

2010 ACCESSORIES & EQUIPMENT

Cellular, Entertainment, and Navigation - Equinox & Terrain

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Audio/Video Disc Player Adapter Screws	2.5 N.m	22 lb in
Communication Interface Module Bolts	10 N.m	89 lb in
Navigation Signal Splitter Bolts	9 N.m	80 lb in
Radio Front Center Speaker Screws	2.5 N.m	22 lb in
Radio Front Side Door Lower Speaker Bolts	2.5 N.m	22 lb in
Radio Rear Compartment Speaker Nuts	10 N.m	89 lb in
Radio Rear Side Door Lower Speaker Bolts	2.5 N.m	22 lb in
Radio Screws	23 N.m	17 lb ft
Radio Speaker Amplifier Bolts	2.5 N.m	22 lb in
Radio, Video, Audio Disc Player, and Navigation Information Display Screws	2.5 N.m	22 lb in
Video Display Bolts	9.5 N.m	84 lb in

SCHEMATIC AND ROUTING DIAGRAMS

RADIO/NAVIGATION SYSTEM SCHEMATICS

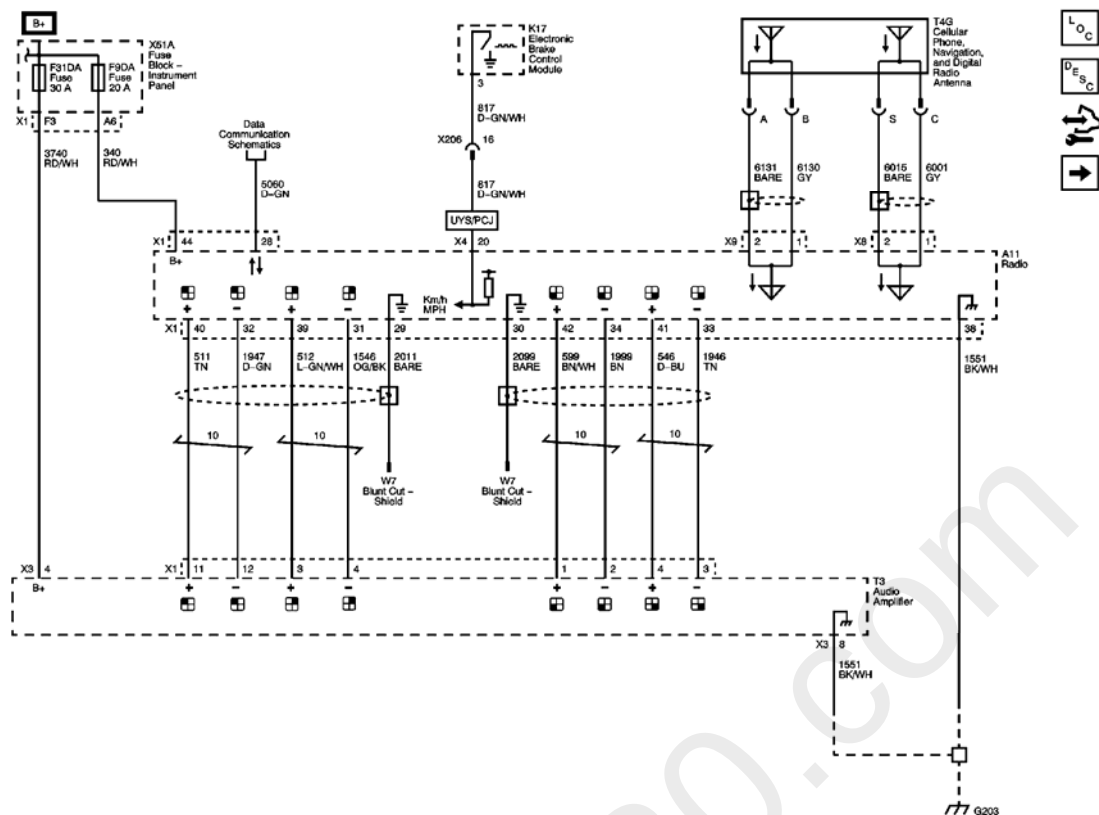


Fig. 1: Power, Ground, and Antennas
 Courtesy of GENERAL MOTORS CORP.

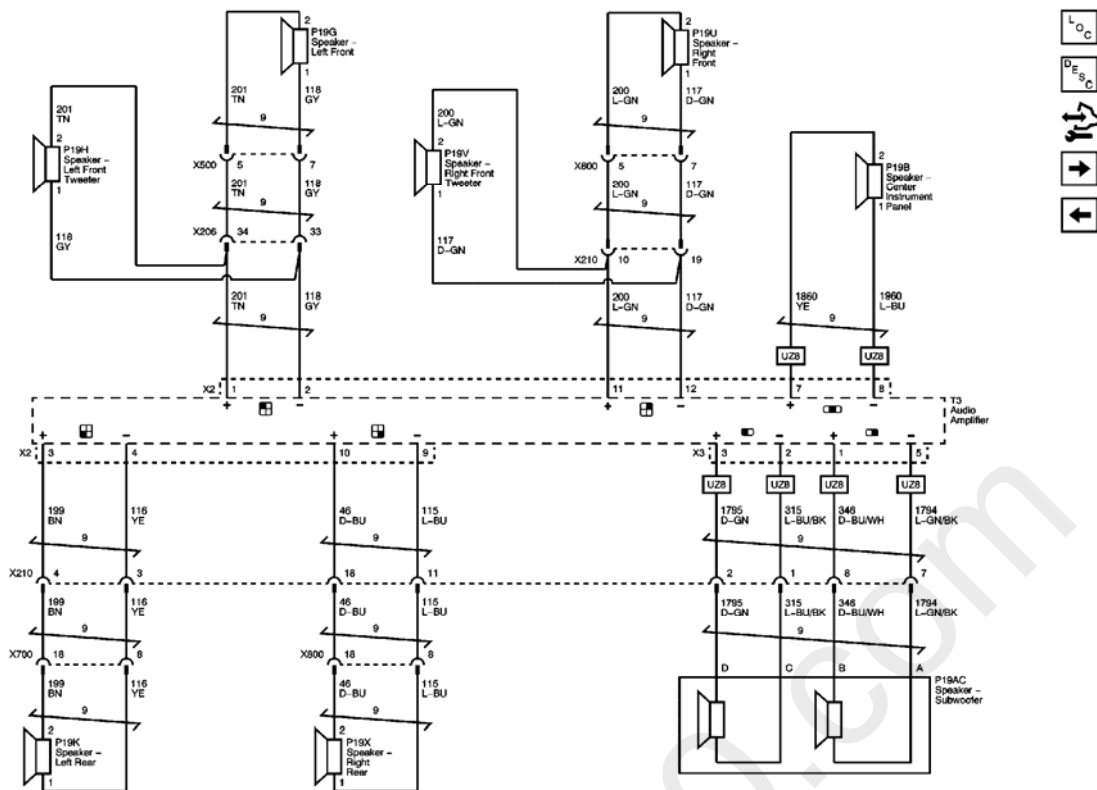


Fig. 2: Amplifier and Speakers
 Courtesy of GENERAL MOTORS CORP.

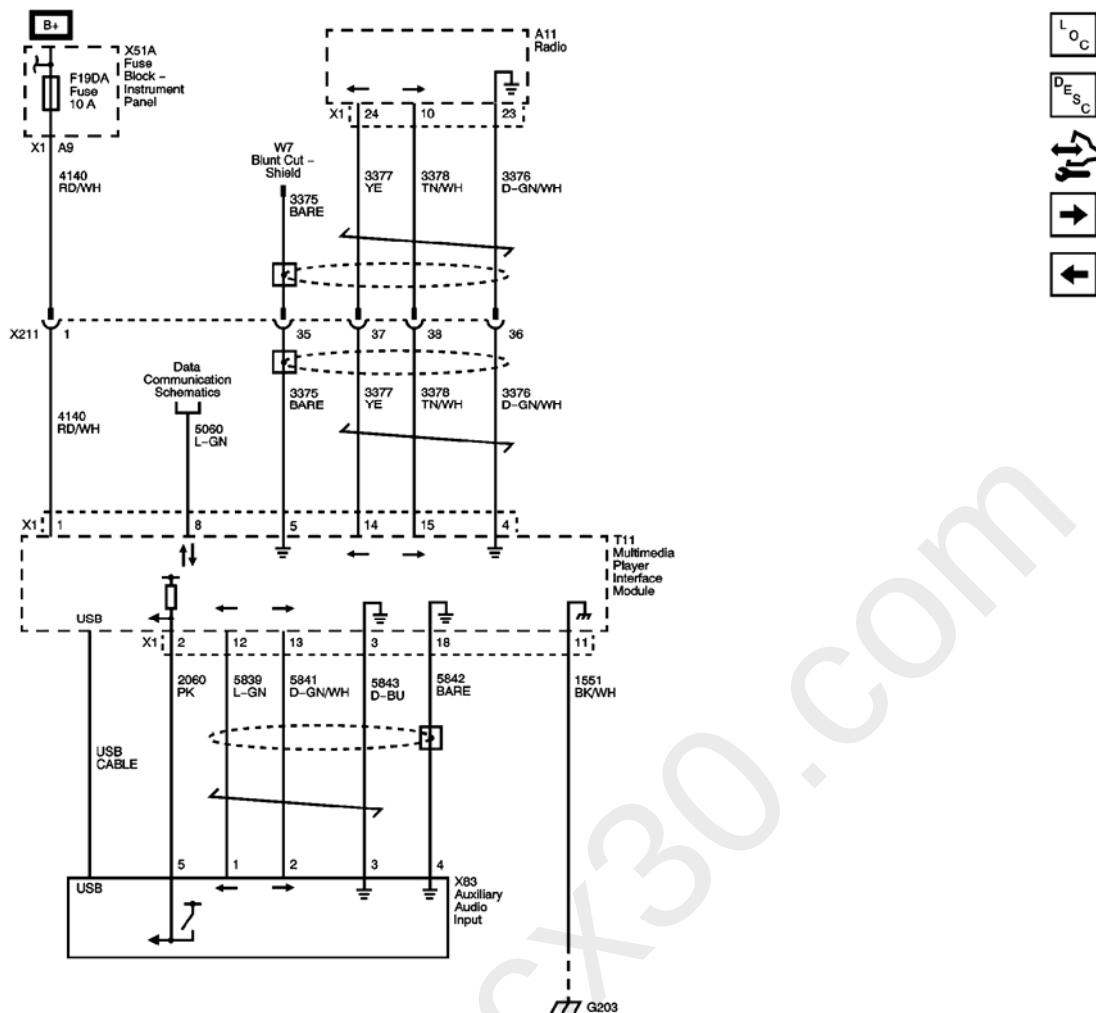


Fig. 3: Multimedia Player Interface and Audio Jacks (KTA)
 Courtesy of GENERAL MOTORS CORP.

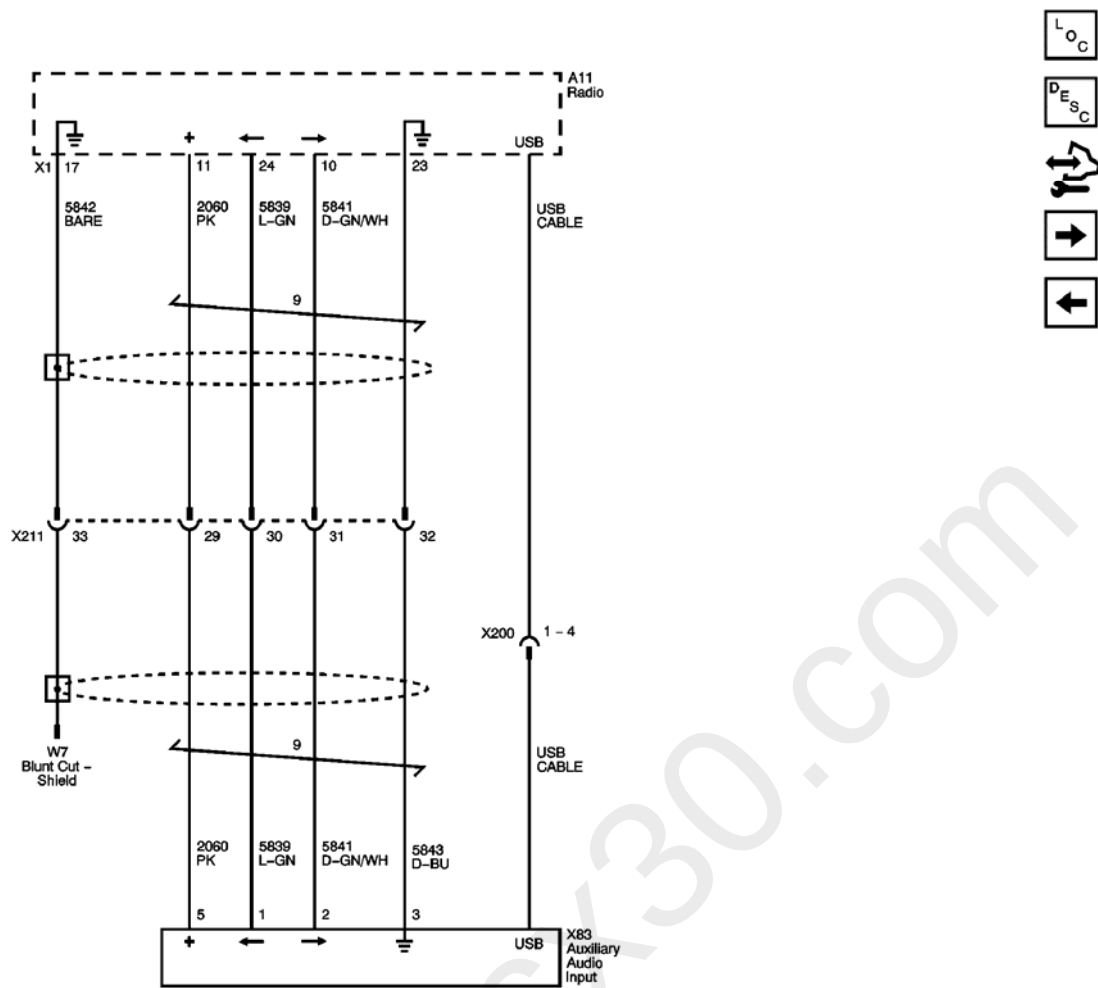


Fig. 4: Audio Jacks (without KTA)
 Courtesy of GENERAL MOTORS CORP.

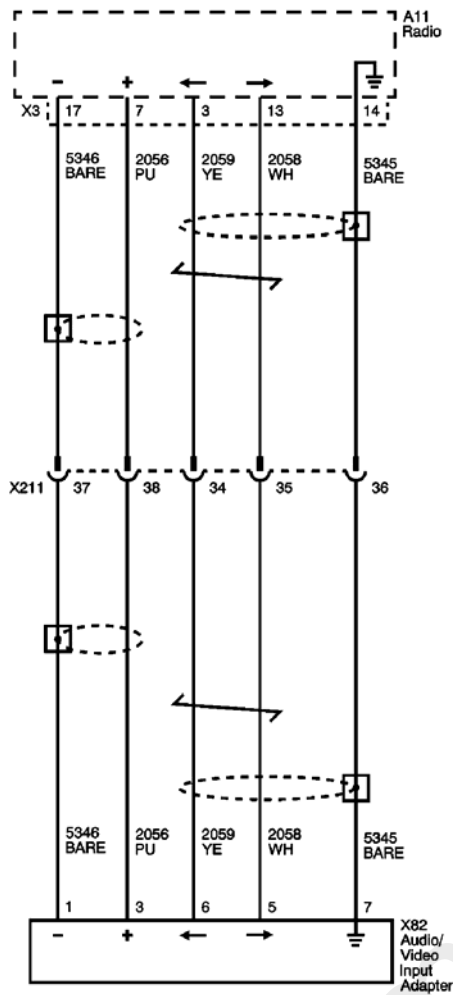


Fig. 5: Video and Audio Jacks (UWG)
 Courtesy of GENERAL MOTORS CORP.

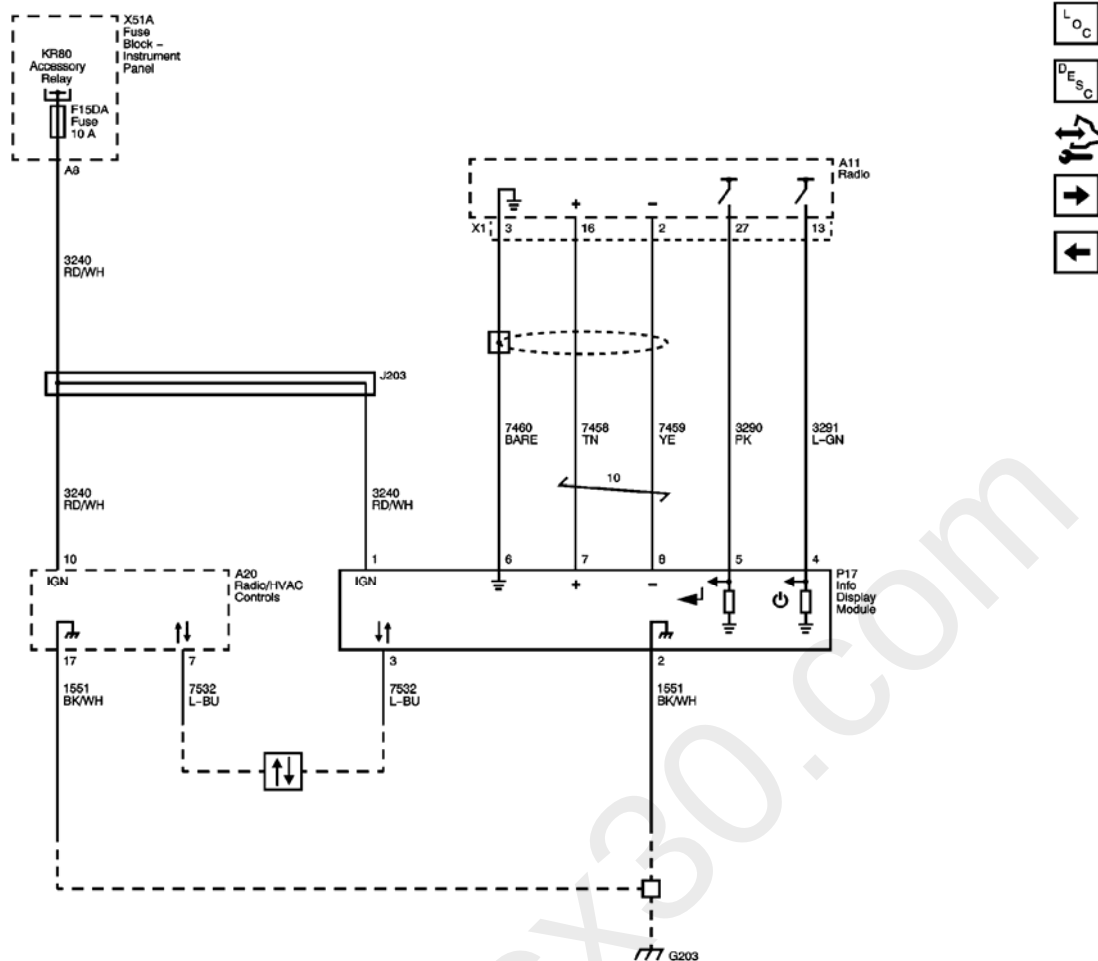


Fig. 7: Radio Display (without UYS or PCJ)
Courtesy of GENERAL MOTORS CORP.

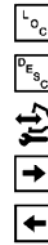
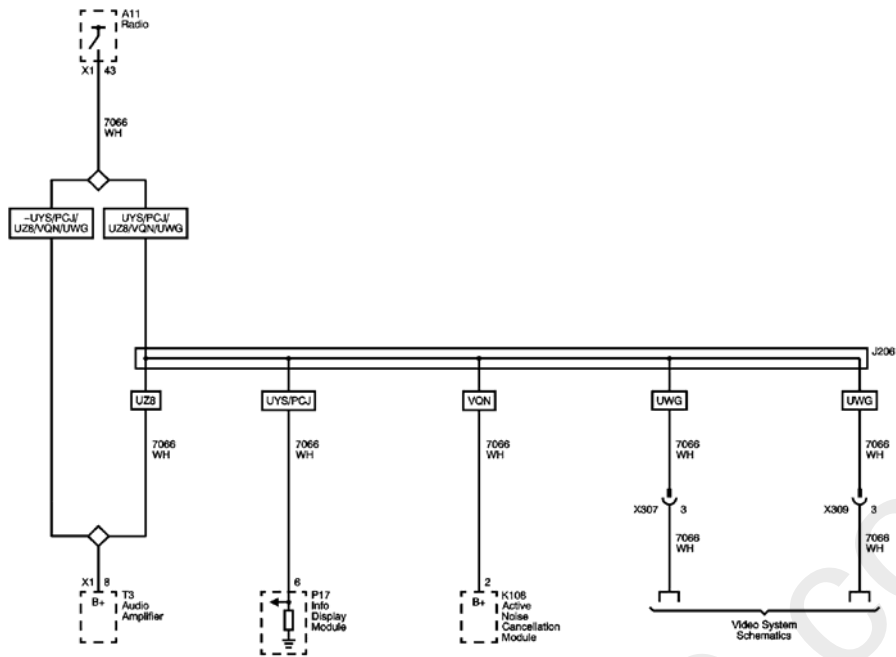
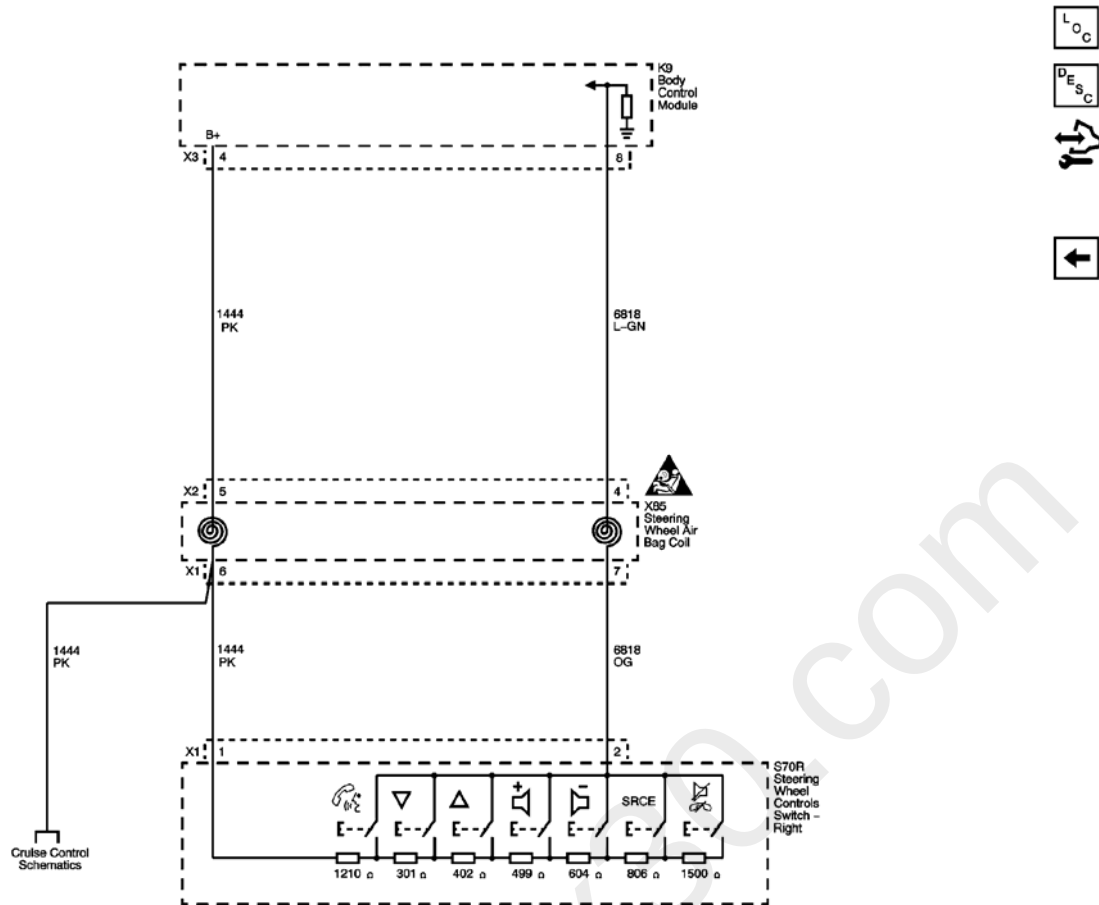


Fig. 8: Remote Device Enable
 Courtesy of GENERAL MOTORS CORP.



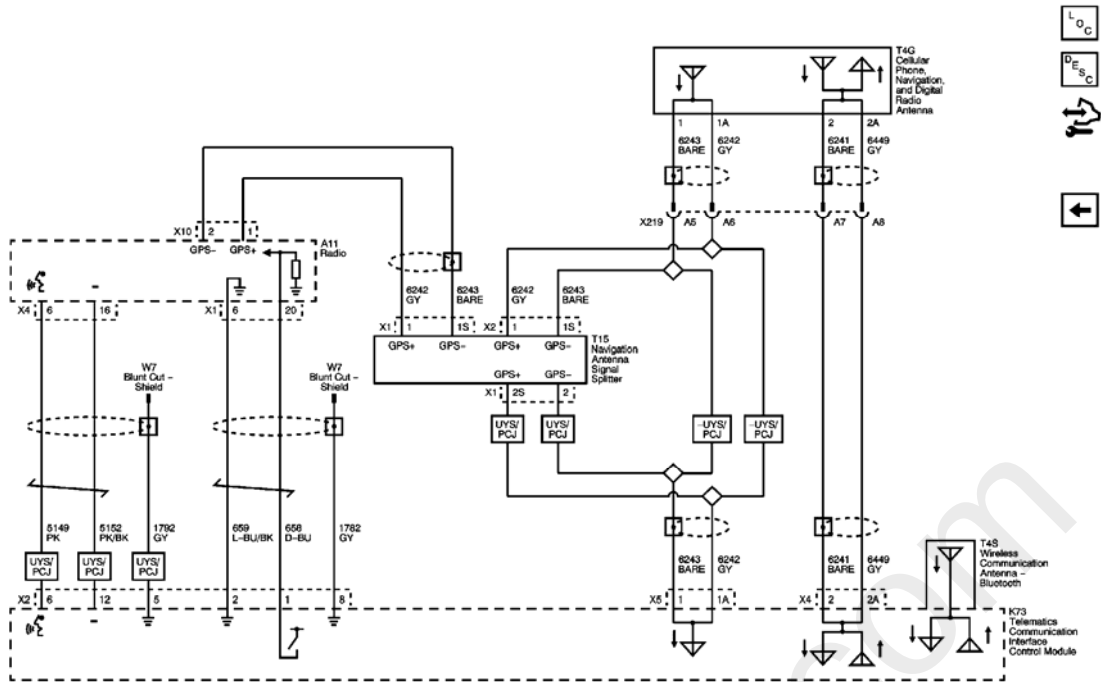


Fig. 11: Antennas (UE1)
 Courtesy of GENERAL MOTORS CORP.

VIDEO SYSTEM SCHEMATICS

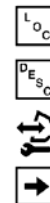
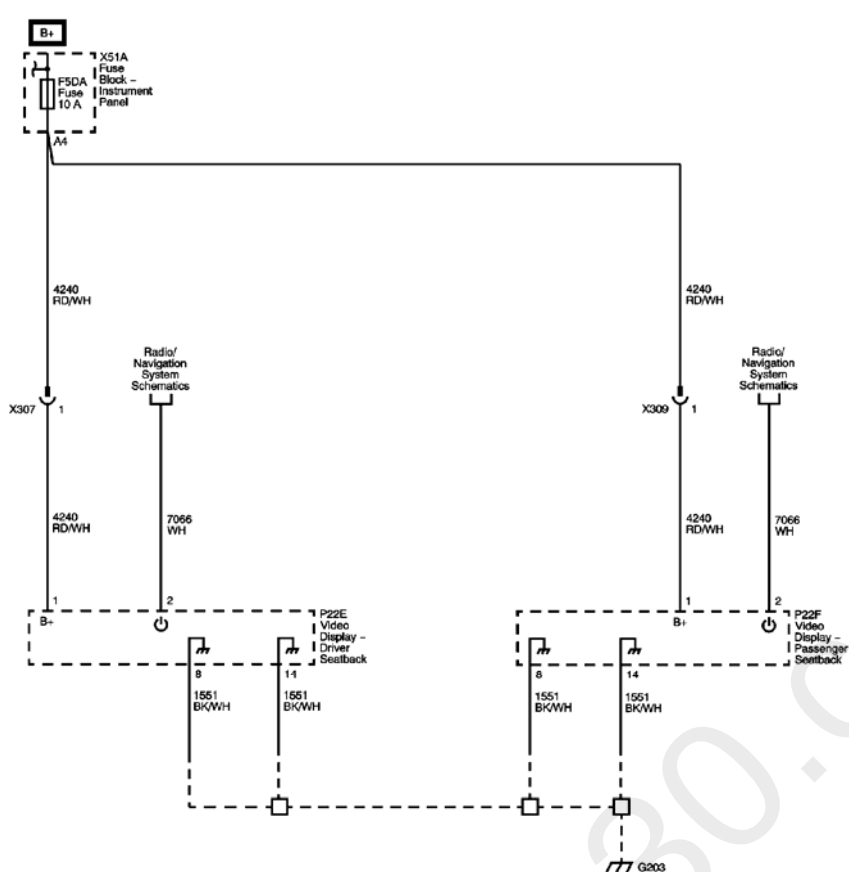


Fig. 12: Power and Ground (UWG)
 Courtesy of GENERAL MOTORS CORP.

