After the OnStar[®] account has been deactivated, customers will experience the following:

- The OnStar[®] status LED will not illuminate.
- The OnStar[®] system will NOT attempt to connect to the OnStar[®] Call Center in the event of a collision or if the vehicle's front air bags deploy for any other reason.
- An emergency button press will play a demo message indicating the service has been deactivated.
- An OnStar[®] Call Center button press will connect the customer with a dedicated sales team who can sell an OnStar[®] subscription and reactivate the vehicle. Depending on the type of OnStar[®] hardware in the vehicle, the customer may first hear a demonstration message stating there is no current OnStar[®] subscription for the vehicle, and directing the customer what to do to activate services.
- OnStar[®] personal calling will not be available, as this feature requires the customer to have a current OnStar[®] account. Attempts to use this feature may result in cellular connection failure messages and the inability to connect to the number dialed.

Certain vehicles that have never had an active OnStar[®] account, or that have been deactivated, may be unable to establish a connection with the OnStar[®] Call Center. When normal published diagnostic procedures do not indicate a possible cause for the no connect concern, the vehicle may have been deactivated. For deactivated vehicles, a no connect response should be considered normal operation. Further diagnosis and subsequent repair is only necessary should the customer elect to become an active OnStar[®] subscriber or renew the account subscription.

OnStar[®] Cellular, GPS, and Diagnostic Limitations

The proper operation of the OnStar[®] System is dependent on several elements outside the components integrated into the vehicle. These include the National Cellular Network Infrastructure, the cellular telephone carriers within the network, and the GPS.

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The cellular operation of the OnStar[®] system may be inhibited by factors such as the users range from an analog or digital cellular tower, the state of the cellular carrier's equipment, and the location where the call is placed.

Making an OnStar[®] key press in areas that lack sufficient cellular coverage or have a temporary equipment failure will result in either the inability of a call to complete with a data transfer or the complete inability to connect to the OnStar[®] Call Center. The OnStar[®] system may also experience connection issues if the identification numbers for the module, station identification number, electronic serial number or manufacturers electronic ID, are not recognized by the cellular carriers local signal receiving towers.

The satellites that orbit earth providing the OnStar system with GPS data have almost no failures associated with them. In the event of a no GPS concern, the failure will likely lie with the inability of the system to gain GPS signals because of its location, i.e. in a parking structure, hardware failure, or being mistaken with an OnStar[®] call which has reached the Call Center without vehicle data.

During diagnostic testing of the OnStar[®] system, the technician should ensure the vehicle is located in an area that has a clear unobstructed view of the open sky, and preferably, an area where analog or digital cellular calls have been successfully placed. These areas can be found by successfully making an OnStar[®] keypress in a known good OnStar[®] equipped vehicle and confirming success with the OnStar[®] Call Center advisor. Such places can be used as a permanent reference for future OnStar[®] testing.

Mobile Identification Number and Mobile Directory Number

The telematics communication interface control module utilizes 2 numbers for cellular device identification, call routing and connection, a mobile identification number and a mobile directory number. The mobile identification number represents the number used by the cellular carrier for call routing purposes while the mobile directory number represents the number dialed to reach the cellular device.

Operation of the OnStar[®] Speech Recognition Systems

OnStar[®] users communicate with 2 speech recognition systems. Speech recognition allows the user to speak to one computer in the vehicle, and one reached over a phone line. The computer tries to understand the users command, and responds by speaking back, or by taking the appropriate action, e.g. dialing the phone.

- Personal Calling uses a speech recognition system that resides in the vehicle. When the user presses the phone button, the system states, Ready, and listens for the user's command. The user can speak commands to control the hands-free phone.
- Virtual advisor is a remote speech recognition system that the caller can access by making a phone call. The user connects to virtual advisor by requesting it during personal calling use. The user is then transferred to the virtual advisor server and talks to it via a cellular connection.

The OnStar[®] speech recognition systems use speech technology that is designed to understand a wide range of American English speakers. Although there is no one right way to speak English, the system will work best when users try to modify their pronunciation should they encounter difficulty. Users who do not obtain good results are advised to try the tips and workarounds found in this section.

General Tips for Better Speech Recognition

Concern	Tip for Better Result
Noise	Noise may confuse the speech recognition system. You usually get better performance from the system in quieter conditions: • The HVAC fan creates noise. Turn it down or OFF for better speech system performance. • Driving at high speeds creates louder road noise and wind noise. You may get better results at lower speeds. • An open window or an open sunroof allows more noise to enter the vehicle. Close all windows for better results. • Noisy rainstorms can also reduce performance. • If passengers are talking while you use the speech system, it may be confused by their speech. You will get better results if all occupants of the vehicle are quiet while the system is listening for commands.

Concern	Tip for Better Result
When to Speak	In Personal Calling, the system is only listening after it prompts you to speak with a beep. • When the system prompts you to speak, you have about 5 seconds to respond. If the system does not hear a response, it will prompt you again, or cancel the transaction. • If you begin to speak too soon, try pausing for a half second before speaking after the beep. • In the Virtual Advisor, the system is always listening for commands, even while it is speaking.
How to Speak	Speak forcefully, and clearly. • The noisier the environment, the louder you need to speak. If you are in the driver seat, speak facing the front of the car. If you are a passenger, speak facing the rearview mirror. • Speak calmly, and naturally. The system may sometimes fail your repeated attempts to give a command. If your speech is distorted by shouting or frustration, this may cause more errors. • People with high-pitched voices may have better results by speaking in a deeper, lower-pitched voice. However, do not lower the volume of the voice. • Avoid speaking with a rising intonation, like asking a question. Use a flat or falling intonation, like giving an answer.
What to Say	Personal Calling: One-word commands • The Personal Calling system listens for only one word at a time. There are some exceptions, 2-word phrases that are spoken and understood as a single word, e.g. "virtual advisor", "voice feedback", and "my number". You can enter phone numbers only one digit at a time, and the system repeats each digit as it hears it. • Say "Help" at the Ready prompt to hear the list of Personal Calling commands. • Virtual Advisor can understand sentences with more than one word. It also expects to hear a 4-digit number all at once when it asks for your PIN. • Say, "What are my choices?" to hear a list of commands that the Virtual Advisor understands.
Entering a phone number	• If you have trouble getting numbers correctly into the system, store your frequently-called number in the directory, so the system will remember them. After you have stored a number with a nametag, then you simply say "call" and the nametag in order to call the number. • If the system cannot understand your numbers, ask another person to help you enter your frequently-called numbers. This person can speak the numbers, then you can speak the nametag.
Storing or dialing a number	When you have finished speaking your phone number, you do not need to say "store" or "dial" to indicate that you are done. If you pause and say nothing, the system will ask you if you want to store or dial. Say "yes".

Concern	Tip for Better Result
Creating nametags	- Short nametags that are similar may be easily confused by the system. You may get better recognition of your nametags if you make them longer, for example "George Washington" without pause, instead of "George" only. - If you want to use nametags while driving, it is best to store the nametag with some vehicle noise in the background. If you are in park while you are storing nametags, you can turn the fan on low or open windows in order to create some background noise.
Virtual Advisor 4-digit PIN	Say the 4 digits in a natural way, without pausing between digits.
Interrupting	- When the Virtual Advisor is speaking, you can interrupt it with another command. The first word in your command helps to get its attention. - If the Virtual Advisor has trouble understanding your commands when you interrupt, try speaking the first word loudly and clearly, then pause for an instant, then continue with the rest of the command. For example: "Get... my weather" or "Lookup... a quote for General Motors".

ONSTAR DESCRIPTION AND OPERATION (UE1)

This OnStar[®] system consists of the following components:

- Telematics communication interface control module
- OnStar[®] three button assembly
- Microphone
- Cellular antenna
- Navigation antenna
- Bluetooth[®] antenna (If equipped)
- Back up battery (If equipped)
- WiFi Hotspot (If equipped)
- TTY (Teletypewriter)

This system also interfaces with the factory installed vehicle audio system.

