Cellular, Entertainment, and Navigation

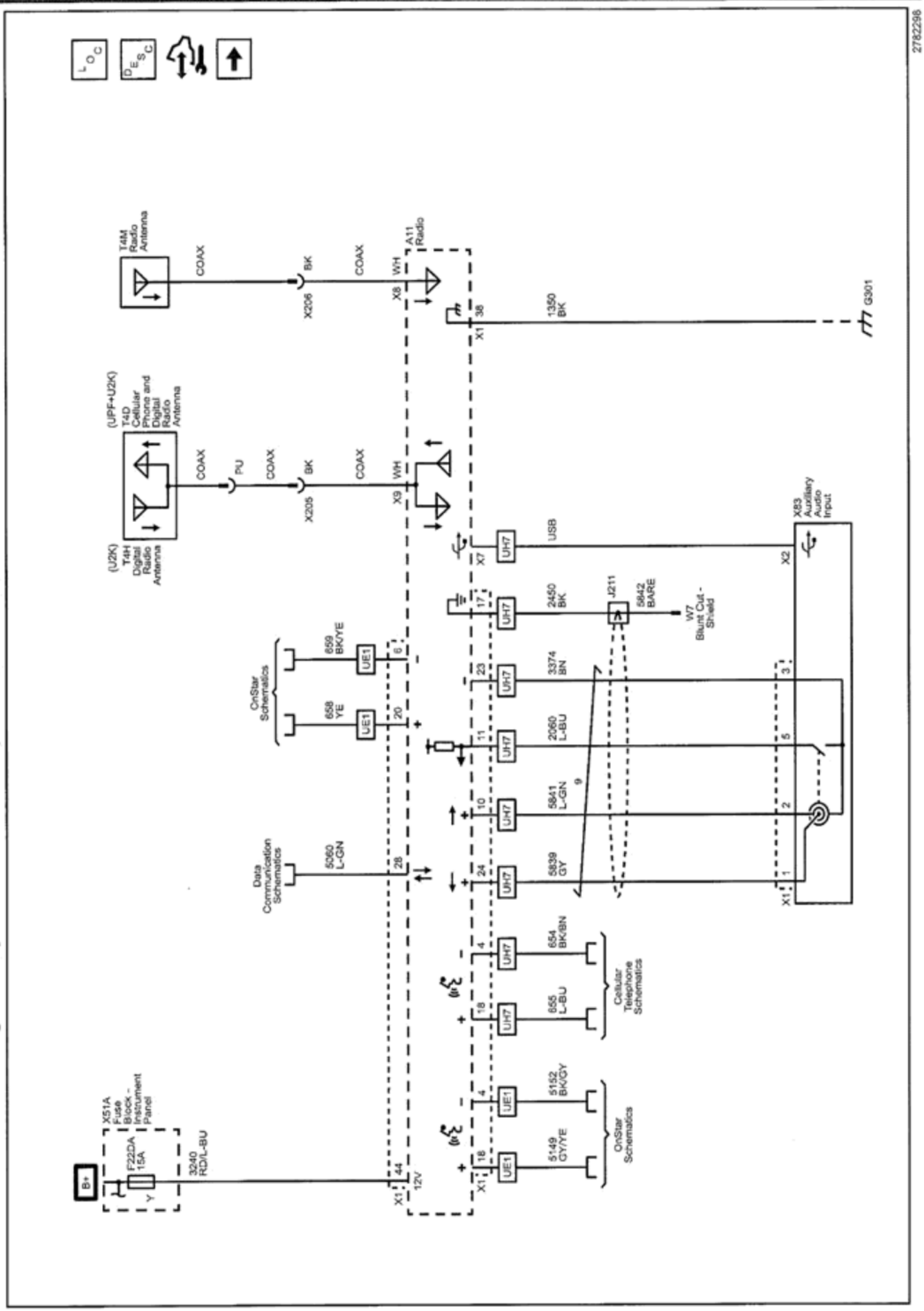
Specifications

Fastener Tightening Specifications

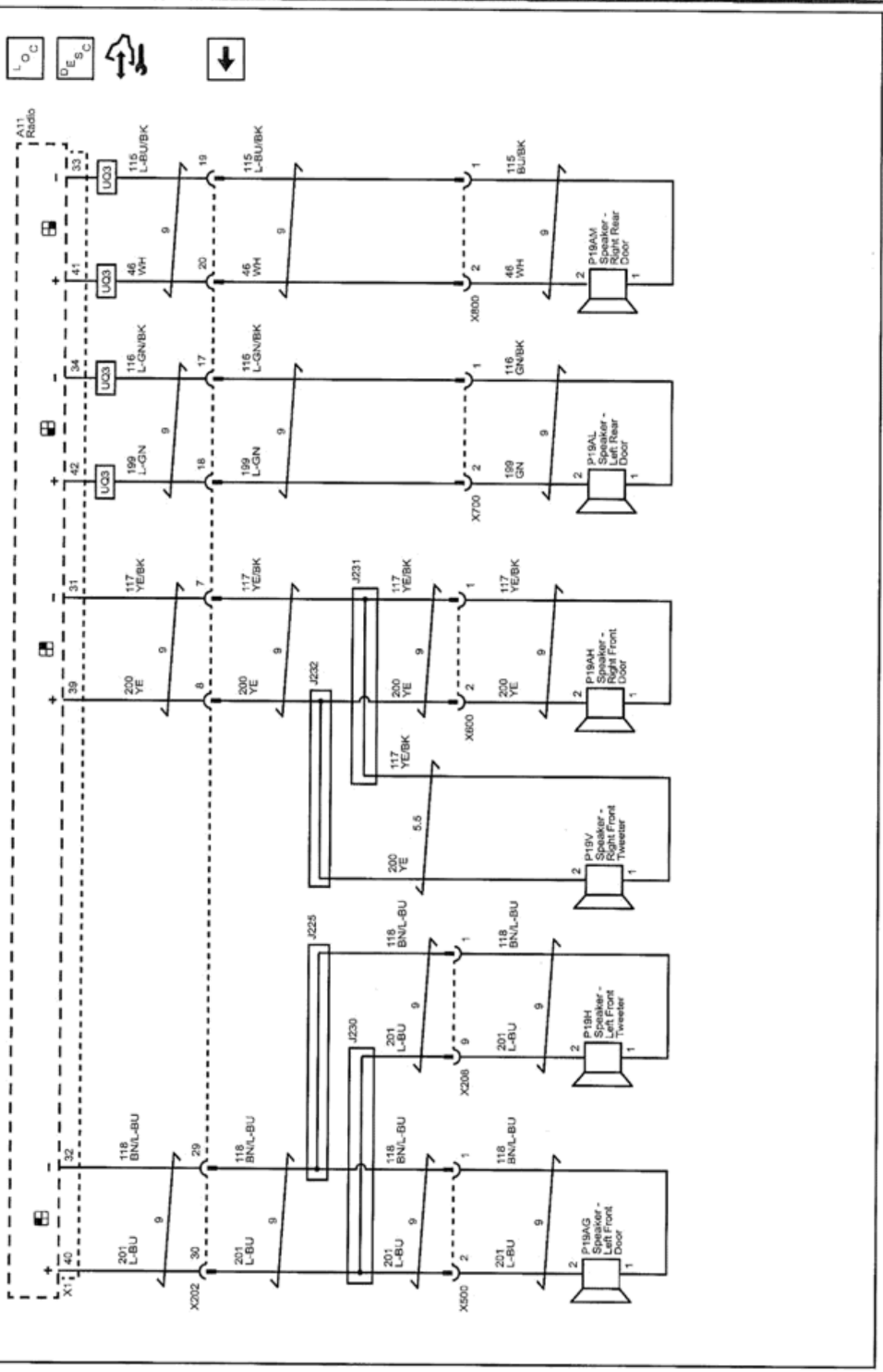
Application	Specification	
	Metric	English
Radio Antenna Base Fastener	9 N·m	80 lb in

Schematic and Routing Diagrams

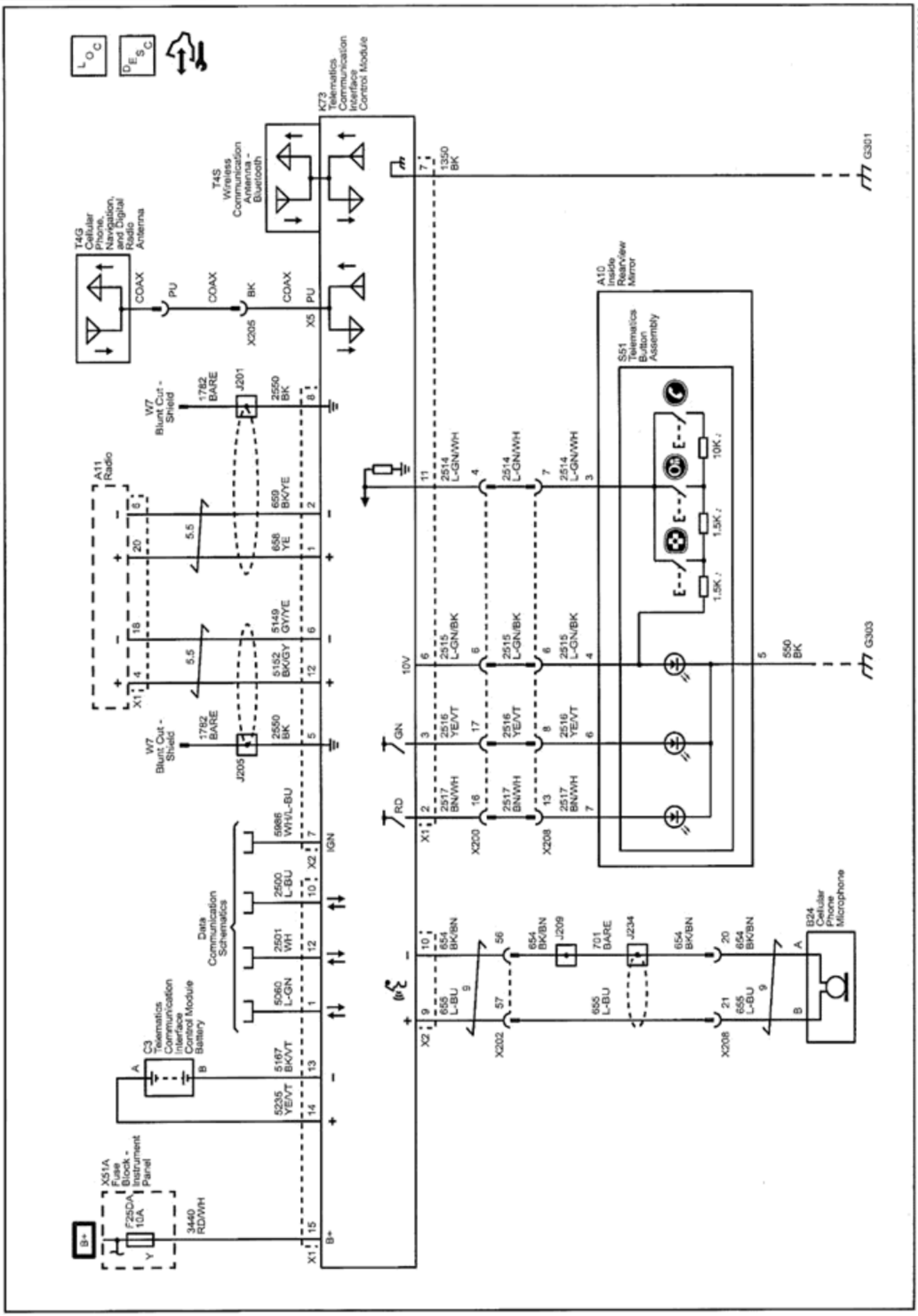
Radio/Navigation System Schematics (Power, Ground, Serial Data, Antenna, and Audio Input)



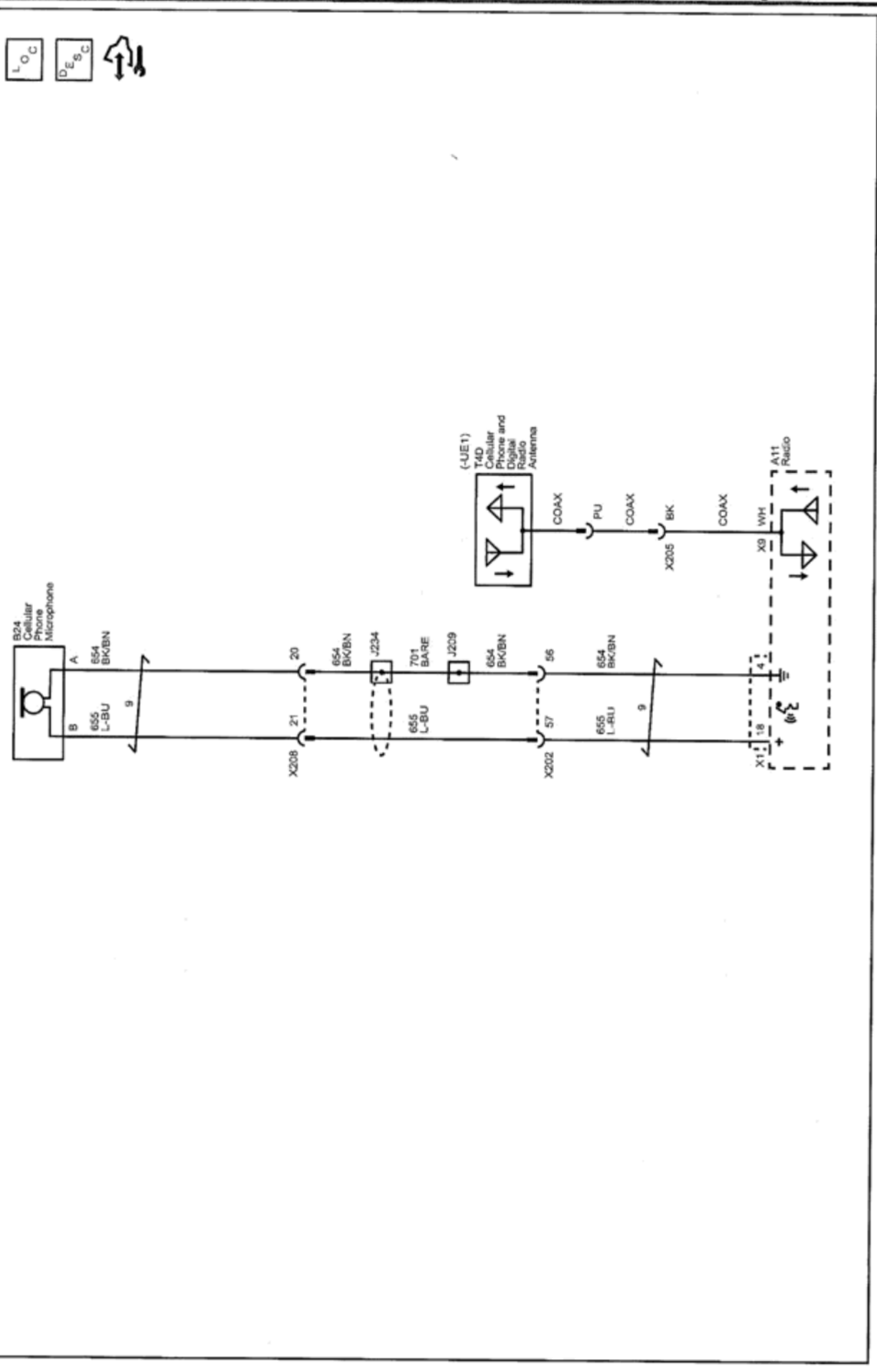
Radio/Navigation System Schematics (Speakers)



OnStar Schematics (OnStar (UE1))



Cellular Telephone Schematics (Cellular Telephone Microphone (UH7))



Diagnostic Information and Procedures

DTC B1025, B1035, B1045, or B1055

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC B1025 01: Left Front Audio Output Circuit Short to Battery
DTC B1025 02: Left Front Audio Output Circuit Short to Ground
DTC B1025 04: Left Front Audio Output Circuit Open
DTC B1035 01: Right Front Audio Output Circuit Short to Battery
DTC B1035 02: Right Front Audio Output Circuit Short to Ground
DTC B1035 04: Right Front Audio Output Circuit Open
DTC B1045 01: Left Rear Audio Output Circuit Short to Battery
DTC B1045 02: Left Rear Audio Output Circuit Short to Ground
DTC B1045 04: Left Rear Audio Output Circuit Open
DTC B1055 01: Right Rear Audio Output Circuit Short to Battery
DTC B1055 02: Right Rear Audio Output Circuit Short to Ground
DTC B1055 04: Right Rear Audio Output Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Speaker Output (+) Signal	B1025 02, 1	B1025 04, 1	B1025 01, 1, 2	—
Left Front Speaker Output (-) Signal	B1025 02, 1	B1025 04, 1	B1025 01, 1, 2	—
Right Front Speaker Output (+) Signal	B1035 02, 1	B1035 04, 1	B1035 01, 1, 2	—
Right Front Speaker Output (-) Signal	B1035 02, 1	B1035 04, 1	B1035 01, 1, 2	—
Left Rear Speaker Output (+) Signal	B1045 02, 1	B1045 04, 1	B1045 01, 1, 2	—
Left Rear Speaker Output (-) Signal	B1045 02, 1	B1045 04, 1	B1045 01, 1, 2	—
Right Rear Speaker Output (+) Signal	B1055 02, 1	B1055 04, 1	B1055 01, 1, 2	—
Right Rear Speaker Output (-) Signal	B1055 02, 1	B1055 04, 1	B1055 01, 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.