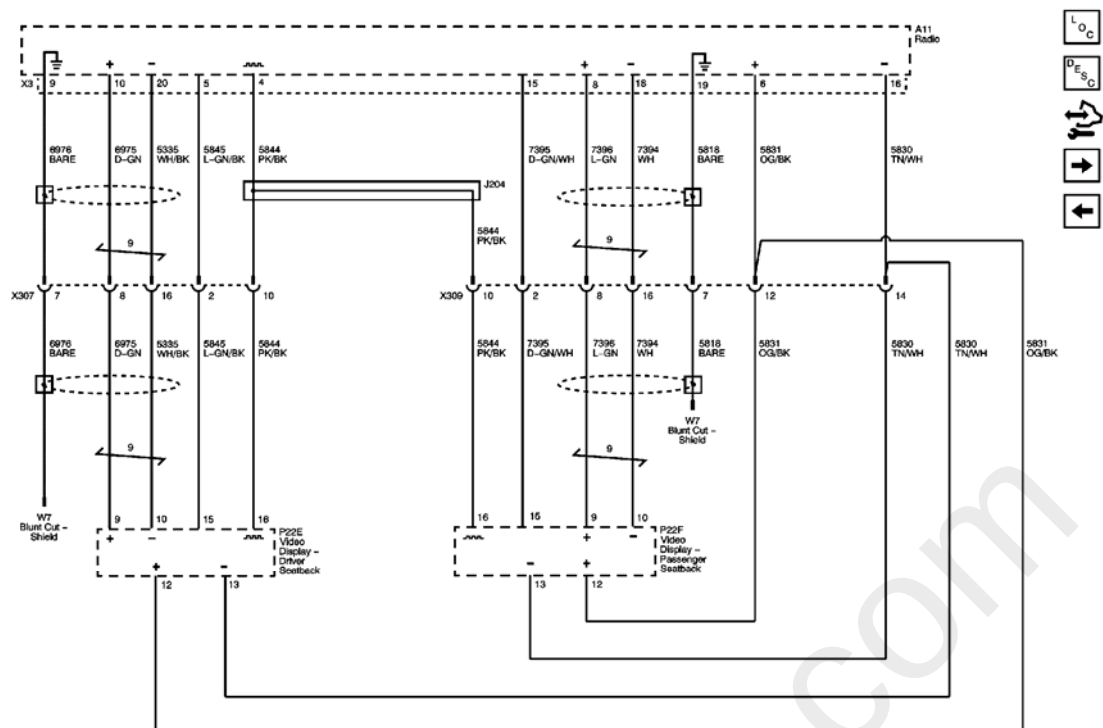


Fig. 13: Video Signals (UWG)

Courtesy of GENERAL MOTORS CORP.

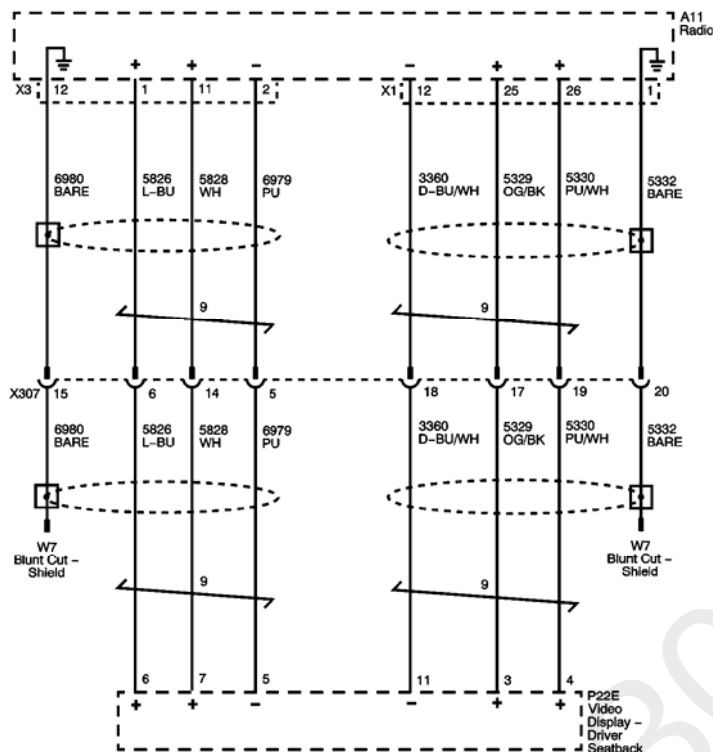


Fig. 14: Audio Signals (UWG)

Courtesy of GENERAL MOTORS CORP.

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC B0000	B0000 5A: Vehicle Speed Information Circuit Not Plausible
DTC B1020	B1020 00: Auxiliary Electronic Control Unit (ECU) Performance
DTC B125A	B125A 02: Antenna Signal Circuit Short to Ground B125A 04: Antenna Signal Circuit Open Circuit
DTC B125C	B125C 01: Satellite Antenna 1 Circuit Short to Battery B125C 02: Satellite Antenna 1 Circuit Short to Ground B125C 04: Satellite Antenna 1 Circuit Open Circuit
DTC B1265	B1265 02: Switched 14 Volt Performance Short to Ground
DTC B1271	B1271 00: Theft Protection Active
DTC B1278 or B1279	B1278 01: Left Auxiliary Input Signal Circuit Short to Battery

	B1278 02: Left Auxiliary Input Signal Circuit Short to Ground B1279 01: Right Auxiliary Input Signal Circuit Short to Battery B1279 02: Right Auxiliary Input Signal Circuit Short to Ground
<u>DTC B1287</u>	B1287 01: Amplifier Control Signal Circuit Short to Battery B1287 02: Amplifier Control Signal Circuit Short to Ground B1287 04: Amplifier Control Signal Circuit Open
<u>DTC B1288</u>	B1288 01: Video Display Mode Control Signal Short to Battery B1288 02: Video Display Mode Control Signal Short to Ground B1288 04: Video Display Mode Control Signal Open Circuit
<u>DTC B1289</u>	B1289 01: Video Display Brightness Control Signal Short to Battery B1289 02: Video Display Brightness Control Signal Short to Ground B1289 04: Video Display Brightness Control Signal Open Circuit
<u>DTC B2455</u>	B2455 00: Cellular Phone Microphone Circuit B2455 04: Cellular Phone Microphone Circuit Open
<u>DTC B2462</u> <u>(OnStar/Navigation GPS Antenna)</u>	B2462 01: Global Positioning System Short to Battery B2462 02: Global Positioning System Short to Ground B2462 04: Global Positioning System Open
<u>DTC B2470</u>	B2470 04: Cellular Phone Antenna Circuit Open Circuit
<u>DTC B2476 or B2482</u>	B2476 04: Cellular Phone Select Service Switch Open Circuit B2476 59: Cellular Phone Select Service Switch Stuck Button B2482 00: Cellular Phone Select Service Switch Range/Performance
<u>DTC B2485</u>	B2485 04: Wireless Communication Antenna Circuit Open

DTC B0000

Diagnostic Instructions

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

DTC Descriptor

DTC B0000 5A

Vehicle Speed Information Circuit Not Plausible

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal Terminal 20 X4	B0000 5A	B0000 5A	B0000 5A	B0000 5A

Circuit/System Description

The radio receives a vehicle speed signal from the electronic brake control module (EBCM) in order to correlate actual vehicle speed to the movement of the vehicle calculated by the navigation system and reported serial data.

Conditions for Running the DTC

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

Conditions for Setting the DTC

- Vehicle speed from serial data is more than 5 km/h (3 mph) and vehicle speed pulse from the EBCM is 0 km/h (0 mph).
- Vehicle speed calculated from the navigation processing software is more than 36 km/h (22 mph) and vehicle speed pulse from the EBCM is 0 km/h (0 mph) for 10 seconds continuously.

Action Taken When the DTC Sets

- Turn by turn route navigation may be inoperative.
- Vehicle indicated location may be inaccurate.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC clears after 100 malfunction-free ignition cycles.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Navigation System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

NOTE: **Diagnose any antilock brake system (ABS) related DTCs before performing this diagnostic.**

1. Ignition OFF, disconnect the X4 harness connector at the A11 radio.
2. Ignition ON, operate the vehicle drive wheels at 5 mph. Test for 3-7 Hertz between the signal circuit terminal 20 and ground.
 - If not within the specified range, test the signal circuit terminal 20 for an open, high resistance, short to ground or short to voltage. If the circuit tests normal replace the K17 EBCM.
3. If the circuit tests normal, replace the A11 radio.

Repair Procedures

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

Control Module References for radio or EBCM replacement, setup, and programming

DTC B1020

Diagnostic Instructions

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

DTC Descriptor

DTC B1020 00

Auxiliary Electronic Control Unit (ECU) Performance

Circuit/System Description

The radio communicates with the radio/HVAC control via serial data. This DTC indicates a fault in the radio/HVAC control. No external circuits are involved. The radio may continue to respond normally to faceplate functions when this DTC is set.

Conditions for Running the DTC

- Ignition is ON or in the 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

The radio receives an improper status response indicating an internal ECU fault in the radio/HVAC control.

Action Taken when the DTC Sets

No action is taken.

Conditions for Clearing the DTC

- A current DTC clears when the radio receives a proper status response message back from the radio control assembly.
- A history DTC clears after 50 malfunction-free ignition cycles.

Diagnostic Aids

- This DTC may be stored as a history DTC without affecting the operation of the radio/HVAC control.
- If stored only as a history DTC and not retrieved as a current DTC, do not replace the radio/HVAC control.
- If this DTC is retrieved as both a current and history DTC, replace the radio/HVAC control.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

If this DTC is retrieved as a current DTC, replace the radio/HVAC control.

Repair Procedures

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

Control Module References for radio/HVAC control replacement, setup, and programming

DTC B125A

Diagnostic Instructions

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

DTC Descriptors

DTC 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 clear after 50 consecutive malfunction-free ignition cycles have occurred.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, A11 radio ON, tune to a strong AM or FM station. Verify that the AM or FM reception is clear.

Circuit/System Testing

1. Ignition OFF, disconnect the radio antenna coax from the A11 radio and from the radio antenna.
2. Test for infinite resistance between the antenna coax center terminal and ground.
 - If less than the specified value, replace the antenna coax.
3. Test for less than 5 ohms on the antenna coax center circuit from end to end.
 - If greater than the specified range, replace the antenna coax.
4. Ignition ON, test for less than 1 V between the antenna coax center terminal and ground.
 - If greater than the specified range, replace the antenna coax.
5. Test for infinite resistance between the coax center terminal and the outer shield.
 - If less than the specified value, replace the antenna coax.
6. Connect the antenna coax to the A11 radio. Test for 12-15 V between the antenna coax center terminal and ground at the radio antenna connector.
 - If not within the specified range, replace the A11 radio.
7. If all circuits test normal, replace the radio antenna.

Repair Procedures

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

- **Radio Antenna Base Replacement**
- **Radio Antenna Replacement**
- **Control Module References** for radio replacement, setup, and programming

DTC B125C

Diagnostic Instructions

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

DTC Descriptors

DTC B125C 01

Satellite Antenna 1 Circuit Short to Battery

DTC B125C 02

Satellite Antenna 1 Circuit Short to Ground

DTC B125C 04

Satellite Antenna 1 Circuit Open Circuit

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.

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.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**

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

Special Tools

EL-48028 Digital Radio Test Antenna. See **Special Tools**.

Circuit System Verification

With the vehicle outside in an area with an unobstructed view of the southern sky, tune to XM. Verify XM reception is clear and the No XM Signal message is not displayed on the radio.

Circuit/System Testing

1. Ignition OFF, disconnect the digital radio antenna coax cable from the radio. Connect the **EL-48028** to the radio and place on the roof of the vehicle. See **Special Tools**.
2. Ignition ON, radio tuned to XM channel 1. Verify DTC B125C is not set as current and XM reception is improved.
 - If DTC B125C is set as current or the reception is not improved, replace the radio.
3. Ignition OFF, reconnect the antenna coax cable at the radio. Disconnect the antenna coax cable from the digital radio antenna.
4. Ignition ON, radio ON, test for 4.5-5.5 V between the antenna coax cable center terminal and an outer shield.
 - If less than the specified range, test the antenna coax cable for an open/high resistance.
 - If greater than the specified range, test the antenna coax cable for a short to voltage.
5. If all circuits test normal, replace the digital radio antenna.

Repair Procedures

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

- **Radio Antenna Base Replacement**
- **Control Module References** for radio replacement, setup, and programming

DTC B1265

Diagnostic Instructions

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

DTC Descriptor

DTC B1265 02

Switched 14 Volt Performance Short to Ground

Circuit/System Description

When the radio is on, a discrete 12 V signal is supplied on the entertainment remote enable circuit to the Audio Amplifier, Navigation Info Display Module (if equipped), the Seatback Video Displays (if equipped) and the Active noise Cancellation Module (if equipped). This signal is used to control the power state of the components.

Conditions for Running the DTC

The following are conditions that must be present in order for the radio to enable diagnostics:

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

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

- **Radio/Navigation System Schematics**
- **Video System Schematics**

Connector End View Reference

Component Connector End Views

Description and Operation

Navigation System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, radio OFF, radio B+ fuse removed, disconnect all of the connectors listed below:
 - Audio Amplifier X1
 - Navigation Information Display Module (if equipped)
 - Driver Seatback Video Display (if equipped)
 - Passenger Seatback Video Display (if equipped)
 - Active Noise Cancellation Module (if equipped)
2. Reinstall the radio B+ fuse. Ignition ON, radio ON, verify that DTC B1265 is NOT set as current.
 - If DTC B1265 is set as current, test the entertainment remote enable circuit for a short to ground. If the circuit tests normal replace the radio.
3. Verify that a test lamp illuminates between the entertainment remote enable circuit terminal listed below and ground:
 - Audio Amplifier X1 terminal 8
 - Navigation Information Display Module terminal 6 (if equipped)
 - Driver Seatback Video Display terminal 2 (if equipped)
 - Passenger Seatback Video Display terminal 2 (if equipped)
 - Active Noise Cancellation Module terminal 2 (if equipped)
 - If the test lamp does not illuminate, test the entertainment remote enable circuit for a short to ground or an open/high resistance. If the circuit tests normal replace the radio.

4. Re-connect the harness connectors listed below one at a time. Verify that DTC B1265 does NOT set as current as each component is re-connected.
 - Audio Amplifier X1
 - Navigation Information Display Module (if equipped)
 - Driver Seatback Video Display (if equipped)
 - Passenger Seatback Video Display (if equipped)
 - Active Noise Cancellation Module (if equipped)
 - If DTC B1265 sets as current, replace the module/component that was just re-connected.

Repair Procedures

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

- **Video Display Replacement**
- **Driver Information Display Replacement**
- **Control Module References** for radio, amplifier, and active noise cancellation module replacement, programming, and Setup

DTC B1271

Diagnostic Instructions

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

DTC Descriptor

DTC B1271 00

Theft Protection Active

Circuit/System Description

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

This DTC is generated by the module when the vehicle identification number (VIN) as received over the data communication circuit and the VIN as stored in the module memory do not match. This also occurs if no VIN is received over the data communication circuit.

Action Taken When the DTC Sets

The radio does not function. The radio display will indicate that Theft Lock is active.

Conditions for Clearing the DTC

Re-calibration with the correct calibrations for the vehicle and cycling the radio to OFF then to ON will clear the DTC if there is no damage to the radio.

Diagnostic Aids

The VIN in the radio is a single one-time VIN learn.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Ignition ON, using the scan tool, verify that the VIN, digits 2-17, of the radio matches the VIN, digits 2-17, of the vehicle.

- If not the specified value, replace the radio.

Repair Procedures

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

Control Module References for radio replacement, setup, and programming

DTC B1278 OR B1279

Diagnostic Instructions

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

DTC Descriptors

DTC B1278 01

Left Auxiliary Input Signal Circuit Short to Battery

DTC B1278 02

Left Auxiliary Input Signal Circuit Short to Ground

DTC B1279 01

Right Auxiliary Input Signal Circuit Short to Battery

DTC B1279 02

Right Auxiliary Input Signal Circuit Short to Ground

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal Terminal 1 X1	B1278 02, 3	3	B1278 01, 3	-
Signal Terminal 2 X1	B1279 02, 2	2	B1279 01, 2	-
Control Circuit	4	4	4	-
Low Reference	-	1	-	-
1. No or distorted audio from both sides 2. No or distorted right side audio 3. No or distorted left side audio 4. External audio inputs inoperative				

Circuit/System Description

A remote 3.5 mm auxiliary stereo jack allows playback of audio signals from remote devices (e.g., laptop

computer, IPOD, MP3 player, etc.). When a remote device audio mini-plug is inserted in the remote auxiliary jack, an internal mechanical switch closes completing the aux jack detect circuit to the radio. The radio automatically detects the input through the circuit and the device begins playing. The radio receives the devices audio signals on the auxiliary input 1 (left) signal circuit and auxiliary input 2 (right) signal circuit. If equipped with a multimedia player interface module, the auxiliary inputs that would normally connect directly to the radio will have the multimedia player interface module inline of those connections. This means that the auxiliary inputs for the radio connect to the multimedia player interface module, and the multimedia player interface module connects to the radio, passing along the audio signals. Only the multimedia player interface module can set these DTCs.

The auxiliary audio jack has an internal mechanical detection switch that will connect the detection signal on the auxiliary audio jack to ground when an auxiliary mini-plug is inserted.

Conditions for Running the DTC

- Ignition in RUN or ACC position.
- The system voltage is at least 9.5 V and no more than 15.5 V.

Conditions for Setting the DTC

- The multimedia player interface module detects a short to battery on the signal circuit terminal 1 or signal circuit terminal 2.
- The multimedia player interface module detects a short to ground on the signal circuit terminal 1 or signal circuit terminal 2.
- All the above conditions are present for greater than 250 mS.

Action Taken When the DTC Sets

No audio is heard from the remote audio device.

Conditions for Clearing the DTC

- The conditions for setting the DTC are no longer present on the auxiliary input signal circuits.
- A history DTC clears after 50 malfunction-free ignition cycles.

Diagnostic Aids

- This DTC may be stored as a history DTC without affecting the operation of the module.
- If stored only as a history DTC and not retrieved as a current DTC, do not replace the module.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the X1 harness connector at the auxiliary audio jack.
2. Ignition ON, test for less than 1 V between the terminals listed below and ground:
 - signal terminal 1
 - signal terminal 2
 - If greater than the specified value, test the circuit for a short to voltage. If the circuit tests normal, replace the multimedia player interface module.
3. Ignition OFF, test for infinite resistance between the terminals listed below and ground:
 - signal terminal 1
 - signal terminal 2
 - If less than the specified value, test the circuit for a short to ground. If the circuit tests normal, replace the multimedia player interface module.
4. If all of the circuits test normal, replace the auxiliary audio jack.

Repair Procedures

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

Control Module References multimedia player interface module replacement, setup, and programming

DTC B1287

Diagnostic Instructions

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

- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC B1287 01

Amplifier Control Signal Circuit Short to Battery

DTC B1287 02

Amplifier Control Signal Circuit Short to Ground

DTC B1287 04

Amplifier Control Signal Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Amplifier Control	DTC B1287 02,**	DTC B1287 04,**	DTC B1287 01,*	-
* No audio output. ** 4 Channel unmute, possible noise in speakers when radio muted or turned off				

Circuit/System Description

The radio amplifier control circuit provides varying pulse width modulated (PWM) signals to control overall muting of the amplifier. The PWM signals are varying duty cycle percentages ranging from 0-100 percent. A low duty cycle unmutes all amplifier channels and a high duty cycle mutes all amplifier channels. The radio monitors the amp control circuit for faults.

Conditions for Running the DTC

The following are conditions that must be present in order for the radio to enable the diagnostics.

- The radio is in ACCESSORY, RUN, or RAP power mode.
- The system voltage is at least 9 V and no more than 16 V.

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

Radio sets the DTC and continues to output correct state.

Conditions for Clearing the DTC

- The condition must be corrected.
- A history DTC clears after 100 malfunction-free ignition cycles.
- The radio receives the clear code command from the scan tool.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Verify the audio system performance by adjusting the fade and balance of the speaker outputs.

Circuit/System Testing

1. Ignition OFF, disconnect the X1 harness connector at the A11 radio.
2. Ignition ON, test for less than 1 V between the radio audio mute signal terminal 37 and ground.
 - If greater than the specified value, test the circuit for a short to voltage. If the circuit tests normal, replace the T3 amplifier.
3. Ignition OFF, test for greater than 20 ohms between the radio audio mute signal terminal 37 and ground.
 - If less than the specified value, test the circuit for a short to ground. If the circuit tests normal, replace the T3 amplifier.
4. Ignition OFF, disconnect the X3 harness connector at the T3 amplifier.

5. Test for less than 5 ohms between the radio X1 terminal 37 to the amplifier X3 terminal 6.
 - If greater than specified range, test the circuit for an open/high resistance.
6. If all circuits test normal, replace the A11 radio.

Repair Procedures

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

Control Module References for radio and amplifier replacement, setup, and programming

DTC B1288

Diagnostic Instructions

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

DTC Descriptors

DTC B1288 01

Video Display Mode Control Signal Short to Battery

DTC B1288 02

Video Display Mode Control Signal Short to Ground

DTC B1288 04

Video Display Mode Control Signal Open Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Video Display B+	2	1	-	-
Remote Enable Control Circuit	B1265 02, 3	4	5	-
DVD Audio Common Signal (-)	6	6	6	-
Left DVD Audio Signal (+)	7	7	7	-
Right DVD Audio Signal (+)	8	8	8	-
DVD Video Signal (+)	9	9	7	-
DVD Video Signal (-)	9	9	9, 10	-
Infrared Remote Signal (+)	11	11	11	-
Infrared Remote Signal (-)	11	11	11	-

Video Mode Signal	B1288 02, 12	B1288 04, 12	B1288 01, 12	-
Video Bright Signal	B1289 02, 13	B1289 04, 13	B1289 01, 13	-
Ground Terminal 8	-	1	-	-
Ground Terminal 14	-	1	-	-

1. One or both seatback displays inoperative
2. Both seatback displays inoperative
3. All infotainment devices controlled by circuit inoperative, no sound from speakers
4. One or more infotainment devices controlled by circuit inoperative
5. Power state of all infotainment devices controlled by circuit cannot be controlled by radio
6. No or distorted audio heard in wireless headphones
7. No or distorted left channel audio heard in wireless headphones
8. No or distorted right channel audio heard in wireless headphones
9. No or distorted image in seatback display
10. Serious damage to radio can occur
11. Infrared remote control inoperative
12. Seatback display mode cannot be controlled/changed
13. Seatback display brightness cannot be controlled/adjusted

Circuit/System Description

The radio can command the seatback video display mode on vehicles equipped with rear seat entertainment (RSE) video. The radio utilizes discreet mode control circuits to each display to control the screen display mode via a pulse width modulated signal. If the display screen does not receive a signal, the display screen will operate in a default full screen mode.

Conditions for Running the DTC

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

Conditions for Setting the DTC

The DTC will set when the radio detects a short to voltage, short to ground, or an open/high resistance in the video display mode control circuit 400 ms after the radio activates the remote enable circuit.

Action Taken When the DTC Sets

The radio sets the DTC and defaults the video display to normal mode.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Video System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Video Entertainment System Description and Operation (Non-Headrest DVD Systems) or **Video Entertainment System Description and Operation (Dual Headrest DVD Systems)** or **Video Entertainment System Description and Operation (Seatback Display)**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON, Radio ON, DVD playing, use the infrared remote control to change the display mode of the seatback video displays.
 - If one of both of the seatback video displays mode setting cannot be controlled, refer to Circuit/System Testing.
2. Verify that DTC B1288 is NOT set as current.
 - If DTC B1288 is set as current, refer to Circuit/System Testing below.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the appropriate P22 seatback video display.
2. Ignition ON, DVD playing, test for 190-210 HZ DC between the video mode control circuit terminal 15 and ground.
 - If not within the specified range, test the control circuit for a short to voltage, short to ground, or an open/high resistance. If the circuit tests normal, replace the radio.
3. If all circuits test normal, replace the P22 rear video display.

Repair Procedures

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

- **Video Display Replacement**
- **Control Module References** for Radio replacement, setup, and programming

DTC B1289

Diagnostic Instructions

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

DTC Descriptors

DTC B1289 01

Video Display Brightness Control Signal Short to Battery

DTC B1289 02

Video Display Brightness Control Signal Short to Ground

DTC B1289 04

Video Display Brightness Control Signal Open Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Video Display B+	2	1	-	-
Remote Enable Control Circuit	B1265 02, 3	4	5	-
DVD Audio Common Signal (-)	6	6	6	-
Left DVD Audio Signal (+)	7	7	7	-
Right DVD Audio Signal (+)	8	8	8	-
DVD Video Signal (+)	9	9	7	-
DVD Video Signal (-)	9	9	9, 10	-
Infrared Remote Signal (+)	11	11	11	-
Infrared Remote Signal (-)	11	11	11	-
Video Mode Signal	B1288 02, 12	B1288 04, 12	B1288 01, 12	-
Video Bright Signal	B1289 02, 13	B1289 04, 13	B1289 01, 13	-
Ground Terminal 8	-	1	-	-
Ground Terminal 14	-	1	-	-

1. One or both seatback displays inoperative
2. Both seatback displays inoperative

3. All infotainment devices controlled by circuit inoperative, no sound from speakers
4. One or more infotainment devices controlled by circuit inoperative
5. Power state of all infotainment devices controlled by circuit cannot be controlled by radio
6. No or distorted audio heard in wireless headphones
7. No or distorted left channel audio heard in wireless headphones
8. No or distorted right channel audio heard in wireless headphones
9. No or distorted image in seatback display
10. Serious damage to radio can occur
11. Infrared remote control inoperative
12. Seatback display mode cannot be controlled/changed
13. Seatback display brightness cannot be controlled/adjusted

Circuit/System Description

The radio can control the seatback video display brightness on vehicles equipped with rear seat entertainment (RSE) video. A single brightness control circuit is used by the radio to control the display screen brightness for both displays via a pulse width modulated signal. If the display screen does not receive a signal, the display screen will operate at default brightness, which is a middle brightness level.

Conditions for Running the DTC

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

Conditions for Setting the DTC

The DTC will set when the radio detects a short to voltage, short to ground, or an open/high resistance in the video display brightness control circuit 400 ms after the radio activates the remote enable circuit.

Action Taken When the DTC Sets

The radio sets the DTC and defaults the video display to full brightness.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Video System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Video Entertainment System Description and Operation (Non-Headrest DVD Systems) or **Video Entertainment System Description and Operation (Dual Headrest DVD Systems)** or **Video Entertainment System Description and Operation (Seatback Display)**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON, Radio ON, DVD playing, use the infrared remote control to change the brightness level of the seatback video displays.
 - If one of both of the seatback video displays brightness level cannot be controlled, refer to Circuit/System Testing below.
2. Verify that DTC B1289 is NOT set as current.
 - If DTC B1289 is set as current, refer to Circuit/System Testing below.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connectors at both of the P22 seatback video displays.
2. Ignition ON, DVD playing, test for 190-210 HZ DC between the video brightness control circuit terminal 16 and ground at each of the P22 seatback video displays.
 - If not within the specified range, test the control circuit for a short to voltage, short to ground, or an open/high resistance. If the circuit tests normal, replace the radio.
3. Ignition OFF, reconnect the harness connector at the P22E driver seatback video display.
4. Ignition ON, DVD playing, test for 190-210 HZ DC between the video brightness control circuit terminal 16 and ground at the P22F passenger seatback video display.
 - If not within the specified range, replace the P22E driver seatback video display.
5. If all circuits test normal, replace the P22F passenger seatback video display.

Repair Procedures

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

- **Video Display Replacement**

- **Control Module References** for Radio replacement, setup, and programming

DTC B2455

Diagnostic Instructions

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

DTC Descriptors

DTC B2455 00

Cellular Phone Microphone Circuit

DTC B2455 04

Cellular Phone Microphone Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Cellular Microphone Signal	B2455 00, B2455 04	B2455 00, B2455 04	B2455 00, B2455 04	-
Cellular Microphone Drain	-	B2455 00, B2455 04	1	-
1. OnStar Microphone Inoperative - Caller Cannot Be Heard				

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 microphone is in use, voice data from the user is sent back to the telematics communication interface control module on the signal circuit. The telematics communication interface control module provides a ground for the cellular phone microphone via the low reference wire.

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

- The telematics communication interface control module detects an open, short to ground or short to voltage in the cellular phone microphone signal circuit for 10 seconds or greater.
- The telematics communication interface control module detects an open/high resistance in the low reference circuit for 10 seconds 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

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the B24 cellular phone microphone.

2. Ignition OFF and scan tool disconnected, wait until all retained accessory power is OFF, test for less than 10 ohms between the low reference circuit terminal 1 or A (depending on vehicle) and ground, allowing up to 5 minutes for the circuit resistance to drop to its lowest reading.
 - If greater than the specified range, test the circuit for an open/high resistance.
3. Ignition ON, test for 9.5-10.5 V between the signal circuit terminal 2 or B (depending on vehicle) and ground.
 - If less than the specified range, test the circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K73 telematics communication interface control module.
 - If greater than the specified range, test the circuit for a short to voltage. If the circuit tests normal, replace the K73 telematics communication interface control module.
4. If all circuit test normal, replace the B24 cellular phone microphone.