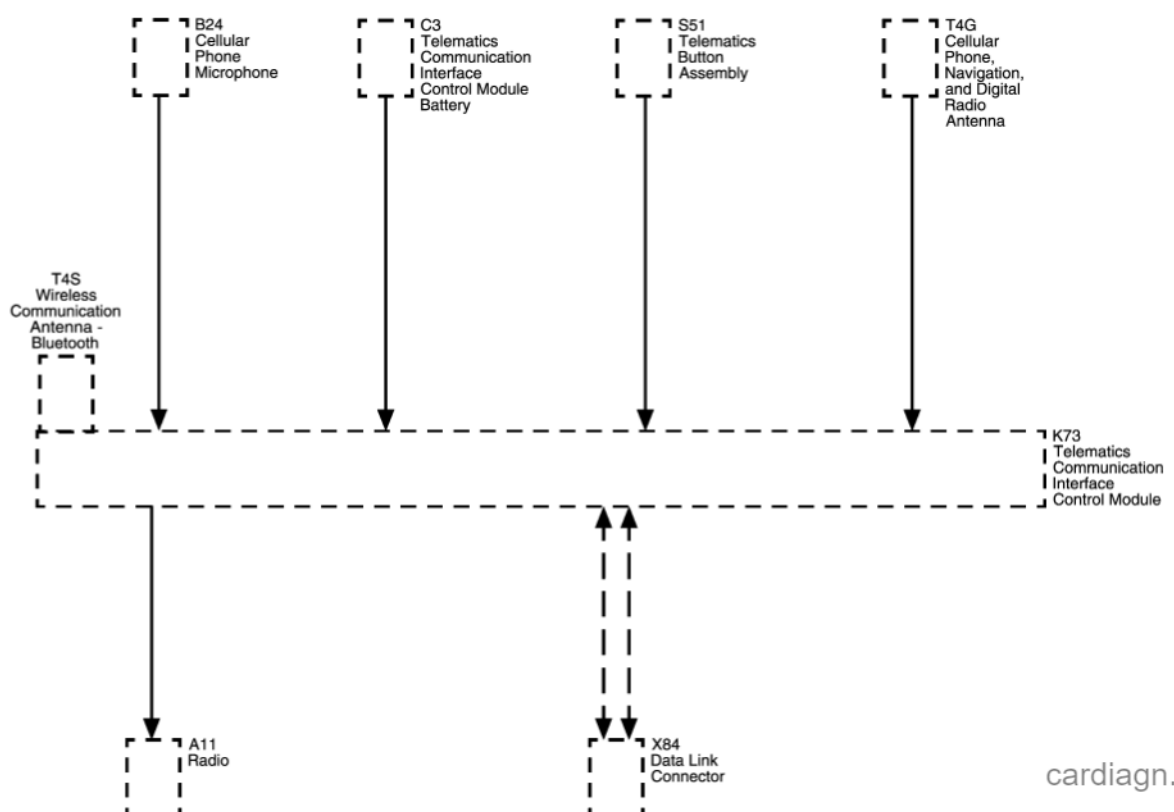


Fig. 57: OnStar System Block Diagram
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
B24	B24 Cellular Phone Microphone
C3	C3 Telematics Communication Interface Control Module Battery
S51	S51 Telematics Button Assembly
T4G	T4G Cellular Phone, Navigation, and Digital Radio Antenna
T4S	T4S Wireless Communication Antenna - Bluetooth
K73	K73 Telematics Communication Interface Control Module
A11	A11 Radio
X84	X84 Data Link Connector

Telematics Communication Interface Control Module

The OnStar Generation 10 system uses Global System for Mobile Communication (GSM) to communicate data and voice signals over the national cellular network. The module may also have the ability to act as a Wireless Local Area Network (WLAN) Wi-Fi hotspot similar to a home wireless router. The module houses an internal WLAN antenna enabling hotspot connectivity and streaming high speed media to the entertainment system. The module also may enable Teletypewriter (TTY) and be capable of Bluetooth communication utilizing an internal antenna. The module is capable of up to 4G LTE speeds and houses 2 technology systems, one to process Global Positioning System (GPS) data, and another for cellular information. The module sends and receives all cellular communications over two cellular antennas and cellular antenna coax cables.

The OnStar Gen 10 system has two antenna inputs, a primary cellular signal and a combined GPS/secondary cellular signal. The OnStar™ system uses the United States Global Positioning System (GPS) signals to provide location on demand. GPS is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near Earth where there is an unobstructed line of sight to four or more GPS satellites.

The module also has the capability of activating certain features such as, the horn, remote starting, initiating door lock/unlock, or activating the exterior lamps using the serial data circuits. These functions can be commanded by the OnStar™ Call Center per a customer request or mobile device app depending on vehicle and customer subscription.

Dedicated circuits are used to connect the telematics communication interface control module to a microphone, the button assembly, radio, and if equipped the Back Up Battery (BUB). The telematics communication interface control module communicates with the rest of the vehicle over the serial data bus.

Power is provided by a dedicated, fused B+ circuit. Ground is provided through the vehicle wiring harness attached to the module. The power mode state is determined by the telematics communication interface control module through serial data messaging.

OnStar™ Three Button Assembly

- The OnStar™ button assembly may be part of the rearview mirror, or a separate, stand alone unit. The button assembly is comprised of 3 buttons or 3 capacitive touch buttons and status LED's or an error indicator. The buttons are defined as follows:
 - The answer/end button, which is black with a white phone icon or a white driver figure seated with voice signals near its face, allows the user to answer and end calls or initiate speech recognition.
 - The blue OnStar™ call center button, which displays the OnStar™ logo, allows the user to connect to the OnStar™ call center.
 - The emergency button, which displays white letters "SOS" with red background, sends a high priority emergency call to the OnStar™ call center when pressed.

If the LED does not illuminate, this may indicate that the customers OnStar™ subscription is not active or has expired. Push the blue OnStar button to connect to an advisor who can then verify the account status.

The telematics communication interface control module supplies 10 volts to the OnStar™ button assembly on the keypad supply voltage circuit. When pressed, each button completes a circuit across a resistor allowing a specific voltage to be returned to the telematics communication interface control module on the keypad signal circuit.

Depending upon the voltage range returned the telematics communication interface control module is able to identify which button has been pressed.

The OnStar[®] status LED or error indicator is located near the buttons. The LED is green when the system is ON and operating normally. When any indicator is illuminated and flashing, it is an indication that a call is in progress. When the LED is red, this indicates a system malfunction is present. In the event there is a system malfunction and the OnStar[®] system is still able to make a call, the LED will flash red during the call.

Each LED or error indicator is controlled by either the telematics communication interface control module over dedicated LED signal circuits or by low speed GM LAN serial data depending on the inside rearview mirror option. Ground for the LED is provided by the wiring harness attached to the button assembly.

Secondary OnStar[®] Controls

Some vehicles may have an additional button that when pushed can engage the OnStar[®] system. The button may be a symbol of a face with sound waves, or may say MUTE, or be a symbol of a radio speaker with a slash through it.

By engaging the OnStar[®] system with this feature, the user can interact with the system by use of voice commands. A complete list of these commands is supplied in the information provided to the customer. If the information is not available for reference, at any command prompt the user can say "HELP" and the telematics communication interface control module will return an audible list of available commands.

OnStar[®] Microphone

The cellular microphone can be part of the rearview mirror assembly, or a stand-alone unit in the headliner or roof console. In either case, the telematics communication interface control module supplies approximately 10V to the microphone on the cellular microphone signal circuit. The microphone modifies the 10V depending on the volume and voice being detected. A cellular microphone low reference circuit or a drain wire provides a ground for the microphone. The microphone signal circuits pass through the telematics communication interface control module to support entertainment voice recognition.

Cellular and GPS Antennas

The combination antenna will have any of the following antenna elements when equipped with OnStar:

- Primary cellular element
- Secondary cellular element
- GPS element
- Digital radio element
- AM/FM element

The Gen 10 OnStar[®] system uses 2 cellular antenna elements to send and receive cellular data, the primary cellular element and the secondary cellular element. The primary cellular signal is carried by a coax cable that connects the antenna directly to the telematics communication interface control module. Details of the secondary cellular signal are further described below.

The GPS antenna element is used to collect the signals of the orbiting GPS satellites. Within the antenna is housed a low noise amplifier that allows for a more broad and precise reception of this data. Also housed within the antenna is circuitry to combine the GPS signal and the secondary cellular signal. Without navigation, the combination GPS/secondary cellular signal is carried by a coax cable that connects directly to the telematics communication interface control module. The cable also provides a path for DC current for powering the antenna. With navigation, the combination GPS/secondary cellular signal is carried by a coax cable that connects to the navigation signal splitter. The splitter supplies the GPS signal to the navigation/entertainment system and the GPS/cellular signal to the telematics communication interface control module.

The digital radio element collects digital radio signals from two satellites and where necessary terrestrial repeaters. The digital radio signal is carried by a coax cable and connected to the digital radio receiver. Refer to Radio/Audio System Description and Operation for further details.

The radio signal is sent from a broadcast station and is then received by the AM/FM radio antenna element. The AM/FM radio signal is carried by a coax cable and is connected to the radio. Refer to Radio/Audio System Description and Operation for further details.

OnStar®,® RemoteLink is a mobile app to link mobile devices to a vehicle for limited diagnostics and feature controls. After downloading the app and registering the device, vehicle owners with an eligible vehicle can use their mobile devices to access real-time data from their vehicle and perform specific commands remotely.

All communication between the app and the vehicle is powered by OnStar's®,® advanced connected vehicle technology. An active OnStar®,® account as well as a valid OnStar®,® username and password are required to use the app. The remote commands must be enabled by logging into the user's OnStar®,® account prior to using the app. Refer to the owners manual for available vehicle data and control features.

Compass Heading

The telematics communication interface module has a compass feature to calculate vehicle direction which is displayed via the instrument panel cluster or designated display. The compass heading is determined by dead reckoning until the GPS 3d fix is established. The dead reckoning is accomplished by using the yaw rate sensors and wheel ticks to determine heading changes from a GPS known heading. The GPS 3d fix heading is determined by the deferential of two locations. If "CAL" is displayed on the Instrument Panel Cluster or designated display refer to the owners manual for steps to calibrate the compass.

Bluetooth®,® (If Equipped)

Bluetooth®,® wireless technology is a short-range communications technology intended to replace the cables connecting portable and/or fixed devices while maintaining high levels of security. Only vehicles with steering wheel controls will have Bluetooth®,® functionality. In order to utilize the vehicle's Bluetooth®,® system, a Bluetooth®,® equipped cellular phone is required.

The Bluetooth®,® antenna is internal to the telematics communication interface control module, radio or human machine interface module and is used to send and receive signals from a Bluetooth®,® enabled cellular phone. The available features and functions are determined by the software within the device being used and the telematics communication interface control module. The operating range of the signal from the vehicle is approximately 30 feet. Note that the operating range is dependent upon the cellular phone being used and battery level of the phone.

With Bluetooth®,® technology customers can experience hands-free calling as their Bluetooth®,® capable cellular phones are wirelessly connected to the vehicle. It will allow customers to place and receive calls using the steering wheel controls and voice recognition. The vehicle audio system will allow you to listen to your call through the vehicle speakers and adjust volume through steering wheel or radio controls.

Not all Bluetooth®,® cellular phones are guaranteed to work with the vehicle's Bluetooth®,® system. Based on the cellular phone's service provider and the manufacturer's implementation of Bluetooth®,®, not all phones support all available Bluetooth®,® functionality. Bluetooth®,® enabled cellular phones will be tested for vehicle compatibility and a feature compatibility list will be provided via the GM Bluetooth®,® website: <http://www.gm.com/vc/bluetooth/>

Bluetooth®,® Features Supported

The following is a list of features supported by the Bluetooth®,® system. Note that not all devices will support all of the listed functions.