Conditions for Running the DTC

- Ignition is ON or in the ACC position
- The system voltage is 9-16 V
- The test is run once during radio wake up

Conditions for Setting the DTC

B1025 01, B1035 01, B1045 01, B1055 01

The radio detects a short to voltage on the specified audio (+) or (–) circuit.

B1025 02, B1035 02, B1045 02, B1055 02

The radio detects a short to ground on the specified audio (+) or (–) circuit.

B1025 04, B1035 04, B1045 04, B1055 04

The radio detects an open on the specified audio (+) or (–) circuit.

Action Taken When the DTC Sets

The radio continues to send the output signal to the speaker signal circuit with the current fault.

Conditions for Clearing the DTC

- A current DTC clears when the conditions for setting the DTC are no longer present and the ignition has been cycled from OFF to ON.
- A history DTC clears after 50 malfunction-free ignition cycles.

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.

Reference Information

Schematic Reference

Radio/Navigation System Schematics on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON, 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

1. Ignition 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**

2.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio.

2.2. 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

2.3. 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**

2.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio. Ignition ON.

2.2. 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 on page 6-92* after completing the repair.

- *Speaker Replacement Reference on page 8-48*
- *Control Module References on page 6-3* for radio replacement, programming, and setup.

DTC B125A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides 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	—
Ground	—	1	—	—
1. May exhibit possible AM/FM interference.				

Circuit/System Description

The multi-band antenna is located on the roof of the vehicle. The radio antenna is enabled when the radio is turned on. The radio provides battery voltage to the antenna using the center conductor of the antenna coaxial cable. When a 12 V signal is seen 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 clears after 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

Radio/Navigation System Schematics on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON, A11 radio ON. Verify station reception is normal when tuned to several known good AM and FM stations.

⇒ **If AM or FM reception is poor.**

Refer to Circuit/System Testing

⇓ **If reception is normal**

2. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the radio antenna coax cable from the A11 radio and from the T4M radio antenna.
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 radio antenna coax cable to the A11 radio.
4. Ignition ON, A11 radio ON.
5. Verify a test lamp illuminates between the antenna coax cable center terminal and ground at the T4M radio antenna.

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

replace the A11 radio.

⇓ **If the test lamp illuminates**

6. Test or replace the T4M radio antenna.

Component Testing

Caution: Refer to *Test Probe Caution on page 0-10*.

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 on page 6-92* after completing the repair.

- *Radio Antenna Base Replacement on page 8-61*
- *Control Module References on page 6-3* for radio replacement, programming, and setup.

DTC B125C

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides 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 on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

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 or Check Antenna message is not displayed on the radio.

⇒ **If DTC B125C is set as current or the No XM Signal or Check Antenna message is displayed.**

Refer to Circuit/System Testing.

⇓ **If DTC B125C is not set as current and the No XM Signal or Check Antenna message is not displayed.**

3. All OK.

Circuit/System Testing

1. Ignition 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, 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, disconnect the digital radio antenna coax cable from the T4D cellular phone, navigation, and digital radio antenna.

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. Replace the T4D cellular phone, navigation, and digital radio antenna.

Component Testing

Caution: Refer to *Test Probe Caution on page 0-10*.

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 on page 6-92* after completing the repair.

- *Radio Antenna Base Replacement on page 8-61*
- *Control Module References on page 6-3* for radio replacement, programming, and setup.

DTC B1271

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides 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 on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON, A11 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 on page 6-92* after completing the repair.

Control Module References on page 6-3 for Radio replacement, programming, and setup

DTC B1446 or B1447

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC B1446: Replace Backup Power Source Below Minimum Threshold

DTC B1447: Backup Power Source Open Circuit

For symptom byte information refer to *Symptom Byte List on page 6-85*

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 tommunication 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 is ON.
- System voltage is between 9.5 and 15.5 V.
- DTC B1447 is not set.

B1447 04

- Ignition is ON.
- 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 Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Circuit Testing on page 11-526*
- *Wiring Repairs on page 11-537*
- *Connector Repairs on page 11-548*

Circuit/System Testing

1. Ignition 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 9.5 V between the B+ circuit terminal 14 and the low reference circuit terminal 13.

⇒ **If 9.5 V or less**

Test or replace the C3 Telematics Communication Interface Control Module Battery.

⇓ **If greater than 9.5 V**

3. Replace the K73 Telematics Communication Interface Control Module .

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Communication Interface Module Battery Replacement on page 8-55*
- *Control Module References on page 6-3* for telematics communication interface control module replacement, programming and setup.

DTC B2455 (OnStar)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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/High Resistance

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 ignition must be in the RUN or ACC position.
- 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 an short to ground in the cellular phone microphone high 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 high signal circuit for 10 s or greater.
- The telematics communication interface control module detects an open/high resistance in the microphone 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

Schematic Reference

OnStar Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the B24 Cellular Phone Microphone, ignition ON.
2. Test for 8.0-10.5 V between the signal circuit terminal B and ground.

⇒ **If less than 8.0 V**

2.1. Ignition OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module.

2.2. 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

2.3. 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**

2.1. Ignition OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.

2.2. 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**

3.1. Ignition OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.

3.2. 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**

4.1. Ignition OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module.

4.2. 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

4.3. 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 on page 6-92* after completing the repair.

- *Mobile Telephone Microphone Replacement on page 8-53*
- *Control Module References on page 6-3* for telematics communication interface control module replacement, programming and setup.

DTC B2455 (Radio)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provide an overview of each diagnostic category.

DTC Descriptors

DTC B2455 01: Cellular Phone Microphone Circuit Short to Battery
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 High Signal	B2455 02	B2455 04	1	—
Microphone Low Signal	—	B2455 04	B2455 01	—
1. Microphone Inoperative — Caller Cannot Be Heard				

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 microphone low signal circuit.

Conditions for Running the DTC

- The ignition must be in the RUN or ACC position.
- 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 seconds.

Conditions for Setting the DTC

B2455 01

- The radio detects a short to voltage in the low signal circuit for 10 seconds or greater.

B2455 02

- The radio detects a short to ground in the high signal circuit for 10 seconds or greater.

B2455 04

- The radio detects an open/high resistance in the high signal circuit for 10 seconds or greater.
- The radio detects an open/high resistance in the low signal circuit for 10 seconds 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 on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 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.

1. Ignition ON.
2. Verify that DTC B2455 is set.

⇒ **If DTC B2455 is not set**

Refer to *OnStar Microphone Malfunction on page 8-36*.

⇓ **If DTC B2455 is set**

3. Verify that your voice can be heard clearly after placing a cellular call.

⇒ **If your voice can not be heard clearly**

Refer to Circuit/System Testing.

⇓ **If your voice can be heard clearly**

4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the B24 Cellular Phone Microphone, ignition ON.
2. Test for 9.5-10.5 V between the signal circuit terminal B and ground.

⇒ **If less than 9.5 V**

2.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio.

2.2. 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

2.3. 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 10.5 V**

2.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio, ignition ON.

2.2. 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 9.5-10.5 V**

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

⇒ **If greater than 1 V**

4.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio, ignition ON.

4.2. 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, replace the A11 Radio.

⇓ **If less than 1 V**

5. Test for 9.5-10.5 V between the signal circuit terminal B and the signal circuit terminal A.

⇒ **If less than 9.5 V**

5.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio.

5.2. Test for infinite resistance between the signal circuit terminal A and ground.

⇒ If less than infinite resistance, repair the short to ground in the circuit.

⇓ If infinite resistance

5.3. Test for less than 2 Ω in the signal circuit terminal A end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, replace the vehicle A11 Radio.

⇒ **If greater than 10.5 V**

5.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio, ignition ON.

5.2. Test for less than 1 V between the signal circuit terminal A 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 9.5-10.5 V**

6. Test or replace the B24 Cellular Phone Microphone.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Mobile Telephone Microphone Replacement on page 8-53*
- *Control Module References on page 6-3* for Radio replacement, programming and setup.

DTC B2470

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides 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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Cellular Antenna Signal	B2470 02	B2470 04	—	—

Circuit/System Description

The cellular phone, navigation, and digital radio antenna is connected to the telematics communication interface control module. This module supplies 5 V to the cellular phone, navigation, and digital radio antenna to power the internal amplifier.

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

The telematics communication interface control module does not detect the presence of a cellular phone antenna.

Action Taken When the DTC Sets

- The vehicle is unable to connect to the OnStar® Call Center.
- The OnStar® status LED turns red.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

OnStar Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-49903 GM OnStar Antenna Diagnostic Tool Kit

Circuit/System Verification

Note: The following verification requires the vehicle to be outside with an unobstructed view of the southern sky. Allow 5 minutes after turning the ignition ON for the GPS satellites to acquire vehicle signal.

1. Ignition ON.
2. Verify that DTC B2470 is not set.

⇒ **If DTC B2470 is set**

Refer to Circuit/System Testing

⇓ **If DTC B2470 is not set**

3. Verify that a call can be successfully placed to the OnStar Call Center by pressing the blue OnStar button.

⇒ **If unable to connect with the OnStar Call Center.**

Refer to *Unable to Contact OnStar Call Center on page 8-50*

⇓ **If able to connect with the OnStar Call Center**

4. All OK.

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 and all vehicle systems OFF, disconnect the GPS and 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-49903–3 kit (EL-49903–5 adapter and EL-49903–4 coax cable), connect the *EL-49903* GM OnStar antenna diagnostic tool kit to the K73 Telematics Communication Interface Control Module. Place the test antenna on the roof of the vehicle, ignition ON.
3. Verify the DTC does not set while operating the vehicle within the conditions for running the DTC.

⇒ **If the DTC sets**

Replace the K73 Telematics Communications Interface Control Module.

⇓ **If the DTC does not set**

4. Ignition OFF.
5. Disconnect the *EL-49903* GM OnStar antenna diagnostic tool kit 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 T4G Cellular Phone, Navigation, and Digital Radio Antenna.

Component Testing

Caution: Refer to *Test Probe Caution on page 0-10*

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 on page 6-92* after completing the repair.

- *Radio Antenna Base Replacement on page 8-61*
- *Control Module References on page 6-3* for telematics communication interface control module replacement, setup, and programming

DTC B2476 or B2482

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC B2476 04: Cellular Phone Select Service Switch Open
DTC B2476 59: Cellular Phone Select Service Switch Protection Time-out
DTC B2482 00: Cellular Phone Select Service Switch Range/Performance

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
10 V Reference	B2476 04	B2476 04	B2476 04	—
Signal Terminal 3	1	B2476 04	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.
- Battery voltage must be between 9–16 V.

Conditions for Setting the DTC

B2476 04

The telematics communication interface control module detects a short to voltage or an open/high resistance on the keypad 10 V reference 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

Schematic Reference

OnStar Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 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.
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 A10 Inside Rearview Mirror

⇓ **If all of the buttons operate normally**

3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the A10 Inside Rearview Mirror. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

⇒ **If 10 Ω or greater**

2.1. Ignition OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Ignition ON.
4. Test for 8.0–10.5 V between the 10 V reference circuit terminal 4 and ground.

⇒ **If less than 8.0 V**

4.1. Ignition OFF, disconnect the harness connector at the K73 Telematics Communication Interface Control Module.

4.2. 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

4.3. 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**

4.1. Ignition OFF, disconnect the harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.

4.2. 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.
6. Test for 500–900 Ω between the signal circuit terminal 3 and ground.

⇒ **If less than 500 Ω**

6.1. Disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module.

6.2. 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**

6.1. Disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.

6.2. 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

6.3. Ignition OFF.

6.4. 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 A10 Inside Rearview Mirror.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair procedure.

- *Inside Rearview Mirror Replacement on page 4-235*
- *Control Module References on page 6-3* for telematics communication interface control module replacement, programming, and setup.

DTC B2485

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provide an overview of each diagnostic category.

DTC Descriptors

DTC B2485 02: Wireless Communication (BT) Antenna Circuit Short to Ground
DTC B2485 04: Wireless Communication (BT) Antenna Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	B2485 02	B2485 04	—	—

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 Bluetooth ® antenna is a small fixed antenna connected directly to the telematics communication interface control module and is used to send and receive signals from a Bluetooth ® enabled cellular phone.

Conditions for Running the DTC

- The ignition is in OFF, ACCESSORY or RUN position.
- The system voltage is between 9–16 V.
- The telematics communication interface control module tests the antenna once every second.

Conditions for Setting the DTC

B2485 02

- The signal voltage is less than 1 V.
- The above conditions must be met for 500 ms.

B2485 04

- The signal voltage is greater than 2 V.
- The above conditions must be met for 500 ms.

Actions Taken When the DTC Sets

- The OnStar ® status LED turns red.
- Bluetooth ® functionality is disabled.

Conditions for Clearing the DTC

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

Diagnostic Aids

- Verify the mobile device is properly configured for the feature being used. Refer to the device manufacturers information.
- Verify the function/feature that is being used is supported by the mobile device.
- The device must be paired to the telematics communication interface control module 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

OnStar Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Special Tools

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

Circuit/System Testing

1. Verify that the T4S Wireless Communication Antenna — Bluetooth ® is properly connected to the K73 Telematics Communication Interface Control Module and is not damaged.

⇒ **If the antenna is disconnected**

Connect the T4S Wireless Communication Antenna — Bluetooth ® to the module.

⇒ **If the antenna is damaged**

Test or replace the T4S Wireless Communication Antenna — Bluetooth ® .

⇓ **If the antenna is connected and not damaged**

Note: The Multi-Media Interface Tool 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.

2. Ignition ON, infotainment system ON.
3. Verify the infotainment system successfully pairs with the Multi-Media Interface Tool.

⇒ **If the infotainment system does not successfully pair with the Multi-Media Interface Tool.**

3.1. Test or replace the T4S Wireless Communication Antenna — Bluetooth ®.

3.2. Clear the DTC, ignition OFF.

3.3. Ignition ON.

3.4. Verify the DTC is not set.

⇒ If the DTC is set, replace the K73 Telematics Communication Interface Control Module.

⇓ If the DTC is not set

3.5. All OK.

⇓ **If the infotainment system successfully pairs with the Multi-Media Interface Tool.**

4. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

Control Module References on page 6-3 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 on page 6-66* 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 on page 8-67*.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Radio/Audio System. Refer to *Checking Aftermarket Accessories on page 11-525*.
- 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 on page 11-531*.

Symptom List

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

- *Bluetooth Malfunction (Radio - With UH7) on page 8-32* or *Bluetooth Malfunction (Radio - Without UH7) on page 8-33* or *Bluetooth Malfunction (OnStar) on page 8-34*
- *No Global Positioning System (GPS) Reception on page 8-40*
- *OnStar Microphone Malfunction on page 8-36*
- *OnStar Audio Malfunction on page 8-38*
- *OnStar Button LED Malfunction on page 8-41*
- *OnStar Call Center Remote Function Requests Malfunction on page 8-44*
- *OnStar Button Malfunction on page 8-45*
- *Unable to Contact OnStar Call Center on page 8-50*
- *OnStar Voice Recognition Malfunction on page 8-52*
- *OnStar Steering Wheel Control Functions Malfunction on page 8-47*

Symptoms - Entertainment

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

1. Perform the *Diagnostic System Check - Vehicle on page 6-66* 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 on page 8-73*.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Radio/Audio System. Refer to *Checking Aftermarket Accessories on page 11-525*.
- 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 on page 11-531*.

Symptom List

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

- *Application Malfunction on page 8-27*
- *Auxiliary Audio Input Malfunction on page 8-28*
- *Bluetooth Malfunction (Radio - With UH7) on page 8-32* or *Bluetooth Malfunction (Radio - Without UH7) on page 8-33* or *Bluetooth Malfunction (OnStar) on page 8-34*
- *Digital Radio Poor or No Reception on page 8-35*
- *Radio Poor Reception on page 8-47*
- *Speaker Malfunction on page 8-49*

Application Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provide an overview of each diagnostic category.

Circuit/System Description

The term application refers to any piece of software that works on a system (hardware) that is being operated by it's own software. Applications are typically small software programs which uses the hardware to perform a specific task, as opposed to operating the entire system.

Diagnostic Aids

- For an application to be used, it must be installed on both the vehicle infotainment system and a compatible mobile device.
- The application must work correctly on the device to work with the vehicle infotainment system.
- The user may be required to log-in to the application on the mobile device before using the application from the vehicle controls.
- Applications use the mobile device and connection to a service provider to operate. Connection quality issues, or service provider data transmission issues can give the appearance of a vehicle malfunction.
- The device must be connected to the system. This may be done wirelessly via Bluetooth ®, or via the vehicle USB port.