Repair Procedures

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

- **Mobile Telephone Microphone Replacement**
- **Control Module References** for telematics communication interface control module replacement, setup, and programming

DTC B2462 (ONSTAR/NAVIGATION GPS ANTENNA)

Diagnostic Instructions

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

DTC Descriptors

DTC B2462 01

Global Positioning System Short to Battery

DTC B2462 02

Global Positioning System Short to Ground

DTC B2462 04

Global Positioning System Open

Circuit/System Description

The cellular phone and navigation antenna is connected to the telematics communication interface control

module. This module supplies 5 V to the cellular phone and navigation antenna to power the internal amplifier. When the vehicle is equipped with the optional navigation radio, a navigation signal splitter is installed to distribute the GPS signal to both the telematics communication interface control module and the navigation radio. The navigation radio supplies 5 V through the GPS antenna coaxial cable to the navigation signal splitter to power the internal navigation radio signal amplifier.

Conditions for Running the DTC

Onstar - Telematics Communication Interface Control Module

- Ignition is in the RUN or ACC position.
- System voltage is greater than 9 V and less than 16 V.
- The above conditions are present for greater than 1 second.

Navigation Radio

- Radio On.
- System voltage is greater than 9 V and less than 16 V.
- The navigation radio tests the GPS antenna every 10 seconds.

Conditions for Setting the DTC

B2462 01

The telematics communication interface control module and/or the navigation radio detect a short to B+ on the GPS antenna signal circuit.

B2462 02

The telematics communication interface control module and/or the navigation radio detect a short to ground on the GPS antenna signal circuit.

B2462 04

The telematics communication interface control module and/or the navigation radio detect an open/high resistance on the GPS antenna signal circuit.

Action Taken When the DTC Sets

Onstar - Telematics Communication Interface Control Module

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

Navigation Radio

- The radio uses the last reported position and the vehicle speed signal to calculate the vehicle position.

- Route guidance may be inaccurate.
- Turn by turn navigation may be inaccurate or inoperative.

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**
- **Radio/Navigation System Schematics**

Connector End View Reference

- **Component Connector End Views**
- **Antenna Coaxial/Connector Cable Identification Table**

Description and Operation

- **OnStar Description and Operation**
- **Radio/Audio System Description and Operation**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Special Tools

EL-49903 GM OnStar Antenna Diagnostic Tool Kit. See **Special Tools**.

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 key on for the GPS satellites to acquire vehicle signal.

1. Ignition ON, wait 5 minutes, then contact the OnStar call center consultant by pressing the blue OnStar button. A call center consultant should answer the call, verifying the vehicle OnStar system is functioning and the consultant can locate the vehicle.
 - If the OnStar system is not functioning and the vehicle is not equipped with a navigation radio, refer to OnStar Malfunction without Navigation Radio.
 - If the OnStar system is not functioning and the vehicle is equipped with a navigation radio, refer to OnStar Malfunction with Navigation Radio.
2. Verify the Navigation Radio functions while driving the vehicle.
 - If the navigation radio does not function, refer to Navigation Radio Malfunction.

Circuit/System Testing

OnStar Malfunction without Navigation Radio

1. Ignition OFF, disconnect both the GPS and cell coax cable connectors at the K73 telematics communication interface control module.
2. Connect the **EL-49903** to the K73 telematics communication interface control module; place the test antenna on the roof of the vehicle. See **Special Tools**.
3. Ignition ON, wait 5 minutes, then contact the OnStar call center consultant by pressing the blue OnStar button. A call center consultant should answer the call, ask the consultant to verify the vehicle location to confirm the GPS system is functioning.
 - If the OnStar GPS does not function, replace the K73 telematics communication interface module.
4. Ignition OFF, perform the coax cable test on the coax cable, refer to Component Testing. The coax cable should pass the test.
 - If the coax cable does not pass the test, replace the coax cable.
5. If all circuits test normal, replace the T4 cellular phone and navigation antenna.

OnStar Malfunction with Navigation Radio

1. Ignition OFF, disconnect both the GPS and cell coax cable connector at the K73 telematics communication interface control module.
2. Connect the **EL-49903** to the K73 telematics communication interface control module; place the test antenna on the roof of the vehicle. See **Special Tools**.
3. Ignition ON, wait 5 minutes, then contact the OnStar call center consultant by pressing the blue OnStar button. A call center consultant should answer the call, ask the consultant to verify the vehicle location to confirm the GPS system is functioning.
 - If the OnStar system does not function, replace the k73 telematics communication interface module.
4. Ignition OFF, connect both coax cable connectors to the K73 telematics communication interface control module.
5. Disconnect the GPS coax cable connector at the navigation antenna signal splitter. Connect the **EL-49903** to the navigation antenna signal splitter. See **Special Tools**.
6. Ignition ON, wait 5 minutes, contact the OnStar call center consultant by pressing the blue OnStar button.

A call center consultant should answer the call, ask the consultant to verify the vehicle location to confirm the GPS system is functioning.

- If the OnStar GPS does not function, perform the coax cable test on the coax cable between the K73 telematics communication interface control module and the navigation antenna signal splitter, refer to Component Testing. If the cable tests normal replace the navigation antenna signal splitter.
- 7. Ignition OFF, perform the coax cable test on the coax cable between the navigation antenna signal splitter and the T4E cellular phone and navigation antenna, refer to Component Testing. The coax cable should pass the test.
 - If the coax cable does not pass the test, replace the coax cable.
- 8. If all circuits test normal, replace the T4E cellular phone and navigation antenna.

Navigation Radio Malfunction

1. Ignition OFF, disconnect the GPS coax cable connector at the navigation radio.
2. Connect the **EL-49903** to the navigation radio; place the test antenna on the roof of the vehicle. See **Special Tools**.
3. Verify the Navigation Radio functions while driving the vehicle.
 - If the navigation radio does not function, replace the navigation radio.
4. Ignition OFF, perform the coax cable test on the coax cable between the navigation radio and the navigation antenna signal splitter, refer to Component Testing. The coax cable should pass the test.
 - If the coax cable does not pass the test, replace the T4E cellular phone and navigation antenna coax.
5. If all circuits test normal, replace the navigation antenna signal splitter.

Component Testing

CAUTION: Refer to Test Probe Caution .

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

Coax Cable Test

1. Ignition OFF, disconnect the coax cable at both components.
2. Test for less than 5 ohms between both ends of the coax cables center terminals.
 - If greater than the specified range, replace the coax cable
3. Test for greater than 10k ohms between the coax cable center wire and the outer coax shield.
 - If less than the specified range, replace the coax cable.

Repair Procedures

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

- **Radio Antenna Base Replacement**
- **Control Module References** for telematics communication interface control module replacement, setup, and programming

DTC B2470

Diagnostic Instructions

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

DTC Descriptor

DTC B2470 04

Cellular Phone Antenna Circuit Open Circuit

Circuit/System Description

The cellular phone antenna is connected to the telematics communication interface control module with a RG-58 coax cable. The telematics communication interface control module polls the data from the cellular phone antenna once every second.

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 second.

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

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Verify that the T4F cellular phone antenna and T4F cellular phone antenna coupling assembly are not damaged.

- If the antenna assembly is damaged, replace the T4F cellular phone antenna.

Circuit/System Testing

1. Ignition OFF, disconnect the antenna coax from the K73 telematics communication interface control module and the T4F cellular phone antenna.
2. Ignition ON, test for less than 1 V between the antenna coax center terminal and ground.
 - If greater than the specified range, replace the antenna coax.
3. Ignition ON, test for less than 1 V between the antenna coax outer shield and ground.
 - If greater than the specified range, replace the antenna coax.
4. Test for infinite resistance between the antenna coax center terminal and ground.
 - If less than the specified value, replace the antenna coax.
5. Test for infinite resistance between the antenna coax outer shield and ground.

- If less than the specified value, replace the antenna coax.
- 6. Test for less than 5 ohms at the cellular antenna coax center terminal from end to end.
 - If greater than specified value, replace the antenna coax.
- 7. Test for less than 5 ohms at the cellular antenna coax outer shield from end to end.
 - If greater than specified value, replace the antenna coax.
- 8. Test for infinite resistance between the antenna coax center terminal and the outer shield.
 - If less than specified value, replace the antenna coax.
- 9. If coax cable tests normal, replace the T4F cellular phone antenna.
- 10. Clear the DTCs and operate the vehicle within the conditions for running the DTC. Verify DTC B2470 does not set.
 - If the DTC sets, replace the K73 telematics communication interface control module.

Repair Procedures

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

- **Radio Antenna Base Replacement**
- **Control Module References** for telematics communication interface control module replacement, setup, and programming

DTC B2476 OR B2482

Diagnostic Instructions

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

DTC Descriptors

DTC B2476 04

Cellular Phone Select Service Switch Open Circuit

DTC B2476 59

Cellular Phone Select Service Switch Stuck Button

DTC B2482 00

Cellular Phone Select Service Switch Range/Performance

Diagnostic Fault Information

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
10 V Reference	-	B2476 04	-	-
Control Terminal 6	1	1	2	-
Control Terminal 7	1	1	2	-
Signal Terminal 3	3	3	-	B2476 59, B2482 00
Ground	-	B2476 04	-	-
1. OnStar® LED Inoperative 2. LED Illuminated At All Times 3. 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 keypad supply voltage 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 an open/high resistance on the keypad supply voltage circuit.

B2482 and B2476 59

The telematics communication interface control module detects a valid signal on the keypad signal circuit for longer than 15 seconds. If one of the OnStar® buttons is held or stuck for 15 seconds 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

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the A10 inside rearview mirror.
2. Test for less than 10 ohms between the mirror ground circuit terminal 5 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Ignition ON, test for less than 1 V between the keypad signal circuit terminal 3 and ground.
 - If greater than the specified range, test the keypad signal circuit for a short to voltage. If the circuit tests normal, replace the K73 telematics communication interface control module.
4. Ignition OFF, test for 600k-800k ohms between the keypad signal circuit terminal 3 and ground.
 - If less than the specified range, test the keypad signal circuit for a short to ground. If the circuit tests normal, replace the K73 telematics communication interface control module.
 - If greater than the specified range, test the keypad signal circuit for an open/high resistance. If the circuit tests normal, replace the K73 telematics communication interface control module.
5. Ignition ON, test for 9.5-10.5 V between the keypad supply voltage circuit terminal 4 and ground.

- If less than the specified range, test the supply voltage circuit for a short to ground or open/high resistance. If the circuit tests normal, replace the K73 telematics communication interface control module.
 - If greater than the specified range, test the supply voltage circuit for a short to voltage. If the circuit tests normal, replace the K73 telematics communication interface control module.
6. If all circuits test normal, test or replace the button assembly.

Repair Procedures

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

- **Inside Rearview Mirror Replacement**
- **Control Module References** for telematics communication interface control module replacement, setup and programming

DTC B2485

Diagnostic Instructions

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

DTC Descriptors

DTC B2485 04

Wireless Communication Antenna Circuit Open

Circuit/System Description

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.

Conditions for Running the DTC

- Ignition ON.
- Battery voltage must be between 9-16 V.
- The telematics communication interface control module tests the antenna once every second.

Conditions for Setting the DTC

The telematics communication interface control module detects a short to ground or an open/high resistance in the Bluetooth ® antenna.

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.

Schematic Reference

OnStar Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Verify the Bluetooth ® antenna is properly connected to the K73 telematics communication interface control module and is not damaged.
 - If the antenna is disconnected or damaged, repair or replace as necessary.
2. Ignition ON, verify the DTC B2485 is not set.
 - If the DTC is set, replace the Bluetooth ® antenna. Clear the DTC and cycle the ignition OFF then back ON. If the DTC resets as current, replace the K73 telematics communication interface control module.

Repair Procedures

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

- **Wireless Communication Interface Antenna Replacement**
- **Control Module References** for telematics communication interface control module replacement, setup, and programming

SYMPTOMS - CELLULAR COMMUNICATION

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

1. Perform the **Diagnostic System Check - Vehicle** before using the Symptom Tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to **OnStar Description and Operation**.

Visual/Physical Inspection

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

Intermittent

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

Symptom List

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

- **Bluetooth Malfunction**
- **OnStar Global Positioning System (GPS) Data Not Current or Inaccurate**
- **OnStar Microphone Malfunction**
- **OnStar Audio Malfunction**
- **OnStar Button LED Malfunction**
- **OnStar Call Center Remote Function Requests Malfunction**
- **OnStar Button Malfunction**
- **Unable to Contact OnStar Call Center**
- **OnStar Voice Recognition Malfunction**
- **OnStar Steering Wheel Control Functions Malfunction**

SYMPTOMS - ENTERTAINMENT

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

1. Perform the **Diagnostic System Check - Vehicle** before using the Symptom Tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data link.
2. Review the system operation in order to familiarize yourself with the system functions. Refer to **Radio/Audio System Description and Operation**.

Visual/Physical Inspection

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

Intermittent

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

Symptom List

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

- **Radio Poor Reception**
- **Radio Displays LOC, LOCKED, or CODE**
- **Digital Radio Poor or No Reception**
- **Speaker Malfunction**
- **Speaker Replacement Reference**

AUDIO/VIDEO PLAYER ADAPTER - AUDIO OR VIDEO MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Right Auxiliary Audio Signal	1	1	1	-

Left Auxiliary Audio Signal	2	2	2	-
Auxiliary Audio Common Ground	-	1, 2	-	-
Auxiliary Video Ground	-	3	-	-
Auxiliary Video High Signal	3	3	3	-
1. No or distorted right side audio 2. No or distorted left side audio 3. No or distorted video				

Circuit/System Description

The audio/video adaptor allows the connection of audio and video signals from an external device such as a camcorder, video game console or MP3 player to the rear seat entertainment system. The middle jack is for left audio (white), the right jack is for right audio (red), and the left jack is for video (yellow). The system requires standard RCA cables to connect your external device to the RCA jacks. The auxiliary audio and video circuits are connected to the radio.

Diagnostic Aids

Verify the external audio or video device is operating normally before performing this diagnostic procedure.

Reference Information

Schematic Reference

Video System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Video Entertainment System Description and Operation (Non-Headrest DVD Systems) or **Video Entertainment System Description and Operation (Dual Headrest DVD Systems)** or **Video Entertainment System Description and Operation (Seatback Display)**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

IMPORTANT: Verify the DVD player in the radio is operating normally before performing this diagnostic procedure. If there is any problems with operating the DVD player, refer to Symptoms - Entertainment

1. Ignition OFF, disconnect the X3 harness connector at the radio.
2. Ignition ON, test for less then 1 volt between the appropriate signal circuit terminals listed below and ground.
 - Auxiliary audio left signal (+) - terminal 1
 - Auxiliary audio right signal (+) - terminal 2
 - Auxiliary audio drain wire (-) - terminal 9
 - Auxiliary video signal (+) - terminal 8
 - Auxiliary video drain wire (+) - terminal 16
 - If greater then specified range, test the circuit for a short to voltage.
3. Test for infinite resistance between the terminals listed below and ground.
 - Auxiliary audio left signal (+) - terminal 1
 - Auxiliary audio right signal (+) - terminal 2
 - Auxiliary audio drain wire (-) - terminal 9
 - Auxiliary video signal (+) - terminal 8
 - Auxiliary video drain wire (+) - terminal 16
 - If less then the specified value, test the circuit for a short to ground.
4. Test for less then 5 ohm between the terminals on the radio X3 harness connector and the external terminals on the audio/video adaptor listed below:
 - Auxiliary audio left signal (+) - terminal 1 and the inside of the center (white) jack
 - Auxiliary audio right signal (+) - terminal 2 and the inside of the right (red) jack
 - Auxiliary audio drain wire (-) - terminal 9 and the outside of both the center (white), and the right (red) jacks
 - Auxiliary video signal (+) - terminal 8 and the inside of the left (yellow) jack
 - Auxiliary video drain wire (+) - terminal 16 and the outside of the left (yellow) jack
 - If greater then the specified value, test the circuit for an open/high resistance. If the circuit tests normal, replace the adaptor.
5. If all circuits test normal, replace the radio.

Repair Procedures

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

- **Audio/Video Disc Player Adapter Replacement**
- **Control Module References** for Radio replacement, setup, and programming

BLUETOOTH MALFUNCTION

Diagnostic Instructions

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

Circuit/System Description

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.

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.gm.com/vc/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

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify DTC B2485 is not set.
 - If DTC B2485 is set, refer to **DTC B2485**
2. Set up a Bluetooth ® test tool or equivalent.
3. Ignition ON, perform the discovery/search operation with the test tool. Verify the vehicle appears in the list of available devices.
 - If the vehicle is not in the list of available devices, repeat the discovery/search operation. If the vehicle is still not in the list of available devices, replace the K73 telematics communication interface control module.
4. Follow the instructions provided in the Vehicle Owners Manual for pairing a device. Verify successful pairing with the test tool.
 - If pairing is not successful, repeat the pairing process. If pairing is still not successful, replace the K73 telematics communication interface control module.
5. Refer to Diagnostic Aids.

Repair Procedures

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

Control Module References for telematics communication interface control module replacement, setup, and programming

DIGITAL RADIO POOR OR NO RECEPTION

Diagnostic Instructions

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

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.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Special Tools

EL-48028 Digital Radio Test Antenna. See Special Tools.

Circuit/System Verification

1. Tune to a strong AM or FM station and verify each speaker is producing clear and even sound, with no distortion.
 - If any speaker is not producing sound or the sound produced is distorted, refer to Speaker Malfunction.
2. With the vehicle outside in an area with an unobstructed view of the southern sky, tune to XM. Verify XM reception is clear and the No XM Signal message is not displayed on the radio.

Circuit/System Testing

1. Ignition OFF, disconnect the digital radio antenna coax from the radio. Connect the **EL-48028** to the radio and place on the roof of the vehicle. See Special Tools. Move the vehicle outside in an area with an unobstructed view of the southern sky.
2. Ignition ON, radio tuned to XM channel 1, verify XM reception is clear and uninterrupted.

- If reception is not clear, replace the radio.
- 3. Ignition OFF, reconnect the antenna coax cable at the radio. Disconnect the antenna coax cable from the digital radio antenna.
- 4. Ignition ON, radio ON, test for 4.5-5.5 V between the antenna coax cable center terminal and outer shield.
 - If less than the specified range, test the antenna coax cable for an open/high resistance.
 - If greater than the specified range, test the antenna coax cable for a short to voltage.
- 5. If all circuits test normal, replace the digital radio antenna.

Repair Procedures

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

- **Radio Antenna Base Replacement**
- **Control Module References** for radio replacement, setup, and programming

ONSTAR GLOBAL POSITIONING SYSTEM (GPS) DATA NOT CURRENT OR INACCURATE

Diagnostic Instructions

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

Circuit/System Description

The telematics communication interface control module receives information from a specific cellular phone and navigation antenna located on the outside of the vehicle. The cellular phone and navigation antenna is connected to the telematics communication interface control module via a shielded coaxial cable. The antenna cable also provides a path for DC current for powering the antenna.

Diagnostic Aids

- The GPS signal title on the scan tool 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 vehicle communication interface module. Upon entering this screen, the GPS signal title will automatically 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.

Reference Information

Schematic Reference

OnStar Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE: 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 the satellites. It is also necessary to inform the OnStar® Call Center advisor that this call is for vehicle diagnostic purposes.

1. Ignition ON, observe the GPS signal status indicator for at least 10 seconds with a scan tool. The indicator should display Yes.
 - If the indicator does not display Yes, refer to Circuit/System Testing.
2. Call and verify the OnStar advisor has received the GPS data.
 - If the advisor did not receive the GPS data and the call was a 'fail to voice', contact the GM Technical Assistance Center.
 - If the advisor did not receive the GPS data and the call was not a 'fail to voice', refer to Circuit/System Testing.
3. Verify with the OnStar Call Center advisor that your actual position is within a reasonable distance from the actual location of the vehicle.
 - If your actual position is not within a reasonable distance from the actual location of the vehicle, replace the K73 telematics communication interface control module.

Circuit/System Testing

1. Disconnect the cellular phone and navigation antenna coax cable from the K73 telematics communication interface control module.
2. Ignition ON, test for 4.5-5.5 V between the K73 telematics communication interface control module coax cable center conductor terminal at the module and ground.
 - If not within the specified range, replace the K73 telematics communication interface control module.
3. Reconnect the coax cable to the telematics communication interface control module. Disconnect the coax cable from the T4 cellular phone and navigation antenna.
4. Test for 4.5-5.5 V between the coax cable center conductor and the outer shield.
 - If not within the specified range, replace the coax cable.
5. If all circuits test normal, replace the T4 cellular phone and navigation antenna.

Repair Procedures

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

- **Radio Antenna Base Replacement**
- **Control Module References** for telematics communication interface control module replacement, setup, and programming

ONSTAR MICROPHONE MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Cellular Microphone Signal	B2455 00	B2455 00	B2455 00	-
Cellular Microphone Drain	-	B2455 00	1	-
1. OnStar Microphone Inoperative - Caller Cannot Be Heard				

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. The telematics communication interface control module provides a ground for the microphone via the low reference wire.

Reference Information

Schematic Reference

OnStar Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the B24 cellular phone microphone.
2. Test for less than 10 ohms between the low reference circuit terminal A and ground.
 - If greater than the specified range, test the circuit for an open/high resistance.
3. Ignition ON, test for 9.5-10.5 V between the signal circuit terminal B and ground.
 - If less than the specified range, test the circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K73 telematics communication interface control module.
 - If greater than the specified range, test the circuit for a short to voltage. If the circuit tests normal, replace the K73 telematics communication interface control module.
4. If all circuit test normal, replace the B24 cellular phone microphone.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Mobile Telephone Microphone Replacement
- Control Module References for telematics communication interface control module replacement, setup, and programming

ONSTAR AUDIO MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Audio Signal	1	1	1	-
Audio Common Signal	-	1	-	-
1. No (or Noisy) OnStar® Audio				

Circuit/System Description

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

Reference Information

Schematic Reference

- **OnStar Schematics**
- **Radio/Navigation System Schematics**

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Tune radio to a known good station and verify the audio is heard clearly through all speaker channels.
 - If audio is not heard clearly, refer to **Speaker Malfunction**.
2. Ignition ON, radio ON, set volume to comfortable level and press OnStar® Call Center button. Verify Connecting to OnStar® message is heard clearly through the audio system.
 - If OnStar® message is noisy or distorted, refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF, disconnect the X1 harness connector at the radio.
2. Ignition ON, test for a varying AC voltage between the following signal circuit terminals listed below and ground when the OnStar® Call Center button is pressed.
 - Audio Signal Circuit- terminal 20
 - Audio Common Circuit- terminal 6
 - If AC voltage was not present, test the circuit for a short to voltage, short to ground, or an open/high resistance. If the circuit tests normal, replace the K73 telematics communication interface control module.
3. If all circuits test normal, replace the radio.

Repair Procedures

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

Control Module References for radio or telematics communication interface control module replacement, setup, and programming.

NO GLOBAL POSITIONING SYSTEM (GPS) RECEPTION

Diagnostic Instructions

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

Circuit Description

The global positioning system antenna is connected to the navigation radio by a coaxial cable. The antenna cable also provides a path for DC current for powering the antenna.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Navigation System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

NOTE: The global positioning system 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.

1. Ignition OFF, disconnect the global positioning system antenna coax cable from the A11 radio.
2. Ignition ON, test for 4.5-5.5 V between the GPS coax cable connection center conductor.
 - If not within the specified range, replace the A11 radio.
3. If all circuits test normal, replace the T4E global positioning system antenna.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for Radio replacement, setup, and programming

ONSTAR BUTTON LED MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Keypad Supply Voltage	B2476 00	B2476 00	B2476 00	-
Keypad Green LED Control	1	1	2	-
Keypad Red LED Control	1	1	2	-
Keypad Signal	3	3	-	-
Inside Rearview Mirror Ground	-	1	-	-
1. OnStar® LED Inoperative 2. LED Illuminated At All Times 3. OnStar® Buttons Inoperative				

Circuit Description

The OnStar® status LEDs are located in the inside rear view 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.

Reference Information

Schematic Reference

OnStar Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE: If the green LED is off with the Key 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, command the Green LED ON and OFF with a scan tool while observing the green LED on the A10 inside rear view mirror. The green LED should turn ON and OFF when commanded.
2. Command the red LED ON and OFF with a scan tool while observing the red LED on the A10 inside rear view mirror. The red LED should turn ON and OFF when commanded.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the A10 inside rear view mirror.
2. Doors closed, courtesy lamps OFF, test for less than 10 ohms between the ground circuit terminal 5 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Ignition ON, command the green LED OFF with a scan tool. Test for less than 1 V between the control circuit terminal 6 and ground.
 - If greater than the specified range, test the control circuit for a short to voltage. If the circuit tests normal, replace the K73 telematics communication interface control module.
4. Command the green LED ON with a scan tool. Test for greater than 9 V between the control circuit terminal 6 and ground.
 - If less than the specified range, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K73 telematics communication interface control module.
5. Command the red LED OFF with a scan tool. Test for less than 1 V between the control circuit terminal 7 and ground.
 - If greater than the specified range, test the control circuit for a short to voltage. If the circuit tests normal, replace the K73 telematics communication interface control module.
6. Command the red LED ON with a scan tool. Test for greater than 9 V between the control circuit terminal 7 and ground.
 - If less than the specified range, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the K73 telematics communication interface control module.
7. If all circuits test normal, replace the A10 inside rear view mirror.

Repair Procedures

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

- **Inside Rearview Mirror Replacement**
- **Control Module References** for telematics communication interface control module replacement, setup and programming

ONSTAR CALL CENTER REMOTE FUNCTION REQUESTS MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** 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. A failure in the National Cellular Network infrastructure that has since been corrected.

Reference Information

Schematic Reference

OnStar Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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. Verify that the horn, lights, and the doors locks on the vehicle operate properly.
 - If the applicable system does not operate properly, refer to **Diagnostic System Check - Vehicle** .
2. Contact the OnStar® Call Center by pressing the blue OnStar® button. Verify with the OnStar® advisor that all of the remote functions (door locks, lights, or horn) work.
 - If unable to connect with the OnStar® call center, refer to **Unable to Contact OnStar Call Center**.
 - If the remote functions do not operate when requested, replace the K73 telematics communication interface control module.

Repair Procedures

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

Control Module References for telematics communication interface control module replacement, setup, and programming

ONSTAR BUTTON MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Keypad Supply Voltage	B2476 00	B2476 00	B2476 00	-
Keypad Green LED Control	1	1	2	-
Keypad Red LED Control	1	1	2	-
Keypad Signal	3	3	-	B2482 00
Inside Rearview Mirror Ground	-	1	-	-
1. OnStar® LED Inoperative 2. LED Illuminated At All Times 3. 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 keypad supply voltage 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.

Reference Information

Schematic Reference

OnStar Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

Ignition ON, press the OnStar® Call buttons one at the time. Verify that all of the OnStar® buttons operate normally.

- If some OnStar® buttons are inoperative but not all, replace the inside rearview mirror.
- If none of the OnStar® buttons operate, refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the A10 inside rearview mirror.
2. Test for less than 10 ohms between the appropriate ground circuit terminal listed below and ground:

- Terminal 5 (UVC+UYS/PCJ/-UVC/UYS/PCJ)
- Terminal 8 (UVC-UYS/PCJ)
 - If greater than the specified range, test the ground circuit for an open/high resistance.
- 3. Ignition ON, test for less than 1 V between the signal circuit terminal 3 and ground.
 - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the K73 telematics communication interface control module.
- 4. Ignition OFF, test for 500-900 ohms between the appropriate signal circuit terminal listed below and ground:
 - Terminal 3 (UVC+UYS/PCJ/-UVC/UYS/PCJ)
 - Terminal 11 (UVC-UYS/PCJ)
 - If less than the specified range, test the signal circuit for a short to ground. If the circuit tests normal, replace the K73 telematics communication interface control module.
 - If greater than the specified range, test the signal circuit for an open/high resistance. If the circuit tests normal, replace the K73 telematics communication interface control module.
- 5. Ignition ON, test for 8.5-10.5 V between the appropriate 10 V reference circuit terminal listed below and ground:
 - Terminal 4 (UVC+UYS/PCJ/-UVC/UYS/PCJ)
 - Terminal 12 (UVC-UYS/PCJ)
 - If less than the specified range, test the 10 V reference circuit for a short to ground or open/high resistance. If the circuit tests normal, replace the K73 telematics communication interface control module.
 - If greater than the specified range, test the 10 V reference circuit for a short to voltage. If the circuit tests normal, replace the K73 telematics communication interface control module.
- 6. If all circuits test normal, test or replace the A10 rearview mirror.