- Automatic reconnection - highest priority phone will automatically be connected to vehicle when vehicle ignition is on
- Hands-free dialing- via digits, redial, name tags (phone number saved to a nametag via voice recognition)
- Answering a call
- Ending a call
- Mute a Call
- Rejecting a call - ignore an incoming call
- Call Waiting
- Three-way Calling - initiated from hands-free system
- Send Number During a Call - this is used when calling a menu-driven phone system
- Transfer a Call - transfer call from vehicle to cellular phone and visa versa
- Voice Pass-Thru - allow access to the voice recognition commands on the cellular phone

Pairing a Bluetooth® Cellular Phone to the Vehicle

In order to use hands-free calling, the cellular phone must be paired to the vehicle. Up to five devices can be paired to the vehicle at one time, but only one can be connected at any given time. To pair a phone, the customer must know how to operate the Bluetooth® functionality of their phone. The pairing process must only be done one time for each phone, unless that phone's information is deleted. The system will always generate a password and will provide that password if the device you are pairing does not support Secure Simple Pairing (SSP). If the device being paired does support SSP the system will not provide the password and automatically pair the device. For safety reasons, the pairing process is disabled while the vehicle is moving.

Once the Bluetooth® cellular phone has been paired with vehicle, it will automatically connect to the vehicle when the ignition is on and the device is on. When more than one paired phone is in the vehicle, the phone with the highest priority will be connected. If the cellular phone is in use while getting into the vehicle, the phone can be switched to hands-free mode with the press of a button. In addition, a call in progress can be transferred from the vehicle hands-free mode to the phone to continue the call as the customer exits the vehicle.

Complete pairing instructions are provided in the Vehicle Owners Manual.

Back-up Battery (If Equipped)

NOTE:

Do not disconnect the main vehicle battery or remove the OnStar® fuse with the ignition key in any position other than OFF. Disconnecting power to the OnStar® module in any way while the ignition is ON or with retained accessory power activated may cause activation of the OnStar® Back-Up Battery. This action is per design as the back-up battery is designed to provide power to the telematics communication interface control module so an emergency notification call can be made after an event where the main battery is disabled. Once the Back-Up Battery is activated it will stay on until the power is restored back to the telematics communication interface control module. The telematics communication interface control module naturally chooses the main supply voltage as it's default supply, but if the main supply is removed or lost for any reason the OnStar® module will use the Back-Up Battery as a power supply as long as the default supply can not be detected. The back-up battery is not rechargeable and once discharged below 9.5 volts the back-up battery must be replaced.

Certain OnStar® equipped vehicles may also be equipped with a back-up battery. The back-up battery is a non-rechargeable, lithium battery intended to provide an auxiliary power source for the telematics communication interface control module in the event where power from the main vehicle battery is lost.

The back-up battery is intended to have a limited life span of approximately 4 years and is designed to maintain an open circuit voltage between 16 V and 9 V throughout this period. This allows the battery to power the basic functions of the telematics communication interface control module for least one 200 second (5 minute) call at the end of the 4 year span, should the main vehicle battery be lost. In the case of a vehicle losing vehicle battery power, OnStar will switch over to the backup battery based on an internal algorithm. It will look for an air-bag deploy, or near-deploy, messages from the SDM. If there are no messages the OnStar module will stay wake for a few minutes longer and monitor the buttons in the mirror. If not pressed, the modules will power down and shut off completely.

The back-up battery is connected to the telematics communication interface control module through the back-up battery positive voltage circuit and back-up battery ground circuit and is protected from a short circuit by means of an internal fuse. In the event the back-up battery, battery positive voltage circuit is shorted to the back-up battery ground circuit or chassis ground, the fuse will open and render the back-up battery permanently inoperable. The status of the back-up battery and its associated wiring is monitored by the telematics communication interface control module.

WiFi Hotspot

The telematics communication interface control module acts as a Wireless Local Area Network (WLAN) WiFi hotspot router and uses direct 4G LTE connectivity to the internet. It has the ability to connect up to 7 devices at one time. A data plan is required and when purchased, a security default password is established. There are several ways to change the SSID or password, by placing a call to the OnStar Call Center, by using the Gen 10 mobile app or through the scan tool.

The system utilizes a secure autoconnect feature between the telematics communication interface control module and the radio/HMI. No user interaction is required, it is always available and ready to connect to a dedicated in car

device. The ignition must be in Run, Accessory or RAP for WiFi to operate.

Audio System Interface

When the OnStar[®] requires audio output, a serial data message is sent to the audio system to mute all radio functions and transmit OnStar[®] originated audio. The OnStar[®] audio is transmitted to the vehicle audio system by a dedicated signal circuit and a low reference circuit.

The audio system will mute and an audible ring will be heard through the speakers if the vehicle receives a call with the radio ON.

On some vehicles, the HVAC blower speed may be reduced when the OnStar[®] system is active to aid in reducing interior noise. When the system is no longer active, the blower speed will return to its previous setting.

OnStar[®] Sleep Cycle

The OnStar[®] system uses a unique sleep cycle to allow the system to receive cellular calls while the ignition is in the OFF position and retained accessory power mode has ended. This cycle enables the telematics communication interface control module to perform remote functions, such as door unlock, as commanded over the air by the OnStar[®] Call Center, and to continue to maintain an acceptable level of battery electrical drain.

The OnStar[®] system uses 4 states of readiness, depending upon the type of cellular market the vehicle is in when the ignition is put into the OFF state:

- High power
- Low power
- Sleep
- Digital standby

The high power state is in effect whenever the ignition is in the ON or RUN position, or retained accessory power is enabled, and the OnStar[®] system is sending or receiving calls or when the system is performing a remote function.

The low power state is in effect when the OnStar[®] system is idle with the ignition in the ON or RUN position, or with retained accessory power enabled.

The sleep state is entered after the vehicle has been shut off and the retained accessory power has timed out while in an analog cellular area. At a predetermined time recorded within the telematics communication interface control module, the system re-enters the low power state to listen for a call from the OnStar[®] Call Center for 1 minute. After this interval, the system will again return to the sleep state for 9 minutes. If a call is sent during the 1 minute interval, the OnStar[®] system will receive the call and immediately go into the high power mode to perform any requested functions. If no call is received during the 1 minute interval, the system will go back into the sleep mode for another 9 minutes. This process will continue for up to 48 hours, after which the OnStar[®] system will turn off until the ignition is turned to the ON or RUN position.

The digital standby power state is entered after the vehicle has been shut off and the retained accessory power has timed out while in a digital cellular area. When in digital standby mode, the OnStar[®] module is able to perform all remote functions as commanded by an OnStar[®] advisor at any time, for a continuous 120 hours. After 120 hours, the OnStar[®] module will go into sleep mode until a wake up signal from the vehicle is seen by the telematics communication interface control module. If the OnStar module loses the digital cellular signal it will revert to analog mode and follow the standard sleep state (9 minutes OFF, 1 minute standby) based on the time of the GPS signals, this will continue until a digital cellular signal is again received.

If the OnStar[®] system loses battery power while the system is in a standby or sleep mode, the system will remain OFF until battery power is restored and the ignition is turned to the ON or RUN position.

Features

OnStar[®] Personal Calling

The hands free, OnStar[®] personal calling cellular phone feature is an additional feature of the OnStar[®] system. This feature is embedded within the telematics communication interface control module; however it must be activated by an OnStar[®] advisor. OnStar[®] personal calling operates similar to most hands free cellular phones in that the availability for its usage is based on minutes or units. The customer must have a current

OnStar®, subscription, as this feature cannot be utilized without it. To use OnStar®, personal calling, the customer must also purchase units (minutes) as outlined in the owners guide provided with the OnStar®, system. Units begin to deplete, 1 unit is equal to 1 minute, as the customer makes outbound phone calls, answers inbound phone calls, or while connected to the OnStar®, virtual advisor. In addition, units may also have an expiration date, depending upon the type of units purchased.

Customers have the ability to store telephone numbers within the module, referenced by a nametag for the convenience of frequently dialed numbers. After storing a nametag, the user can dial this number by initiating the OnStar®, personal calling feature, speaking the word "call," and repeating the nametag assigned.

Turn by Turn Navigation

Turn by Turn Navigation allows the driver to contact OnStar®, to obtain directions for driving from a current location to a desired location. The Turn by Turn Navigation system stores your planned route and continually checks your position along that route, when you deviate from the planned route, the system will recognize this and prompt the driver with verbal prompts for how to proceed. The driver then responds verbally to direct the system to continue the current routing or to recalculate the route because of a missed turn.

Advisor Record Feature

The Advisor Record Feature allows the user to store any information given during a call with an OnStar®, Advisor. Recording is activated by pressing the blue OnStar button during a call; pressing the button a second time stops the recording. The stored information can be played back by pressing the phone button on the three button assembly and using the voice command "Advisor Playback".

Teletypewriter (TTY) Users

OnStar has the ability to communicate to deaf, hard-of-hearing, or speech-impaired customers while in the vehicle. The available dealer-installed TTY system can provide in-vehicle access to all of the OnStar services, except Virtual Advisor and OnStar Turn-by-Turn Navigation.

Deactivated OnStar®, Accounts

In the event a customer has not renewed their OnStar®, account after expiration or the account was never activated, OnStar®, will make a discrete cellular call to the vehicle to deactivate the OnStar®, system. Before taking this action, customers are notified that the OnStar®, system in their vehicle will be deactivated unless they elect to renew the account. After the OnStar®, account has been deactivated, customers will experience the following:

- The OnStar®, status LED will not illuminate.
- The OnStar®, system will NOT attempt to connect to the OnStar®, Call Center in the event of a collision or if the vehicle's front air bags deploy for any other reason.
- An emergency button press will play a demo message indicating the service has been deactivated.
- An OnStar®, Call Center button press will connect the customer with a dedicated sales team who can sell an OnStar®, subscription and reactivate the vehicle. Depending on the type of OnStar®, hardware in the vehicle, the customer may first hear a demonstration message stating there is no current OnStar®, subscription for the vehicle, and directing the customer what to do to activate services.
- OnStar®, personal calling will not be available, as this feature requires the customer to have a current OnStar®, account. Attempts to use this feature may result in cellular connection failure messages and the inability to connect to the number dialed.