  When a mobile device is connected via Bluetooth®, some or all of the device controls may be unavailable from the radio controls. This varies dependant upon the device being used. Refer to the vehicle owners manual, supplements, and the device manufacturers information for information on devices, control, and operation. Refer to the device manufacturers information for the preferred connection method.
- The device must be unlocked, and any additional applications should be closed.
- If the device has any sound enhancement features such as noise reduction or echo control, these features should be turned off.
- A low battery condition in the mobile device may not allow the device to connect to the system, or can create communication issues with the device. Verify the device battery state of charge and re-charge or replace as needed.
- If a 'Please See Device' or similar type error message is displayed, this may indicate the device has lost it's connection to the vehicle, or the device has lost it's external data connection.
- If a cable is used for connection, attempt to connect the device using a different cable; cables can deteriorate over time or become damaged.

Reference Information

Schematic Reference

Radio/Navigation System Schematics on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify the application is installed on the mobile device and is up to date.

⇒ **If the application is not installed or is not up to date.**

Install or update the application on the device.

⇓ **If the application is installed on the mobile device and is up to date**

2. Verify the application operates correctly on the mobile device.

⇒ **If the application is not operating correctly on the mobile device.**

Refer to the application website.

⇓ **If the application is operating correctly on the mobile device.**

3. 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**

4. Verify the application is installed on the A11 Radio and is up to date.

⇒ **If the application is not installed or is not up to date.**

Install or update the application on the A11 Radio.

⇓ **If the application is installed on the A11 Radio and is up to date**

5. Ignition ON, A11 Radio ON.
6. Verify the mobile device can connect to the infotainment system. Refer to the owners manual for information on the preferred connection method for the device.

⇒ **If the mobile device cannot connect to the vehicle infotainment system.**

- If unable to connect via Bluetooth, refer to *Bluetooth Malfunction (Radio - With UH7) on page 8-32* or *Bluetooth Malfunction (Radio - Without UH7) on page 8-33* or *Bluetooth Malfunction (OnStar) on page 8-34*.
- If unable to connect via USB, refer to *Auxiliary Audio Input Malfunction on page 8-28*.

⇓ **If the mobile device connects to the vehicle infotainment system.**

7. Launch the application.
8. Verify the applications operates properly with the vehicle infotainment system.

⇒ **If the application does not function properly**

Refer to diagnostic aids.

⇓ **If the application functions properly**

9. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

Control Module References on page 6-3 for radio replacement, programming, and setup.

Auxiliary Audio Input Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provide an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Auxiliary Audio Common Signal	—	6	—	—
Auxiliary Detection Signal	5	6	—	—
Left Auxiliary Audio Signal	2	2	2, 4	—
Right Auxiliary Audio Signal	3	3	3, 4	—
USB Cable	1	1	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. Radio does not detect auxiliary device connection, AUX not available as input selection
6. AUX always available as an input selection, with or without auxiliary device connected

Circuit/System Description

Auxiliary Audio Input Jack

The 3.5 mm auxiliary audio input jack is located in the console. All circuits from the auxiliary jack are connected directly to the radio. Audio signals from the device are sent to the radio from the auxiliary input jack via the left, right, and common audio signal circuits.

The infotainment system may also have an additional auxiliary audio input jack available on the radio face. This input interfaces internally with the radio, no external circuits are involved.

When a portable audio playback device is connected to an auxiliary jack, an internal switch detects the connection and the radio will switch to AUX as the audio source.

USB Port

The vehicle may be equipped with a USB port in the console. This port allows USB 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 switches to USB as the audio source. Once connected, the device can be controlled from the radio controls.

The USB port is connected to the radio via a standard USB cable. Mini type USB connectors are used to connect the cable at the USB port and at the radio. Standard 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.

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

Diagnostic Aids

Auxiliary Audio Input Jack

- 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 AUX or CD/AUX button to select the device.
- If the system detects the device, but the audio is not heard or is not clear, attempt to connect the device using a different cable; cables can deteriorate over time or become damaged.
- 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

- When a device is first connected to the USB port, the infotainment system automatically switches to that device. If an auxiliary device has already been connected, press the AUX or CD/AUX button to select the device.
- A low battery condition in a portable media player may not allow the device to connect to the system, or can create communication issues with the device. Verify the device battery state of charge and re-charge or replace as needed.
- Connect the device directly to the USB port if possible. Only use a cable if it is required to connect the device. The use of extension cables can cause communication issues.
- If a cable is required for connection, attempt to connect the device using a different cable; cables can deteriorate over time or become damaged.
- Attempt audio playback from multiple USB devices when diagnosing USB concerns. Device compatibility can vary based on vehicle equipment. If the infotainment system is capable of operating any USB type device, the cause of the concern is not with the vehicle system. The inoperative device(s) may be incompatible or contain no recognized media types.
- If a 'Device Not Supported' or similar type error message is displayed, this indicates the system has connected to the device but cannot communicate with it properly. This does not indicate an issue with the vehicle system. The device may be incompatible, may require a 'reset', or may require an update to its software/firmware.
- If a 'No Supported Data Found' or similar type error message is displayed, this indicates the system has connected to the device and is communicating, but cannot find any compatible files/data. This does not indicate an issue with the vehicle system. Verify the device contains compatible media/file types.
- Poor connections or damaged USB cables can cause intermittent or no operation of USB devices. Inspect connectors, terminals, and cables for damage and replace components as necessary. Ensure all USB inline connections and connections at components are fully seated and connector position retainers/locks are secure.

Reference Information

Schematic Reference

Radio/Navigation System Schematics on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*

- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

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

Circuit/System Verification

Auxiliary Audio Input Jack - Console

1. Verify no DTCs are present.

⇒ **If any DTCs are present**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If no DTCs are present**

2. Ignition ON, radio ON.
3. Verify the infotainment system switches to AUX as the audio source with the *EL-50334-20* Multi-Media Interface Tester (MIT) connected to the auxiliary audio input jack.

⇒ **If the infotainment system does not switch to AUX as the audio source**

Refer to Circuit/System Testing – Auxiliary Audio Input Jack.

⇓ **If the infotainment system switches to AUX as the audio source**

4. Verify the audio from the *EL-50334-20* Multi-Media Interface Tester (MIT) is heard through the vehicle infotainment system while operating the test tool to begin audio playback.

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

Refer to Circuit/System Testing – Auxiliary Audio Input Jack

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

5. All OK

Auxiliary Audio Input Jack - Radio (If Equipped)

1. Verify no DTCs are present.

⇒ **If any DTCs are present**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If no DTCs are present**

2. Ignition ON, radio ON.
3. Verify the infotainment system switches to AUX as the audio source with the *EL-50334-20* Multi-Media Interface Tester (MIT) connected to the auxiliary audio input jack.

⇒ **If the infotainment system does not switch to AUX as the audio source**

Replace the A11 Radio.

⇓ **If the infotainment system switches to AUX as the audio source**

4. Verify the audio from the *EL-50334-20* Multi-Media Interface Tester (MIT) is heard through the vehicle infotainment system while operating the test tool to begin audio playback.

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

Replace the A11 Radio.

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

5. All OK.

USB Port

1. Verify no DTCs are present.

⇒ **If any DTCs are present**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If no DTCs are present**

2. Ignition ON, radio ON.
3. Verify the infotainment system switches to USB as the audio source with the *EL-50334-20* Multi-Media Interface Tester (MIT) connected to the USB port.

⇒ **If the infotainment system does not switch to USB as the audio source**

Refer to Circuit/System Testing – USB Port.

⇓ **If the infotainment system switches to USB as the audio source**

4. Verify the audio from the *EL-50334-20* Multi-Media Interface Tester (MIT) is heard through the vehicle 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 – USB Port.

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

5. All OK.

Circuit/System Testing

Auxiliary Audio Input Jack

1. Ignition OFF, disconnect the X1 harness connector at the X83 Auxiliary Audio Input. Ignition ON, radio ON.
2. Test for 2.5–3.5 V between the signal circuit terminal 5 and ground.

⇒ **If less than 2.5 V**

2.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio.

2.2. 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

2.3. 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**

2.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio, ignition ON.

2.2. 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 2.5–3.5 V**

3. Test for less than 1 V between the signal circuits listed below and ground:
   - Left auxiliary audio signal circuit terminal 1
   - Right auxiliary audio signal circuit terminal 2
   - Auxiliary audio common signal circuit terminal 3

⇒ **If 1 V greater**

3.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio. Ignition ON.

3.2. 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 less than 1 V**

4. Ignition OFF, disconnect the X1 harness connector at the A11 Radio.
5. Test for infinite resistance between the signal circuits listed below and ground:
   - Auxiliary audio common signal circuit terminal 23
   - Left auxiliary audio signal circuit terminal 24
   - rRght auxiliary audio signal circuit terminal 10

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

6. Test for less than 5 Ω between the signal circuit terminals listed below:
   - A11 Radio terminal 24 X1 and the X83 Auxiliary Audio Input terminal 1 X1
   - A11 Radio terminal 10 X1 and the X83 Auxiliary Audio Input terminal 2 X1
   - A11 Radio terminal 23 X1 and the X83 Auxiliary Audio Input terminal 3 X1

⇒ **If 5 Ω greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 5 Ω**

7. Replace the X83 Auxiliary Audio Input. Connect all harness connectors.
8. Connect and operate the *EL-50334-20* Multi-Media Interface Tester (MIT).
9. Verify the audio from the test tool is heard through the vehicle infotainment system.

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

Replace the A11 Radio.

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

10. All OK.

USB Port

1. Ignition OFF, disconnect the USB cable connection at the A11 Radio.

Note: USB cables and adapters for the following tests are found in the *EL-50334-50* USB Cable and Adapter Kit.

2. Connect the EL-50334-2 Type A female to Mini B male USB Cable to the A11 Radio.
3. Connect the *EL-50334-20* Multi-Media Interface Tester (MIT) to the EL-50334-2 cable. Ignition ON, radio ON
4. Verify the infotainment system switches to USB as the audio source.

⇒ **If the infotainment system does not switch to USB as the audio source**

Replace the A11 Radio.

⇓ **If the infotainment system switches to USB as the audio source**

5. Ignition OFF, connect the vehicle USB cable to the A11 Radio. Disconnect the USB cable at the X83 Auxiliary Audio Input.

Note: The EL-50334–4 adapter may be required for the following test.

6. Connect the *EL-50334-20* Multi-Media Interface Tester (MIT) to the vehicle USB cable. Ignition ON, radio ON.
7. Verify the infotainment system switches to USB as the audio source.

⇒ **If the infotainment system does not switch to USB as the audio source**

Replace the USB cable assembly.

⇓ **If the infotainment system switches to USB as the audio source**

8. Test or replace the X83 Auxiliary Audio Input.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Audio Disc Player and USB Receptacle Replacement on page 8-60*
- *Control Module References on page 6-3* for radio replacement, programming, and setup.

Bluetooth Malfunction (Radio - With UH7)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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 streaming of data (music, voice, information) from cellular phones and other mobile devices that support those features. The radio may also be capable of interfacing with cellular phones for hands-free features.

Refer to the vehicle owners manual, supplements, and the device manufacturers 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 manufacturers 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 on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify the 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: Verify the device being used for testing is capable of the Bluetooth ® feature(s) related to the customer concern.

2. Ignition ON, infotainment system ON.
3. Verify the infotainment system successfully pairs with a mobile device.

⇒ **If the infotainment system does not successfully pair with a mobile device**

3.1. Attempt to pair another mobile device.

⇒ If the infotainment system cannot pair with any mobile device, replace the A11 Radio.

⇓ If the infotainment system successfully pairs with the mobile device

3.2. The malfunction is related to the mobile device.

⇓ **If the infotainment system successfully pairs with the mobile device**

4. Verify the infotainment system performs the desired feature using the mobile device.

⇒ **If the feature does not function correctly**

4.1. Pair another mobile device.

4.2. Verify the infotainment system performs the desired feature using the mobile device.

⇒ If the infotainment system cannot perform the desired feature with any mobile device, replace the A11 Radio.

⇓ If the infotainment system successfully performs the desired feature.

4.3. The malfunction is related to the mobile device.

⇓ **If the feature functions correctly**

5. All OK. Refer to Diagnostic Aids.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

Control Module References on page 6-3 for radio replacement, programming, and setup.

Bluetooth Malfunction (Radio - Without UH7)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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 streaming of data (music, voice, information) from cellular phones and other mobile devices that support those features. The radio may also be capable of interfacing with cellular phones for hands-free features.

Refer to the vehicle owners manual, supplements, and the device manufacturers 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 manufacturers 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 on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

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

Circuit/System Verification

1. Verify no DTCs are present.

⇒ **If any DTCs are present**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **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 on page 6-92* after completing the repair.

Control Module References on page 6-3 for radio replacement, programming, and setup

Bluetooth Malfunction (OnStar)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provide an overview of each diagnostic category.

Circuit/System Description

The Bluetooth ® antenna is internal to, or is a small fixed antenna connected directly to, the telematics communication interface control module and is used to send and receive signals from a Bluetooth ® enabled cellular phone. The antenna utilizes no cabling and is not external 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. For safety reasons, the pairing process is disabled while the vehicle is moving.

Diagnostic Aids

- The purpose of this diagnostic is to verify the ability of the telematics communication interface control module to pair to a Bluetooth ® device.
- Before performing this test, verify compatibility of the cellular phone(s) the customer is attempting to use with the vehicle. Based on the cellular phone's service provider and the manufacturer's implementation of Bluetooth ®, not all phones support all available Bluetooth ® functionality. A vehicle and feature compatibility list will be provided via the GM Bluetooth ® website: http://www.onstar.com/web/Bluetooth/
- If the vehicle passes the following tests and a compatible device is being used, the concern may be due to a device malfunction or an incomplete/improper pairing attempt.
- A Bluetooth ® test tool or equivalent can also be used to verify the ability of the customers cellular phone(s) to pair with another device.

Schematic Reference

OnStar Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

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

Circuit/System Verification

1. Ignition ON.
2. Verify DTC B2485 is not set.

⇒ **If DTC B2485 is set**

Refer to *DTC B2485 on page 8-25*

⇓ **If DTC B2485 is not set**

Note: The Multi-Media Interface 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 Multi-Media Interface Tool.

⇒ **If the infotainment system does not successfully pair with the Multi-Media Interface Tool.**

4.1. Verify the vehicle is equipped with an external Bluetooth® Antenna.

⇒ If not equipped with an external Bluetooth® Antenna, replace the K73 Telematics Communication Interface Control Module

⇓ If equipped with an external Bluetooth® Antenna

4.2. Replace the Bluetooth® Antenna.

4.3. Verify the infotainment system successfully pairs with the Multi-Media Interface Tool.

⇒ If the infotainment system does not successfully pair with the Multi-Media Interface Tool, replace the K73 Telematics Communication Interface Control Module.

⇓ If the infotainment system successfully pairs with the Multi-Media Interface Tool.

4.4. All OK.

⇓ **If the infotainment system successfully pairs with the Multi-Media Interface Tool.**

5. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair procedure.

Control Module References on page 6-3 for telematics communication interface control module replacement, programming, and setup.

Digital Radio Poor or No Reception

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides 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 on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

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 or Check Antenna message is not displayed on the radio.

⇒ **If DTC B125C is set as current or the No XM Signal or Check Antenna message is displayed.**

Refer to Circuit/System Testing.

⇓ **If DTC B125C is not set as current and the No XM Signal or Check Antenna message is not displayed.**

3. All OK.

Circuit/System Testing

1. Ignition 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, 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, disconnect the digital radio antenna coax cable from the T4D cellular phone, navigation, and digital radio antenna.

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. Replace the T4D cellular phone, navigation, and digital radio antenna.

Component Testing

Caution: Refer to *Test Probe Caution on page 0-10.*

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 on page 6-92* after completing the repair.

- *Radio Antenna Base Replacement on page 8-61*
- *Control Module References on page 6-3* for radio replacement, programming, and setup.

OnStar Microphone Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides 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 Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 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. Ignition ON.
2. Verify that DTC B2455 is not set.

⇒ **If DTC B2455 is set**

Refer to *DTC B2455 (OnStar) on page 8-17* or *DTC B2455 (Radio) on page 8-19*.

⇓ **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. Ignition OFF, disconnect the harness connector at the B24 Cellular Phone Microphone, ignition ON.
2. Test for 8.0-10.5 V between the signal circuit terminal B and ground.

⇒ **If less than 8.0 V**

2.1. Ignition OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module.

2.2. 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

2.3. 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**

2.1. Ignition OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.

2.2. 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**

3.1. Ignition OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.

3.2. 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**

4.1. Ignition OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module.

4.2. 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

4.3. 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. Ignition 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, ignition ON.
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 15

⇒ **If greater than 1 V**

Repair the short to voltage in the circuit.