Repair Procedures

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

- **Diagnostic Repair Verification**
- **Control Module References** for telematics communication interface control module replacement, programming and setup

ONSTAR STEERING WHEEL CONTROL FUNCTIONS MALFUNCTION

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

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

ANTENNA COAXIAL/CONNECTOR CABLE IDENTIFICATION TABLE

ONSTAR, GPS, XM, AM/FM-CONNECTOR IDENTIFICATION AT CIM

SYSTEM	COAX TYPE	PURPLE	BLUE	CURRY (Mustard Yellow)	GREEN
OnStar (Cellular)	RG 58	X	-	-	-
GPS	RG 174	-	X	-	-
XM	RG 316	-	-	X	-
XM w/High Gain Antenna Module (Cables longer than 4400 mm (14.5 ft))	-	-	-	-	X

CONNECTOR IDENTIFICATION AT ONSTAR ANTENNA BASE

CONNECTOR CONFIGURATION	OnStar (Cellular) PURPLE	GPS BLUE	XM CURRY (Mustard Yellow)	XM GREEN	AM/FM
3 Individual Connectors	X	X	X	-	-
2 Individual Connectors	X	X	-	-	-
3 Way Connector w/3 COAX Cables	X	X	X	-	-
3 Way Connector w/2 COAX Cables with a Separate Connector for XM	X	X	X (S)	-	-
3 Blue 2 Way Connectors + Power Feed (Hexband)	X	-	X	-	X
1 Connector with Splitter	X (S)	X (S)	-	-	-
High Gain Antenna XM 3 Individual Connectors (ver 1)	X	X	-	X	-
High Gain Antenna XM Blue 2 Way with Separate Green Connector (ver 2)	2 way	2 way	-	X	-

RADIO DISPLAYS CAL OR CAL ERR

Diagnostic Instructions

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

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Verify the CAL or CAL ERROR is not displayed on radio.

- If the radio displays CAL or CAL ERROR, reprogram the radio. If the radio still displays CAL or CAL ERR after performing the reprogramming procedure, replace the radio.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for Radio replacement, setup, and programming

RADIO DISPLAYS LOC, LOCKED, OR CODE

Diagnostic Instructions

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

Diagnostic Aids

The vehicle identification number (VIN) in the radio is a single one-time VIN learn.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

Ignition ON, using the scan tool, verify that the VIN, digits 2-17, of the radio matches the VIN, digits 2-17, of the vehicle.

- If not the specified value, replace the radio.

Repair Procedures

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for radio replacement, setup, and programming

RADIO POOR RECEPTION

Diagnostic Instructions

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

Diagnostic Fault Information

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

Circuit/System Description

AM and FM radio reception is dependent on the following components:

- Radio antenna
- Coax cable between the radio antenna and the radio
- Radio

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.

Diagnostic Aids

Poor AM and FM radio reception is dependent on multiple influences, some of which may not be vehicle related. Areas which have high RF traffic or block the signal path may cause a degradation in radio reception. Radio reception may also be influenced by items within the vehicle, but not part of the radio system. Such examples are aftermarket electrical accessories or other items which may generated noise in the vehicle electrical system.

AM reception is highly dependent on the antenna receiving battery voltage from the radio. The antenna has a built in antenna amplifier that boosts both AM and FM reception. If the antenna does not receive battery voltage, the radio will still receive FM stations but AM stations will not be received.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Inspect the antenna for proper mounting or physical damage.
 - If damage is found, repair or replace as necessary
2. Radio ON, tune to several known strong FM, AM, and XM (if equipped) stations, and play a known good CD. Verify clear sound from all sources.
 - If audio quality is poor from all sources, refer to **Speaker Malfunction**.

Circuit/System Testing

1. Ignition OFF, disconnect the radio antenna coax from the A11 radio and from the radio antenna.
2. Test for infinite resistance between the antenna coax center terminal and ground.
 - If less than the specified value, replace the antenna coax.
3. Test for less than 5 ohms on the antenna coax center circuit from end to end.
 - If greater than the specified range, replace the antenna coax.
4. Ignition ON, test for less than 1 V between the antenna coax center terminal and ground.
 - If greater than the specified range, replace the antenna coax.
5. Test for infinite resistance between the coax center terminal and the outer shield.
 - If less than the specified value, replace the antenna coax.
6. Connect the antenna coax to the A11 radio. Test for 12-15 V between the antenna coax center terminal and ground at the radio antenna connector.
 - If not within the specified range, replace the A11 radio.
7. If all circuits test normal, replace the radio antenna.

Repair Procedures

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

- **Radio Antenna Base Replacement**
- **Radio Antenna Replacement**
- **Control Module References** for radio replacement, setup, and programming

SPEAKER REPLACEMENT REFERENCE

Component	Repair Instruction
Front Center Speakers	Refer to <u>Radio Front Center Speaker Replacement</u>
Front Side Door Lower Speakers	Refer to <u>Radio Front Side Door Lower Speaker Replacement</u>
Front Tweeter Speakers	Refer to <u>Radio Windshield Side Garnish Molding Speaker Replacement</u>
Rear Subwoofer	Refer to <u>Radio Rear Compartment Speaker Replacement</u>
Rear Side Door Lower Speakers	Refer to <u>Radio Rear Side Door Lower Speaker Replacement</u>

SPEAKER MALFUNCTION

Diagnostic Instructions

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

Circuit/System Description

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

Diagnostic Aids

- Improper speaker mounting or loose trim may cause an audible buzz or distortion. Inspect the appropriate speaker and the surrounding interior trim for proper and secure mounting. If the speaker or surrounding interior trim is found to be loose or improperly secured, correctly secure the item.
- When equipped with an amplifier, it is possible for some individual circuit faults to affect more than one speakers operation. Perform diagnostic tests in the sequence listed to avoid misdiagnosis.

Reference Information

Schematic Reference

Radio/Navigation System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Radio/Audio System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Special Tools

J 39916-A CD and Cassette Diagnostic Audio Kit. See Special Tools.

Circuit/System Verification

Radio ON, Mute OFF, verify clear audio is heard from each audio T19 speaker.

- If audio is inoperative from all speakers, refer to Amplifier Circuit Malfunction.
- If audio is inoperative from one or more, but not all, speakers or the audio emitted from the speakers is not clear, refer to Radio and Amplifier Output Circuit Testing.

Circuit/System Testing

Amplifier Circuit Malfunction

1. Ignition OFF, disconnect the X3 harness connector at the T3 audio amplifier.
2. Ignition OFF, test for less than 10 ohms between the ground circuit terminal 8 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Verify that a test lamp illuminates between the B+ circuit terminal 4 and ground.
 - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance.
4. Ignition OFF, disconnect the X1 harness connector at the T3 audio amplifier.
5. Connect a test lamp between the control circuit terminal 8 and ground.
6. Ignition ON, turn the A11 radio ON and OFF. The test lamp should turn ON and OFF when changing between the commanded states.
 - If the test lamp is always ON, test the control circuit for a short to voltage. If the circuit tests normal, replace the A11 radio.
 - If the test lamp is always OFF, test the control circuit for a short to ground or an open/high

resistance. If the circuit tests normal, replace the A11 radio.

7. If all circuits test normal, refer to Radio and Amplifier Output Circuit Testing.

Radio and Amplifier Output Circuit Testing

1. Ignition OFF, disconnect the X1 harness connector at the T3 amplifier.
2. Ignition ON, radio ON, test for 4-8 V between the control circuit terminals listed below and ground.
 - Left front speaker control (+) terminal 11
 - Left front speaker control (-) terminal 12
 - Right front speaker control (+) terminal 9
 - Right front speaker control (-) terminal 10
 - Left rear speaker control (+) terminal 1
 - Left rear speaker control (-) terminal 2
 - Right rear speaker control (+) terminal 3
 - Right rear speaker control (-) terminal 4
 - If less than the specified range, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the A11 radio.
 - If greater than the specified range, test the control circuit for a short to voltage. If the circuit tests normal, replace the A11 radio.

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 audio test CD from the J 39916-A CD and Cassette Diagnostic Audio Kit. See Special Tools.
4. Play track number three (50 Hz bass test tone) from the test CD. Test for 49-51 Hz AC between the control circuit terminals listed below and ground.
 - Left front speaker control (+) terminal 11
 - Left front speaker control (-) terminal 12
 - Right front speaker control (+) terminal 9
 - Right front speaker control (-) terminal 10
 - Left rear speaker control (+) terminal 1
 - Left rear speaker control (-) terminal 2
 - Right rear speaker control (+) terminal 3
 - Right rear speaker control (-) terminal 4
 - If not the specified value, replace the A11 radio.
5. Ignition OFF, reconnect the X1 harness connector at the T3 audio amplifier.
6. Disconnect the harness connector at the appropriate T19 speaker.
7. Ignition ON, radio ON, test for 4-8 V between the appropriate control circuit terminals listed below and ground:

- Door speakers, front tweeter speakers, or center I/P speaker: speaker control (-) circuit terminal 1
- Door speakers, front tweeter speakers, or center I/P speaker: speaker control (+) circuit terminal 2
- Left subwoofer speaker control (-) circuit terminal A
- Left subwoofer speaker control (+) circuit terminal B
- Right subwoofer speaker control (-) circuit terminal C
- Right subwoofer speaker control (+) circuit terminal D
- If less than the specified range, test the control circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the T3 audio amplifier.
- If greater than the specified range, test the control circuit for a short to voltage. If the circuit tests normal, replace the T3 audio amplifier.

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

8. Play track number three (50 Hz bass test tone) from the test CD. Test for 49-51 Hz AC between the appropriate control circuit terminals listed below and ground.
 - Door speakers, front tweeter speakers, or center I/P speaker: speaker control (-) circuit terminal 1
 - Door speakers, front tweeter speakers, or center I/P speaker: speaker control (+) circuit terminal 2
 - Left subwoofer speaker control (-) circuit terminal A
 - Left subwoofer speaker control (+) circuit terminal B
 - Right subwoofer speaker control (-) circuit terminal C
 - Right subwoofer speaker control (+) circuit terminal D
 - If not the specified value, replace the T3 audio amplifier.
9. If all circuits test normal, replace the appropriate T19 speaker.

Repair Procedures

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

- **Speaker Replacement Reference**
- **Control Module References** for amplifier or radio replacement, setup, and programming

UNABLE TO CONTACT ONSTAR CALL CENTER

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** 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**
- **Antenna Coaxial/Connector Cable Identification Table**

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Special Tools

EL-49903 GM OnStar Antenna Diagnostic Tool Kit. See **Special Tools**.

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 key on for the GPS satellites to acquire vehicle signal.**

Ignition ON, wait 5 minutes, then contact the OnStar call center consultant by pressing the blue OnStar button. A call center consultant should answer the call, verifying the vehicle OnStar system is functioning and the consultant can locate the vehicle.

- If the unit does not connect to the OnStar Call Center, verify the vehicles OnStar subscription is valid, has not expired and is in good standing.

Circuit/System Testing

1. Ignition OFF, disconnect both the GPS and cell coax cable connectors at the K73 telematics communication interface control module.
2. Connect the **EL-49903** to the K73 telematics communication interface control module, place the test antenna on the roof of the vehicle. See **Special Tools**.
3. Ignition ON, wait 5 minutes, and then contact the OnStar call center consultant by pressing the blue OnStar button. A call center consultant should answer the call.
 - If the unit does not connect to the OnStar Call Center and the subscription is valid, use a scan tool to obtain and record the following information: Electronic Serial Number (ESN), Station Identifier (STID), GM 8-digit part number, Mobile Identification Number (MIN), Mobile Dialed Number (MDN), Transceiver ID (Trans ID) and call GM TAC.
4. Request the consultant to verify the vehicle location to confirm the GPS system is functioning.
 - If the OnStar GPS does not function, replace the K73 telematics communication interface module.
5. Ignition OFF, perform the coax cable test on the coax cable, refer to Component Testing. The coax cable should pass the test.
 - If the coax cable does not pass the test, replace the coax cable.
6. If all circuits test normal, replace the T4 cellular phone and navigation antenna.

Component Testing

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

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

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

Coax Cable Test

1. Ignition OFF, disconnect the GPS and cellular phone coax cable at both components.
2. Test both for less than 5 ohms between both ends of the coax cables center terminals.
 - If greater than the specified range, replace the failed coax cable.
3. Test for greater than 10k ohms between the coax cable center wire and the outer coax shield.
 - If less than the specified range, replace the coax cable.

Repair Procedures

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

- **Radio Antenna Base Replacement**
- **Control Module References** for telematics communication interface control module replacement, setup, and programming

VIDEO ENTERTAINMENT SYSTEM MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Video Display B+	2	1	-	-
Remote Enable Control Circuit	B1265 02, 3	4	5	-
DVD Audio Common Signal (-)	6	6	6	-
Left DVD Audio Signal (+)	7	7	7	-
Right DVD Audio Signal (+)	8	8	8	-
DVD Video Signal (+)	9	9	7	-
DVD Video Signal (-)	9	9	9, 10	-
Infrared Remote Signal (+)	11	11	11	-
Infrared Remote Signal (-)	11	11	11	-
Video Mode Signal	B1288 02, 12	B1288 04, 12	B1288 01, 12	-
Video Bright Signal	B1289 02, 13	B1289 04, 13	B1289 01, 13	-
Ground Terminal 8	-	1	-	-

Ground Terminal 14	-	1	-	-
1. One or both seatback displays inoperative 2. Both seatback displays inoperative 3. All infotainment devices controlled by circuit inoperative, no sound from speakers 4. One or more infotainment devices controlled by circuit inoperative 5. Power state of all infotainment devices controlled by circuit cannot be controlled by radio 6. No or distorted audio heard in wireless headphones 7. No or distorted left channel audio heard in wireless headphones 8. No or distorted right channel audio heard in wireless headphones 9. No or distorted image in seatback display 10. Serious damage to radio can occur 11. Infrared remote control inoperative 12. Seatback display mode cannot be controlled/changed 13. Seatback display brightness cannot be controlled/adjusted				

Circuit Description

The rear seat entertainment (RSE) system utilizes the vehicle radio to play DVD movies and transmit video signals to the digital video disc (DVD) seatback displays. When the radio is turned ON, the DVD seatback displays receive a voltage signal from the radio via the remote enable signal circuit indicating the system status. Discreet output circuits from the radio are used to transmit the DVD images to each of the DVD seatback displays. The radio utilizes discreet mode control circuits to each display to control the screen display mode via a pulse width modulated signal. A single brightness control circuit is used by the radio to control the display screen brightness for both displays via a pulse width modulated signal.

Reference Information

Schematic Reference

Video System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Video Entertainment System Description and Operation (Non-Headrest DVD Systems) or **Video Entertainment System Description and Operation (Dual Headrest DVD Systems)** or **Video Entertainment System Description and Operation (Seatback Display)**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON, Radio ON, DVD playing, verify that the Rear Seat Entertainment System audio and video functions are working properly.
 - If the Rear Seat Entertainment System is inoperative refer to Circuit/System Testing.
2. Verify that all remote control functions are working properly.
 - If one or more functions on the remote control are inoperative, refer to **Video Entertainment System Remote Control Malfunction**.
3. Verify that each headphone is working properly.
 - If one or more of the headphones are inoperative, refer to **Video Entertainment System Wireless Headphone Malfunction**.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the appropriate DVD display.
2. Test for less than 10 ohms between the ground circuit terminals listed below and ground.
 - Ground terminal 8
 - Ground terminal 14
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Verify a test lamp illuminates between the B+ circuit terminal 1 and ground.
 - If the test lamp does not illuminate, test the B+ circuit for a short to ground or an open/high resistance.
4. Ignition ON, radio ON, verify a test lamp illuminates between the remote enable control circuit terminal 2 and ground.
 - If the test lamp does not illuminate, test the remote enable circuit for a short to ground or an open/high resistance.
5. DVD playing, test for 190-210 HZ DC between the video bright control circuit terminal 16 and ground.
 - If not within the specified range, test the control circuit for a short to voltage, short to ground, or an open/high resistance. If the circuit tests normal, replace the radio.
6. Command the rear screen video mode to normal, test for 190-210 HZ DC between the video mode signal circuit terminal 15 and ground.
 - If not within the specified range, test the control circuit for a short to voltage, short to ground, or an open/high resistance. If the circuit tests normal, replace the radio.
7. DVD playing, test for 1-3 V between the control circuit terminals listed below and ground.
 - Video Signal (+)- terminal 9
 - Video Signal (-) - terminal 10
 - If greater than specified range, test the control circuit for a short to voltage. If the circuit tests normal, replace the radio.

- If less than specified range, test the control circuit for a short to ground or an open/high resistance.
If the circuit tests normal, replace the radio.

8. If all circuits test normal, replace the DVD display.

Repair Procedures

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

- **Video Display Replacement**
- **Control Module References** for radio replacement, setup, and programming

VIDEO ENTERTAINMENT SYSTEM REMOTE CONTROL MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Video Display B+	2	1	-	-
Remote Enable Control Circuit	B1265 02, 3	4	5	-
DVD Audio Common Signal (-)	6	6	6	-
Left DVD Audio Signal (+)	7	7	7	-
Right DVD Audio Signal (+)	8	8	8	-
DVD Video Signal (+)	9	9	7	-
DVD Video Signal (-)	9	9	9, 10	-
Infrared Remote Signal (+)	11	11	11	-
Infrared Remote Signal (-)	11	11	11	-
Video Mode Signal	B1288 02, 12	B1288 04, 12	B1288 01, 12	-
Video Bright Signal	B1289 02, 13	B1289 04, 13	B1289 01, 13	-
Ground Terminal 8	-	1	-	-
Ground Terminal 14	-	1	-	-

1. One or both seatback displays inoperative
2. Both seatback displays inoperative
3. All infotainment devices controlled by circuit inoperative, no sound from speakers
4. One or more infotainment devices controlled by circuit inoperative
5. Power state of all infotainment devices controlled by circuit cannot be controlled by radio
6. No or distorted audio heard in wireless headphones
7. No or distorted left channel audio heard in wireless headphones
8. No or distorted right channel audio heard in wireless headphones

9. No or distorted image in seatback display
10. Serious damage to radio can occur
11. Infrared remote control inoperative
12. Seatback display mode cannot be controlled/changed
13. Seatback display brightness cannot be controlled/adjusted

Circuit/System Description

The infrared remote signal is used to transmit signals from the rear seat entertainment (RSE) remote control via pulse width modulated (PWM) signals to the radio. When a key on the remote is pressed, the remote control sends an infrared message to the infrared receiver located in the DVD display. The infrared receiver converts these infrared signals into a frequency and sends the message to the radio to perform the appropriate function. Both seatback displays contain receivers for the infrared remote, which are connected to common (+) and (-) signal circuits to the radio.

Reference Information

Schematic Reference

Video System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Video Entertainment System Description and Operation (Non-Headrest DVD Systems) or **Video Entertainment System Description and Operation (Dual Headrest DVD Systems)** or **Video Entertainment System Description and Operation (Seatback Display)**

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON, Radio ON, DVD playing, verify that the Rear Seat Entertainment System audio/video functions are working properly.

- If the Rear Seat Entertainment System is inoperative, refer to **Video Entertainment System Malfunction**.
- 2. Verify that all remote control functions are working properly.
 - If one or more, but not all of the functions on the remote control is inoperative, replace the remote control.
 - If all functions are inoperative on the remote control, test or replace the batteries.
- 3. Verify that all remote control functions are working properly pointing at the left and right DVD display while holding the remote control 8-10 inches from each display.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connectors at both of the P22 seatback video displays.
2. Ignition OFF, scan tool disconnected, open driver door, wait two minutes. Test for less than 1 ohms between the infrared remote signal (-) circuits terminal 13 and ground.
 - If greater than the specified range, test the signal (-) circuit for an open/high resistance. If the circuits test normal, replace the A11 radio.
3. Ignition ON, DVD playing, test for 1-4 V between the infrared remote signal (+) circuit terminal 12 and ground.
 - If less than specified range, test the signal (+) circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the A11 radio.
 - If greater than specified range, test the signal (+) circuit for a short to voltage. If the circuit tests normal, replace the A11 radio.
4. Ignition OFF, reconnect the harness connector at the P22E driver seatback video display.
5. Ignition ON, DVD playing, test for 1-4 V between the infrared remote signal (+) circuit terminal 12 and ground at the P22F passenger seatback video display.
 - If not within the specified range, replace the P22E driver seatback video display.
6. If all circuits test normal, replace the P22F passenger seatback video display.

Repair Procedures

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

- **Video Display Replacement**
- **Control Module References** for radio replacement, setup, and programming

VIDEO ENTERTAINMENT SYSTEM WIRELESS HEADPHONE MALFUNCTION

Diagnostic Instructions

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Video Display B+	2	1	-	-
Remote Enable Control Circuit	B1265 02, 3	4	5	-
DVD Audio Common Signal (-)	6	6	6	-
Left DVD Audio Signal (+)	7	7	7	-
Right DVD Audio Signal (+)	8	8	8	-
DVD Video Signal (+)	9	9	7	-
DVD Video Signal (-)	9	9	9, 10	-
Infrared Remote Signal (+)	11	11	11	-
Infrared Remote Signal (-)	11	11	11	-
Video Mode Signal	B1288 02, 12	B1288 04, 12	B1288 01, 12	-
Video Bright Signal	B1289 02, 13	B1289 04, 13	B1289 01, 13	-
Ground Terminal 8	-	1	-	-
Ground Terminal 14	-	1	-	-
1. One or both seatback displays inoperative 2. Both seatback displays inoperative 3. All infotainment devices controlled by circuit inoperative, no sound from speakers 4. One or more infotainment devices controlled by circuit inoperative 5. Power state of all infotainment devices controlled by circuit cannot be controlled by radio 6. No or distorted audio heard in wireless headphones 7. No or distorted left channel audio heard in wireless headphones 8. No or distorted right channel audio heard in wireless headphones 9. No or distorted image in seatback display 10. Serious damage to radio can occur 11. Infrared remote control inoperative 12. Seatback display mode cannot be controlled/changed 13. Seatback display brightness cannot be controlled/adjusted				

Circuit/System Description

The driver seatback DVD display contains the infrared transmitter for the wireless headphones. The audio that is sent over the DVD audio signal circuits is a varying AC voltage. The transmitter processes the signal and transmits the audio signals to the headphones. If the display is in the closed position, the infrared signals will not be available for the operation of the wireless headphones and the remote control.

Reference Information

Schematic Reference

Video System Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Video Entertainment System Description and Operation (Non-Headrest DVD Systems) or Video Entertainment System Description and Operation (Dual Headrest DVD Systems) or Video Entertainment System Description and Operation (Seatback Display)

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE: **Test or replace the headphone batteries before performing the circuit/system verification.**

1. Ignition ON, Radio ON, DVD playing, verify that the Rear Seat Entertainment System audio/video functions are working properly.
 - If the Rear Seat Entertainment System is inoperative, refer to Video Entertainment System Malfunction.
2. Turn ON the wireless headphones. Verify the power indicator lamp on the wireless headphone illuminates.
 - If the power indicator lamp does not illuminate, replace the wireless headphones.
3. Ignition ON, Radio ON, DVD playing, verify that each headphone is working properly.
 - If all of the headphones are inoperative, or the sound is distorted, refer to Circuit/System Testing.
 - If only one of the headphones is not producing sound, or the sound is distorted, replace the appropriate set of headphones.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the P22E driver seatback video display.
2. Ignition OFF, scan tool disconnected, open driver door, wait five minutes, test for 20-25 ohms between the DVD audio low reference signal (-) circuits terminal 5 and ground.
 - If greater than the specified range, test the low reference (-) circuit for an open/high resistance. If the circuits test normal, replace the A11 radio.
3. Ignition ON, DVD playing with audio present, set the DMM to read min/max, test for a varying voltage

greater than 50 mV from 10 mV-250 mV AC between the control circuits listed below and ground:

- Left DVD audio control (+) - terminal 6
 - Right DVD audio control (-) - terminal 7
 - If not within the specified range, test the control circuit for a short to voltage, short to ground or an open/high resistance. if the circuits test normal, replace the A11 radio.
4. If all circuits test normal, replace the headphones. If the headphones are still inoperative, replace the P22E driver seatback video display.

Repair Procedures

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

- **Video Display Replacement**
- **Control Module References** for radio replacement, setup, and programming

ONSTAR VOICE RECOGNITION MALFUNCTION

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** 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 circuits. Speech recognition allows the user to speak to one computer in the vehicle, and one reached over the cellular communication network. The module attempts to understand the users command, and responds by speaking back, or by taking the appropriate action, e.g. dialing the phone.

Reference Information

Schematic Reference

OnStar Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

OnStar Description and Operation

Electrical Information Reference

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

Circuit/System Verification

NOTE:

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

1. Ignition ON, press OnStar® Call button. 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**.
2. Press the OnStar® Call answer button. Attempt to operate the OnStar® system using multiple different voice commands. Verify the system responds appropriately to all voice commands.
 - If the OnStar® system does not respond to any voice commands, replace the K73 telematics communication interface control module.
3. If the system is operational, but does not respond appropriately to certain commands refer to **OnStar Description and Operation** for tips on proper pronunciation.

Repair Procedures

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

Control Module References for telematics communication interface control module replacement, setup, and programming

REPAIR INSTRUCTIONS

MOBILE TELEPHONE MICROPHONE REPLACEMENT

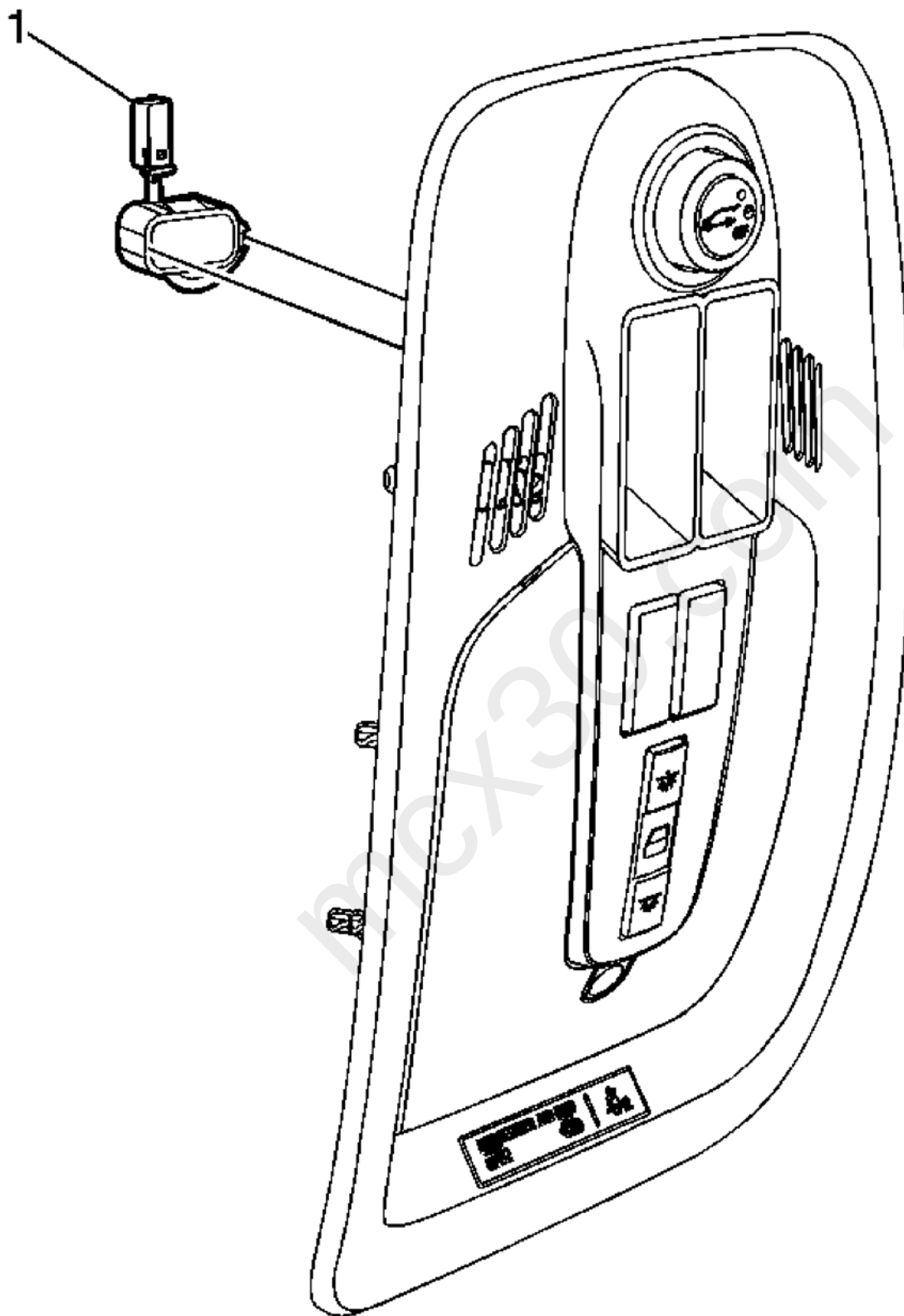


Fig. 15: Mobile Telephone Microphone

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the roof console. Refer to <u>Roof Console Replacement</u> .	
1	Mobile Telephone Microphone Procedure: Disconnect the electrical connector.