Certain vehicles that have never had an active OnStar®, account, or that have been deactivated, may be unable to establish a connection with the OnStar®, Call Center. When normal published diagnostic procedures do not indicate a possible cause for the no connect concern, the vehicle may have been deactivated. For deactivated vehicles, a no connect response should be considered normal operation. Further diagnosis and subsequent repair is only necessary should the customer elect to become an active OnStar®, subscriber or renew the account subscription.

OnStar®, Cellular, GPS, and Diagnostic Limitations

The proper operation of the OnStar®, System is dependent on several elements outside the components integrated into the vehicle. These include the National Cellular Network Infrastructure, the cellular telephone carriers within the network, and the GPS.

The cellular operation of the OnStar[®] system may be inhibited by factors such as the users range from an analog or digital cellular tower, the state of the cellular carrier's equipment, and the location where the call is placed. Making an OnStar[®] key press in areas that lack sufficient cellular coverage or have a temporary equipment failure will result in either the inability of a call to complete with a data transfer or the complete inability to connect to the OnStar[®] Call Center. The OnStar[®] system may also experience connection issues if the identification numbers for the module, station identification number, electronic serial number or manufacturers electronic ID, are not recognized by the cellular carriers local signal receiving towers.

The satellites that orbit earth providing the OnStar system with GPS data have almost no failures associated with them. In the event of a no GPS concern, the failure will likely lie with the inability of the system to gain GPS signals because of its location, i.e. in a parking structure, hardware failure, or being mistaken with an OnStar[®] call which has reached the Call Center without vehicle data.

During diagnostic testing of the OnStar[®] system, the technician should ensure the vehicle is located in an area that has a clear unobstructed view of the open sky, and preferably, an area where analog or digital cellular calls have been successfully placed. These areas can be found by successfully making an OnStar[®] keypress in a known good OnStar[®] equipped vehicle and confirming success with the OnStar[®] Call Center advisor. Such places can be used as a permanent reference for future OnStar[®] testing.

Mobile Identification Number and Mobile Directory Number

The telematics communication interface control module utilizes 2 numbers for cellular device identification, call routing and connection, a mobile identification number and a mobile directory number. The mobile identification number represents the number used by the cellular carrier for call routing purposes while the mobile directory number represents the number dialed to reach the cellular device.

Operation of the OnStar[®] Speech Recognition Systems

OnStar[®] users communicate with 2 speech recognition systems. Speech recognition allows the user to speak to one computer in the vehicle, and one reached over a phone line. The computer tries to understand the users command, and responds by speaking back, or by taking the appropriate action, e.g. dialing the phone.

- Personal Calling uses a speech recognition system that resides in the vehicle. When the user presses the phone button, the system states, Ready, and listens for the user's command. The user can speak commands to control the hands-free phone.
- Virtual advisor is a remote speech recognition system that the caller can access by making a phone call. The user connects to virtual advisor by requesting it during personal calling use. The user is then transferred to the virtual advisor server and talks to it via a cellular connection.

The OnStar[®] speech recognition systems use speech technology that is designed to understand a wide range of American English speakers. Although there is no one right way to speak English, the system will work best when users try to modify their pronunciation should they encounter difficulty. Users who do not obtain good results are advised to try the tips and workarounds found in the Infotainment System Manual or the Owners Manual.

RADIO/AUDIO SYSTEM DESCRIPTION AND OPERATION

Each item in the list below represents topics covered in detail below.

- Radio Circuit Operation
- Information Display and Controls
- Antenna System
- Radio Reception
- Speaker Operation
- Audio Amplifier (If equipped)
- Theft Deterrent
- Bluetooth[®] (if equipped)
- Auxiliary Audio Input Jack (If equipped)
- USB Port (If equipped)
- OnStar[®]
- Steering Wheel Controls (If equipped)
- SCV (Speed Compensated Volume)

- FOTA (Firmware Over The Air)

Radio Circuit Operation

Radio Power

The radio is supplied power by a fused B+ circuit. The radio does not use a discrete ignition feed circuit for power moding. The power mode master provides the system power mode to the radio via serial data messages. The power mode master determines the system power mode by processing power mode information from ignition switch inputs. Serial data power modes supported by the radio are OFF, ACCESSORY, RUN, and CRANK REQUEST.

Radio Retained Accessory Power

The radio retained accessory power system is controlled by serial data. The activation/termination is the same as relay operation (see Retained Accessory Power Description and Operation) with one exception; the only door switch that will turn off the radio during retained accessory power is the driver door open switch.

Radio Grounds

The vehicle harness provides a ground for the radio circuits. The radio may also be case grounded.

Radio Data Link Communication

The radio communicates with other modules via serial data.

Radio Audio Outputs

Each of the audio output channel circuits (+) and (-), at the radio have a DC bias voltage that is approximately one half of battery voltage. The audio being played on the system is produced by a varying AC voltage that is centered around the DC bias voltage on the same circuit. The AC voltage is what causes the speaker cone to move and produce sound. The frequency (Hz) of the AC voltage signal is directly related to the frequency of the input (audio source playing) to the audio system. Both the DC bias voltage and the AC voltage signals are needed for the audio system to properly produce sound.

Information Display and Controls

The info display module and radio controls can be separate components from the radio or combined with the radio into one assembly.

When the info display module and radio controls are separate the radio controls communicate radio control inputs directly to the radio through discrete circuits for volume up, volume down and power ON button. It also uses a series of resistors through a single signal circuit when the home, seek up, seek down and phone buttons are pressed. After receiving the message the radio will perform the requested function. The info display module receives digital video data from the radio for on-screen display information through the LVDS (Low Voltage Differential Signal) cable. The radio communicates with the info display module over the radio display touch interrupt request signal for touch screen inputs.

Antenna System

Multi-Band Antenna (if equipped)

The multi-band antenna is located on the roof of the vehicle. This type of antenna may be used with the AM/FM radio, cellular and GPS signals. Keep this antenna clear of snow and ice build up for clear reception. If the vehicle has a sunroof, the performance of the system may be affected if the sunroof is open. Loading items onto the roof of the vehicle can interfere with the performance of the system, ensure the multi-band antenna is not obstructed.

Active Antenna (if equipped)

The active antenna system uses an integral antenna applied as an applique to the rear glass. The antenna module receives both AM and FM signals from the rear glass antenna. The antenna is part of the rear window and looks similar to the defogger grid. One antenna receives AM signals while the other antenna receives FM signals. Any damage to the antenna requires replacing the glass.

The radio antenna module is enabled when the radio is turned on. The radio provides battery voltage to the antenna module using the center conductor of the antenna coaxial cable. When a 12 V signal is seen by the module on the center conductor of the antenna coax, both AM and FM signals are amplified.

AM/FM Radio Signal

The radio signal is sent from a broadcast station and is then received by an antenna. The strength of the signal received depends on the following:

- The power output (wattage) of the broadcasting station
- The location of the vehicle (or receiver) relative to the broadcast tower.
- Height of the broadcast antenna
- Height of the receiving antenna
- Obstacles between the tower and the receiver
- Atmospheric conditions
- What band (AM or FM) the station is broadcasting
- Type of antenna and the ground plane

Radio Data System (RDS)

The RDS feature is available only on FM stations that broadcast RDS information. This system relies upon receiving specific information from these stations and only works when the information is available. While the radio is tuned to an FM-RDS station, the station name or call letters display. RDS data is carried in what is known as a "subcarrier". A subcarrier is a frequency that the FM broadcaster is authorized to use to send data that is not audible in the main audio program.

RDS functions will only work with FM broadcast stations that are broadcasting RDS data. Not all FM Broadcast stations broadcast RDS data or offer all of the RDS services.

The information displayed is dependent upon the information broadcast by the particular station. The information may vary greatly between stations. RDS functions may not work properly when reception is weak, reception is of poor quality, or RDS is not implemented properly by the FM Broadcaster. In some cases, a radio station broadcasting incorrect information may cause the RDS features of the radio to appear to work improperly.

With RDS, the radio can do the following:

- Display text information such as: station identification, type of programming, and general information (artist and song title, station messages, call in phone numbers, etc.).
- Seek to stations broadcasting the selected type of programming
- Receive announcements concerning local and national emergencies
- Receive alert warnings of local or national emergencies. When an alert announcement comes on the current radio station, ALERT! displays. You will hear the announcement, even if the volume is low or if an auxiliary device is playing. If an auxiliary device is playing, play stops during the announcement. Alert announcements cannot be turned off. ALERT! is not affected by tests of the emergency broadcast system. This feature is not supported by all RDS stations.

Digital Radio Receiver (If equipped)

The vehicle may have one of two digital radio options, satellite transmitted (XM-Sirius) or terrestrial Digital Audio Broadcast (DAB) depending on geographical area.

XM-Sirius

The XM satellite receiver is integrated into the radio. XM satellite radio provides digital radio reception. The XM signal is broadcast from two satellites and, where necessary, terrestrial repeaters. The high power satellites allow the antenna to receive the XM signal even when foliage and other partial obstructions block the antennas view of the satellite. Terrestrial repeaters are used in dense urban areas. These repeaters will receive the satellite signal and re-broadcast them at much higher power levels in order to ensure reception in areas with densely packed tall buildings. A service fee is required in order to receive the XM service.