⇓ **If less than 1 V**

3. Ignition OFF.
4. Test for infinite resistance between the 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 15

⇒ **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 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 15

⇒ **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 on page 6-92* after completing the repair procedure.

- *Mobile Telephone Microphone Replacement on page 8-53*
- *Control Module References on page 6-3* for radio or telematics communication interface control module replacement, programming, and setup.

OnStar Audio Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Audio High Signal terminal 1	1	1	1	—
Audio Low Signal terminal 2	1	1	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 Schematics on page 8-6*
- *Radio/Navigation System Schematics on page 8-4*

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON, 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 on page 8-49*

⇓ **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 and vehicle systems OFF, disconnect the X2 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.
2. Test for less than 4 V between each of the signal circuits listed below and ground:
   - Terminal 1
   - Terminal 2

⇒ **If 4 V or greater**

2.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio, ignition ON.

2.2. Test for less than 1 V between the signal circuits and ground.

⇒ If greater than 1 V, repair the short to voltage in the circuit.

⇒ If less then 1 V, replace the A11 Radio.

⇓ **If less than 4 V**

3. Ignition OFF.
4. Test for infinite resistance between each of the signal circuits listed below and ground:
   - Terminal 1
   - Terminal 2

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

5. Disconnect the X1 harness connector at the A11 Radio.
6. Test for less than 2 Ω in each of the signal circuits listed below end to end:
   - K73 Telematics Communication Interface Control Module Terminal 1 X2
   - K73 Telematics Communication Interface Control Module Terminal 2 X2

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 2 Ω**

7. Replace the K73 Telematics Communication Interface Control Module.
8. 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**

9. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair procedure.

Control Module References on page 6-3 for radio or telematics communication interface control module replacement, programming, and setup.

No Global Positioning System (GPS) Reception

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

Circuit/System Description

The navigation antenna is connected to the Telematics Communication Interface Control Module. The module supplies 5 V to the antenna to power the internal amplifier through the center conductor of the antenna coax cable.

Diagnostic Aids

- The scan tool Telematics Communication Interface Control Module GPS signal parameter will display a Yes or No dependent upon whether or not the module sees an increment of the seconds transmitted by GPS signals to the Telematics Communication Interface Control Module. Upon entering this screen, the GPS signal title will initially display Yes, regardless of the presence of time increment, for at least 2 seconds, while the algorithm in the scan tool determines the status of the clock. If increment is found, Yes is continually displayed. If the clock remains static, No is displayed. The scan tool looks for increment every second, regardless of current display.
- Inaccurate or aged GPS position concerns which are no longer present may have been due to the temporary loss of GPS signal reception by the vehicle. Conditions such as tunnels or parking structures will restrict the cellular phone and navigation antenna from a clear view of the satellites in the sky and may have caused this temporary data loss.
- The GPS requires a clear line of sight to the sky to operate properly. In most cases the GPS will not have reception near tall buildings or inside structures.

Reference Information

Schematic Reference

Radio/Navigation System Schematics on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note: The following verification requires the vehicle to be outside with an unobstructed view of the southern sky. Allow 5 minutes after turning the ignition ON for the vehicle to acquire the GPS satellites signal.

1. Ignition ON.
2. Verify that no DTCs are set.

⇒ **If any DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If no DTCs are set**

3. Verify that an OnStar advisor can locate the vehicle after performing a blue button press.

⇒ **If the advisor can not locate the vehicle**

Refer to Circuit System Testing.

⇓ **If the advisor can locate the vehicle**

4. All OK.

Circuit/System Testing

Note: The global positioning system (GPS) requires a clear line of sight to the sky to operate properly. It may take up to 15 minutes for the Nav Radio to acquire a GPS signal. In most cases the GPS will not have reception near tall buildings or inside structures.

1. Ignition OFF, disconnect the GPS and cellular coax cable connector at the K73 Telematics Communication Interface Control Module.
2. Using the *EL-49903* OnStar Antenna Diagnostic Tool Kit, connect the EL-49903-3 antenna to the K73 telematics communication interface module. Place the test antenna on the roof of the vehicle, ignition ON.
3. Verify that an OnStar advisor can locate the vehicle after performing a blue button press.

⇒ **If the advisor can not locate the vehicle**

Replace the K73 Telematics Communication Interface Control Module.

⇓ **If the advisor can locate the vehicle**

4. Test the coax cable between the K73 Telematics Communication Interface Control Module and the T4G Cellular Phone, Navigation, and Digital Radio Antenna. Refer to component testing.

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

Replace the coax cable.

⇓ **If the coax cable passes the test**

5. Test or replace the T4G Cellular Phone, Navigation, and Digital Radio Antenna.

Component Testing

Caution: Refer to *Test Probe Caution on page 0-10*.

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.
- The vehicle may be equipped with sectioned coax. Test each section and replace only the faulty section, not the entire length of coax.

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 on page 6-92* after completing the diagnostic procedure.

- *Radio Antenna Base Replacement on page 8-61*
- *Control Module References on page 6-3* for Radio replacement, setup, and programming

OnStar Button LED Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC B2476 04: Cellular Phone Select Service Switch Open
DTC B2476 59: Cellular Phone Select Service Switch Protection Time-out
DTC B2482 00: Cellular Phone Select Service Switch Range/Performance

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
10 V Reference	B2476 04	B2476 04	B2476 04	—
Control Terminal 6	1	1	2	—
Control Terminal 7	1	1	2	—
Signal Terminal 3	B2476 04	B2476 04	B2476 59	B2476 59, B2482 00
Ground	—	B2476 04	—	—
1. OnStar® LED Inoperative 2. LED Illuminated At All Times				

Circuit Description

The OnStar® status LEDs are located in the inside rearview mirror telematic button assembly. The green LED is illuminated when the system is ON and operating normally. When the green LED is green and flashing, it is an indication that a call is in progress. When the red LED 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 LED will flash red during the call. The OnStar® LEDs are controlled by the telematics communication interface control module via the keypad green LED control circuit and the keypad red LED control circuit.

Conditions for Running the DTC

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

Conditions for Setting the DTC

B2476 04

The telematics communication interface control module detects a short to voltage or an open/high resistance on the keypad 10 V reference 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

Schematic Reference

OnStar Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note:

- If the green LED is off with the ignition ON and the LED functions correctly when commanded with the scan tool, contact the OnStar Center to confirm the vehicle has a current subscription.

1. Ignition ON.
2. Verify no DTC are set.

⇒ **If any DTC are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*

⇓ **If no DTC are set**

3. Verify that the green LED turns ON and OFF when commanding the Green Indicator ON and OFF with a scan tool.

⇒ **If the green LED does not turn ON and OFF**

Refer to Circuit/System Testing – Green LED Test

⇓ **If the green LED turns ON and OFF**

4. Verify that the red LED turns ON and OFF when commanding the Red Indicator ON and OFF with a scan tool.

⇒ **If the red LED does not turn ON and OFF**

Refer to Circuit/System Testing – Red LED Test

⇓ **If the red LED turns ON and OFF**

5. All OK.

Circuit/System Testing

Green LED Test

1. Ignition OFF, and all vehicle systems OFF, disconnect the harness connector at the A10 Inside Rearview Mirror. It may take up to 2 min for all vehicle systems to power down. Doors closed, courtesy lamps OFF.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

⇒ **If 10 Ω or greater**

2.1. Ignition OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Ignition ON.

4. Test for less than 1 V between the control circuit terminal 6 and ground while commanding the Green Indicator OFF with a scan tool.

⇒ **If 1 V or greater**

4.1. Ignition OFF, disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.

4.2. Test for less than 1 V between the control circuit terminal 6 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 6 and ground while commanding the Green Indicator ON with a scan tool.

⇒ **If 8 V or less**

5.1. Ignition OFF, disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module.

5.2. Test for infinite resistance between the control circuit terminal 6 and ground.

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

⇓ If infinite resistance

5.3. 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 A10 Inside Rearview Mirror.

Red LED Test

1. Ignition OFF, and all vehicle systems OFF, disconnect the harness connector at the A10 Inside Rearview Mirror. It may take up to 2 min for all vehicle systems to power down. Doors closed, courtesy lamps OFF.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

⇒ **If 10 Ω or greater**

2.1. Ignition OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Ignition ON.

4. Test for less than 1 V between the control circuit terminal 7 and ground while commanding the Red Indicator OFF with a scan tool.

⇒ **If 1 V or greater**

4.1. Ignition OFF, disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.

4.2. Test for less than 1 V between the control circuit terminal 7 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 7 and ground while commanding the Red Indicator ON with a scan tool.

⇒ **If 8 V or less**

5.1. Ignition OFF, disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module.

5.2. Test for infinite resistance between the control circuit terminal 7 and ground.

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

⇓ If infinite resistance

5.3. 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 A10 Inside Rearview Mirror.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Inside Rearview Mirror Replacement on page 4-235*
- *Control Module References on page 6-3* 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 on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides 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 Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Important:

- 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. Ignition ON.
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 on page 6-66*.

⇓ **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 on page 8-50*

⇓ **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 on page 6-92* after completing the repair.

Control Module References on page 6-3 for telematics communication interface control module replacement, programming and setup.

OnStar Button Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC B2476 04: Cellular Phone Select Service Switch Open
DTC B2476 59: Cellular Phone Select Service Switch Protection Time-out
DTC B2482 00: Cellular Phone Select Service Switch Range/Performance

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
10 V Reference	B2476 04	B2476 04	B2476 04	—
Signal Terminal 3	B2476 04	B2476 04	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 activated.

Conditions for Running the DTC

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

Conditions for Setting the DTC

B2476 04

The telematics communication interface control module detects a short to voltage or an open/high resistance on the keypad 10 V reference 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

Schematic Reference

OnStar Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 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.
2. Verify no DTCs are set.

⇒ **If any DTCs are set**

Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69

⇓ **If no DTCs are set**

3. 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 A10 Inside Rearview Mirror.

⇓ **If all of the buttons operate normally**

4. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the A10 Inside Rearview Mirror. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 5 and ground.

⇒ **If 10 Ω or greater**

2.1. Ignition OFF.

2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Ignition ON.
4. Test for 8.0–10.5 V between the 10 V reference circuit terminal 4 and ground.

⇒ **If less than 8.0 V**

4.1. Ignition OFF, disconnect the harness connector at the K73 Telematics Communication Interface Control Module.

4.2. 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

4.3. 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**

4.1. Ignition OFF, disconnect the harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.

4.2. 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.
6. Test for 500–900 Ω between the signal circuit terminal 3 and ground.

⇒ **If less than 500 Ω**

6.1. Disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module.

6.2. 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**

6.1. Disconnect the X1 harness connector at the K73 Telematics Communication Interface Control Module, ignition ON.

6.2. 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

6.3. Ignition OFF.

6.4. 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 A10 Inside Rearview Mirror.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Inside Rearview Mirror Replacement on page 4-235*
- *Control Module References on page 6-3* 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 on page 8-118*, to begin diagnosis of the steering wheel control concern.

Radio Poor Reception

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides 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	—
Ground	—	1	—	—
1. May exhibit possible AM/FM interference.				

Circuit/System Description

The multi-band antenna is located on the roof of the vehicle. The radio antenna is enabled when the radio is turned on. The radio provides battery voltage to the antenna using the center conductor of the antenna coaxial cable. When a 12 V signal is seen 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 clears after 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

Radio/Navigation System Schematics on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON, A11 radio ON. Verify station reception is normal when tuned to several known good AM and FM stations.

⇒ **If AM or FM reception is poor.**

Refer to Circuit/System Testing

⇓ **If reception is normal**

2. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the radio antenna coax cable from the A11 radio and from the T4M radio antenna.
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 radio antenna coax cable to the A11 radio.
4. Ignition ON, A11 radio ON.
5. Verify a test lamp illuminates between the antenna coax cable center terminal and ground at the T4M radio antenna.

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

replace the A11 radio.

⇓ **If the test lamp illuminates**

6. Test or replace the T4M radio antenna.

Component Testing

Caution: Refer to *Test Probe Caution on page 0-10.*

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 on page 6-92* after completing the repair.

- *Radio Antenna Base Replacement on page 8-61*
- *Control Module References on page 6-3* for radio replacement, programming, and setup.

Speaker Replacement Reference

Component	Repair Instruction
Front Door Speaker	*Radio Front Side Door Speaker Replacement on page 8-65*
Front Tweeter Speaker	*Radio Windshield Side Garnish Molding Speaker Replacement on page 8-64*
Rear Door Speaker	*Radio Rear Side Door Speaker Replacement on page 8-66*

Speaker Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides 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	B1025 02, 1	B1025 04, 1	B1025 01, 1, 2	—
Left Front Speaker Output (-) Signal	B1025 02, 1	B1025 04, 1	B1025 01, 1, 2	—
Right Front Speaker Output (+) Signal	B1035 02, 1	B1035 04, 1	B1035 01, 1, 2	—
Right Front Speaker Output (-) Signal	B1035 02, 1	B1035 04, 1	B1035 01, 1, 2	—
Left Rear Speaker Output (+) Signal	B1045 02, 1	B1045 04, 1	B1045 01, 1, 2	—
Left Rear Speaker Output (-) Signal	B1045 02, 1	B1045 04, 1	B1045 01, 1, 2	—
Right Rear Speaker Output (+) Signal	B1055 02, 1	B1055 04, 1	B1055 01, 1, 2	—
Right Rear Speaker Output (-) Signal	B1055 02, 1	B1055 04, 1	B1055 01, 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.

Reference Information

Schematic Reference

Radio/Navigation System Schematics on page 8-4

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Radio/Audio System Description and Operation on page 8-73

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-50334-50 USB Cable and Adapter Kit

Circuit/System Verification

1. Ignition ON, 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

1. Ignition OFF, disconnect the harness connector at the appropriate P19 Speaker. Ignition ON, 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**

2.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio.

2.2. 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

2.3. 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**

2.1. Ignition OFF, disconnect the X1 harness connector at the A11 Radio. Ignition ON.

2.2. 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**

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.

3. Insert the EL-50334-6 Audio Test CD from the *EL-50334-50* USB cable and adapter kit. Play track number three (50 Hz bass test tone) from the test CD.
4. Test for 49–51 Hz AC between each signal circuit terminal 1 and terminal 2 and ground.

⇒ **If not between 49–51 Hz AC**

Replace the A11 Radio.

⇓ **If between 49–51 Hz AC**

5. Test or replace the P19 Speaker.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Speaker Replacement Reference on page 8-48*
- *Control Module References on page 6-3* for radio replacement, programming, and setup

Unable to Contact OnStar Call Center

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

Circuit/System Description

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. When an OnStar keypress is made, the telematics communication interface control module activates and connects the system to the cellular carriers communication system by interacting with the national cellular infrastructure. The module sends and receives all cellular communications over the cellular phone and navigation antenna and cellular antenna coax.

Diagnostic Aids

- The customer concern may have been due to a lack of cellular service in a given area. A failure in the National Cellular Network infrastructure at the time of the customers failed connection that has since been repaired may also have been the cause.
- If an OnStar® emergency call is able to successfully connect the vehicle to the OnStar® Call Center when an OnStar® Call Center button press is not, there may be a failure in the ability of the OnStar® system in the vehicle to be recognized by the local cellular carrier.
- If the prompt "OnStar® request ended" is heard, without pressing the white dot button at the end of the OnStar® keypress, the OnStar® system at one time has made a successful cellular connection, but was unable to complete the call.
- It is important 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.

Reference Information

Schematic Reference

OnStar Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

EL-49903 GM OnStar Antenna Diagnostic Tool Kit

Circuit/System Verification

Note: 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 ON.
2. Verify that DTC B2470 is not set.

⇒ **If DTC B2470 is set**

Refer to *DTC B2470 on page 8-21*

⇓ **If DTC B2470 is not set**

3. Verify that a call can be successfully placed to the OnStar Call Center by pressing the blue OnStar button.

⇒ **If unable to connect with the OnStar Call Center.**

Refer to Circuit/System Testing

⇓ **If able to connect with the OnStar Call Center**

4. All OK.

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 and all vehicle systems OFF, disconnect the GPS and 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-49903–3 kit (EL-49903–5 adapter and EL-49903–4 coax cable), connect the *EL-49903* GM OnStar antenna diagnostic tool kit to the K73 Telematics Communication Interface Control Module.
3. Ignition ON, wait 5 min.
4. Verify that a call can be successfully placed to the OnStar Call Center by pressing the blue OnStar button.

⇒ **If unable to connect with the OnStar Call Center**

Test or replace the K73 Telematics Communication Interface Control Module.

⇓ **If able to connect with the OnStar Call Center**

5. Ignition OFF, disconnect the *EL-49903* GM OnStar antenna diagnostic tool kit from the K73 Telematics Communication Interface Control Module
6. Test the coax cable between the K73 Telematics Communication Interface Control Module and the T4G Cellular Phone, Navigation, and Digital Radio Antenna. 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 T4G Cellular Phone, Navigation, and Digital Radio Antenna.