COMMUNICATION INTERFACE MODULE REPLACEMENT

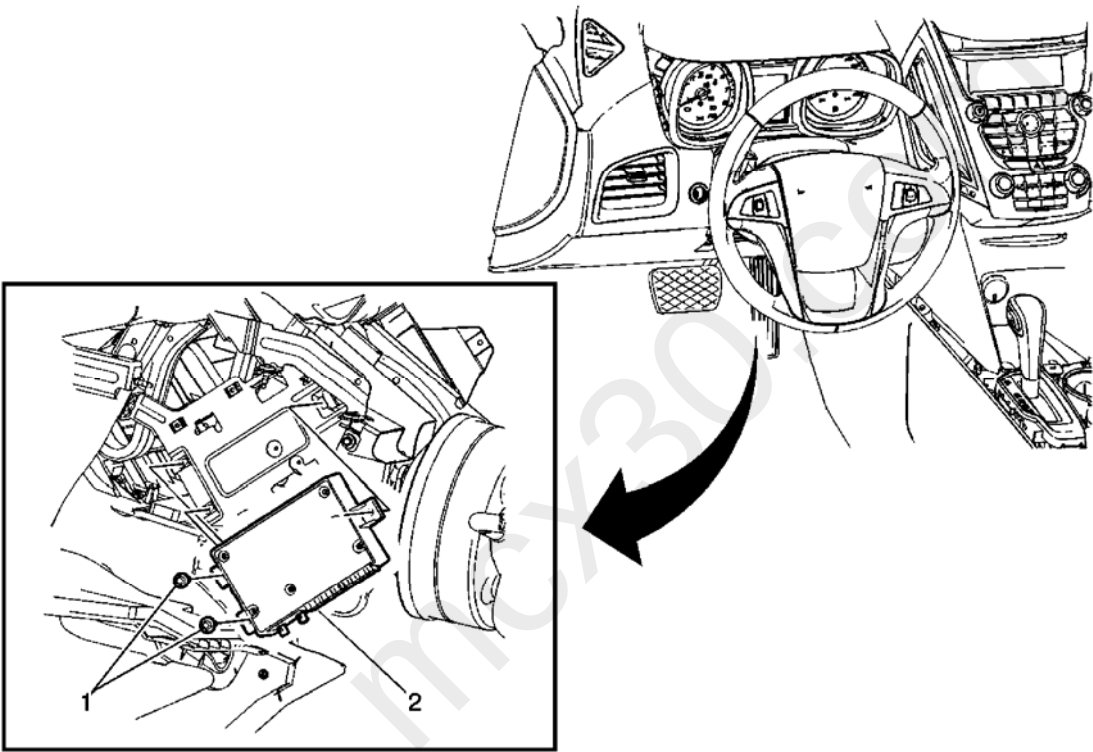


Fig. 16: Communication Interface Module
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the driver side knee bolster reinforcement. Refer to <u>Driver Knee Bolster Reinforcement Replacement (Equinox)</u> or <u>Driver Knee Bolster Reinforcement Replacement (Terrain)</u>	
1	Communication Interface Module Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten: 10 N.m (89 lb in)
	Communication Interface Module
2	Procedure 1. Disconnect the electrical connections. 2. If replacing the communication interface module be sure to transfer bluetooth antenna, if equipped. 3. For programming and set up procedures, refer to <u>Control Module References</u>

WIRELESS COMMUNICATION INTERFACE ANTENNA REPLACEMENT

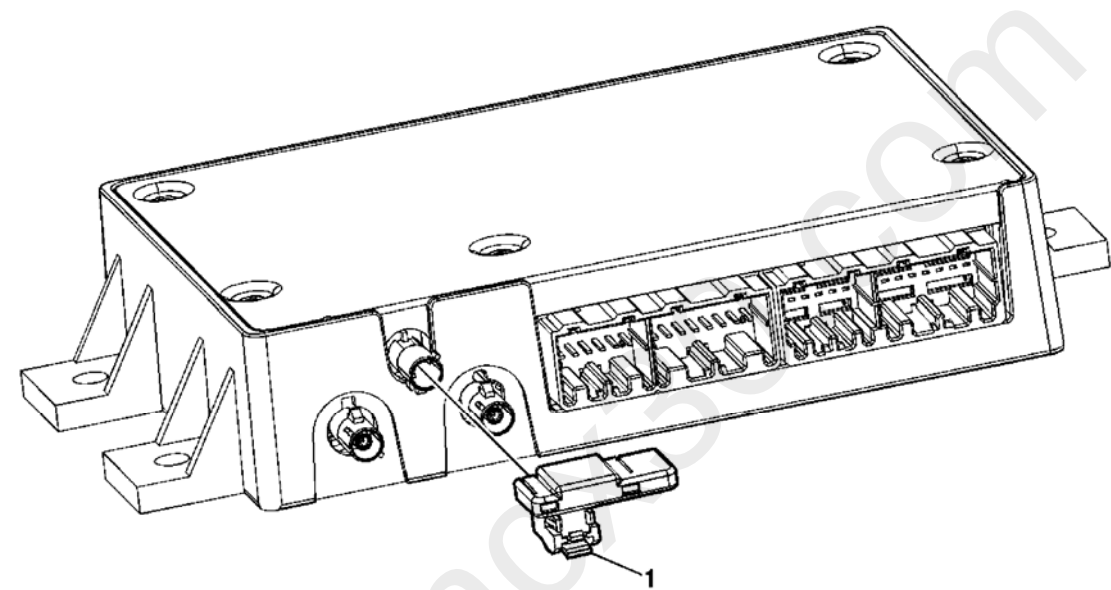


Fig. 17: Wireless Communication Interface Antenna
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the communication interface module. Refer to <u>Communication Interface Module Replacement</u>	
1	Wireless Communication Interface Antenna Bluetooth Module Procedure: Unsnap the Antenna from Communication Module.

RADIO REPLACEMENT

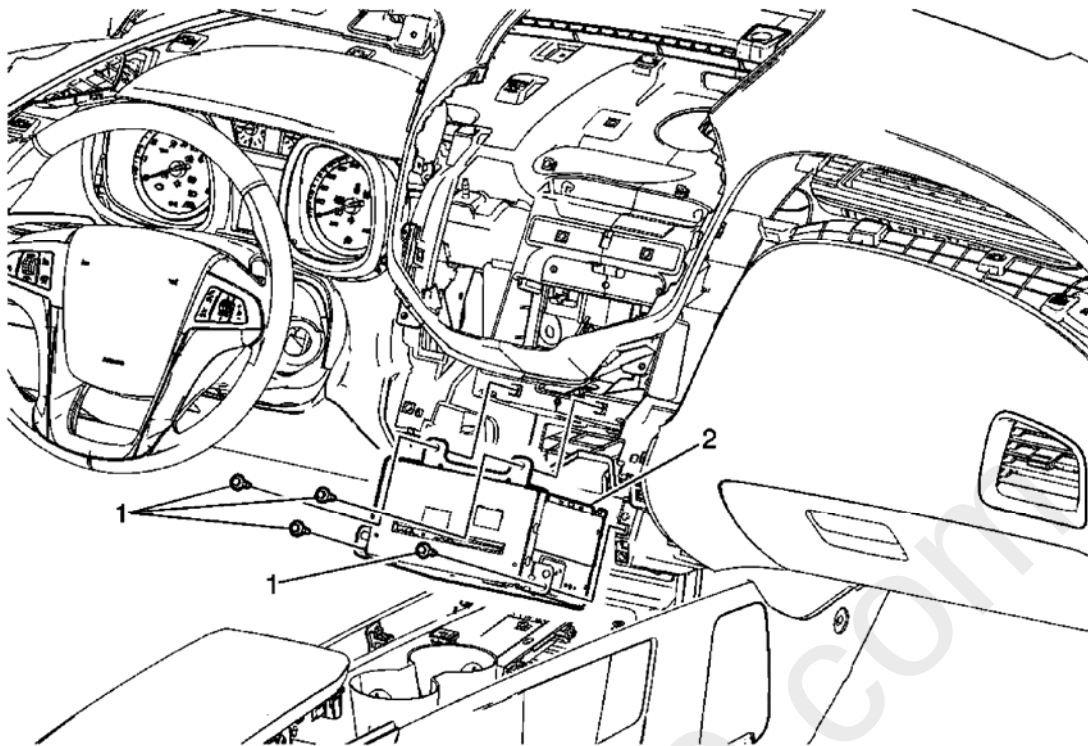


Fig. 18: Radio
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure 1. Remove the radio control assembly. Refer to <u>Radio Control Assembly Replacement</u> 2. Remove the instrument panel center air outlet. Refer to <u>Instrument Panel Center Air Outlet Replacement (Equinox)</u> or <u>Instrument Panel Center Air Outlet Replacement (Terrain)</u> 3. Remove two screws from the lower side of the top pad and two screws from the upper side of the top pad. 4. Remove the mat liner from the cd bezel. 5. Remove the instrument panel lower extension bezel. Refer to <u>Instrument Panel Lower Extension Accessory Bezel Replacement (Equinox)</u> or <u>Instrument Panel Lower Extension Accessory Bezel Replacement (Terrain)</u> 6. Remove the cd bezel rearward and up to disconnect connector. 7. Raise up the lower top pad to clear the radio for removal.	
1	Radio Screw (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten: 23 N.m (17 lb ft)
2	Radio Assembly Procedure 1. Disconnect the electrical connections. 2. Refer to <u>Control Module References</u> for programming and setup information.

RADIO CONTROL ASSEMBLY REPLACEMENT

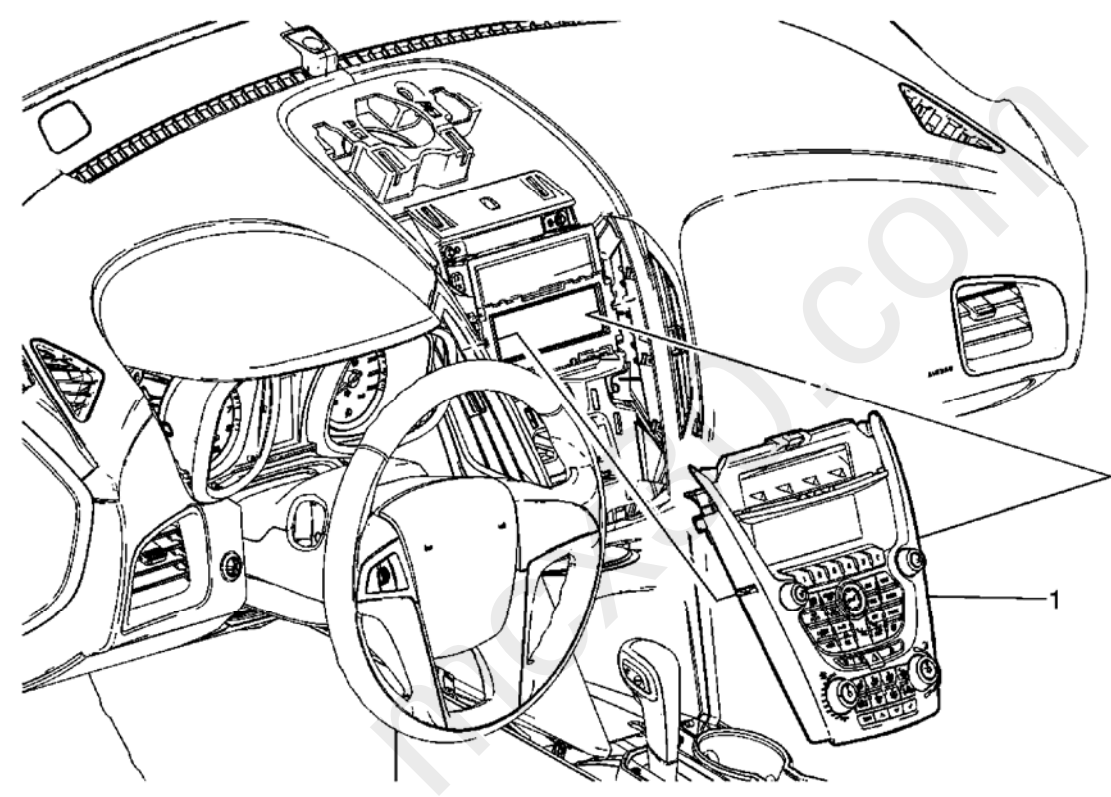


Fig. 19: Radio Control Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: For vehicles equipped with the instrument panel center trim plate. Refer to <u>Instrument Panel Upper Center Trim Panel Replacement (Equinox)</u> or <u>Instrument Panel Upper Center Trim Panel Replacement (Terrain)</u> for removal. For vehicles equipped with the instrument panel center compartment. Refer to <u>Instrument Panel Center Compartment Replacement (Equinox)</u> or <u>Instrument Panel Center Compartment Replacement (Terrain)</u> for removal.	
	Radio Control Assembly
	Procedure

- | | |
|---|--|
| 1 | <ol style="list-style-type: none"> 1. Use a flat-bladed plastic trim tool in order to release the retainer clips securing the AM/FM stereo and clock and audio disc player radio control assembly to the instrument panel. 2. Disconnect the electrical connections. 3. When replacing the radio control assembly, transfer all necessary components. 4. Refer to <u>Control Module References</u> for programming and setup information. |
|---|--|

RADIO VOLUME COMPENSATOR INTERIOR NOISE MICROPHONE REPLACEMENT

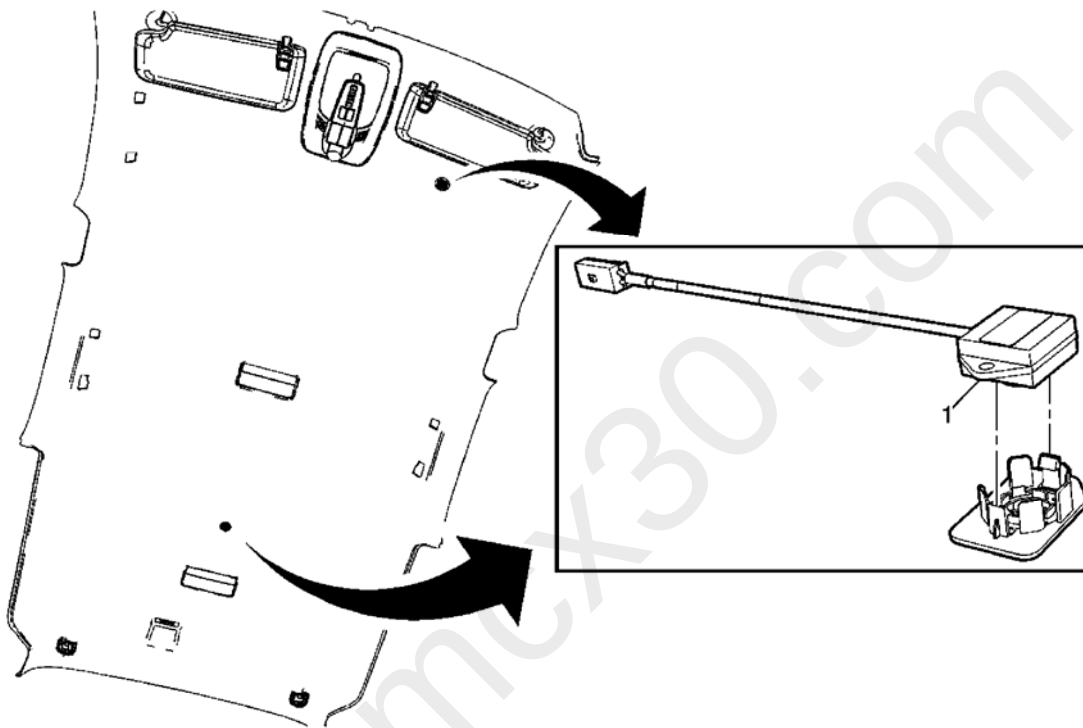


Fig. 20: Radio Volume Compensator Interior Noise Microphone
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Lower the front or rear of the headlining trim panel enough to gain access to the microphone. Refer to <u>Headlining Trim Panel Replacement</u> .	
1	Radio Volume Noise Compensator Interior Noise Microphone Procedure 1. Disconnect the electrical connector. 2. Note the foam position around the front of the microphone and the center foam plug

- over the top of the microphone to ensure proper installation.
3. Remove the foam plug from the top of the microphone and large foam patch from around the microphone.
 4. Unsnap the microphone from the grille assembly bracket.

AUDIO DISC PLAYER AND USB RECEPTACLE REPLACEMENT

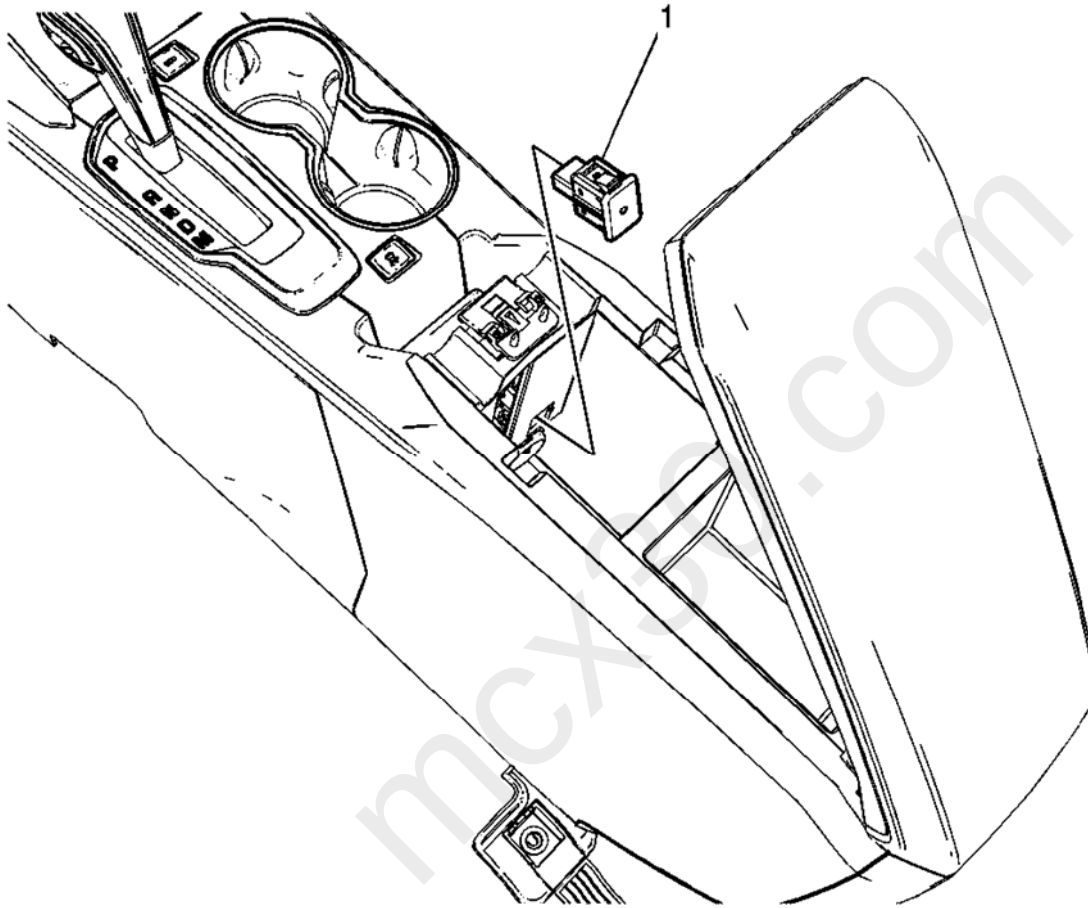


Fig. 21: Audio Disc Player & USB Receptacle
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Audio Disc Player and USB Receptacle Procedure 1. Open arm rest and using a small flat bladed tool, release the receptacle. 2. Disconnect the electrical connector.

RADIO SPEAKER AMPLIFIER REPLACEMENT

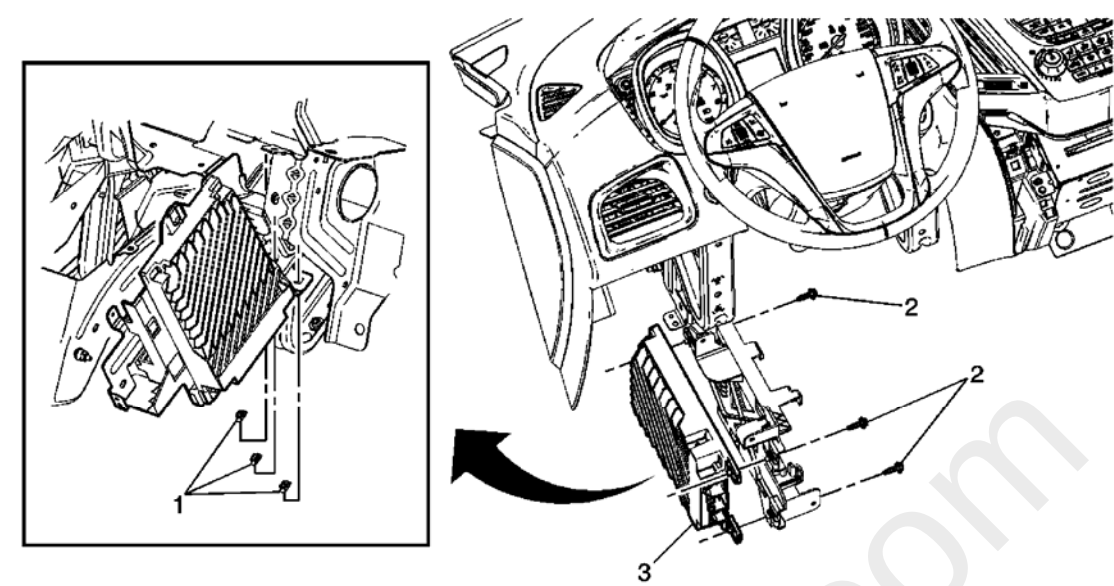


Fig. 22: Radio Speaker Amplifier
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure	
1. Remove the instrument insulator panel. Refer to <u>Instrument Panel Insulator Panel Replacement - Left Side (Equinox)</u> or <u>Instrument Panel Insulator Panel Replacement - Left Side (Terrain)</u>	
2. Remove the driver knee bolster reinforcement. Refer to <u>Driver Knee Bolster Reinforcement Replacement (Equinox)</u> or <u>Driver Knee Bolster Reinforcement Replacement (Terrain)</u>	
1	Amplifier Bracket Push On Nuts (Qty: 3)
2	Radio Speaker Amplifier Bolts (Qty: 3)
	CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2.5 N.m (22 lb in)
3	Radio Speaker Amplifier Procedure: Disconnect the electrical connectors.

MULTIMEDIA PLAYER INTERFACE MODULE REPLACEMENT

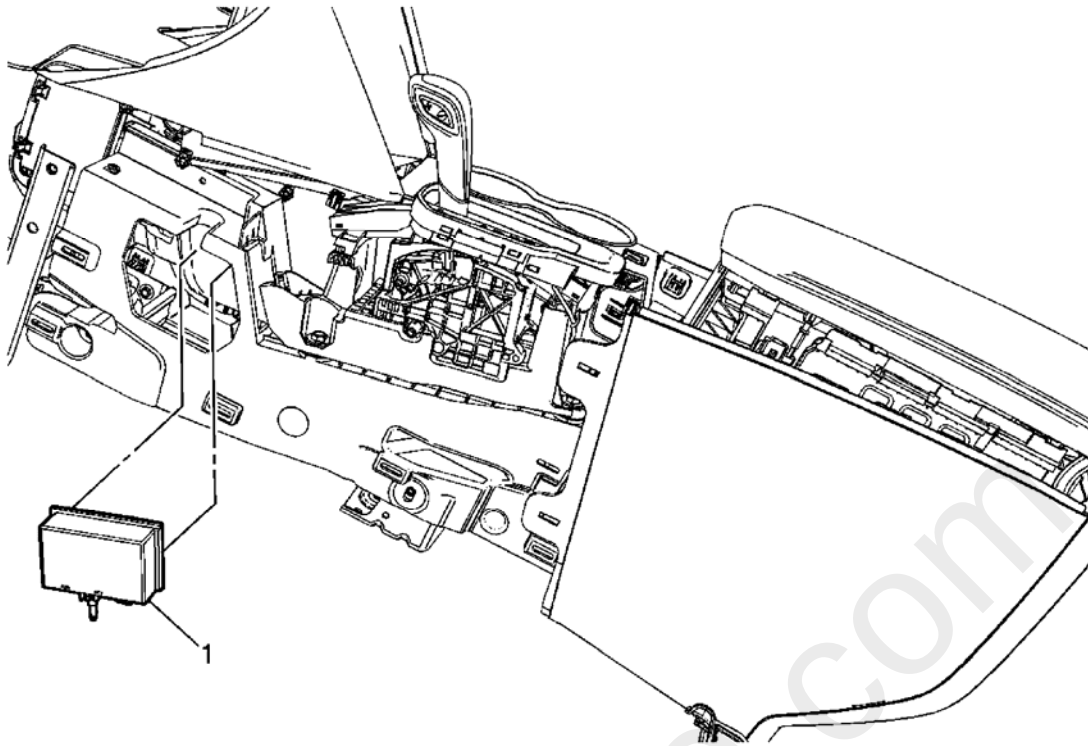


Fig. 23: Multimedia Player Interface Module
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the left front floor lower console side finish cover. Refer to <u>Front Floor Lower Console Side Finish Cover Replacement - Left Side (Equinox)</u> or <u>Front Floor Lower Console Side Finish Cover Replacement - Left Side (Terrain)</u>	
1	Multimedia Player Interface Module Procedure 1. Slide the module upwards after disengaging retaining clips. 2. Disconnect the electrical connectors.

NAVIGATION SIGNAL SPLITTER REPLACEMENT

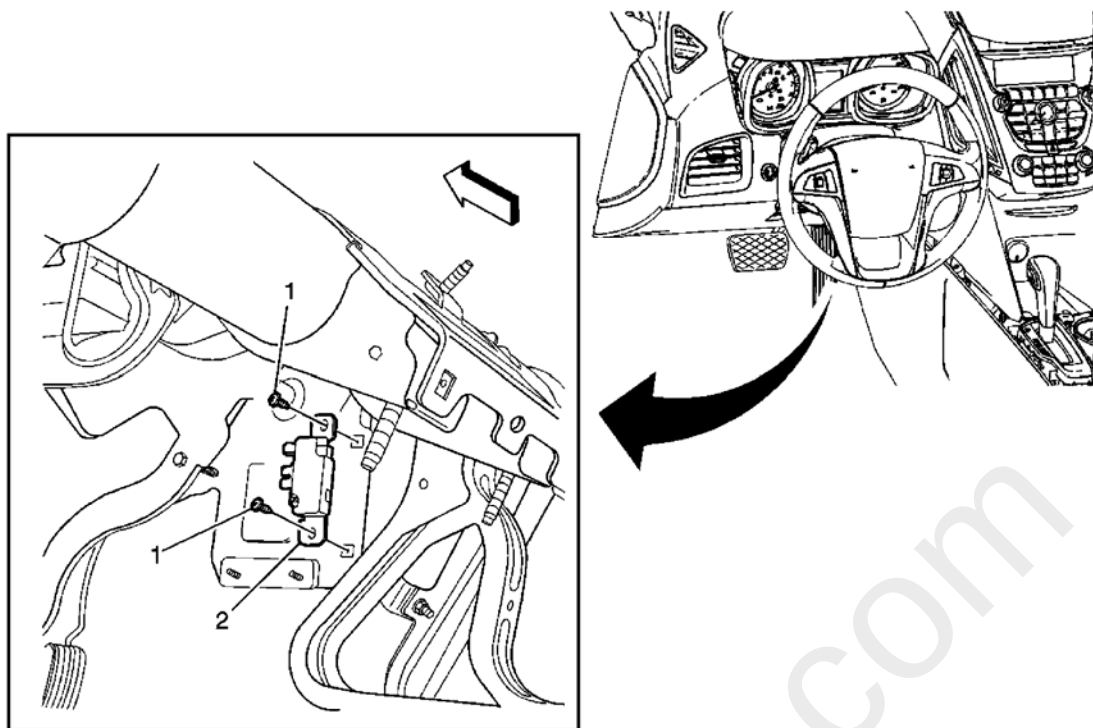


Fig. 24: Navigation Signal Splitter

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the driver side knee bolster reinforcement. Refer to <u>Driver Knee Bolster Reinforcement Replacement (Equinox)</u> or <u>Driver Knee Bolster Reinforcement Replacement (Terrain)</u>	
1	Navigation Signal Splitter Bolt (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 9 N.m (80 lb in)
2	Navigation Signal Splitter Procedure 1. Disconnect the electrical connections. 2. For programming and set up procedures, refer to <u>Control Module References</u>

RADIO ANTENNA BASE REPLACEMENT

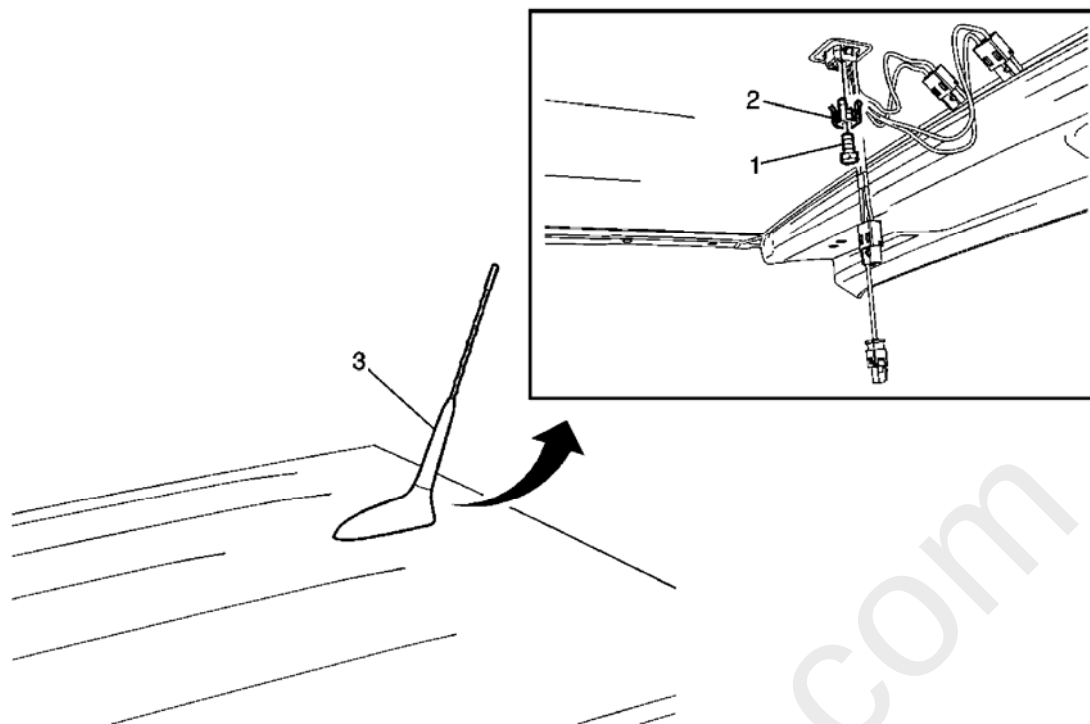


Fig. 25: Radio Antenna Base
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Lower the rear of the headlining trim panel. Refer to <u>Headlining Trim Panel Replacement</u> .	
1	Radio Antenna Base Fastener CAUTION: Refer to <u>Fastener Caution</u> .
2	Radio Antenna Base Retainer Procedure: Use a new retainer.
3	Radio Antenna Base Assembly Procedure: Disconnect the electrical connectors.