Digital Audio Broadcast (DAB)

The DAB receiver is integrated into the radio. DAB radio provides digital radio reception. The DAB signal is broadcast from terrestrial transmitters. Services available can include: main radio stations, additional stations (news, cardiagn.com

sports, etc..) and data services (digital images, video and other data). The availability of services is dependent upon broadcasters in the area. The strength of the DAB signal depends on the following:

- The power output (wattage) of the broadcasting station
- Location of the vehicle (or receiver) relative to the broadcast tower
- Height of the broadcast antenna
- Height of the receiving antenna
- Obstacles between the tower and the receiver
- Type of antenna and the ground plane

Speaker Operation

Speakers turn electrical energy into mechanical energy to move air, using a permanent magnet and an electromagnet. The electromagnet is energized when the radio or amplifier (if equipped) delivers current to the voice coil on the speaker. The voice coil will form a north and south pole that will cause the voice coil and the speaker cone to move in relation to the permanent magnet. The current delivered to the speaker is rapidly changing alternating current (A/C). This causes the speaker cone to move in two directions producing sound.

Audio Amplifier (If equipped)

Amplifier Interface

A fused battery voltage circuit provides the main amplifier power. A switched 12 V output from the radio is used to control the power - state of the amplifier. To respond quickly to audio input and control signals, the amplifier is ON in all vehicle power modes except OFF and CRANK Request. The internal amplifier bridges are fully powered and unmuted when the amplifier receives the switched 12 V input.

Amplifier Operation

The purpose of the amplifier is to increase the power of a voltage or current signal. The output signal of an amplifier may consist of the same frequencies as the input signal or it may consist of only a portion of the frequencies as in the case of a subwoofer or midrange speaker. The radio creates a low level stereo audio output signal, which is sent at the user-defined volume level to the audio amplifier. The audio amplifier amplifies the signal and sends it to the appropriate speakers. Each of the audio output channel circuits (+) and (-), from the amplifier have a DC bias voltage that is approximately one half of battery voltage. The audio being played on the system is produced by a varying AC voltage that is centered around the DC bias voltage on the same circuit. The AC voltage is what causes the speaker cone to move and produce sound. The frequency (Hz) of the AC voltage signal is directly related to the frequency of the input (audio source playing) to the audio system. Both the DC bias voltage and the AC voltage signals are needed for the audio system to properly produce sound.

Theft Deterrent

The radio theft deterrent system is intended to disable or limit radio functionality if incorrect vehicle information is received by the radio. The radio disables functionality if the VIN information received by the radio does not match the VIN information that has been learned by the radio. The radio receives this information via serial data. A possible cause of incorrect VIN info could be the radio was originally installed in another vehicle.

The radio has the following theft operating modes as part of the theft deterrent system:

- Normal Mode: The radio has learned a correct VIN sequence and the VIN information received via serial data matches the learned VIN sequence. In this mode the radio has full functionality.
- No VIN Mode: The radio has not received or learned a correct VIN sequence. In this mode the radio has limited functionality.
- Theft Detected Mode: The radio has learned a correct VIN sequence and the VIN information received via serial data does NOT match the learned VIN sequence. In this mode the radio may be disabled or have limited functionality. The radio display will indicate that theft protection is active.

Bluetooth® (If Equipped)

Bluetooth® wireless technology is a short-range communications technology intended to replace the cables connecting portable and/or fixed devices while maintaining high levels of security. Only vehicles with steering wheel controls will have Bluetooth® functionality. In order to utilize the vehicle's Bluetooth® system, a Bluetooth® equipped cellular phone is required.

The Bluetooth[®] antenna is internal to the telematics communication interface control module, radio or human machine interface module and is used to send and receive signals from a Bluetooth[®] enabled cellular phone. The available features and functions are determined by the software within the device being used and the telematics communication interface control module. The operating range of the signal from the vehicle is approximately 30 feet. Note that the operating range is dependent upon the cellular phone being used and battery level of the phone.

With Bluetooth[®] technology customers can experience hands-free calling as their Bluetooth[®] capable cellular phones are wirelessly connected to the vehicle. It will allow customers to place and receive calls using the steering wheel controls and voice recognition. The vehicle audio system will allow you to listen to your call through the vehicle speakers and adjust volume through steering wheel or radio controls.

Not all Bluetooth[®] cellular phones are guaranteed to work with the vehicle's Bluetooth[®] system. Based on the cellular phone's service provider and the manufacturer's implementation of Bluetooth[®], not all phones support all available Bluetooth[®] functionality. Bluetooth[®] enabled cellular phones will be tested for vehicle compatibility and a feature compatibility list will be provided via the GM Bluetooth[®] website: <http://www.gm.com/vc/bluetooth/>

Bluetooth[®] Features Supported

The following is a list of features supported by the Bluetooth[®] system. Note that not all devices will support all of the listed functions.

- Automatic reconnection - highest priority phone will automatically be connected to vehicle when vehicle ignition is on
- Hands-free dialing- via digits, redial, name tags (phone number saved to a nametag via voice recognition)
- Answering a call
- Ending a call
- Mute a Call
- Rejecting a call - ignore an incoming call
- Call Waiting
- Three-way Calling - initiated from hands-free system
- Send Number During a Call - this is used when calling a menu-driven phone system
- Transfer a Call - transfer call from vehicle to cellular phone and visa versa
- Voice Pass-Thru - allow access to the voice recognition commands on the cellular phone

Auxiliary Audio Input Jack (If equipped)

The infotainment system may have a 3.5 mm (1/8 in.) auxiliary audio input jack located in the center console or on the radio faceplate. The auxiliary audio input jack interfaces directly with the radio. When a portable audio playback device is connected to the auxiliary jack, an internal switch detects the connection and the radio will switch to AUX as the audio source. Audio signals from the device are sent to the radio from the auxiliary jack via the left, right, and common audio signal circuits.

- When a device is first connected to the 3.5 mm (1/8 in.) input jack the infotainment system automatically switches to that device. If an auxiliary device has already been connected, press the Media or AUX button to select the device.
- Playback of an audio device that is connected to the 3.5 mm jack can only be controlled using the controls on the device.
- The volume control on the device may need to be adjusted to ensure sufficient playback volume through the infotainment system.

USB Port (If Equipped)

The infotainment system may have a USB connector located in the center console. The USB connector interfaces directly with the radio. The USB connector supports both USB standards 1.1 and 2.0.

USB Supported Devices:

- USB Flash Sticks (Thumb Drives)
- Portable USB Hard Drives
- Portable Digital Media Players (iPOD[®], ZUNE[®], etc)

Depending on the USB device, some devices may not be recognized, or some features/functions may not be able to be controlled with the radio controls. USB HUB devices are not supported.

Refer to the owner's manual for information on USB devices, control, and operation.

OnStar,® (If equipped)

When OnStar is activated, a serial data message is sent to the radio that activates a software program. When the software begins its process, the fade goes to the front, Bass and Treble are set to the mid range, the outputs are mono, and the audio source is OnStar. OnStar takes priority over any other audio source. All of these actions are preset values stored in the radio.

Steering Wheel Controls (If equipped)

Some audio functions are available using the steering wheel controls. The steering wheel controls duplicate the function of the primary controls available on the radio.

For additional information on steering wheel controls, refer to Steering Wheel Controls Description and Operation.

Speed Compensated Volume

With Speed Compensated Volume the audio system will adjust automatically to make up for road and wind noise as you drive, by increasing the volume as vehicle speed increases. To use speed compensated volume, set the volume to the desired level, then select either Low, Medium, or High. To turn SCV off select the Off screen button.