Component Testing

Caution: Refer to *Test Probe Caution on page 0-10.*

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 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 on page 6-92* after completing the diagnostic procedure.

- *Radio Antenna Base Replacement on page 8-61*
- *Control Module References on page 6-3* for telematics communication interface control module replacement, programming, and setup.

OnStar Voice Recognition Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides 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 circuit. 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 Schematics on page 8-6

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

OnStar Description and Operation on page 8-67

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

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. Ignition ON, press the blue OnStar Call button.
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 on page 8-36*

⇓ **If your voice can be heard clearly**

3. Verify that the system responds appropriately to all voice commands by pressing the blue OnStar Call 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 on page 8-67* for tips on proper pronunciation

⇓ **If the OnStar system responds to all voice commands**

4. All OK.

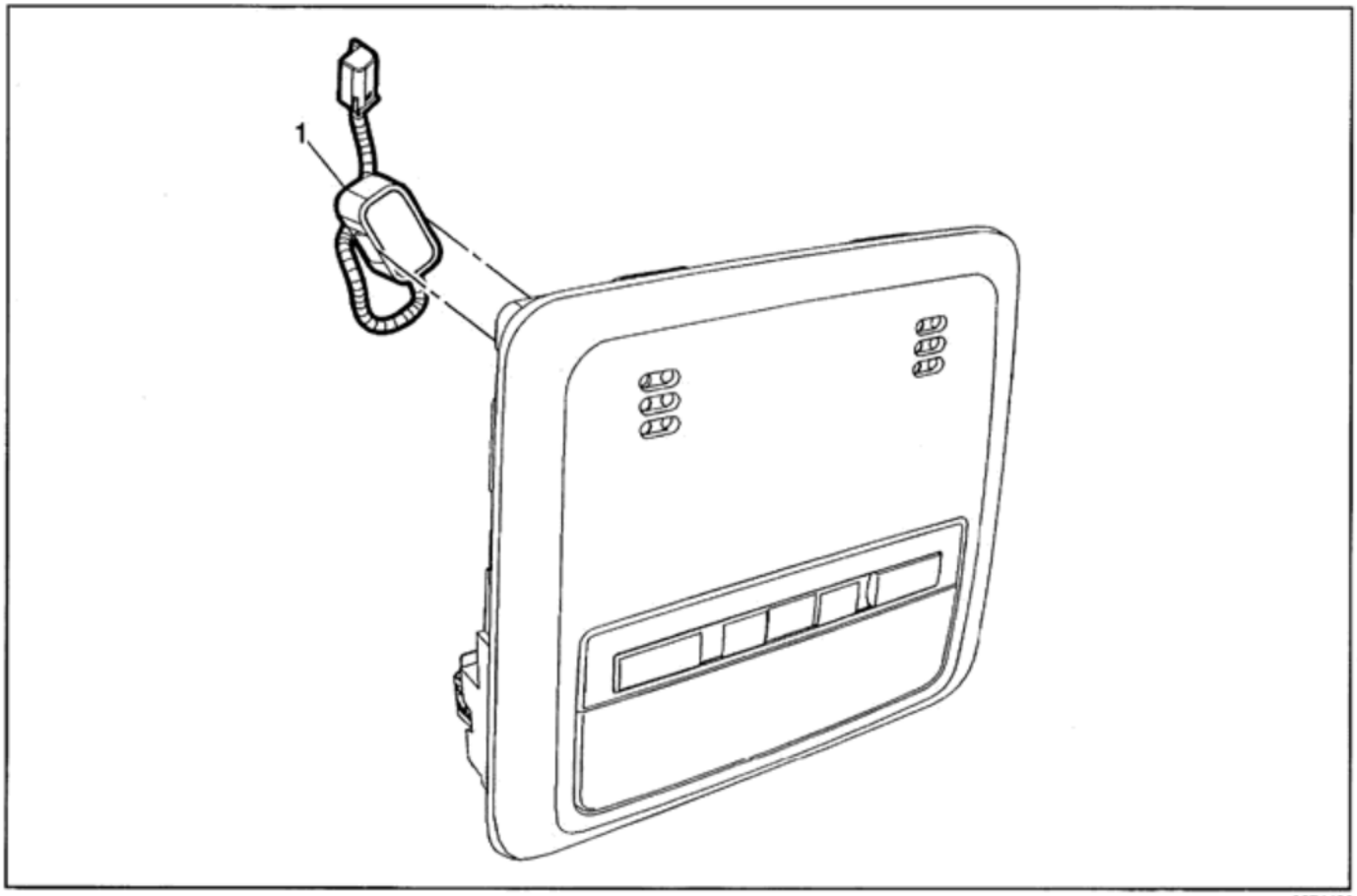
Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair procedure.

Control Module References on page 6-3 for telematics communication interface control module replacement, programming, and setup.

Repair Instructions

Mobile Telephone Microphone Replacement

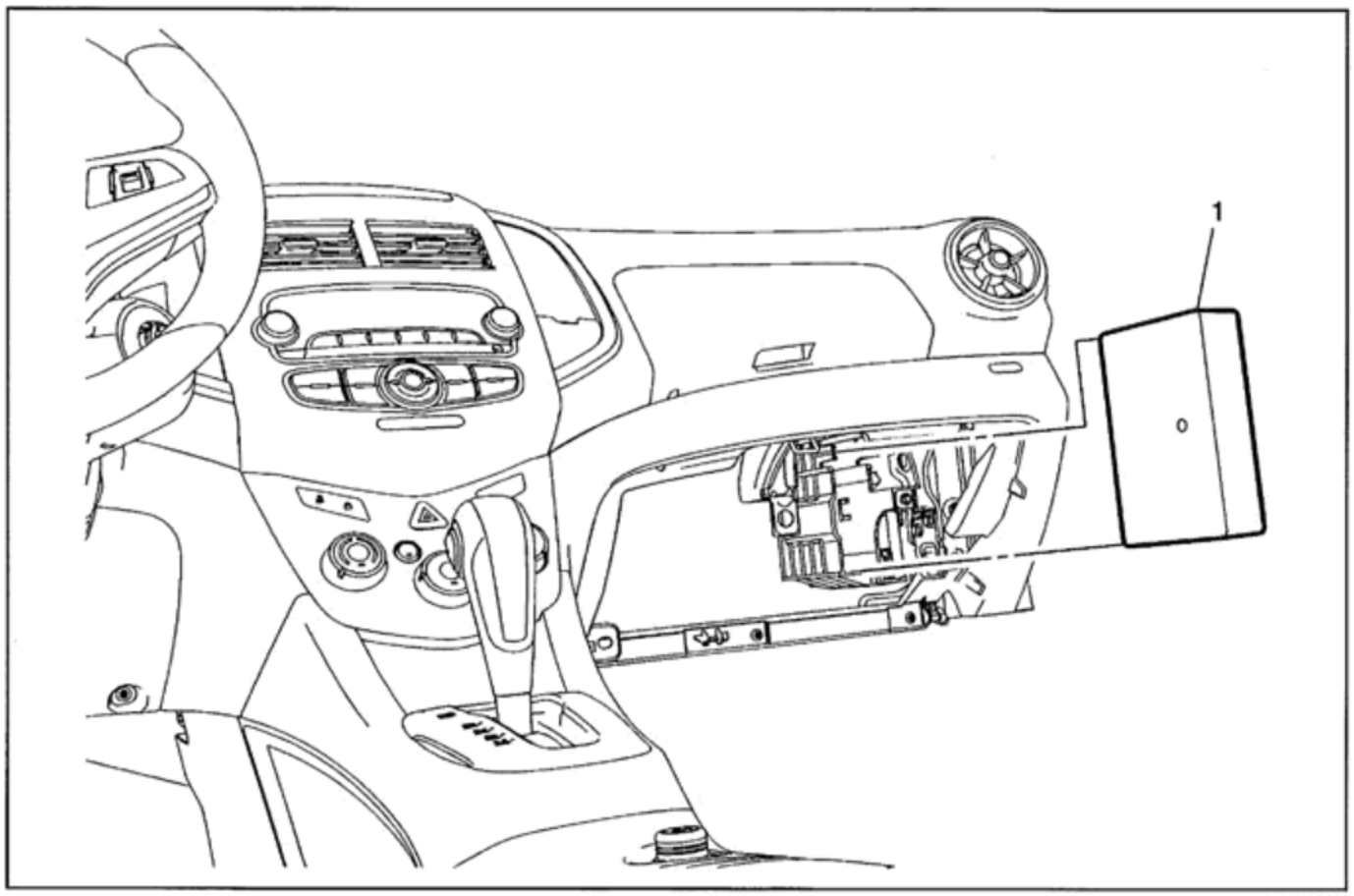


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Mobile Telephone Microphone Replacement

Callout	Component Name
Preliminary Procedure Remove the dome lamp bezel. Refer to *Dome Lamp Bezel Replacement on page 4-190*.	
1	Mobile Telephone Microphone **Procedure** Disconnect the electrical connector.

Communication Interface Module Replacement

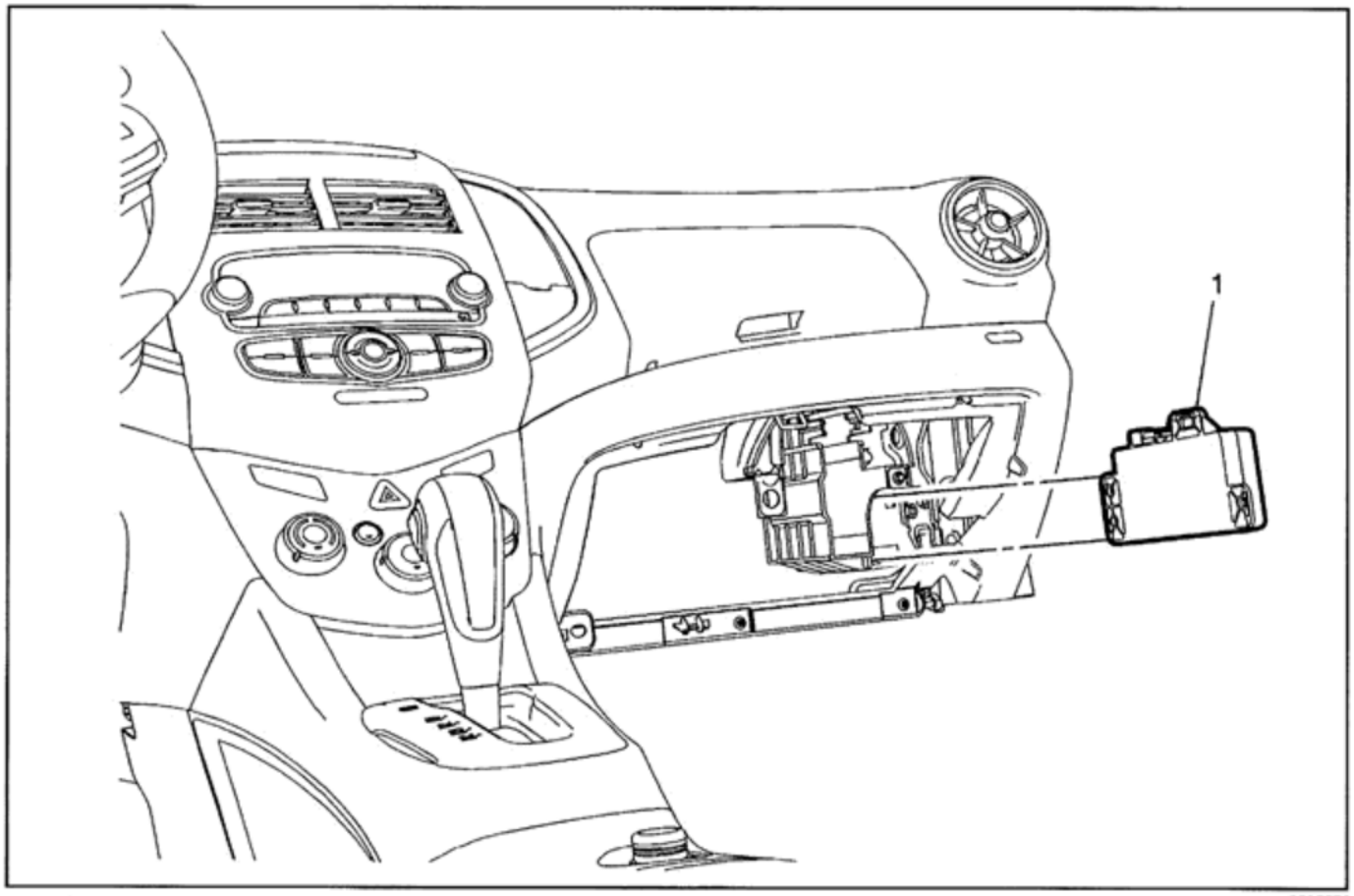


2505565

Communication Interface Module Replacement

Callout	Component Name
Preliminary Procedure 1. Remove the instrument panel lower compartment. Refer to *Instrument Panel Lower Compartment Replacement on page 2-44*. 2. Remove the instrument panel insulator. Refer to *Instrument Panel Insulator Replacement on page 2-29*.	
1	Communication Interface Module **Procedure** 1. Slide the module forward and release from tabs on bracket. 2. Disconnect the electrical connections. 3. If replacing the communication interface module be sure to transfer wireless communication interface antenna, if equipped. 4. For programming and set up procedures, refer to *Control Module References on page 6-3*.

Communication Interface Module Battery Replacement

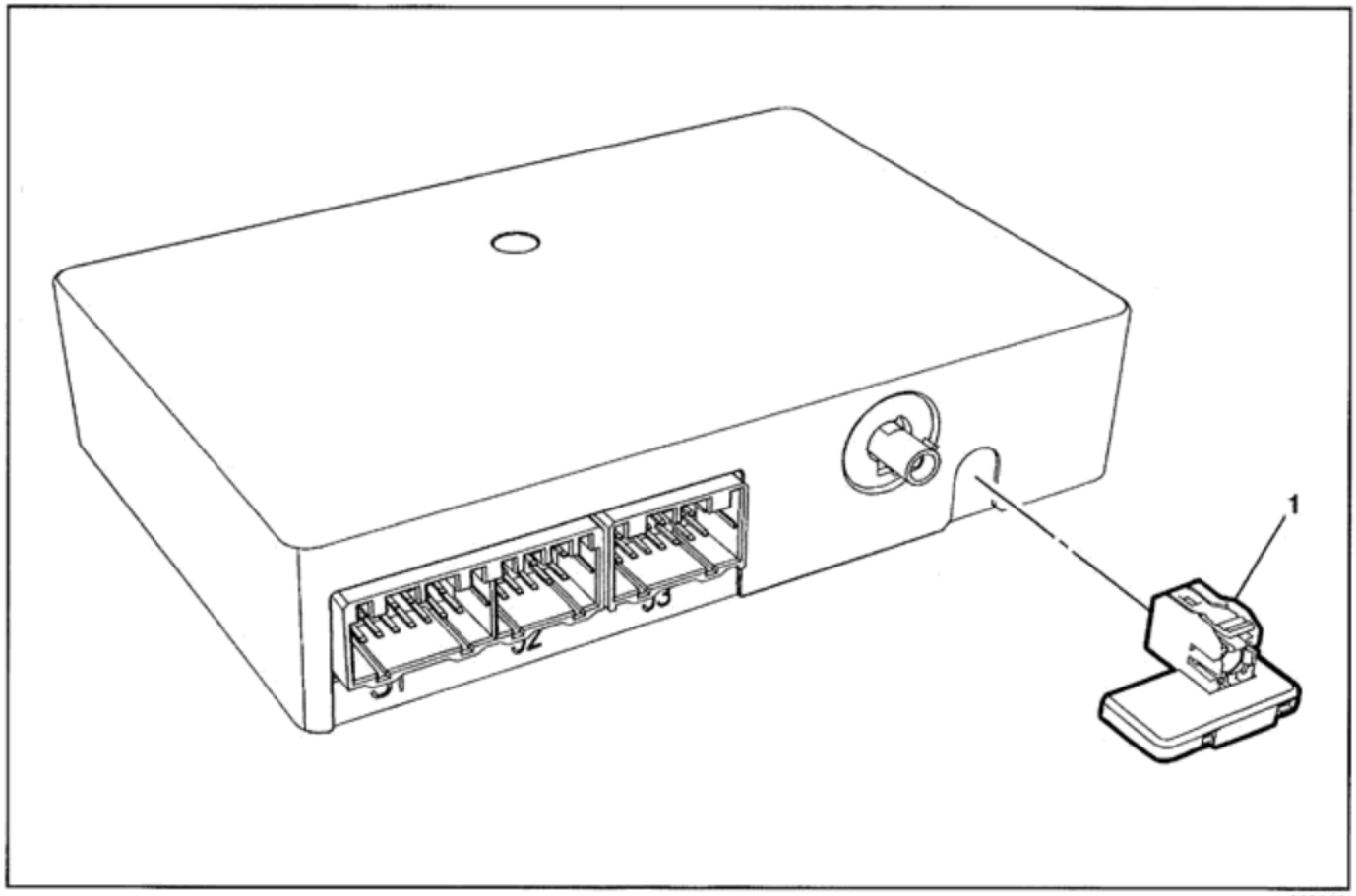


2505570

Communication Interface Module Battery Replacement

Callout	Component Name
Preliminary Procedure Remove the instrument panel lower compartment. Refer to *Instrument Panel Lower Compartment Replacement on page 2-44*	
1	Communication Interface Module Battery **Procedure** 1. Disconnect the electrical connector. 2. Reprogramming of the module may be necessary after losing battery power. 3. For programming and set up procedures, refer to *Control Module References on page 6-3.*