RADIO ANTENNA REPLACEMENT

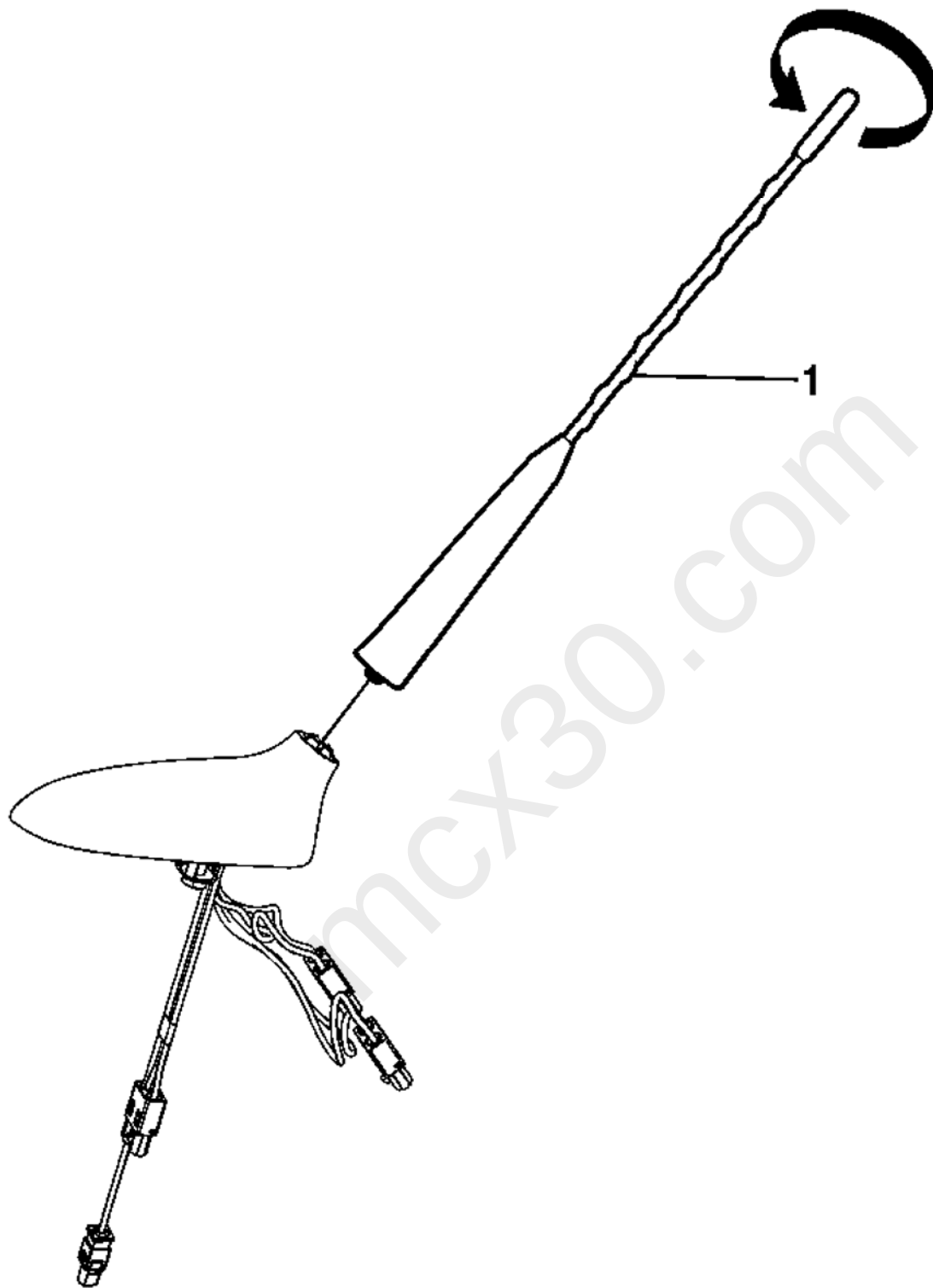


Fig. 26: Radio Antenna

Courtesy of GENERAL MOTORS CORP.

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 (NK5)

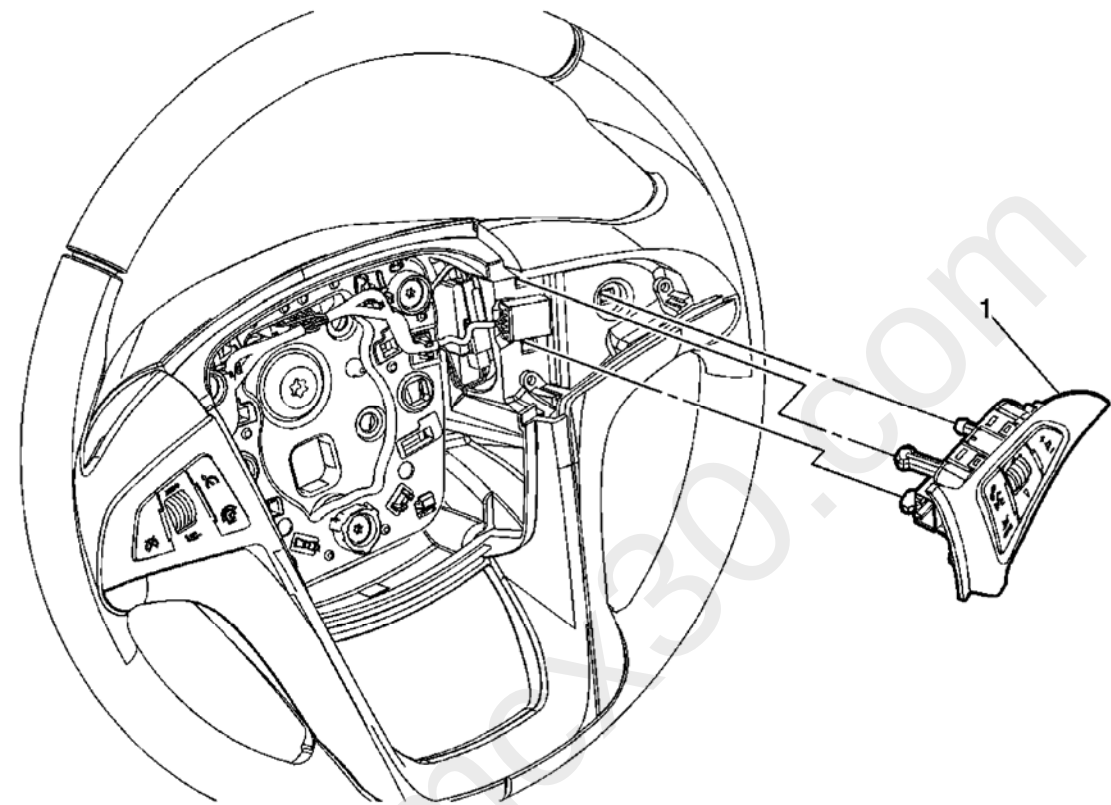


Fig. 27: Radio & Telephone Control Switch (NK5)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the inflatable restraint steering wheel module. Refer to <u>Steering Wheel Inflatable Restraint Module Replacement</u> .	
1	Radio and Telephone Control Switch Assembly Procedure 1. Use flat bladed tool to release the switch from steering wheel. 2. Disconnect the electrical connector.

RADIO AND TELEPHONE CONTROL SWITCH REPLACEMENT (NP5)

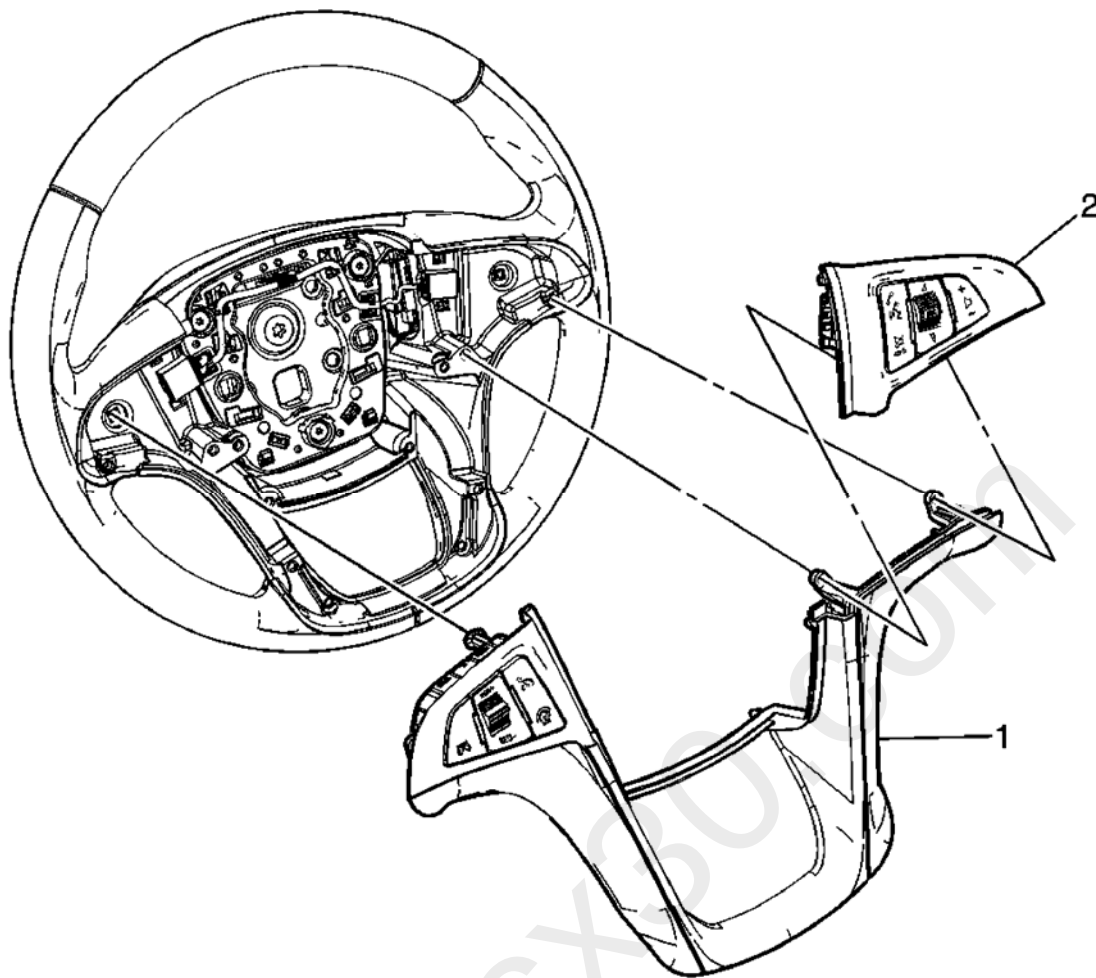


Fig. 28: Radio & Telephone Control Switch (NP5)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the inflatable restraint steering wheel module. Refer to <u>Steering Wheel Inflatable Restraint Module Replacement</u> .	
1	Steering Wheel Spoke Cover
2	Radio and Telephone Control Switch Assembly
	Procedure 1. Use flat bladed tool to release the switch from steering wheel. 2. Disconnect the electrical connector.

DIGITAL VIDEO ANTENNA CABLE REPLACEMENT

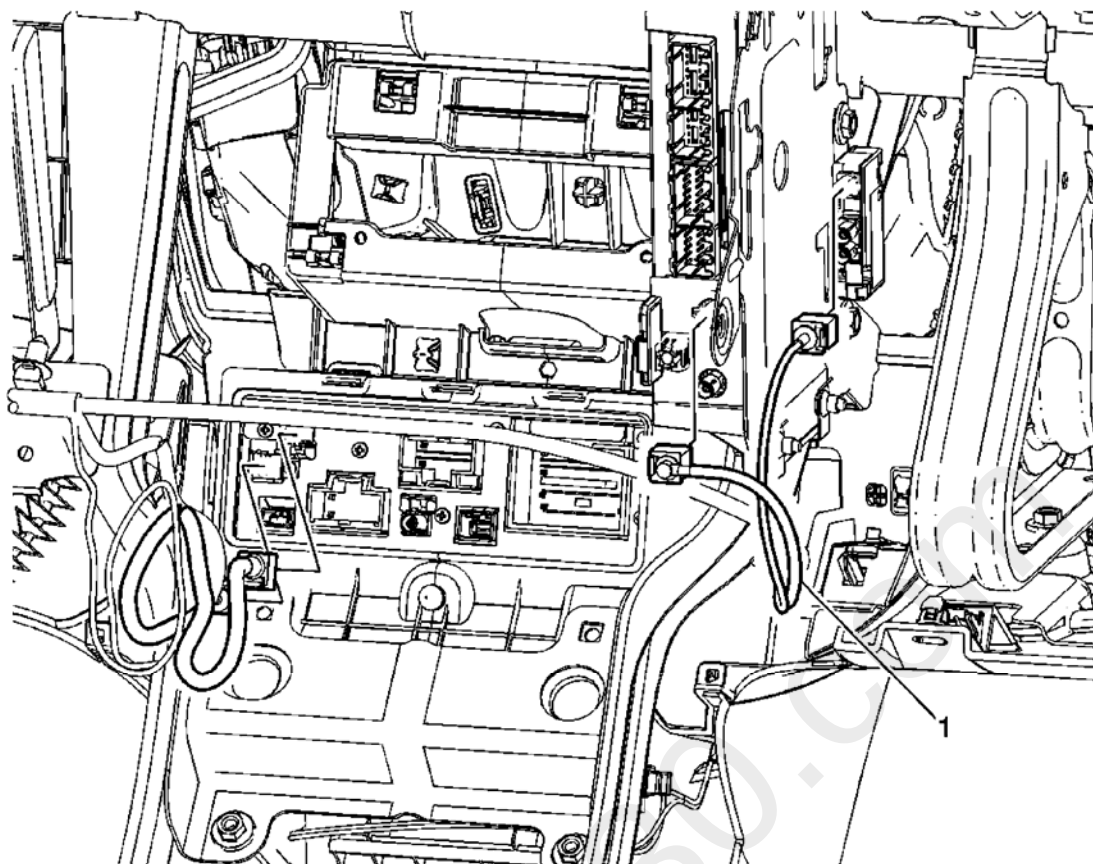


Fig. 29: Digital Video Antenna Cable
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Remove the radio. Refer to <u>Radio Replacement</u>. 2. Remove the driver side knee bolster reinforcement. Refer to <u>Driver Knee Bolster Reinforcement Replacement (Equinox)</u> or <u>Driver Knee Bolster Reinforcement Replacement (Terrain)</u>. 3. Remove the instrument panel compartment door. Refer to <u>Instrument Panel Compartment Door Replacement (Equinox)</u> or <u>Instrument Panel Compartment Door Replacement (Terrain)</u>. 4. Remove the windshield side garnish molding. Refer to <u>Windshield Side Garnish Molding Replacement</u>.	
1	Digital Video Antenna Cable Procedure 1. Disconnect all of the electrical connectors. Cable connects to the radio, communication interface module, and the navigation signal splitter. 2. Note the cable routing prior to removal for installation purposes.

RADIO ANTENNA CABLE EXTENSION CABLE REPLACEMENT

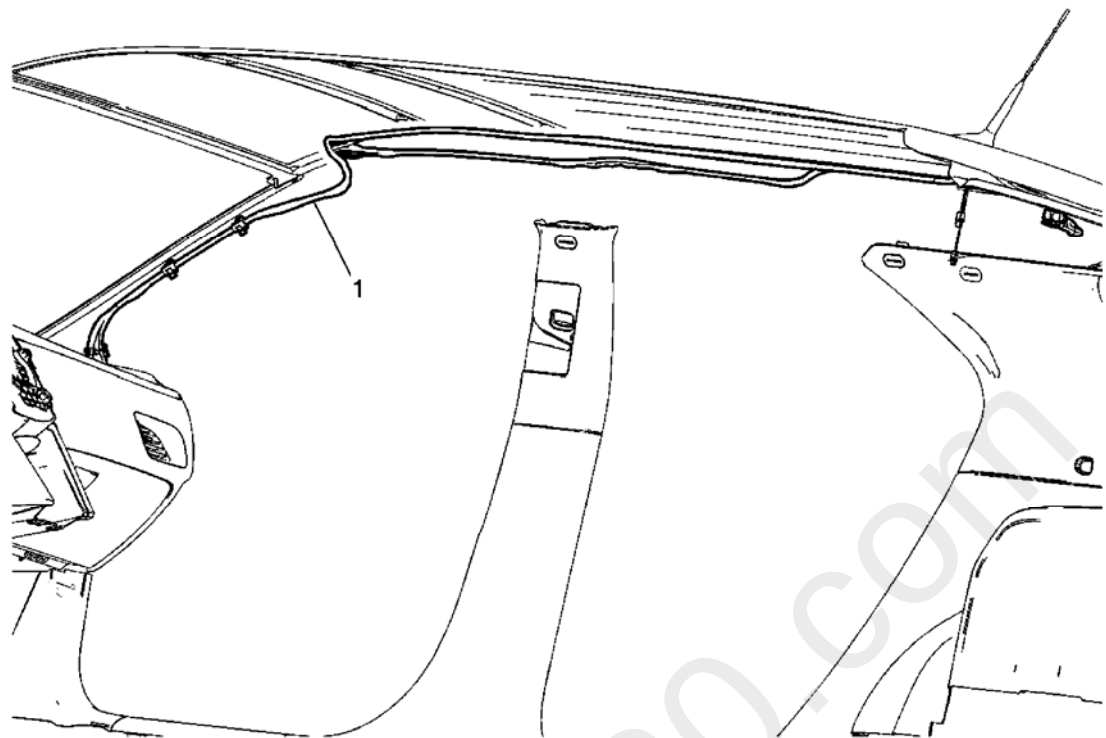


Fig. 30: Radio Antenna Cable Extension Cable
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Lower the headlining trim panel where needed. Refer to <u>Headlining Trim Panel Replacement</u> . 2. Remove the windshield garnish molding. Refer to <u>Windshield Side Garnish Molding Replacement</u> .	
1	Radio Antenna Cable Extension Cable Procedure 1. Disconnect the electrical connectors at each end of the antenna. 2. If the antenna cable is taped into the wiring harness then cut the ends off the old antenna and route the new antenna as close to the old one as possible using tie straps to secure the new cable.

RADIO ANTENNA CABLE EXTENSION CABLE CONNECTOR REPLACEMENT

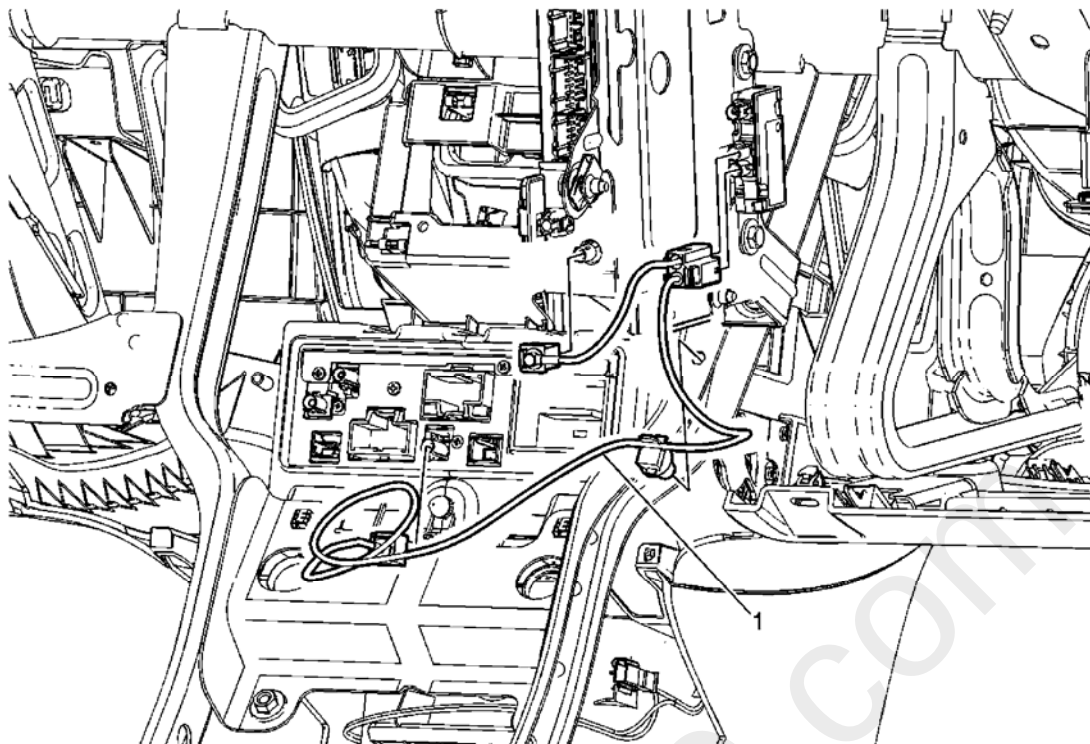


Fig. 31: Radio Antenna Cable Extension Cable Connector
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Remove the radio. Refer to <u>Radio Replacement</u>. 2. Remove the driver side knee bolster reinforcement. Refer to <u>Driver Knee Bolster Reinforcement Replacement (Equinox)</u> or <u>Driver Knee Bolster Reinforcement Replacement (Terrain)</u>.	
1	Radio Antenna Cable Extension Cable Connector Procedure 1. Disconnect all of the electrical connectors. Cable connects to the radio, communication interface module, and the navigation signal splitter. 2. Note the cable routing prior to removal for installation purposes.

RADIO ANTENNA CABLE EXTENSION RADIO END CABLE REPLACEMENT

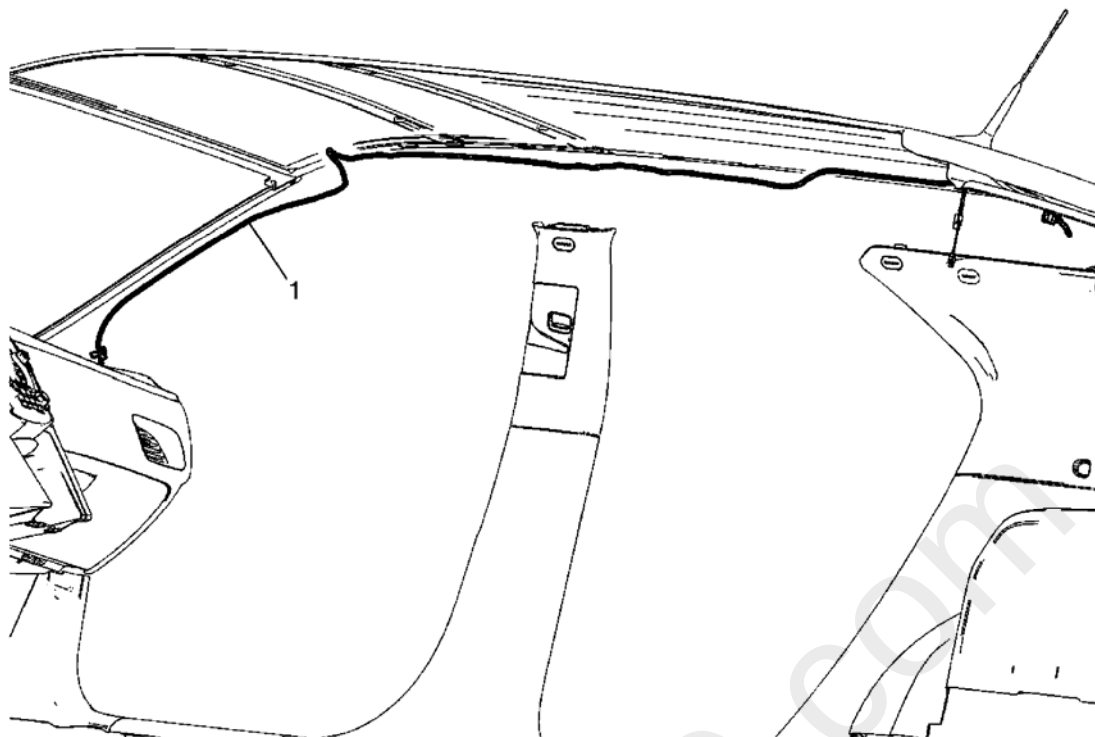


Fig. 32: Radio Antenna Cable Extension Radio End Cable
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Lower the headlining trim panel where needed. Refer to <u>Headlining Trim Panel Replacement</u> . 2. Remove the front side door garnish molding. Refer to <u>Front Side Door Garnish Molding Replacement</u> .	
1	Radio Antenna Cable Extension Radio End Cable Procedure 1. Disconnect the electrical connectors at each end of the antenna. 2. If the antenna cable is taped into the wiring harness then cut the ends off the old antenna and route the new antenna as close to the old one as possible using tie straps to secure the new cable.

RADIO, VIDEO, AUDIO DISC PLAYER, AND NAVIGATION INFORMATION DISPLAY REPLACEMENT

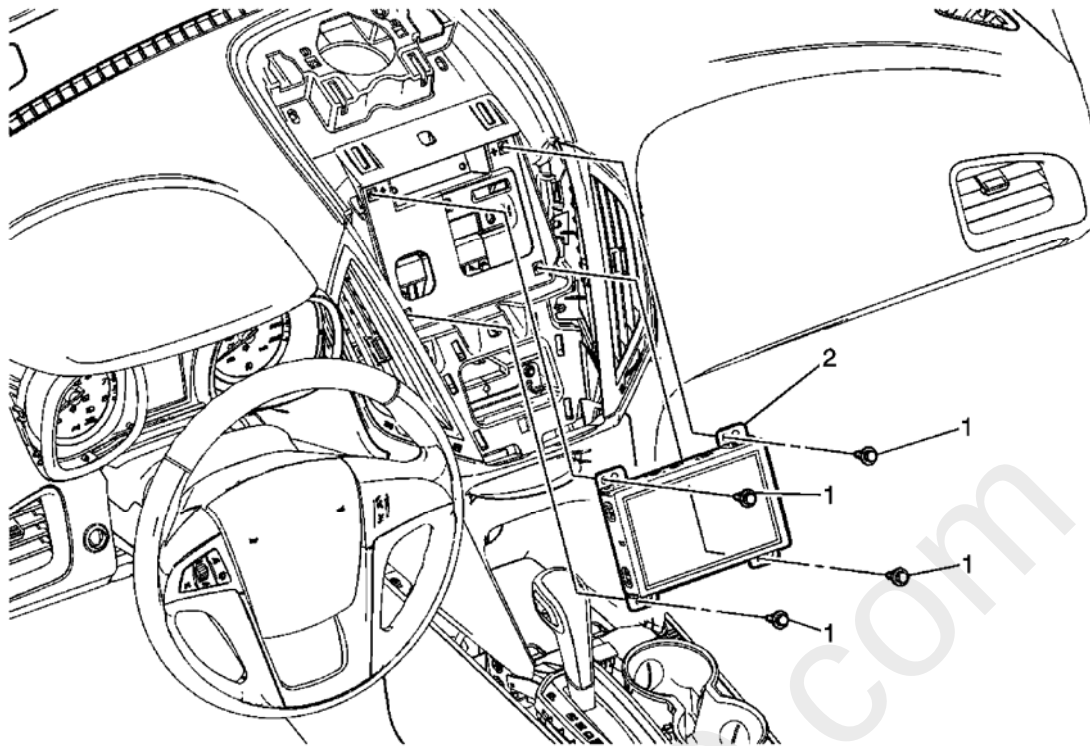


Fig. 33: Radio, Video, Audio Disc Player, & Navigation Information Display
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the radio control assembly. Refer to <u>Radio Control Assembly Replacement</u> .	
1	Radio, Video, Audio Disc Player, and Navigation Display Screws (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2.5 N.m (22 lb in)
2	Radio, Video, Audio Disc Player, and Navigation Display Procedure: Refer to <u>Control Module References</u> for programming and set up information.