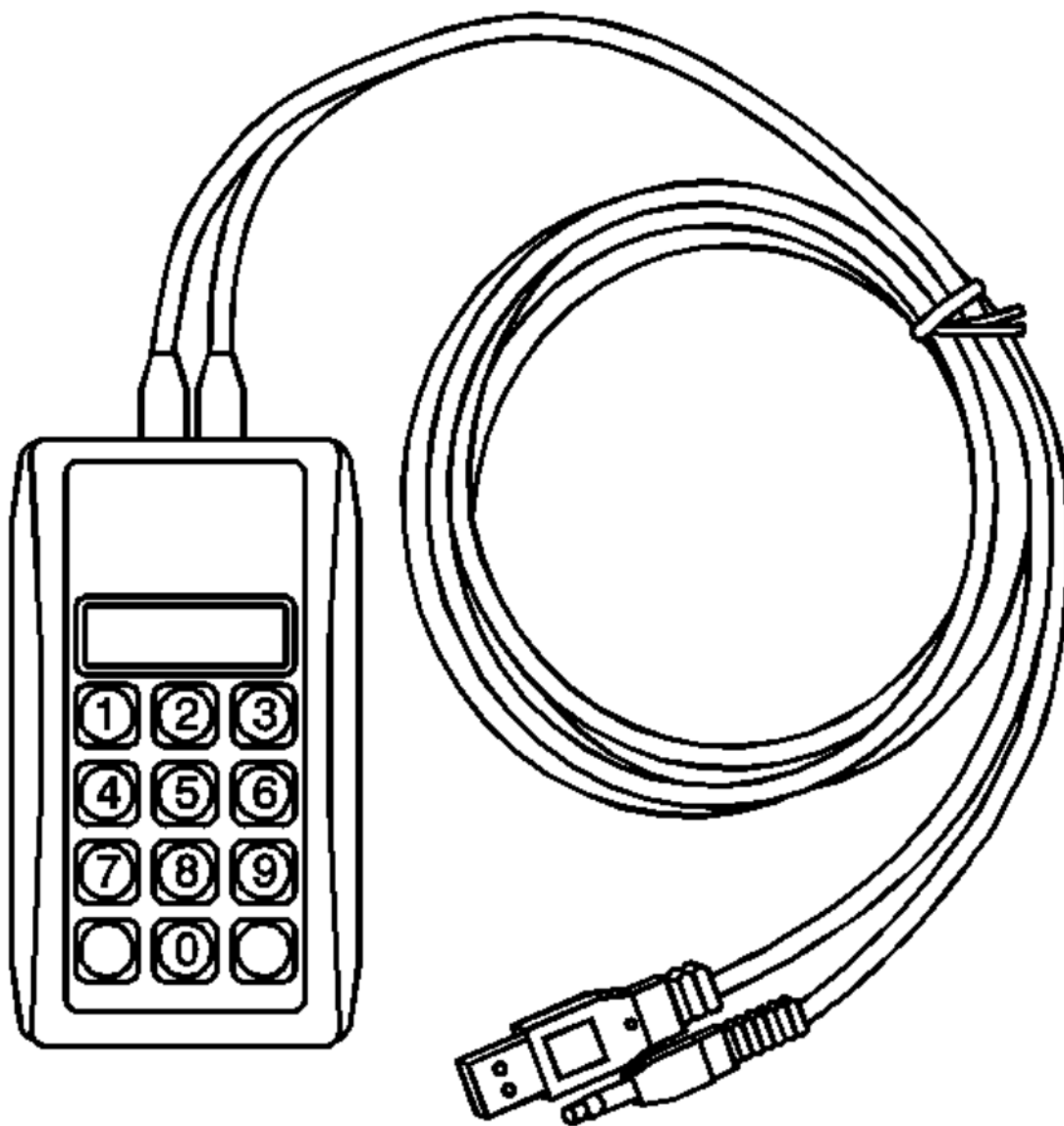
Firmware Over The Air

The Firmware Over The Air feature was designed to reflash software remotely. Remote reflash is an in-vehicle feature that enables the installation of a software package to update the infotainment system without requiring service test equipment to be physically connected to the vehicle. Remote reflash will utilize a long range or short range connection from the host module to a remote IT system.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description



EL-50334-20
Multi-Media
Interface Tester
(MIT)

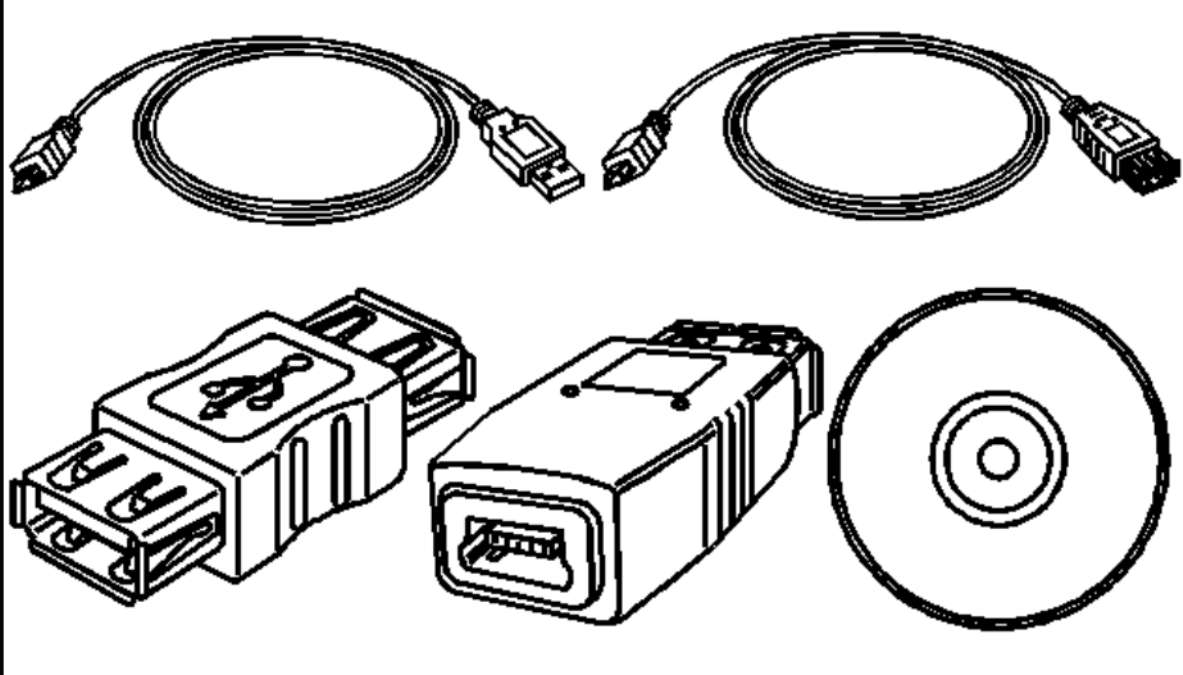
Illustration	Tool Number/Description
 The illustration shows the components of the EL-50334-50 USB Cable and Adapter Kit. At the top, there are two coiled cables. The cable on the left has a standard USB-A connector on one end and a custom connector on the other. The cable on the right has a custom connector on one end and a different custom connector on the other. Below the cables, there are three items: a USB-A to custom connector adapter, a custom connector to custom connector adapter, and a CD-ROM.	EL-50334-50 USB Cable and Adapter Kit

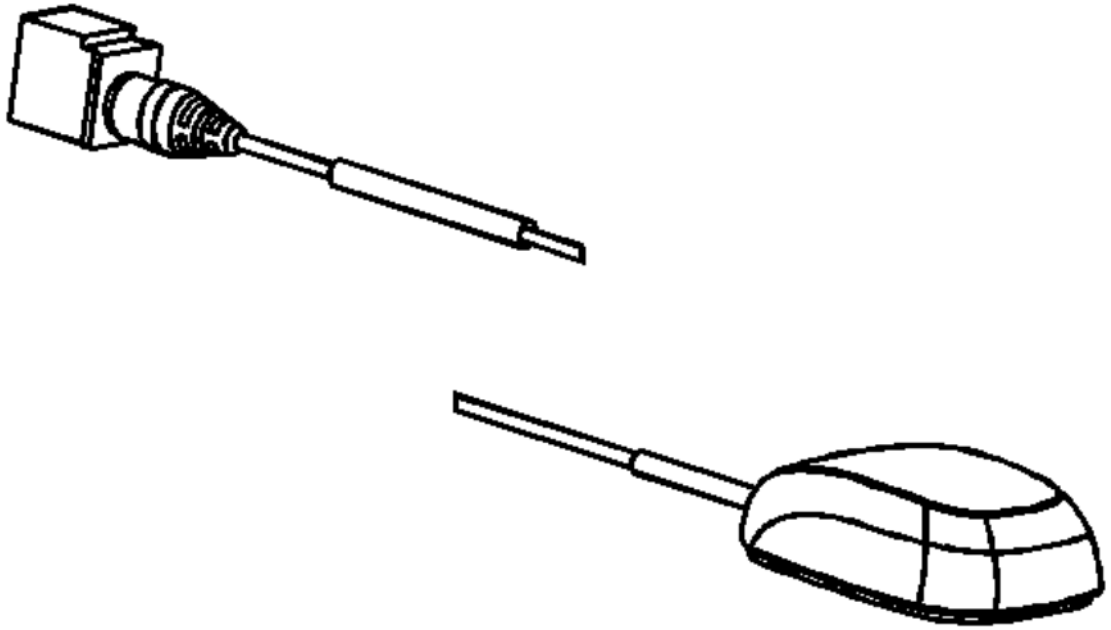
Illustration	Tool Number/Description
	EL-48028 Digital Radio Test Antenna