Wireless Communication Interface Antenna Replacement

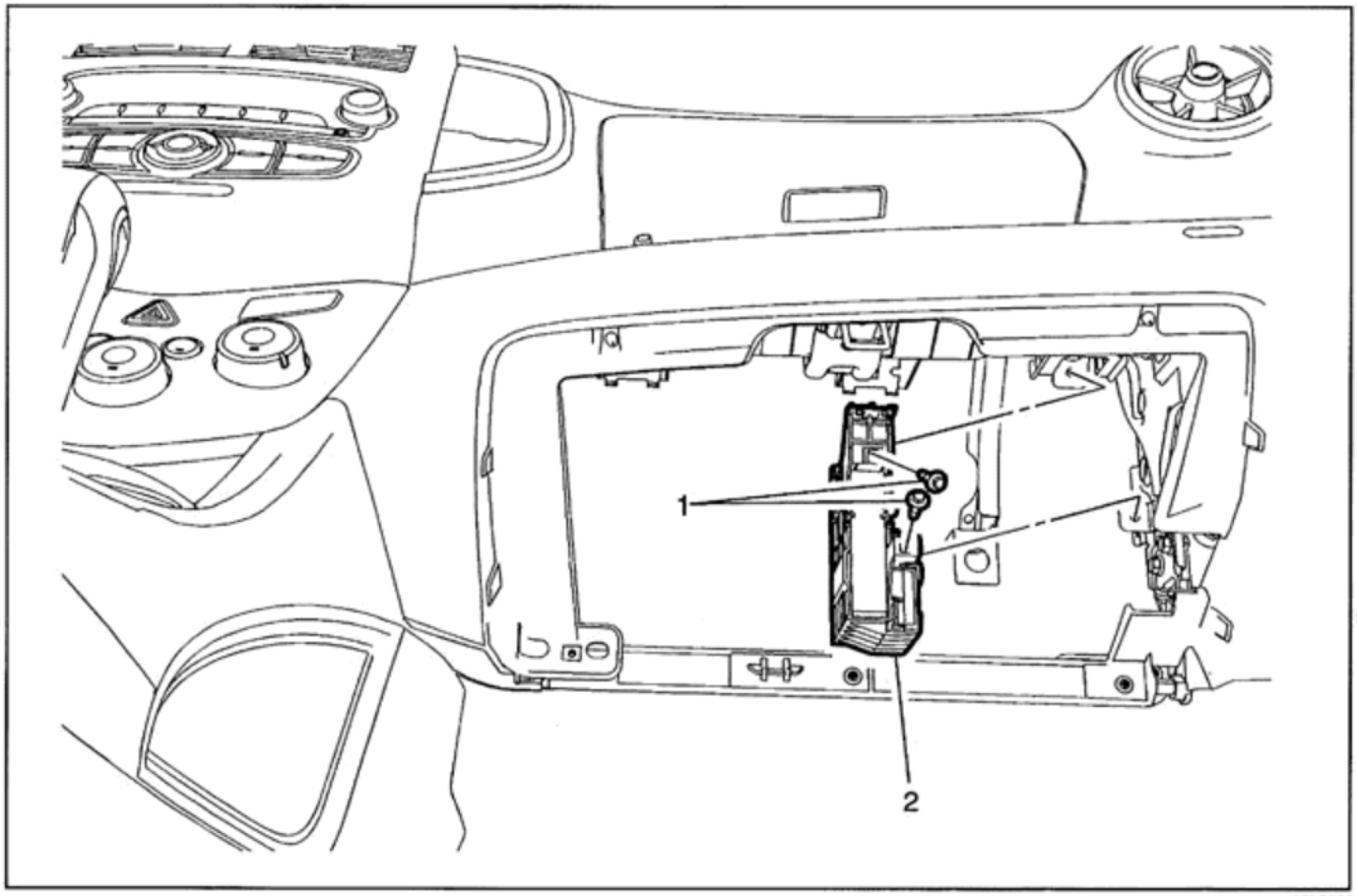


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Wireless Communication Interface Antenna Replacement

Callout	Component Name
Preliminary Procedure Remove the communication interface module. Refer to *Communication Interface Module Replacement on page 8-54*	
1	Wireless Communication Interface Antenna Bluetooth Module **Procedure** Unsnap the Antenna from Communication Module.

Communication Interface Module Bracket Replacement

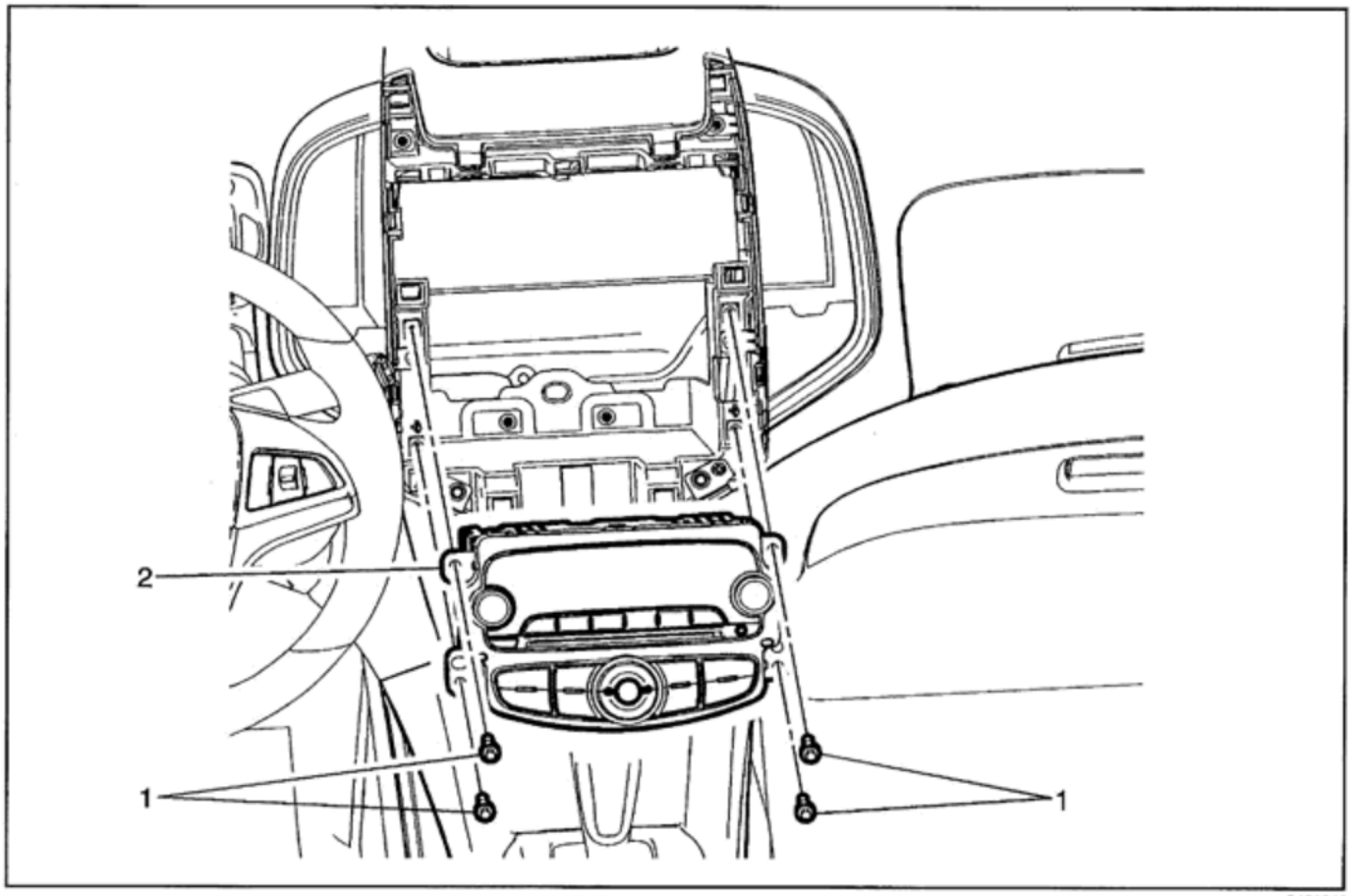


2505569

Communication Interface Module Bracket Replacement

Callout	Component Name
Preliminary Procedure Remove the instrument panel lower compartment. Refer to *Instrument Panel Lower Compartment Replacement on page 2-44*	
1	Communication Interface Module Bracket Bolts (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8*.
2	Communication Interface Module Bracket **Procedure** 1. Disconnect the electrical connectors. 2. Transfer components as necessary.

Radio Replacement (With US8)

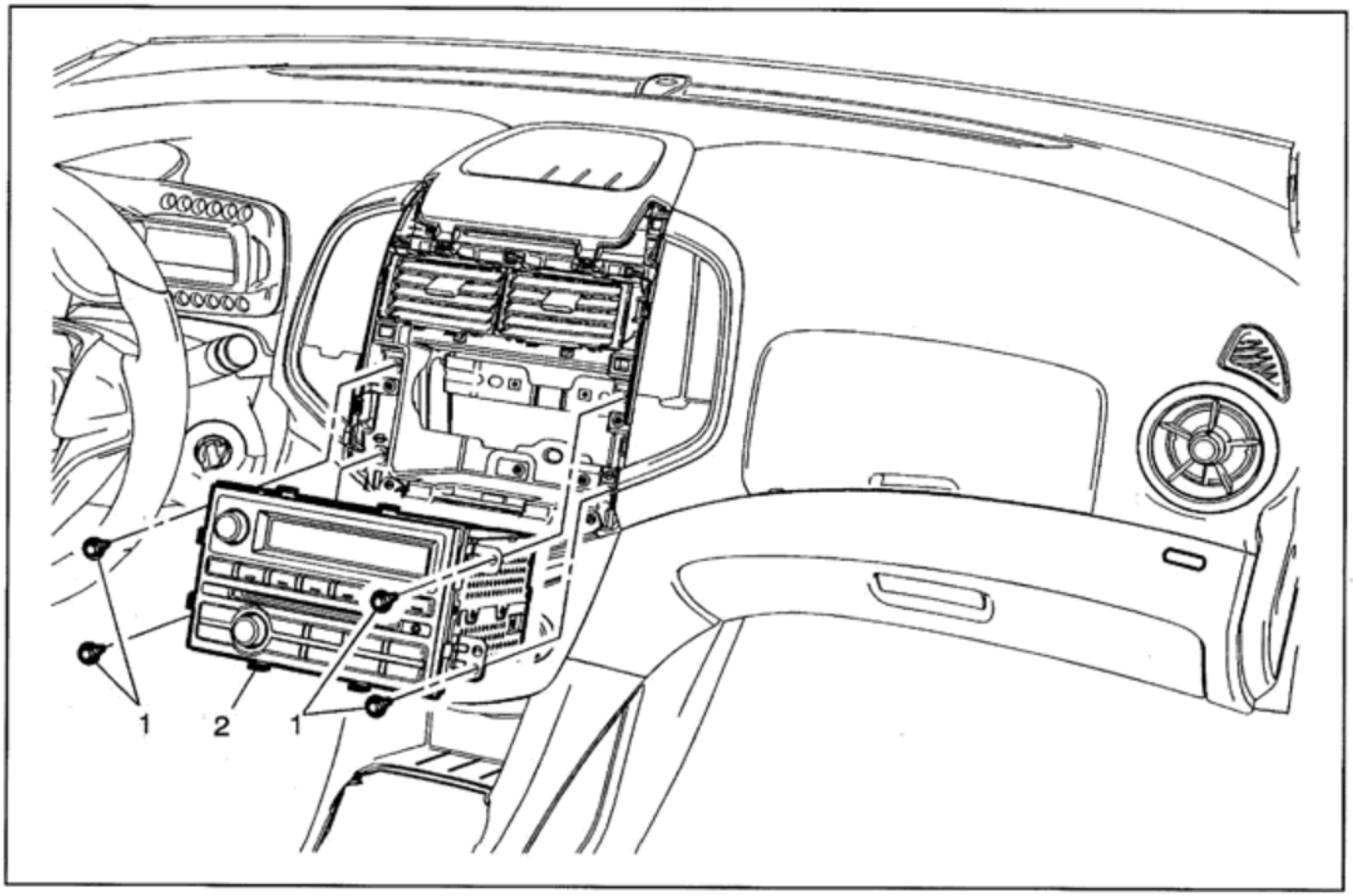


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Radio Replacement (With US8)

Callout	Component Name
Preliminary Procedure Remove the instrument panel center molding. Refer to *Instrument Panel Center Molding Replacement (With U58) on page 2-47* or *Instrument Panel Center Molding Replacement (Without U58) on page 2-48*.	
1	Radio Bolts (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*.
2	Radio Assembly **Procedure** 1. Disconnect the electrical connections. 2. Refer to *Control Module References on page 6-3* for programming and setup information.

Radio Replacement (Without US8)

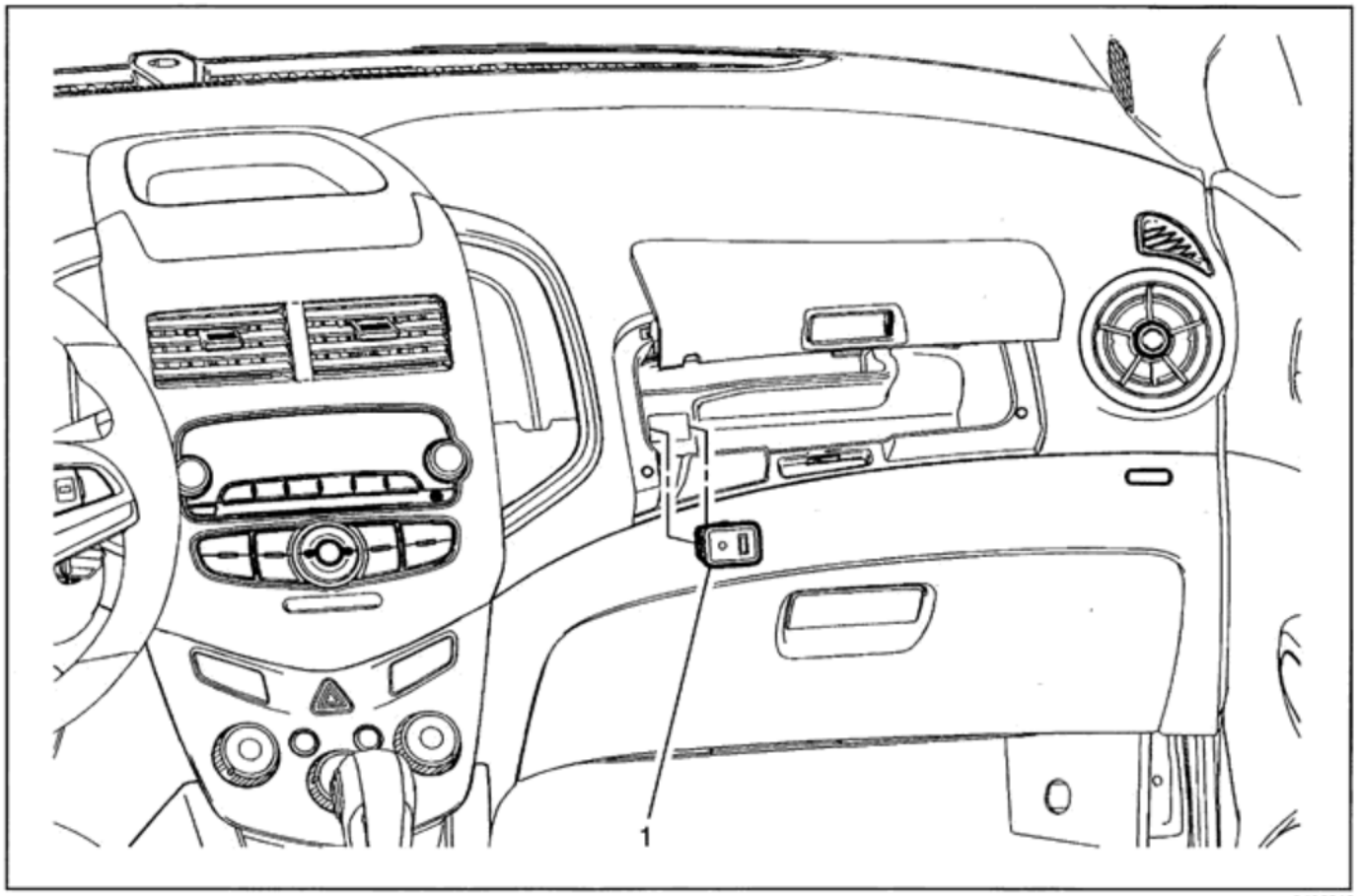


2506928

Radio Replacement (Without US8)

Callout	Component Name
Preliminary Procedure Remove the instrument panel center molding. Refer to *Instrument Panel Center Molding Replacement (With U58) on page 2-47* or *Instrument Panel Center Molding Replacement (Without U58) on page 2-48*.	
1	Radio Bolts (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*.
2	Radio Assembly **Procedure** 1. Disconnect the electrical connections. 2. Refer to *Control Module References on page 6-3* for programming and setup information.