VIDEO DISPLAY REPLACEMENT

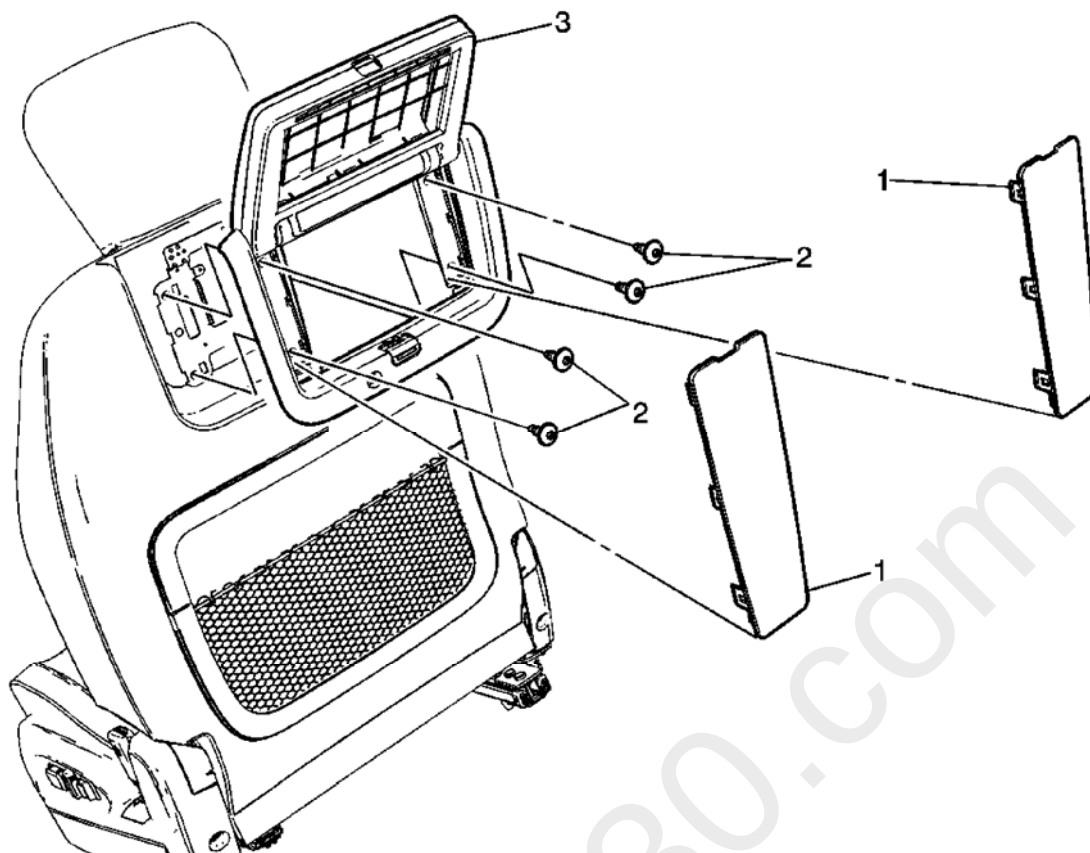


Fig. 34: Video Display
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Video Display Fastener Trim Covers (Qty: 2)
2	Video Display Fastener (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 9.5 N.m (84 lb in)
3	Video Display Assembly Procedure: Disconnect the electrical connections.

AUDIO/VIDEO DISC PLAYER ADAPTER REPLACEMENT

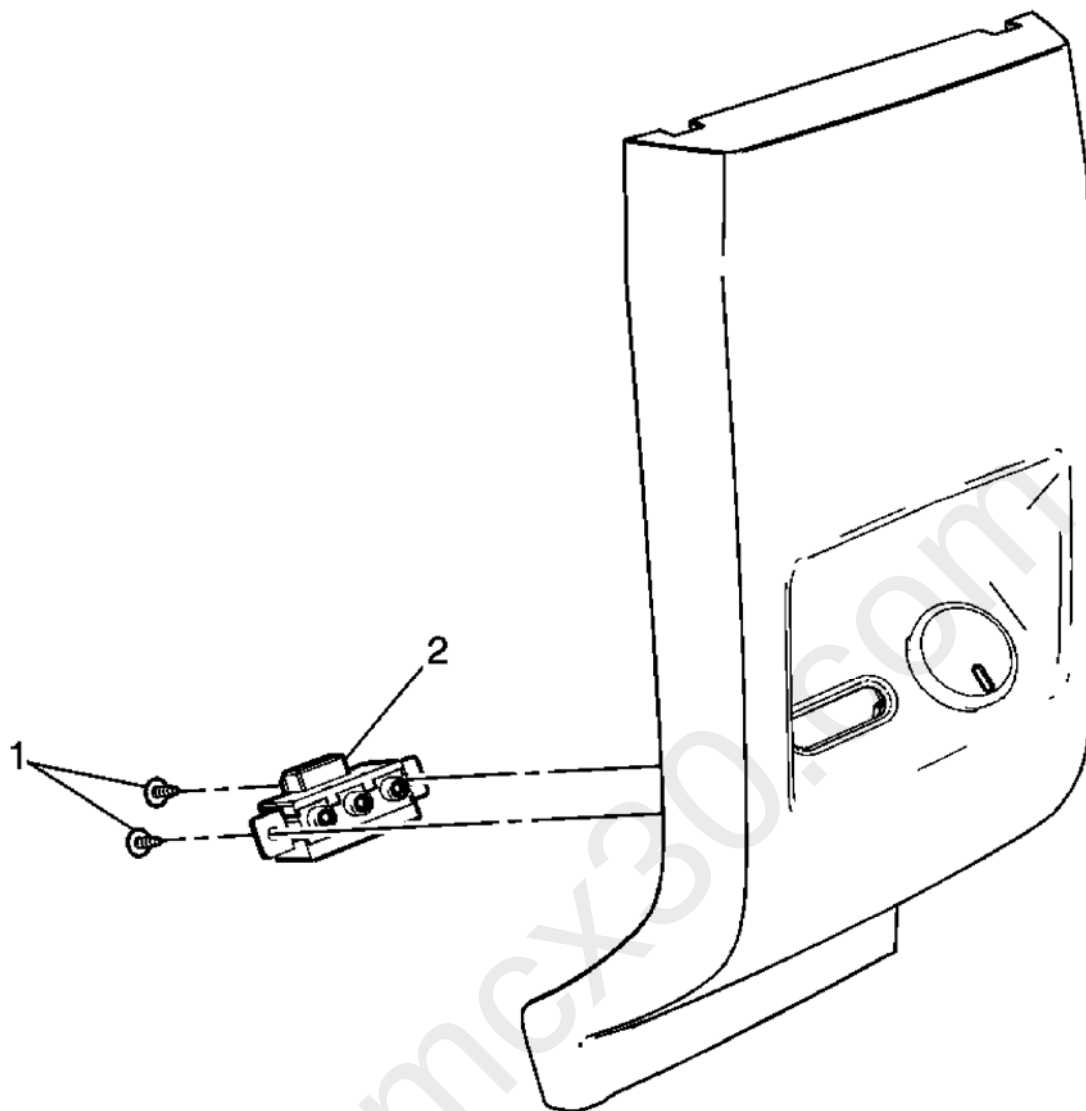


Fig. 35: Audio/Video Disc Player Adapter
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the front floor console rear cover. Refer to <u>Front Floor Console Rear Cover Replacement</u> .	
1	Audio Video Disc Player Adapter Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2.5 N.m (22 lb in)
2	Audio Video Disc Player Adapter

RADIO FRONT CENTER SPEAKER REPLACEMENT

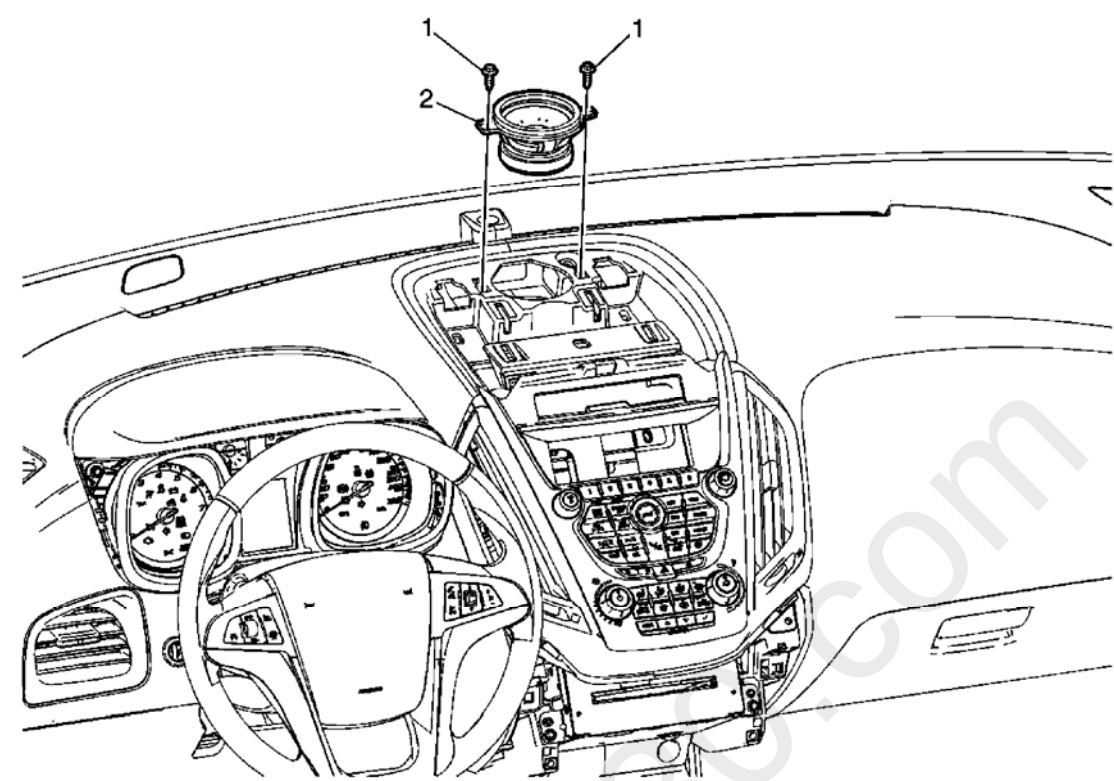


Fig. 36: Radio Front Center Speaker
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the instrument panel center compartment. Refer to <u>Instrument Panel Center Compartment Replacement (Equinox)</u> or <u>Instrument Panel Center Compartment Replacement (Terrain)</u> or the instrument panel upper center trim panel. Refer to <u>Instrument Panel Upper Center Trim Panel Replacement (Equinox)</u> or <u>Instrument Panel Upper Center Trim Panel Replacement (Terrain)</u> .	
1	Radio Front Center Speaker Screw (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 2.5 N.m (22 lb in)
2	Radio Front Center Speaker Assembly Procedure: Disconnect the electrical connector.

RADIO WINDSHIELD SIDE GARNISH MOLDING SPEAKER REPLACEMENT

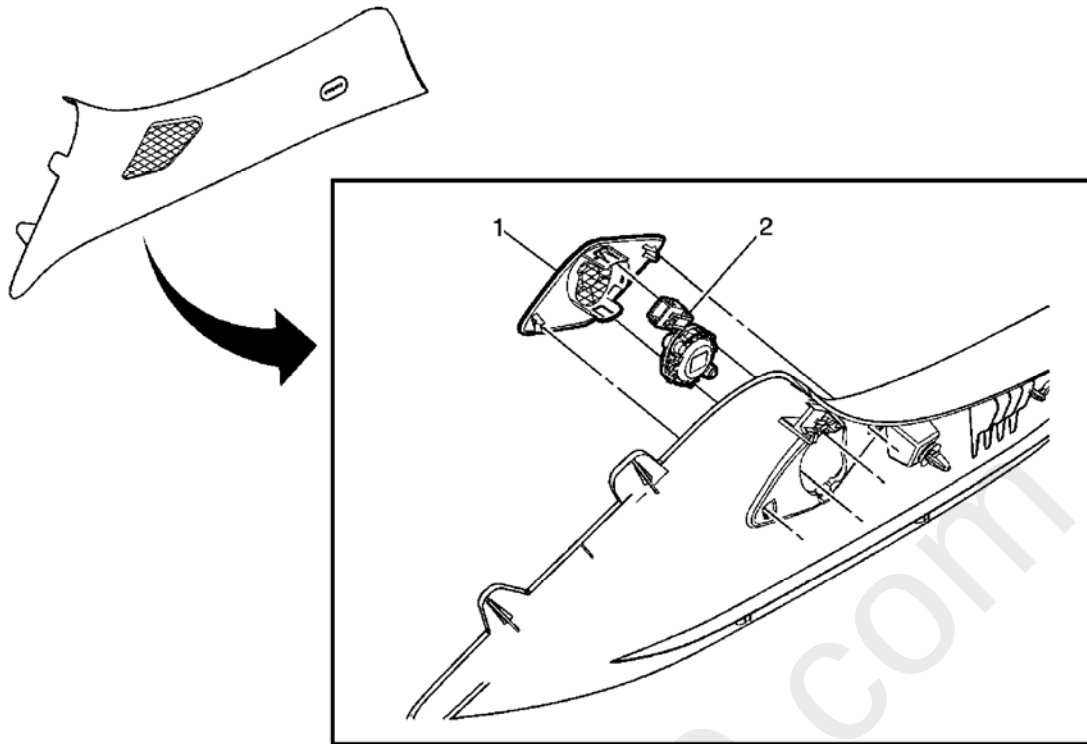


Fig. 37: Radio Windshield Side Garnish Molding Speaker
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the windshield garnish molding. Refer to Windshield Side Garnish Molding Replacement .	
1	Radio Windshield Side Garnish Molding Speaker Grille
2	Radio Windshield Side Garnish Molding Speaker Procedure 1. Disconnect the electrical connector. 2. Unsnap speaker from grille.

RADIO FRONT SIDE DOOR LOWER SPEAKER REPLACEMENT

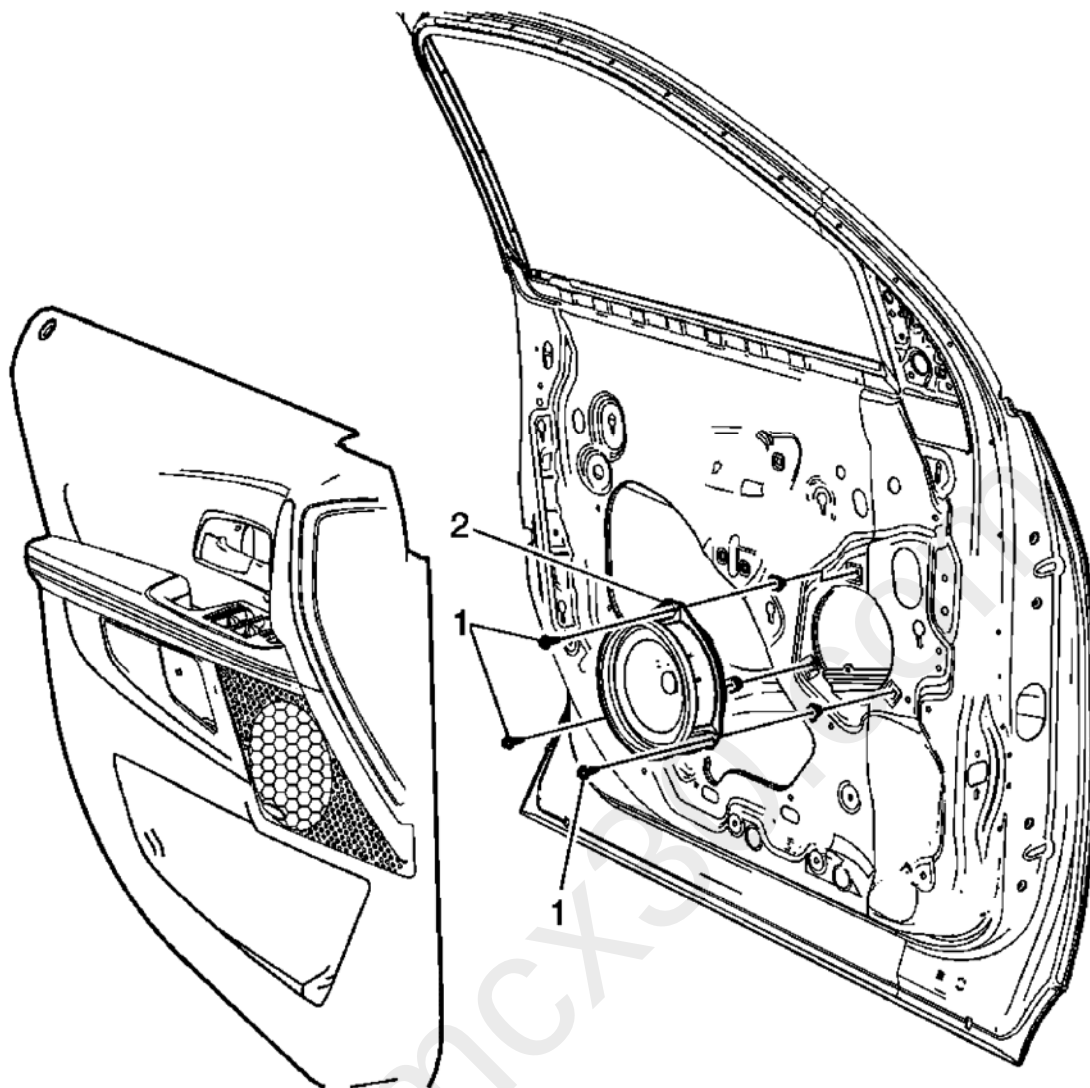


Fig. 38: Radio Front Side Door Lower Speaker
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the front side door trim. Refer to Front Side Door Trim Panel Replacement .	
1	Radio Front Side Door Lower Speaker Screws (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten: 2.5 N.m (22 lb in)
2	Radio Front Side Door Lower Speaker Procedure:

Disconnect the electrical connector.

RADIO REAR SIDE DOOR LOWER SPEAKER REPLACEMENT

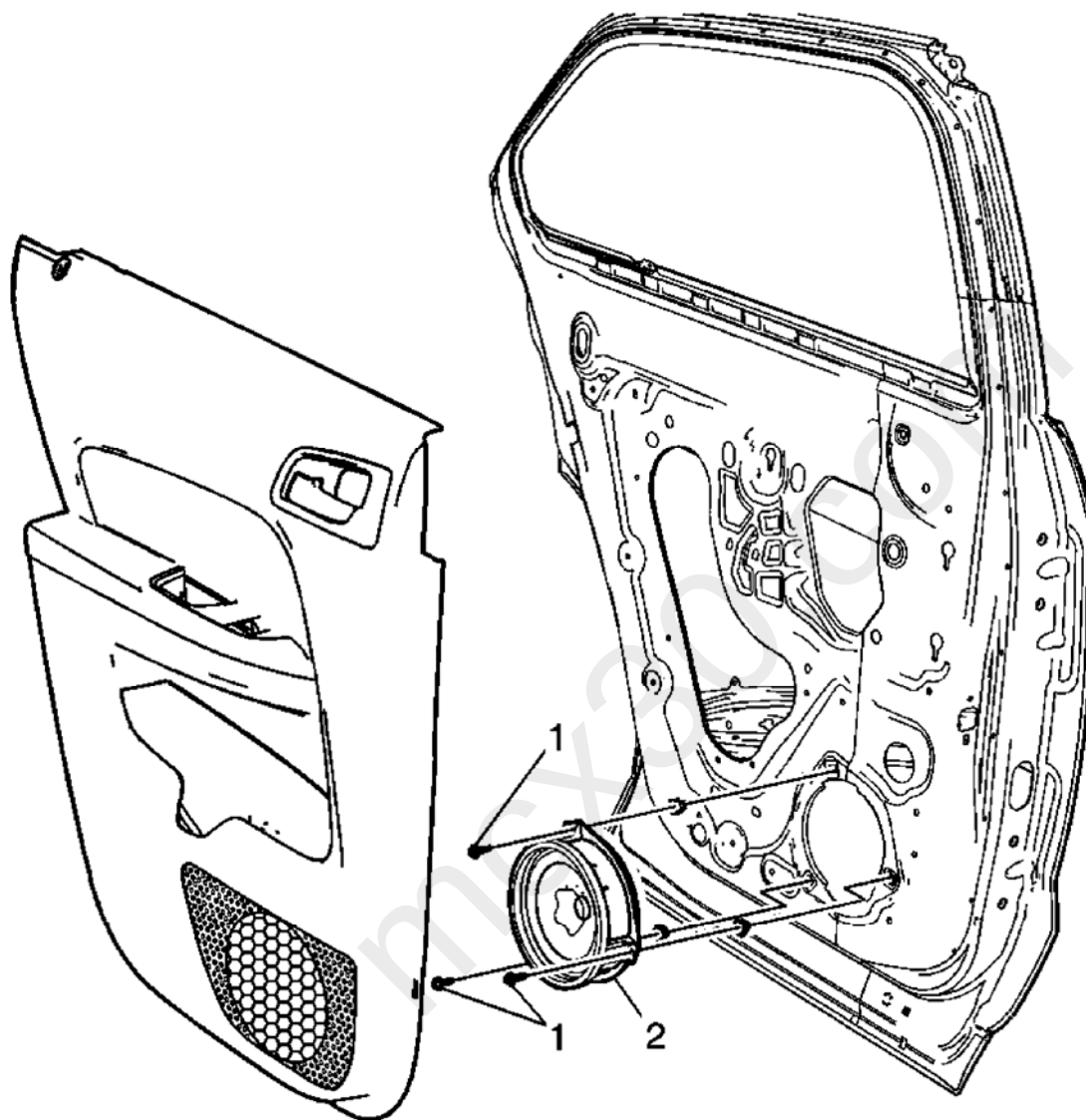


Fig. 39: Radio Rear Side Door Lower Speaker
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the rear side door trim. Refer to <u>Rear Side Door Trim Panel Replacement</u> .	
	Radio Rear Side Door Lower Speaker Screw (Qty: 3)
	CAUTION:

1	Refer to <u>Fastener Caution</u> . Tighten: 2.5 N.m (22 lb in)
2	Radio Rear Side Door Lower Speaker Procedure: Disconnect the electrical connectors.

RADIO REAR COMPARTMENT SPEAKER REPLACEMENT

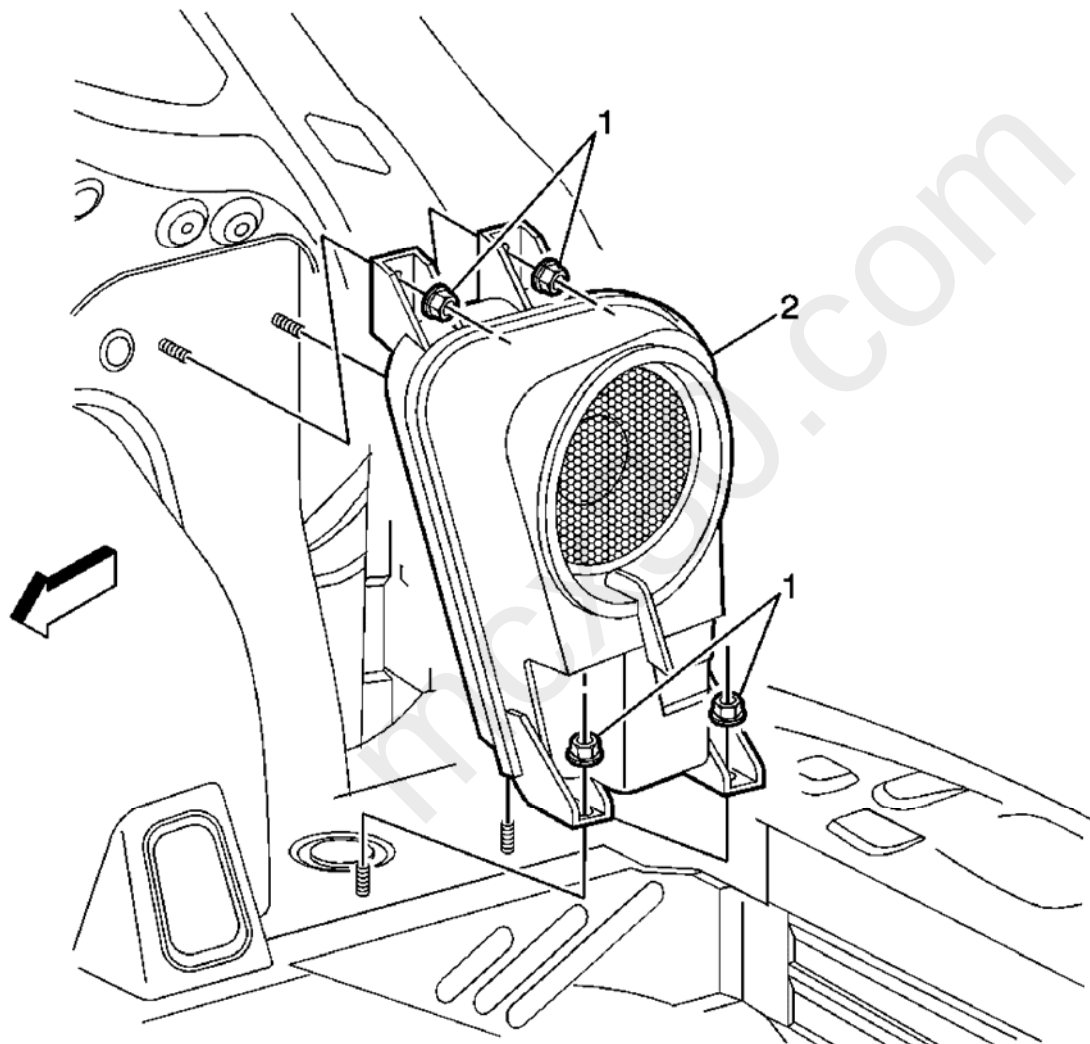


Fig. 40: Radio Rear Compartment Speaker
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the right body side trim panel. Refer to <u>Body Side Trim Panel Replacement - Right Side</u> .	

1	Radio Rear Compartment Speaker Nut (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 10 N.m (89 lb in)
2	Radio Rear Compartment Speaker Procedure: Disconnect the electrical connection.

DESCRIPTION AND OPERATION

NAVIGATION SYSTEM DESCRIPTION AND OPERATION

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

- Audio System Description
- Navigation System Components
- Navigation Radio
- Global Positioning System (GPS) Antenna
- Route Guidance
- Voice Recognition
- Points of Interest
- Traffic Information
- Weather Information

Audio System Description

The Navigation radio operates similar to a traditional radio. For information on the audio description and operation, see **Radio/Audio System Description and Operation**.

Navigation System Components

The navigation system contains the following components:

- Navigation radio
- Info display module
- Radio/HVAC controls
- Global positioning system (GPS) antenna
- Auxiliary audio jacks (If equipped)

Navigation Radio

This component acts as the operator interface for the navigation system, provides the data input from the operator to the navigation system and provides navigation information to the operator via the display screen. The navigation radio is located in the center of the instrument panel. The navigation radio provides the following:

- The hard disk drive provides map data for navigation and map route guidance.
- The navigation system map with routing information displayed on the info display module screen.
- Provides verbal guidance to the operator.
- Connection to the global positioning system (GPS) antenna, which provides the vehicle position information.

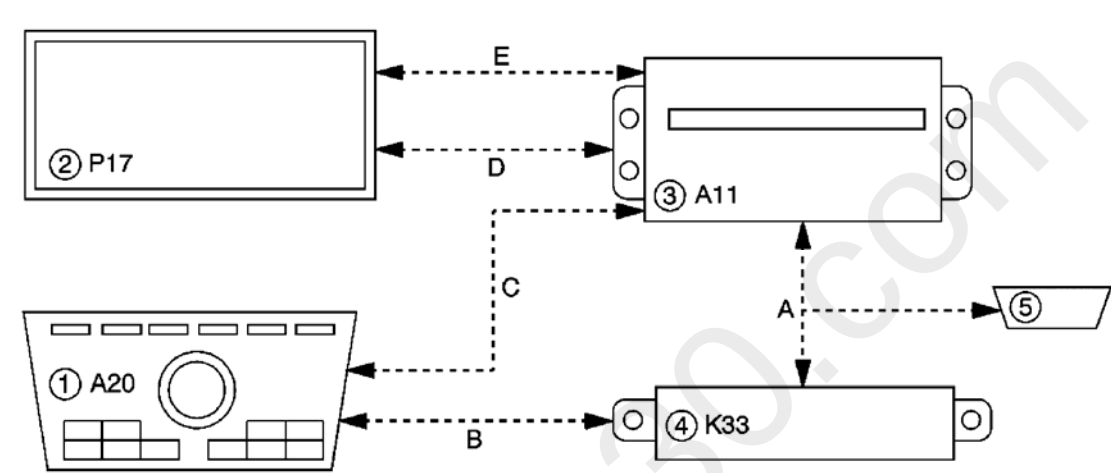


Fig. 41: Navigation Radio Communications Diagram
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Radio/HVAC Controls
2	Info Display Module
3	Radio
4	HVAC Control Module
5	Data Link Connector
a	GMLAN
b	Local Interconnect Network
c	CAN Graphical Interface
d	Digital Video
e	Touch Screen Serial Data

Info Display Module

The info display module has continuous power and ground. When the navigation radio is on, a discrete 12 V signal is supplied on the remote enable circuit to the color display module. This signal is used to control the

power state of the module, which is active when the signal is high and inactive when the signal is low.

The info display module receives digital video data from the radio for on-screen display information through the navigation video signal circuits. With touch-screen capable displays, the radio communicates with the info display module over the serial data circuits for touch screen inputs.

Backlighting dimming level is also communicated to the info display through the touch screen serial data circuits. For non-touch screen displays, a pulse width modulated dimming circuit from the radio controls the display backlighting.