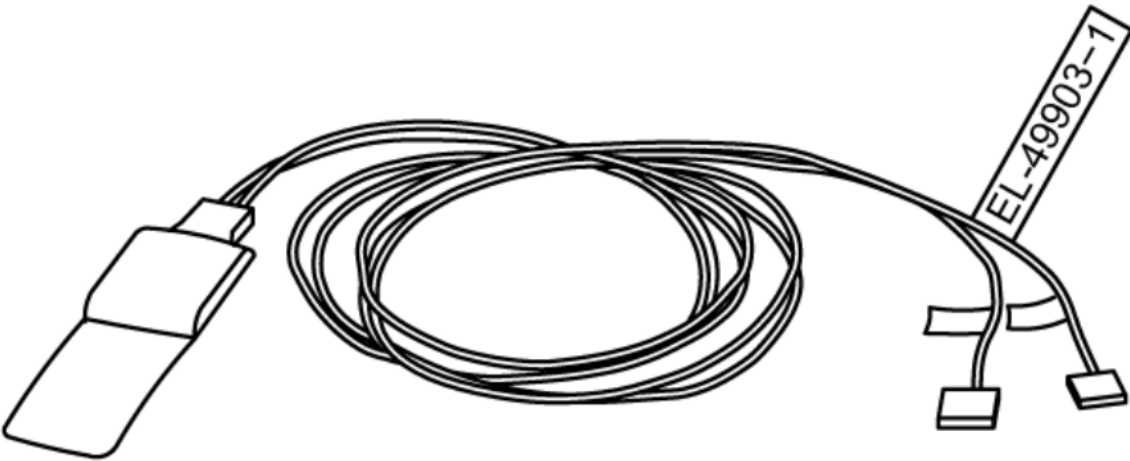
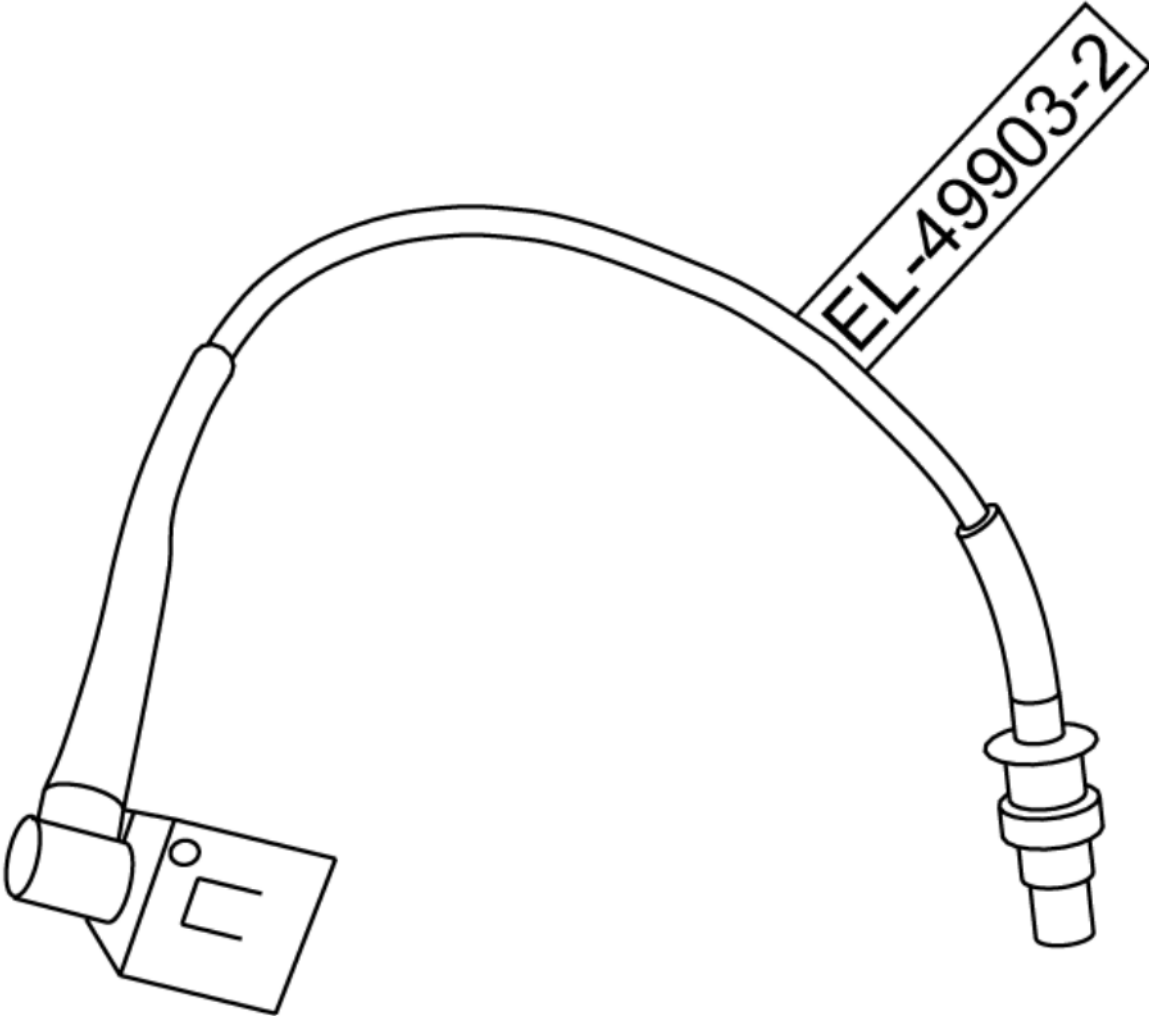
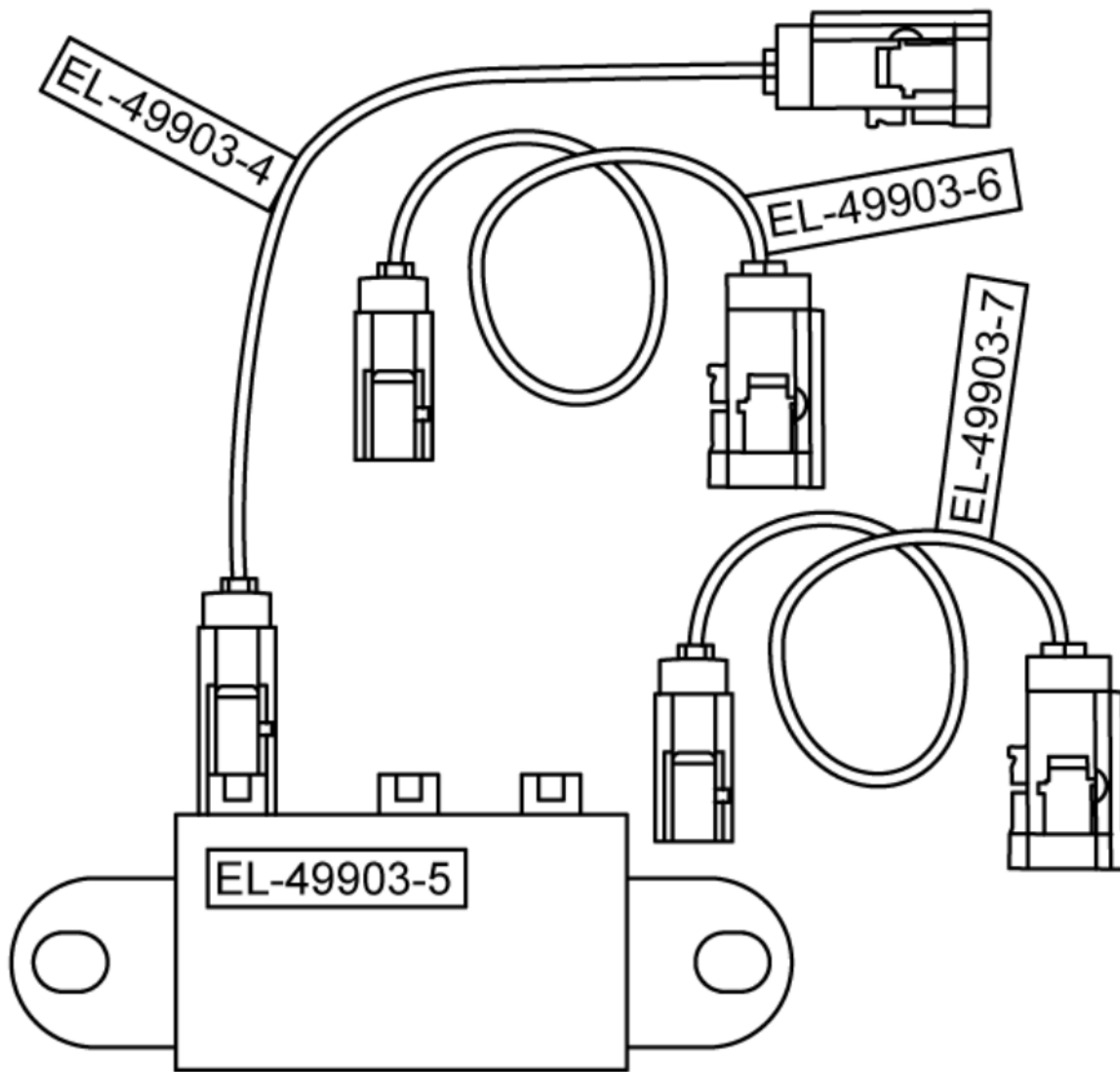
Illustration	Tool Number/Description
	EL-49903-1 Test Antenna, Navn- Cell Conn

Illustration	Tool Number/Description
	EL-49903-2 Adapter Cable-UHF RT Angle



EL-49903-3A
Combiner Kit, Test
Antenna

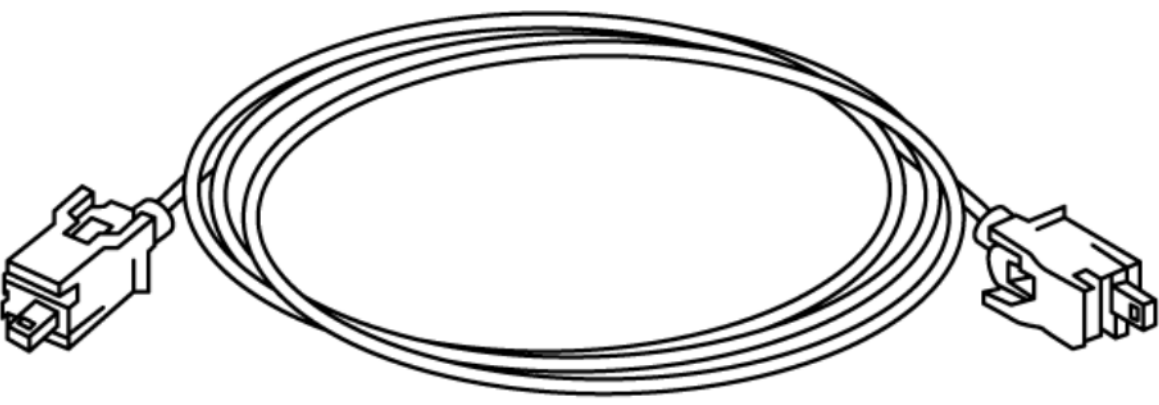
Illustration	Tool Number/Description
 A line drawing of a coiled cable. The cable is coiled into a large oval shape. At each end of the cable is a connector. The connectors are rectangular with several pins or slots visible. The drawing is a simple line art illustration.	EL-50334-12 Infotainment Test Cable - RSE