Audio Disc Player and USB Receptacle Replacement

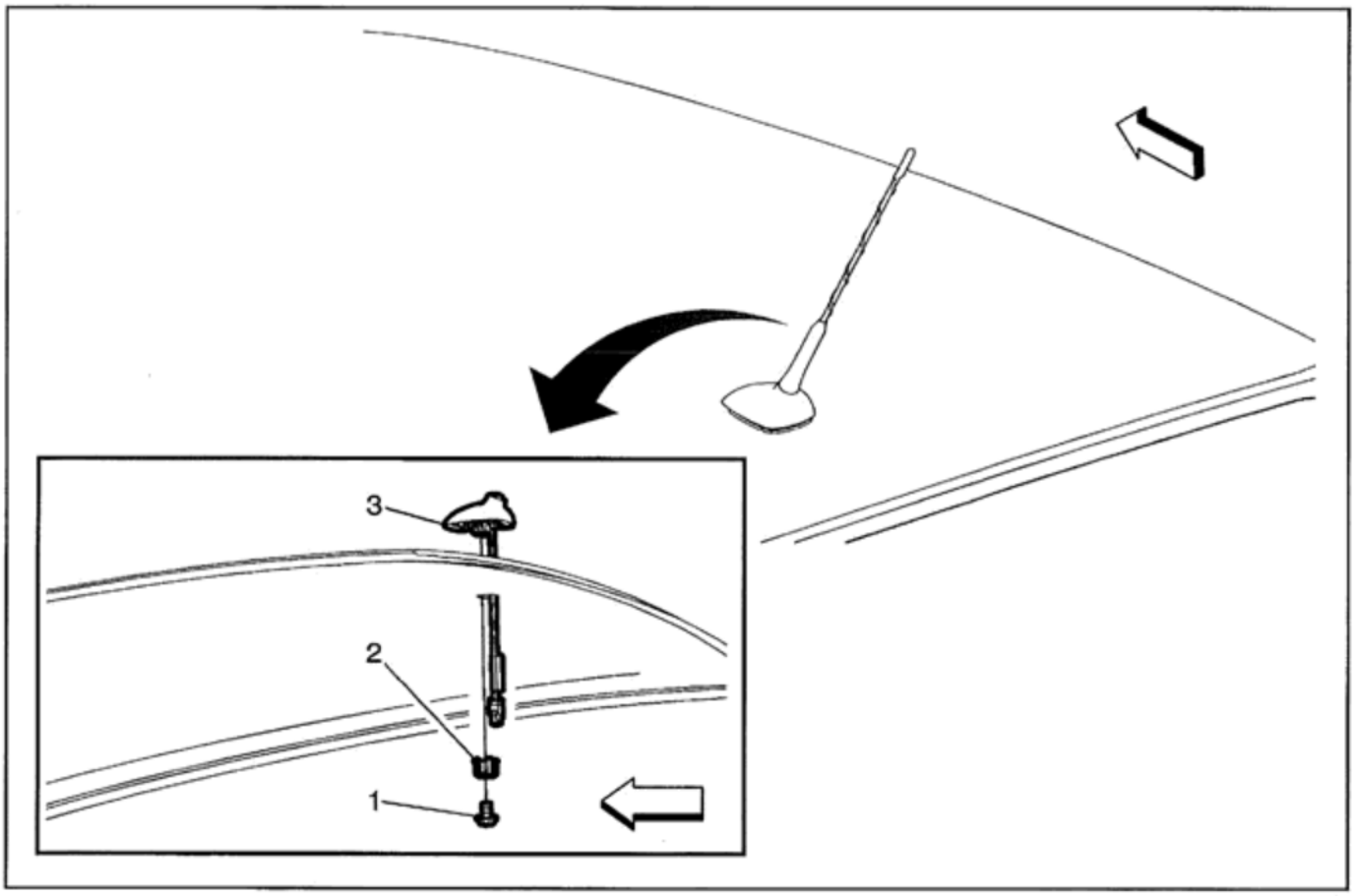


2496212

Audio Disc Player and USB Receptacle Replacement

Callout	Component Name
1	Audio Disc Player and USB Receptacle **Procedure** 1. Open the instrument panel compartment door and using a small flat bladed tool, release the receptacle. 2. Disconnect the electrical connector.

Radio Antenna Base Replacement

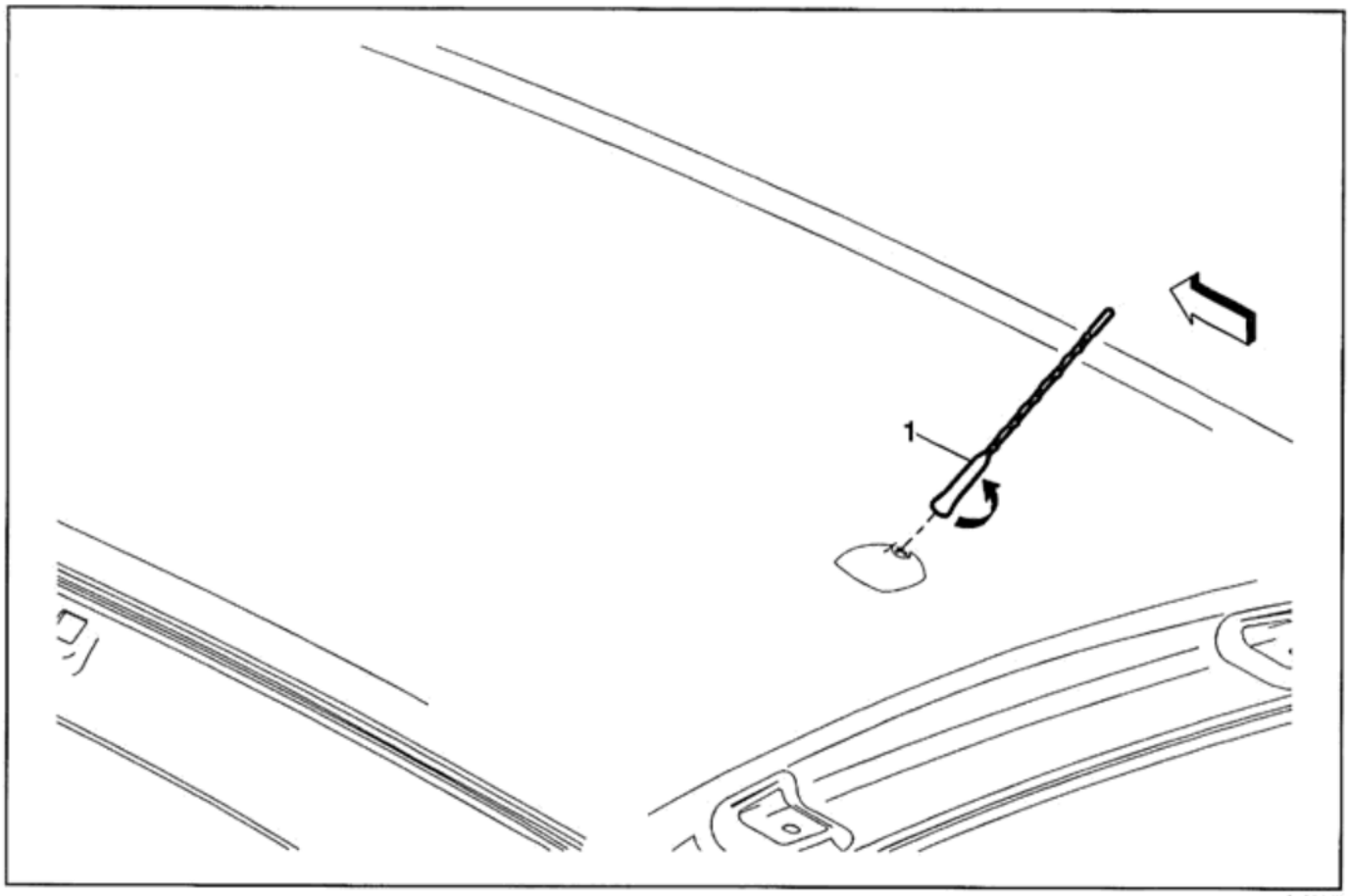


2496816

Radio Antenna Base Replacement

Callout	Component Name
Preliminary Procedure Lower the rear of the headlining trim panel. Refer to *Headlining Trim Panel Replacement (Sedan with Sunroof) on page 2-26* or *Headlining Trim Panel Replacement (Hatchback with Sunroof) on page 2-24* or *Headlining Trim Panel Replacement (Hatchback without Sunroof) on page 2-25* or *Headlining Trim Panel Replacement (Sedan without Sunroof) on page 2-27*.	
1	Radio Antenna Base Fastener **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 9 N•m (80 lb in)
2	Radio Antenna Base Retainer
3	Radio Antenna Base Assembly **Procedure** Disconnect the electrical connectors.

Radio Antenna Replacement

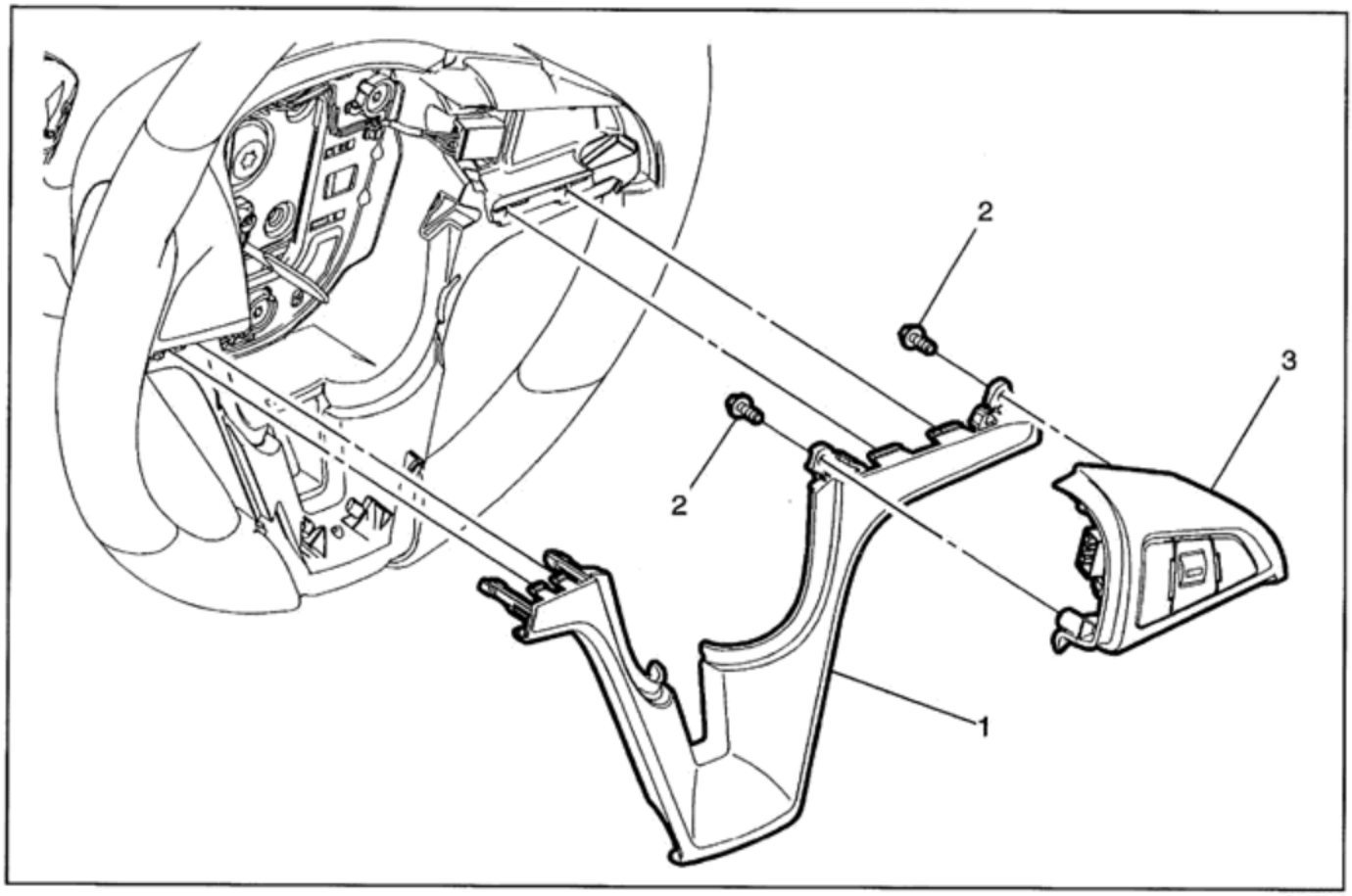


2498814

Radio Antenna Replacement

Callout	Component Name
1	Radio Antenna **Procedure** Rotate the mast counterclockwise in order to release the mast from the antenna base.

Radio and Telephone Control Switch Replacement

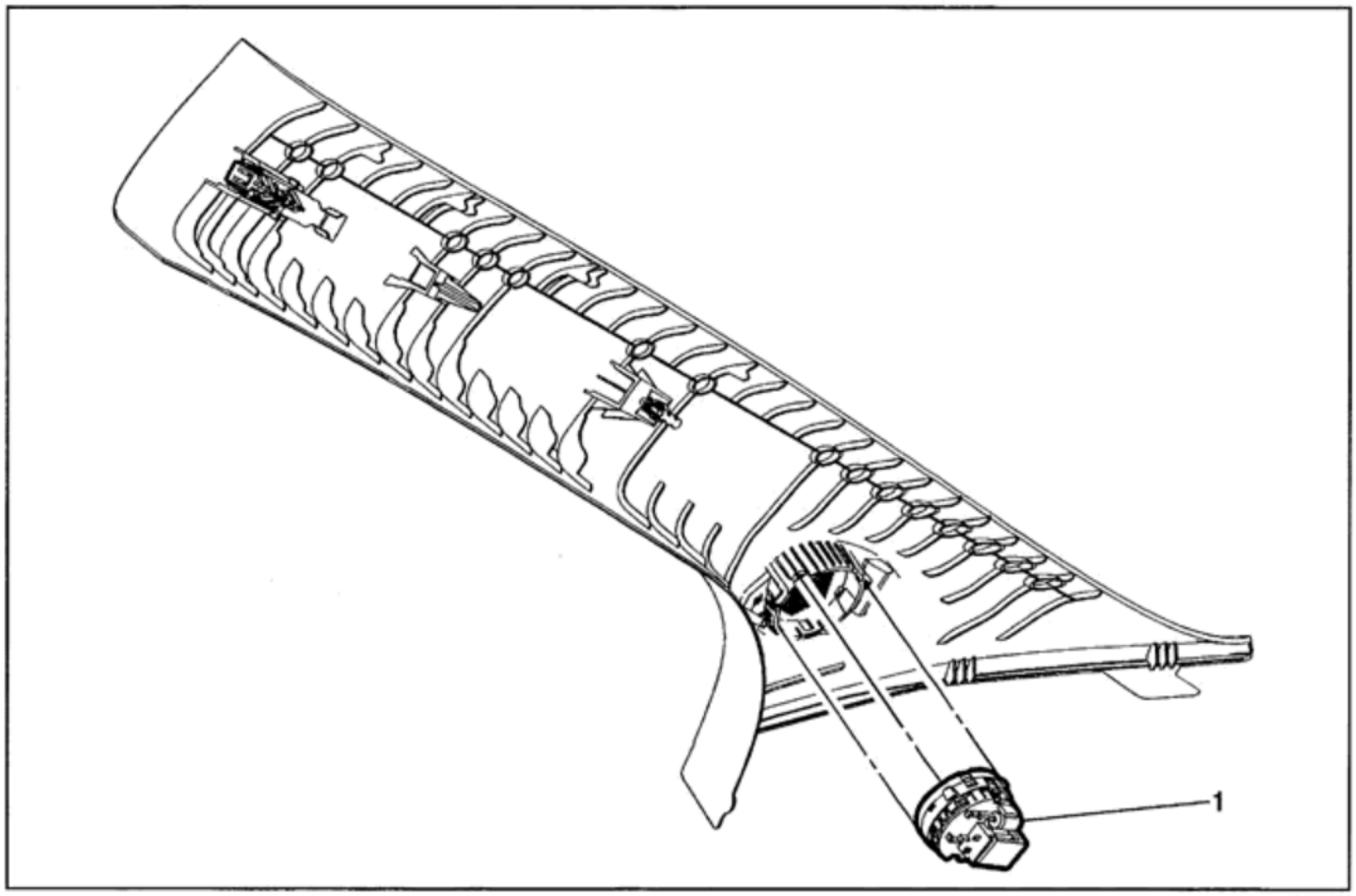


2496200

Radio and Telephone Control Switch Replacement

Callout	Component Name
Preliminary Procedure Remove the sterring wheel inflatable restraint module. Refer to *Airbag Steering Wheel Module Replacement on page 13-118*.	
1	Steering Wheel Lower Cover
2	Steering Wheel Lower Cover Fastener (Qty: 2)
3	Radio and Telephone Control Switch Assembly **Procedure** Disconnect the electrical connector.

Radio Windshield Side Garnish Molding Speaker Replacement

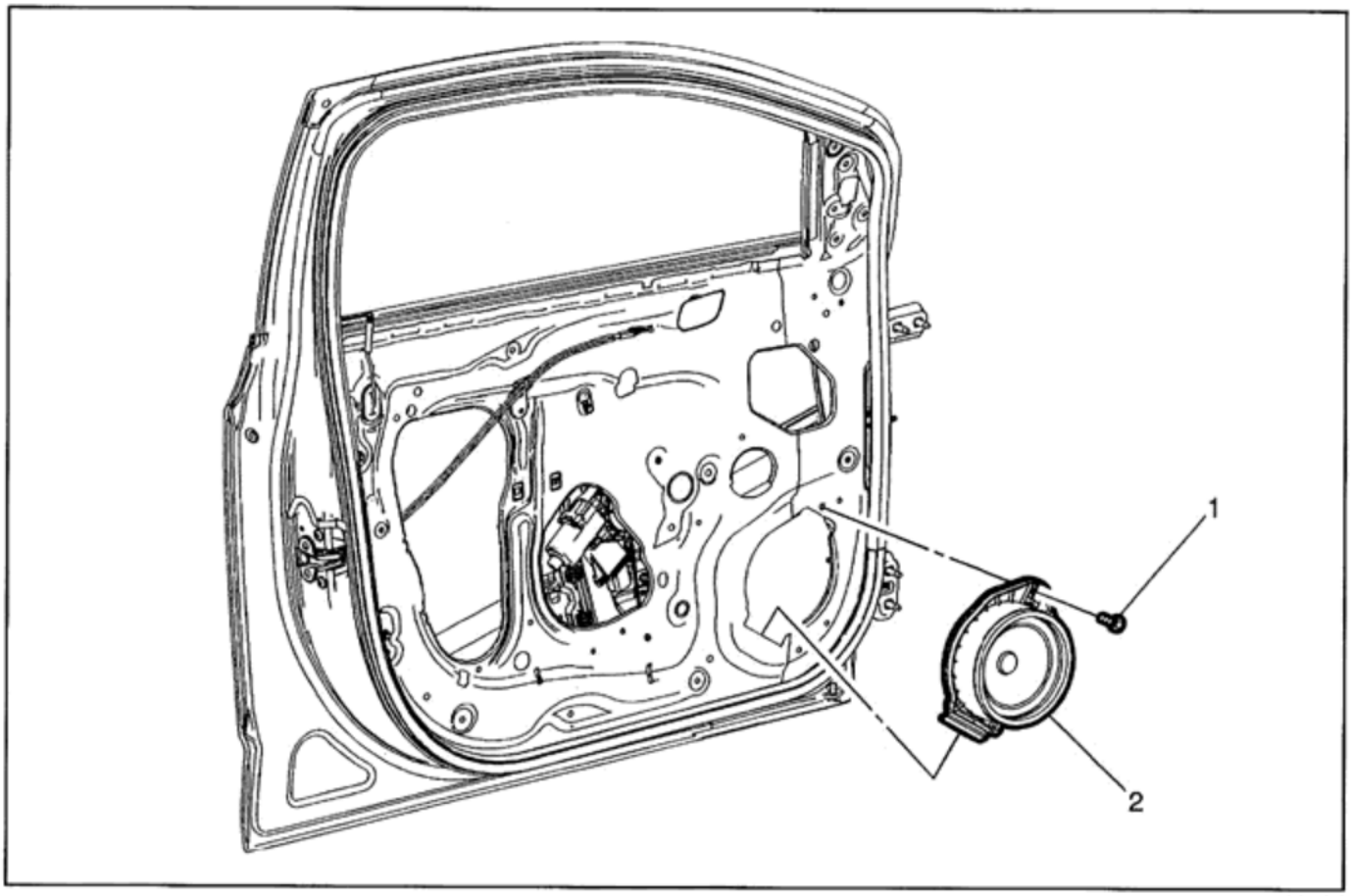


2496182

Radio Windshield Side Garnish Molding Speaker Replacement

Callout	Component Name
Preliminary Procedure Remove the windshield side garnish molding. Refer to *Windshield Side Garnish Molding Replacement on page 2-73*.	
1	Radio Windshield Side Garnish Molding Speaker **Procedure** Depress tabs to remove speaker.

Radio Front Side Door Speaker Replacement

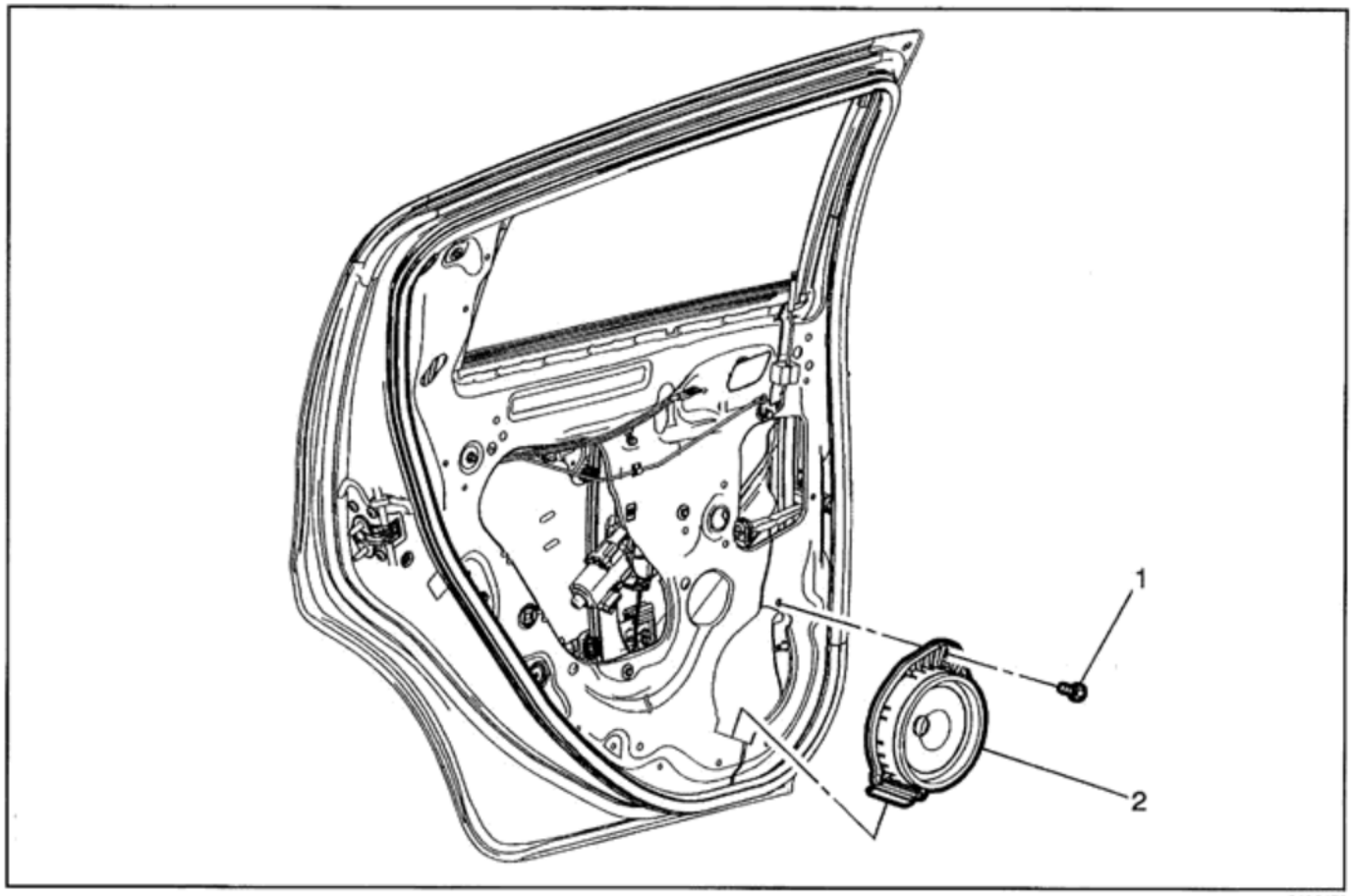


2498169

Radio Front Side Door Speaker Replacement

Callout	Component Name
Preliminary Procedure Remove the front side door trim. Refer to *Front Side Door Trim Replacement on page 2-67*.	
1	Radio Front Side Door Speaker Bolt **Caution:** Refer to *Fastener Caution on page 0-8*.
2	Radio Front Side Door Speaker **Procedure** Disconnect the electrical connector.

Radio Rear Side Door Speaker Replacement



2496172

Radio Rear Side Door Speaker Replacement

Callout	Component Name
Preliminary Procedure Remove the rear side door trim. Refer to *Rear Side Door Trim Replacement (Sedan) on page 2-84* or *Rear Side Door Trim Replacement (Hatchback) on page 2-83*.	
1	Radio Rear Side Door Speaker Bolt **Caution:** Refer to *Fastener Caution on page 0-8*.
2	Radio Rear Side Door Speaker **Procedure** Disconnect the electrical connectors.

Description and Operation

OnStar Description and Operation

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)

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

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

Base Mirror

- 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 mirror has the rear vision camera display in the mirror, the LED's are then interior to the mirror and controlled via data communication on the Low Speed GMLAN bus from the Telematics Communication Interface Control Module to the mirror.

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.

Prismatic Mirror (If Equipped)

- The OnStar® button assembly is apart of the rearview mirror. The button assembly is comprised of 3 capacitive touch buttons and a status LED. The buttons are defined as follows:
  - The answer/end call button, which is a white driver figure seated with voice signals near it's face, allows the user to answer and end calls or initiate speech recognition.
  - The blue OnStar® call center button, which displays the blue OnStar® logo, allows the user to connect to the OnStar® call center.
  - The emergency button, which displays red letters "SOS" as an illuminated Indicator, 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 press is processed and completes a circuit across an internal 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 within the mirror near the buttons. 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.

Electrochromic Mirror (If Equipped)

- The OnStar® button assembly is apart of the rearview mirror. The button assembly is comprised of 3 capacitive touch buttons and an error indicator. The buttons are defined as follows:
  - The answer/end call button, which is a white driver figure seated with voice signals near it's face, allows the user to answer and end calls or initiate speech recognition.
  - The blue OnStar® call center button, which displays the blue OnStar® logo, allows the user to connect to the OnStar® call center.
  - The emergency button, which displays red letters "SOS" as an illuminated Indicator, 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 press is processed and completes a circuit across an internal 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 and illuminate associated indicator above each button.

The OnStar® error indicator is located within the mirror above the buttons between the OnStar® indicator and emergency "SOS" indicator. All three indicators associated with a button press are illuminated 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 OnStar® error indicator is illuminated, 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 OnStar® error indicator will remain illuminated during the call.

If the indicators do 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.

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.

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 a small fixed antenna connected directly to the telematics communication interface control module and is used to send and receive signals from a Bluetooth® enabled cellular phone. The antenna utilizes no cabling and is not external to the vehicle. 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. 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)

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 though 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 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.

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 engine 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.
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.

General Tips for Better Speech Recognition (cont'd)

Concern	Tip for Better Result
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".
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".

Radio/Audio System Description and Operation

The entertainment system on this vehicle may have several different configurations available to it. To determine the specific configuration of the vehicle, please see the Service Parts ID Label, and refer to *RPO Code List on page 1-14*.

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

- Radio Circuit Operation
- Antenna System
- Radio Reception
- Digital Radio Receiver (If equipped)
- Speaker Operation
- Theft Deterrent
- OnStar®
- Auxiliary Audio Input Jack
- USB Port (if equipped)
- Bluetooth® (If equipped)
- Applications (if equipped)
- Steering Wheel Controls (If equipped)
- Speed Controlled Volume (SCV) (If equipped)

Radio Circuit Operation

Radio Power

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 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.

Remote Enable Output

The remote enable circuit is a discrete 12 V signal supplied to infotainment system components when the radio is producing audio, needs the front display on, needs video entertainment system components on, or needs to produce chimes. This signal is used to control the power state of the components. There is no output on radio the remote enable circuit when the vehicle is in the CRANK powermode, this is to minimize current consumption from the attached modules and also to avoid audio pops during crank events.

Antenna System

Multi-Band Antenna

The multi-band antenna is located on the roof of the vehicle. 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.

The radio antenna is enabled when the radio is turned on. The radio provides battery voltage to the antenna using the center conductor of the antenna coaxial cable. This DC voltage does not affect the incoming radio signal. When a 12 V signal is seen by the antenna on the center conductor of the antenna coax, both AM and FM signals are amplified.

Radio Reception

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 a CD is playing. If a CD 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 XM satellite radio 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.

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.

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.

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.

For additional OnStar information, refer to *OnStar Description and Operation on page 8-67*.

Auxiliary Audio Input Jack

The infotainment system has a 3.5mm (1/8 in.) auxiliary audio input jack available on the face of the radio. This input interfaces internally with the radio, no external circuits are involved.

The infotainment system may also have an additional auxiliary audio input jack located in the instrument panel compartment. 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 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.

- When a device is first connected to the 3.5mm (1/8 in.) input jack the infotainment system automatically switches to that device. If an auxiliary device has already been connected, press the AUX or CD/AUX button to select the device.
- Playback of an audio device that is connected to the 3.5mm 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 instrument panel compartment. 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.

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. 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 first connection between devices is established through a process called pairing. In order to pair two devices, a password (passkey) has to be exchanged between the two devices. One device will generate the password, the other device accepts the password to complete the process. Once the devices are paired, future connections between the devices will occur automatically when the devices are on and within range of each other.

The Bluetooth ® hardware is internal to the radio. The radio supports streaming of data (music, voice, information) from cellular phones and other mobile devices that support those features. The radio may also be capable of interfacing with cellular phones for hands-free features.

- 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.
- Up to five devices can be paired to the system, but only one can be connected at any given time.

- Streaming Audio allows playing music from the mobile device wirelessly. Music stored on the mobile device can be viewed and controlled from the display.
- To stream audio from a mobile device, the device must be unlocked, and any additional applications should be closed.

Refer to the vehicle owners manual, supplements, and the device manufacturers information for pairing instructions.

Applications (If equipped)

When the system is equipped with Bluetooth ®, the system may be capable of using applications, commonly referred to as apps.

The term application refers to any piece of software that works on a system (hardware) that is being operated by it's own software. Applications are typically small software programs which uses the hardware to perform a specific task, as opposed to operating the entire system.

- For an application to be used, it must be installed on both the vehicle infotainment system and a compatible mobile device.
- The device must be connected to the system. this may be done wirelessly via Bluetooth ®, or via the vehicle USB port. Refer to the device manufacturers information for the proper connection method.
- When the device is connected, the application on the radio is used to remotely access and control the application on the mobile device.
- The application must work correctly on the device to work with the vehicle infotainment system.
- The user may be required to log-in to the application on the mobile device before using the application from the vehicle controls.
- Using applications will use the device's data plan.
- The device must be unlocked, and any additional applications should be closed.

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

Steering Wheel Controls (If equipped)

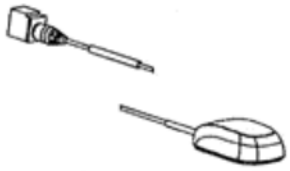
Some audio functions are available using the steering wheel controls. The steering wheel controls duplicate the function of the primary controls available on the radio.

For additional information on steering wheel controls, refer to *Steering Wheel Controls Description and Operation on page 8-120*.

Speed Compensated Volume (If equipped)

With Speed Controlled Volume (SCV), 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 SCV, set the volume at the desired level, and then select either Low, Medium, or High. To turn SCV off, select the Off screen button.

Special Tools and Equipment

Illustration	Tool Number/Description
 2773268	EL–50334–20 Multi-Media Interface Tester (MIT)
 2551420	EL–50334–50 USB Cable and Adapter Kit
 1709512	EL-48028 Digital Radio Test Antenna
 2321176	EL-49903 OnStar Antenna Diagnostic Tool Kit