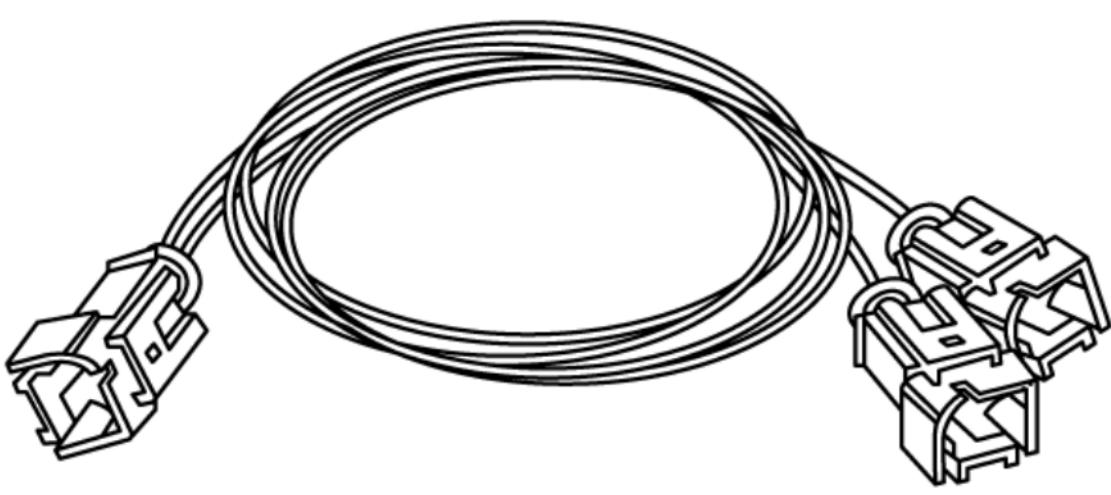
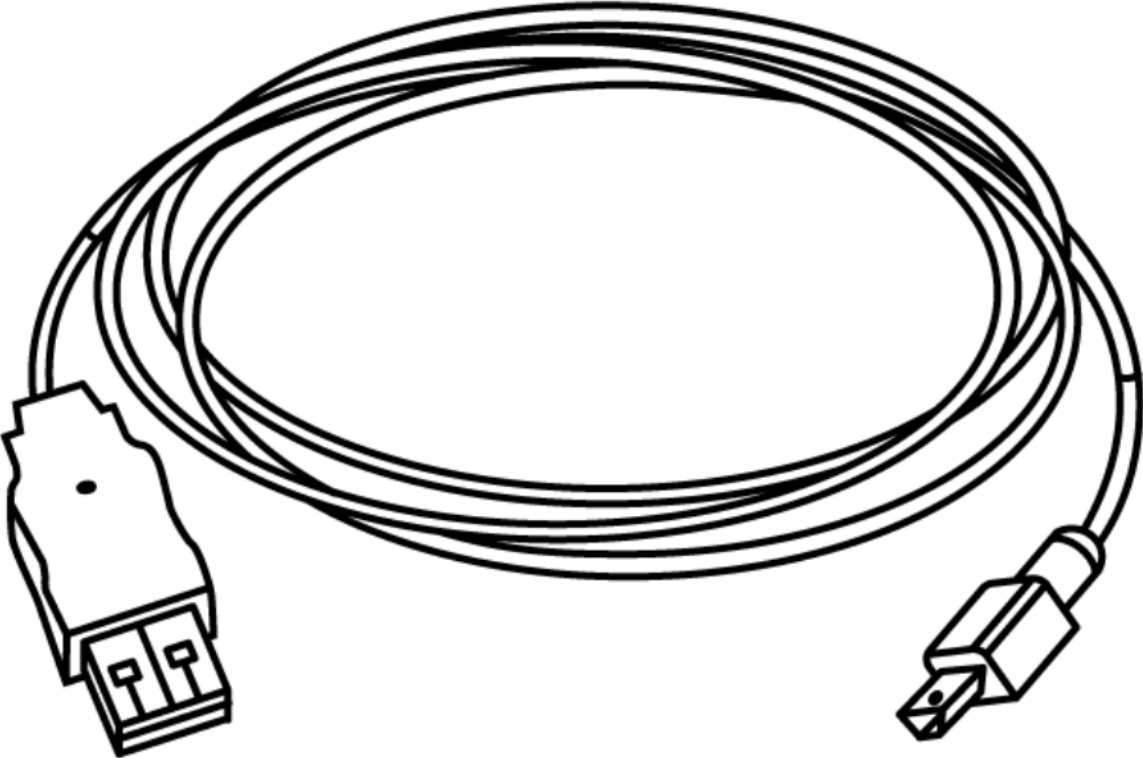
Illustration	Tool Number/Description
 A line drawing of a coiled cable. The cable is shown in a loose loop. On the left end, there is a single connector. On the right end, the cable splits into three separate connectors, forming a three-way splitter. The connectors appear to be a type of automotive or industrial plug.	EL-50334-13 Infotainment Test Cable - RSE Splitter

Illustration	Tool Number/Description
	EL-50334-14 Infotainment Test Cable

SPECIAL TOOLS (MIT TOOL INSTRUCTIONS)

Bluetooth Pairing for Vehicles with Radio RPO: UF7

Either reset the pin code on the radio to 0000, or go under Device Info on the radio and see what the pin code is (to enter it later on the MIT).

1. Turn the BT discoverable ON in the radio Bluetooth settings.
2. Press Pair Device on radio (DO NOT PRESS SEARCH BLUETOOTH DEVICES ON THE RADIO).
3. Press the Pair button on the MIT.
4. When the three LED lights begin flashing on the MIT, enter the pin code (either 0000 if you reset it to that or what the radio pin code was).
5. MIT will then automatically connect with the radio and should show "MIT Connected" message.

Make test call and the audio streaming test.

Holden Radio Bluetooth Pairing Instructions

1. Using the radio controls, place the radio into "Discoverable Mode".
2. Place the MIT into Bluetooth mode by pressing TEST SELECTOR until the Bluetooth LED is illuminated.
3. With the MIT in Bluetooth mode Press and Release the #1 button (the Bluetooth LED will begin to slowly blink).
4. Now Press and release the PAIR/CALL button on the MIT (the Bluetooth LED will begin to blink a little faster).
5. On the radio Enter the PASSKEY when prompted: (press "0000" then Press "OK").

6. The MIT and radio will PAIR and CONNECT (the Bluetooth LED will be Fast Flashing).
7. Use as regular MIT at this point.

For All Other Radios

Testing the Bluetooth Function

1. Verify connection of the MIT to the USB port.
2. Press and release the TEST SELECTOR button until the Bluetooth LED illuminates.
3. Disable all other Bluetooth devices present in the vehicle (ie. cell phones, laptops, etc.).

Standard Bluetooth Pairing/Bonding

1. Use the vehicle controls to place the radio into Bluetooth Pairing mode. The vehicle will prompt you with a security code.
2. Press and release the PAIR/CALL button. The Bluetooth LED will blink slowly while preparing to have a security code entered.
3. Wait for the all three LEDs to blink confirming it is ready to have the security code entered.
4. Enter the code with the MIT keypad and hit ENTER.
5. The Bluetooth LED will blink slowly while pairing/bonding and move to a quick flash once paired/bonded.

The vehicle should confirm pairing/bonding is complete.

Streaming Audio

1. Confirm pairing/bonding is complete - the Bluetooth LED will be in a quick flash mode.
2. On some radios the MIT automatically begins streaming audio via A2DP. The audio playback will confirm that the Bluetooth connection using streaming and the audio is working correctly.
3. On other radios you will need to select Bluetooth Audio from the Source menu to verify Audio Streaming.
4. Audio playback confirms that the Bluetooth connection using Streaming Audio is working correctly.
5. Placing a test call will temporarily stop the streaming audio function, but upon disconnection of that test call, the streaming audio from the MIT will resume.

To Place a Test Call

1. Confirm pairing/bonding is complete - the Bluetooth LED will be in a quick flash mode. If the vehicle is equipped with streaming audio, and the radio is set to play a Bluetooth audio file, the streaming audio playback will be audible.
2. Press and release PAIR/CALL button to place a test call. Streaming audio will be temporarily turned off.
3. Use the vehicle controls to answer the call.

NOTE: If the call is not answered within several rings, the MIT's audio files will not transmit, even though an active call is occurring.

4. Audio playback confirms that the Bluetooth connectivity is working correctly.

NOTE: The MIT will remain paired/bonded when the call is ended by the vehicle. To re-test the call function, place the MIT in Bluetooth mode and press and release the Pair button to reconnect. When testing is completed, delete MIT from the audio system before returning the vehicle to the customer.

5. Use the vehicle controls to end the call. If applicable, streaming audio will resume.

Testing the AUX/Line-In Function

1. Verify connection of the MIT as stated above.
2. Press and release the TEST SELECTOR button until the MIT AUX LED illuminates.
3. Use the vehicle controls to put the audio system into Audio (Line-In) mode.
4. Audio playback confirms that the audio input is working correctly.

Testing the USB Function

1. Verify connection of the MIT as stated above.
2. Press and release the TEST SELECTOR button until the MIT USB LED illuminates.
3. Use the vehicle controls to put the audio system into USB mode.

NOTE: Volume levels may vary dependent upon vehicle audio system.

4. Audio playback confirms that the USB is working correctly.

Troubleshooting Guide

If the MIT unit is still not working properly after following the below troubleshooting, the unit is malfunctioning and should be repaired or replaced.

Unit not Working

- Verify the MIT is powered on correctly as indicated by the green Power LED.
- If Power LED is not illuminated, verify USB power source is working properly.
- If USB power adapter is being used to power the MIT, check and, if necessary, replace the fuse in adapter.

Problem with Aux/Line-In Test

- Verify Aux/Line-In test cable is inserted properly into the vehicle audio input jack. Verify the MIT is in Aux/Line-In mode as indicated by the red AUX LED.
- Verify the vehicle audio system is in Auxiliary or Line-in mode. Verify the vehicle audio system volume is turned up and not in mute mode.

Problem with USB Test

- Verify MIT is in USB mode as indicated by the red USB LED. Verify the vehicle audio system is in USB mode.
- Verify the vehicle audio system volume is turned up and not in mute mode.

Problem with Bluetooth Pairing

- Delete previous devices stored in the device list of the radio and the pair the MIT.
- Remove USB cable, and then reconnect to reset the MIT. Carefully follow the bonding instructions for the correct Passkey procedure.

Problem with Bluetooth Test Call Audio

- Verify the MIT is paired with the vehicle. This is indicated by the quick flashing Bluetooth LED.
- Audio system should have indicated the MIT is bonded.