Radio/HVAC Controls

When equipped with the navigation radio, the radio/HVAC controls communicate radio control inputs directly to the navigation radio with the CAN Graphical Interface (CGI) data circuits. When the operator rotates a radio control knob to change radio stations or increase the volume a message is sent to the radio over CGI serial data. After receiving the message the radio will make the adjustment. Messages communicated between the radio and the radio/HVAC controls include the following:

- Button presses/knob rotations
- Commands for the state of indicators
- Radio control back-lighting

HVAC data for controls and status indicators is communicated between the radio/HVAC controls and the HVAC control module with a separate LIN serial data circuit. HVAC status screen information from the HVAC control module is transmitted to the radio on the GMLAN serial data circuit. The radio then displays the desired screen information on the info display using the video data circuits.

Global Positioning System (GPS) Antenna

The global positioning system (GPS) antenna is located in the upper center of the I/P. The GPS antenna is powered through the same coaxial cable used to send the signals to the NAV radio. Interference to the system may occur if any of the following exist:

- Signals are obstructed by objects such as, tall buildings or trees.
- Metallic objects located on the dashboard.
- Aftermarket glass tinting has been applied to the vehicles windshield.

Route Guidance

The map will display the route to the selected destination. Voice prompts alert the operator of upcoming events (turns) and arrivals at the destination. The navigation system will automatically recalculate if the route is not followed. The navigation radio uses data received from the global positioning system (GPS) satellites as well as the vehicle speed signal to accurately display the current position of the vehicle. The map DVD must be in the NAV radio for route guidance.

Voice Recognition

The Navigation System's voice recognition allows for hands-free operation of navigation and audio system features. The voice recognition can be used when the ignition is in accessory or ON, or when retained accessory power is active. This feature only works if the map DVD is inserted and the AGREE button has been pressed. For a complete list of available commands, refer to the Owners Manual Navigation Supplement and/or Personalization in the Owners manual.

Points of Interest

Points of interests are locations that are frequently visited. Points of interest can be displayed on the map or set as a destination. The following are some of the available Points of interests:

- Gas Station
- Restaurant
- College
- Police Station

Traffic Information

XM NavTraffic™ is a subscription based service that enhances the navigation system with live traffic information. The service provides information on traffic conditions such as traffic speed, accidents, disabled vehicles, construction and road closings.

The integrated XM satellite radio receives the information. When Traffic Information is turned ON in the configuration menu, the available information will be displayed on the map screen.

The traffic information can vary based upon coverage in the area, and coverage is not available in all areas. No information will be displayed if coverage is not available, if there is no traffic information for the area, or if there is no subscription to receive the information.

A subscription fee is required in order to receive the XM NavTraffic™ service. No traffic data will be displayed without a current subscription.

Weather Information

XM NavWeather™ is a subscription based service that transmits weather information to the integrated XM satellite radio. Real time information such as current and future weather and road conditions, atmospheric conditions, and National Weather Service warnings is provided, as well as 3 day forecasts for some cities. Received information is available to be displayed on the Weather Info screen.

A subscription fee is required in order to receive the XM NavWeather™ service. No weather data will be displayed without a current subscription.

ONSTAR DESCRIPTION AND OPERATION

This OnStar® system consists of the following components:

- Telematics Communication Interface Module

- OnStar® 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 Module

The telematics communication interface 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 module through serial data messaging.

Dedicated circuits are used to connect the telematics communication interface module to a microphone, the button assembly, and to command the status LED. The telematics communication interface 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, slowing down stolen vehicle gradually, 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® Button Assembly

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

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

The telematics communication interface 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 module on the keypad signal circuit. Depending upon the voltage range returned the telematics communication interface module is able to identify

which button has been pressed.

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

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

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

Secondary OnStar® Controls

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

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

OnStar® Microphone

The OnStar®, or cellular phone 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 module supplies approximately 10 V to the microphone on the cellular phone microphone signal circuit, and voice data from the user is sent back to the telematics communication interface module over the same circuit. A cellular phone 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:

- Separate, standalone cellular and navigation 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 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 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.

Cellular and Navigation Signal Antenna Splitter

The navigation signal splitter is a component for dividing the navigation signal antenna signal into two paths without any transmission loss. It has two RF-connectors, one signal fakra connector and one double fakra connector. Port 1 is the input for connecting to the navigation signal antenna, port 2 is the output for the car OnStar navigation system, port 3 is the output for the navigation radio. Port 1 and 2 are galvanically coupled internally using a matching network. The OnStar system supplies the navigation signal antenna with power via port 2. Connectivity is made between port 1 and 3 through an internal coupling element and low noise amplifier. The navigation radio provides the amplifier with power via port 3.

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 Bluetooth ® system, a Bluetooth ® equipped cellular phone is required.

The Bluetooth ® antenna is a small fixed antenna connected directly to the telematics communication interface 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 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)

NOTE: Do not disconnect the main vehicle battery or remove the telematics communication interface control module fuse with the ignition key in any position other than OFF. Disconnecting power to the telematics communication interface control 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 module so an emergency notification call can be made after a vehicle collision where the main battery is disabled. Once the Back-Up Battery is activated it will stay on until it has completely discharged. The back-up battery is not rechargeable and once activated 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 module in the event of a vehicle collision 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 16V and 9V throughout this period. This allows the battery to power the basic functions of the telematics communication interface module for least one 200 second (5 minute) call at the end of the 4 year span, should a main vehicle battery loss collision occur.

The back-up battery is connected to the telematics communication interface 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 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 module.

Audio System Interface

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

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

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

OnStar® Sleep Cycle

The OnStar® system uses a unique sleep cycle to allow the system to receive cellular calls while the ignition is in the OFF position and retained accessory power mode has ended. This cycle enables the telematics communication interface 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 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 48 hours. After 48 hours, the OnStar® module will go into sleep mode until a wake up signal from the vehicle is seen by the telematics communication interface 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 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.

Customers have the capability to lock their OnStar® personal calling system by pressing the answer/end call button, speaking "security" and entering a 4-digit code. Once this process is complete, the user must enter the code before OnStar® personal calling is available. In the event the customer cannot remember their code and is unable to use their system, they can press the blue OnStar® button and speak to an advisor to unlock the system by means of a discrete cellular call to the vehicle.

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. On some vehicles, the Turn by Turn Navigation instructions may be displayed to the driver in the radio display or the driver information center.

OnStar® Stolen Vehicle Slowdown (If equipped)

OnStar® Stolen Vehicle Slowdown allows advisors working with law enforcement services to send a signal to limit fuel flow to the engine, gradually slowing down the stolen vehicle.

Stolen Vehicle Slowdown is an enhancement to OnStar's Stolen vehicle Location Assistance, which uses Global Positioning Technology to pinpoint the location of a vehicle reported stolen. Stolen Vehicle Slowdown is powered by OnStar's new generation of hardware (Generation 8).

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 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 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 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 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. • 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, it will tell you "Slower, please." Try pausing for a half second before speaking. • In the Virtual Advisor, the system is always listening for commands, even while it is speaking.
How to Speak	Speak forcefully, and clearly. • The noisier the environment, the louder you need to speak. If you are in the driver seat, speak facing the front of the car. If you are a passenger, speak facing the rearview mirror. • Speak calmly, and naturally. The system may sometimes fail your repeated attempts to give a command. If your speech is distorted by shouting or frustration, this may cause more errors. • People with high-pitched voices may have better results by speaking in a deeper, lower-pitched voice. However, do not lower the volume of the voice. • Avoid speaking with a rising intonation, like asking a question. Use a flat or falling intonation, like giving an answer.
What to Say	Personal Calling: One-word commands • The Personal Calling system listens for only one word at a time. There are

	some exceptions, 2-word phrases that are spoken and understood as a single word, e.g. "virtual advisor", "voice feedback", and "my number". You can enter phone numbers only one digit at a time, and the system repeats each digit as it hears it. • Say "Help" at the Ready prompt to hear the list of Personal Calling commands. • Virtual Advisor can understand sentences with more than one word. It also expects to hear a 4-digit number all at once when it asks for your PIN. • Say, "What are my choices?" to hear a list of commands that the Virtual Advisor understands.
Entering a phone number	• If you have trouble getting numbers correctly into the system, store your frequently-called number in the directory, so the system will remember them. After you have stored a number with a nametag, then you simply say "call" and the nametag in order to call the number. • If the system cannot understand your numbers, ask another person to help you enter your frequently-called numbers. This person can speak the numbers, then you can speak the nametag.
Storing or dialing a number	When you have finished speaking your phone number, you do not need to say "store" or "dial" to indicate that you are done. If you pause and say nothing, the system will ask you if you want to store or dial. Say "yes".
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** .

The entertainment system on this vehicle is configured with either a base or an uplevel system. The base and uplevel systems each contain a radio, antenna, speakers, and on some systems an audio amplifier. The uplevel system differs from the base system by providing the customer with enhanced audio system features. Some of

those features may include the radio data system (RDS), an audio amplifier, programmable equalizer, and digital satellite radio (U2K).

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

- Radio Circuit Operation
- Radio/HVAC Communications
- Radio/HVAC Controls
- Antenna System
- AM/FM Reception
- Digital Radio Receiver (If equipped)
- Speaker Operation
- Audio Amplifier (If equipped)
- Radio Data System (RDS) (If equipped)
- Theft Deterrent
- OnStar ®
- Steering Wheel Controls (If equipped)
- Auxiliary Audio Input Jack (If equipped)
- USB Port (If equipped)
- Multimedia Player Interface Module (If equipped)
- Noise Compensation (If equipped)
- Speed Controlled Volume (SCV) (If equipped)
- Active Noise Cancellation (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.

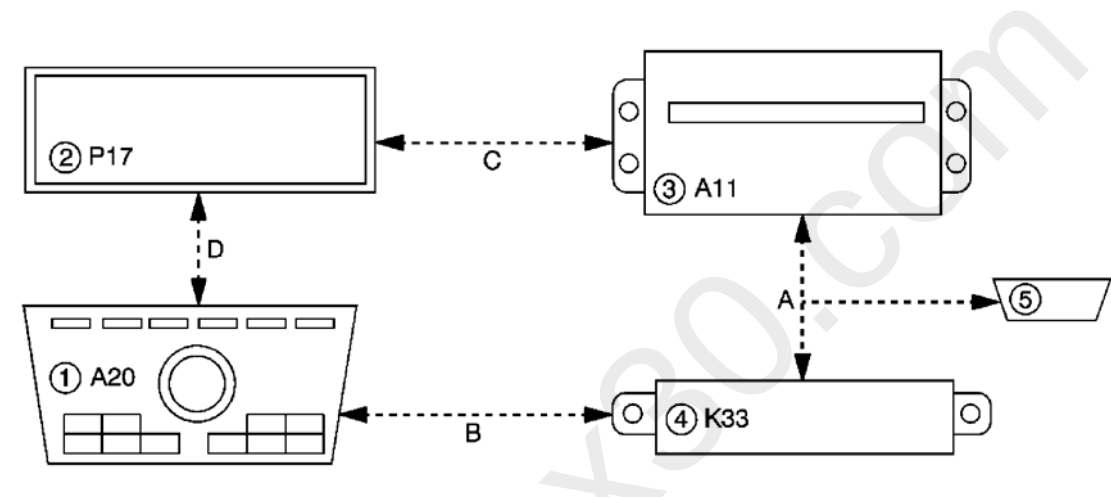


Fig. 42: Radio/HVAC Communications Diagram
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Radio/HVAC Controls
2	Info Display Module
3	Radio
4	HVAC Control Module
5	Data Link Connector
a	GMLAN
b	Local Interconnect Network-HVAC
c	CAN Graphical Interface
d	Local Interconnect Network-Radio

Radio/HVAC Controls

The radio/HVAC controls is a separate component from the radio. The radio/HVAC controls contain the radio control knobs and buttons for all audio functions.

The radio/HVAC controls operate radio functions through serial data messages. The radio/HVAC controls communicate to the info display module through LIN serial data. The info display module communicates to radio through CGI serial data.

When equipped with the optional navigation radio, the radio/HVAC controls communicate directly to the navigation radio, and the display communicates information through the signal circuits to the navigation radio.

When the operator rotates a radio control knob to change radio stations or increase the volume a message is sent to the radio over serial data. After receiving the message the radio will make the adjustment. Messages communicated between the radio and the radio/HVAC controls and info display include the following:

- Button presses/knob rotations
- Info display module dimming
- Radio/HVAC controls back-lighting
- Graphics and text information

HVAC data for controls and status indicators is communicated between the radio/HVAC controls and the HVAC control module with a separate LIN serial data circuit. HVAC status screen information from the HVAC control module is transmitted to the radio on the GMLAN serial data circuit. The radio then displays the desired screen information on the info display using the video data circuits.

Antenna System

Multi-Band Antenna

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

Active Antenna

The active antenna system uses two integral antennas applied as appliques to the rear glass. Each antenna is part of the rear window and looks similar to the defogger grid. One antenna receives AM signals while the other antenna receives FM signals. Any damage to the antenna requires replacing the glass.

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

AM/FM Reception

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.
- 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

AM Reception

The AM band has a lower frequency range than the FM band. These longer wavelengths:

- Bend around Obstacles
- Follow the curvature of the earth
- May reflect off the ionosphere (skip)

The AM frequencies have longer range due to the ground wave. The ground wave follows the curvature of the earth and is effected by its conductivity. Greater conductivity equates to less signal loss thus transmission over water is better than over land. The AM band has a range of 80-320 km (50-200 miles).

FM Reception

The shorter wavelengths of the higher frequency FM band:

- Reflect off obstacles
- Are absorbed by the ground
- Penetrate the ionosphere

Broadcasts in the FM band are limited to line of sight reception which is typically 40 km (25 miles). Even when out of a direct line of sight, the signal may be reflected into areas that would be in a shadow otherwise. Factors which affect the line of sight include:

- Height of the broadcast antenna
- Height of the receiving antenna
- Terrain and buildings in the broadcast path

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.

Audio Amplifier (If equipped)

Amplifier Interface

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

Amplifier Operation

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

Radio Data System (RDS) (If equipped)

The radio may be equipped with the 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:

- Seek to stations broadcasting the selected type of programming
- Receive announcements concerning local and national emergencies
- Display messages from radio stations
- 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.

RDS may display text information such as:

- The name of the station.
- The type of program.
- General information such as artist and song title, call in phone numbers, etc.

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**.

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**.

Auxiliary Audio Input Jack (If equipped)

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

- When a device is first connected to the 3.5mm (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 center console. The USB connector may interface directly with the radio, or be connected to the infotainment system via a Multimedia Player Interface Module. 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.

Multimedia Player Interface Module (MPIM) (If Equipped)

The vehicle may be equipped with a Multimedia Player Interface Module. This module can receive signals via the USB connector, the auxiliary audio input jack, or a Bluetooth® connection. This module receives the incoming signals, then sends the signals as analog audio inputs to the radio.

To allow the radio controls to be used to control portable media devices (USB, Bluetooth, iPOD®, ZUNE®, etc); the MPIM translates the USB signals to GMLAN signals to allow the bi-directional communication between the radio and the device. Depending on the 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.

Noise Compensation (If equipped)

A microphone mounted in the vehicle passenger compartment monitors background noise (such as wind noise from a window being opened) and digitally modifies the system's volume and equalization to ensure optimal sound and performance.

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.

Active Noise Cancellation (If equipped)

The Active Noise Cancellation (ANC) system is a method used to reduce the perception of certain undesirable sounds generated by the engine into the vehicle cabin. The system uses microphone and engine speed signals, software integrated into the amplifier, and the vehicle speakers to determine and generate the correct frequencies needed to achieve the desired reduction.

For additional information on ANC, refer to **Active Noise Cancellation Description and Operation**

VIDEO ENTERTAINMENT SYSTEM DESCRIPTION AND OPERATION (NON-HEADREST DVD SYSTEMS)

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

- Rear Seat Entertainment Circuit Operation
- Rear Entertainment System Components
- DVD Player
- Playing a Disc
- DVD Messages
- Parental Control
- Video Screen
- Remote Control
- Wireless Headphones
- Stereo RCA Jacks
- Rear Seat Audio (RSA)
- Audio Outputs
- Wired Headphone Jacks

Rear Seat Entertainment Circuit Operation

RSE Power

The rear seat entertainment (RSE) uses a switched battery voltage feed circuit for power moding. The radio outputs power to this circuit via the entertainment remote enable signal circuit.

RSE Grounds

The vehicle harness provides a ground for the RSE circuits.

RSE Data Link Communication

The RSE does not communicate with serial data.

RSE Outputs

At minimum volume, the plus (+) and minus (-) audio signals are approximately half battery voltage, measured to vehicle ground. These audio signals are sent from the radio to the Infrared Module, most systems have a common minus (-) signal.

Rear Seat Entertainment Components

The RSE system includes:

- A Digital Versatile Disc (DVD) player
- A video display screen
- Two sets of wireless infrared headphones
- A remote control
- Stereo audio and video inputs in the overhead console for playing an auxiliary device

DVD Player

The DVD player is interated into the radio, and will display on the rear screen. The DVD player can be controlled by both the buttons on the DVD player and by the buttons on the remote control. The DVD player power may be turned on when the ignition is in the run, accessory, or retained accessory power (RAP) power modes. DVDs are manufactured with different region codes based on the country in which they are sold. Therefore, the RSE system DVD player is only compatible with the region code where the vehicle is sold. The DVD region code is printed on the jacket of most DVDs. Home recorded CDs, CD-R or CD-RW formats, may not play in the DVD player.

Playing a Disc

To play a disc, gently insert the disc with the label side up, into the loading slot. The DVD player will continue to load the disc and the player will automatically start if the vehicle ignition is in an enabled power mode. If a disc is already in the player, press the play/pause button on the face of the DVD player or on the remote control. Some DVDs will not allow the user to fast forward or skip the copyright or previews. Some DVDs will automatically begin to play after the previews have finished. If the DVD does not begin to play the main title, refer to the on-screen instructions, and press play on the DVD player buttons or on the remote control.

DVD Messages

The following errors may be displayed on the video screen monitor.

Disc Format Error

This message will be displayed if a disc is inserted upside down, the disc is not able to be read, or if the disc format is not compatible with the DVD player.

Load / Eject Error

This message will be displayed if the disc is not able to properly load or eject.

Disc Play Error

This message will be displayed if the DVD player cannot play the disc. Severely damaged discs will cause this error.

Region Code Error

This message will be displayed if the region code of the DVD media is not compatible with the DVD player.

No Disc

This message will be displayed if the play button is pressed and there is no disc in the DVD player.

Parental Control

The RSE system may have a Parental Control feature, depending on which radio the vehicle has. To start Parental Control, press and hold the radio power button for more than two seconds to stop all system features such as: radio, video screen, RSA, DVD and/or CD. While Parental Control is on, a padlock icon displays. The radio can be turned back on with a single press of the power button, but the RSE system will remain under Parental Control. To turn Parental Control off, press and hold the radio power button for more than two seconds. The RSE returns from where it was previously left and the padlock icon disappears from the radio display. Parental Control can also be turned off by inserting or ejecting any disc, pressing the play icon on the radio DVD display menu, or changing an ignition position.

Video Screen

The rear display screen shows video from either DVD movies, or an AUX input device, such as a video game console or camera. Each video screen has a dedicated video signal circuit to the radio.

Remote Control

To use the remote control, aim it at the infrared window below the video screen and press the desired remote control button. Direct sunlight or very bright light may affect the ability of the entertainment system to receive signals from the remote control. If the remote control does not seem to be working, the batteries may need to be

replaced. Objects blocking the line of sight may affect the function of the remote control.

If the remote control is to be stored for a long period of time, remove the batteries and keep them in a cool, dry place. Do not store the remote control in heat or direct sunlight. This could damage the remote control. Keep the remote control stored in a cool, dry place.

Wireless Headphones

Wireless headphones are optional and allow for rear seat passengers to use the RSE or RSA functions without disturbing the listening of front seat passengers. The wireless headphones receive audio signals from the infrared (IR) transmitters on the overhead console. This transmission is line of sight only, so audio quality will be degraded if anything blocks the transmitter signal from reaching the headphones. On some models, the infrared transmitter will have red LEDs illuminated when the RSE is activated.

The wireless headphones include 2 channels. This allows rear seat passengers to utilize both RSE and RSA functions without disturbing one another. The toggle switch on the right side headphone earpiece switches between channel one and channel 2. RSE is broadcast on channel one, and RSA on channel 2.

Each set of headphones has a rotary volume control. To adjust the volume, adjust this control. The headphones may automatically turn OFF if they lose the infrared signal from the system for approximately 4 minutes in order to preserve their battery power. The signal may be lost if the system is turned off or if the headphones are out of range of the infrared signal transmitters that are located near the video display screen.

AUX Inputs

The AUX input jacks are standard color-coded RCA-style jacks. Video is yellow, right audio is red, and left audio is white. The jacks are located on the rear of the center console. A number of devices may be plugged into the AUX jacks, including, but not limited to video game consoles, digital cameras, camcorders, or other devices. Audio only sources can be played through the AUX jacks from portable audio devices. Turn on the RSA, press the SOURCE key repeatedly until AUX is selected or touch the AUX screen button. An auxiliary device must be connected for the AUX screen button to appear as an option to select on the radio.

Rear Seat Audio (RSA)

The RSA is integrated into the rear HVAC control module. Audio, video source are controlled by the radio through serial data communication. Some sources are; radio (AM/FM), XM™ (if equipped), CD, and if the vehicle has these features, DVD, front auxiliary, and rear auxiliary.

The rear speaker channels pass through the RSA. The rear seat audio can be muted by the RSA when in use. The RSE system includes a radio with a DVD player, a video display screen, 2 wireless headphones, and a remote control.

Audio Outputs

Audio from the DVD player or auxiliary inputs may be heard through the following possible sources:

- Wireless infrared headphones
- Vehicle speakers

- Vehicle wired headphone jacks on rear seat audio controller (if equipped)

The RSE system will always transmit the audio signal by infrared to the wireless headphones, if there is audio available. The RSE system is capable of outputting audio to the vehicle speakers. Once the RSE system is selected as an audio source on the radio you may adjust the speaker volume on the radio to control the volume of the audio to the speakers.

The RSE system is capable of outputting audio to the wired headphone jacks on the rear seat audio controller if the vehicle is so equipped. The RSE system may be selected as an audio source on the Rear Seat Audio controller if the RSE system power is on.

Wired Headphone Jacks

The RSA controller is equipped with two 2.5 mm jacks for wired headphones. The headphones can be used to listen to either the RSE or RSA functions. If both RSE and RSA are used at the same time, the wired headphones may receive only RSA audio.

To use the wired headphones, plug the headphones into the jacks. The left knob controls the left headphones and the right knob controls the right headphones.

VIDEO ENTERTAINMENT SYSTEM DESCRIPTION AND OPERATION (DUAL HEADREST DVD SYSTEMS)

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

- Dual Headrest DVD Circuit Operation
- Dual Headrest DVD System Components
- Dual Headrest DVD Player
- Playing a Disc
- DVD Messages
- Parental Control
- Video Screen
- Remote Control
- Wireless Headphones
- AUX Inputs
- Audio Outputs
- Wired Headphone Jacks

Dual Headrest DVD Circuit Operation

Dual Headrest DVD Power

The Dual Headrest DVD uses a switched battery voltage feed circuit for power moding.

Dual Headrest DVD Grounds

The vehicle harness provides a ground for the Dual Headrest DVD system.

Dual Headrest DVD Data Link Communication

The Dual Headrest DVD system does not communicate with serial data.

Dual Headrest DVD Outputs

The Dual Headrest DVD system can only output video to each screen and through the AV output for external devices such as a camcorder.

Dual Headrest DVD Components

The Dual Headrest DVD system includes:

- Two video display screens
- DVD Control Module
- A Digital Versatile Disc (DVD) player built into each monitor - If equipped with Dual Player
- Two sets of wireless infrared headphones
- A remote control
- Stereo audio and video inputs for playing an auxiliary device

Dual Headrest DVD Player

The DVD players are integrated the display screen. The DVD player can be controlled by both the buttons on the DVD player and by the buttons on the remote control. The DVD player power may be turned on when the ignition is in the run, accessory, or retained accessory power (RAP) power modes. DVDs are manufactured with different region codes based on the country in which they are sold. Therefore, the DVD player is only compatible with the region code where the vehicle is sold. The DVD region code is printed on the jacket of most DVDs. Home recorded CDs, CD-R or CD-RW formats, may not play in the DVD player.

Playing a Disc

To play a disc, gently insert the disc with the label side facing the back of the vehicle, into the loading slot. The DVD player will continue to load the disc and the player will automatically start if the vehicle ignition is in an enabled power mode. If a disc is already in the player, press the play/pause button on the face of the DVD player or on the remote control. Some DVDs will not allow the user to fast forward or skip the copyright or previews. Some DVDs will automatically begin to play after the previews have finished. If the DVD does not begin to play the main title, refer to the on-screen instructions, and press play on the DVD player buttons or on the remote control.

DVD Messages

The following errors may be displayed on the video screen monitor.

Disc Format Error

This message will be displayed if a disc is inserted upside down, the disc is not able to be read, or if the disc format is not compatible with the DVD player.

Load / Eject Error

This message will be displayed if the disc is not able to properly load or eject.

Disc Play Error

This message will be displayed if the DVD player cannot play the disc. Severely damaged discs will cause this error.

Region Code Error

This message will be displayed if the region code of the DVD media is not compatible with the DVD player.

No Disc

This message will be displayed if the play button is pressed and there is no disc in the DVD player. If the disc is inserted wrong, the DVD player automatically ejects the disc and No Disc displays.

Parental Control

Part of the SETUP MENU lets users control the type of movie rating content (from G to Adult) that can be viewed and is only accessible when no disc is loaded. The parental control feature limits viewing to the selected preference. If a disc is inserted into the DVD compartment slot and it exceeds the Parental Setting, the following message appears on display: "The Parental Setting of this player prohibits play. Would you like to allow this disc to play?"

If yes is selected, the six digit password must be entered for the disc to play. If the wrong password is entered, the following message appears: " This movie will not play due to the Parental Setting of the player. To create a six digit password, use the numeric keypad on the remote control. Press the ENTER button to confirm." The default password is 136900.

Video Screen

The rear display screen shows video from either DVD player, or an AUX input device, such as a video game console or camera. Each video screen has a dedicated video signal circuit to the DVD control. If the vehicle is equipped with rear seat entertainment, there is no way to source the movie from the rear seat entertainment to the Dual Headrest DVD screens.

DVD Control Module

The two video screens are linked together by the DVD Control Module. This module allows screen 1 to source the media being played on screen 2. Video, audio, power, and remote signals are sent from the DVD Control Module, to each of the video screens. Video and audio signals are sent from the screen to the control module, and then to both screens.

Remote Control

To use the remote control, aim it at the infrared window above the video screen and press the desired remote control button. Direct sunlight or very bright light may affect the ability of the entertainment system to receive signals from the remote control. If the remote control does not seem to be working, the batteries may need to be replaced. Objects blocking the line of sight may affect the function of the remote control.

If the remote control is to be stored for a long period of time, remove the batteries and keep them in a cool, dry place. Do not store the remote control in heat or direct sunlight. This could damage the remote control. Keep the remote control stored in a cool, dry place.

Wireless Headphones

Wireless headphones allow for rear seat passengers to use the Dual Headrest DVD player without disturbing the listening of front seat passengers. The wireless headphones receive audio signals from the infrared (IR) transmitters on the overhead console. This transmission is line of sight only, so audio quality will be degraded if anything blocks the transmitter signal from reaching the headphones, or if the headphones are placed in the front of the vehicle. On some models, the infrared transmitter will have red LEDs illuminated when activated.

The wireless headphones include 2 channels. This allows rear seat passengers to utilize both screens individually without disturbing one another.

Each set of headphones has a rotary volume control. To adjust the volume, adjust this control. The headphones may automatically turn OFF if they lose the infrared signal from the system for approximately 4 minutes in order to preserve their battery power. The signal may be lost if the system is turned off or if the headphones are out of range of the infrared signal transmitters that are located near the video display screen.

AUX Inputs

The AUX input jacks are standard color-coded RCA-style jacks. Video is yellow, right audio is red, and left audio is white. The jacks are located on the front of the monitor. A number of devices may be plugged into the AUX jacks, including, but not limited to video game consoles, digital cameras, camcorders, or other devices. Audio only sources can be played through the AUX jacks from portable audio devices.

Audio Outputs

Audio from the DVD player or auxiliary inputs may be heard through the following possible sources:

- Wireless infrared headphones
- Vehicle speakers - via the FM transmitter (if equipped)
- Wired headphone jacks on each monitor

The Dual Headrest DVD system will always transmit the audio signal by infrared to the wireless headphones, if there is audio available. The Dual Headrest DVD system may be capable of outputting audio to the vehicle speakers via the FM transmitter. Once the correct FM frequency is selected as an audio source on the radio you may adjust the speaker volume on the radio to control the volume of the audio to the speakers. Only one audio source can be heard through the vehicle's speakers at a time. The audio source being used is specified by the A/V (audio/video) source selected on the driver side head restraint monitor.

The Dual Headrest DVD system is capable of outputting audio through the wired headphone jacks on the monitors.

Wired Headphone Jacks

Each headrest monitor is equipped with a 2.5 mm jack for wired headphones. To use the wired headphones, plug the headphones into the jacks. The headphones can be used to listen to any source the Dual Headrest DVD system can source.

VIDEO ENTERTAINMENT SYSTEM DESCRIPTION AND OPERATION (SEATBACK DISPLAY)

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

- Seatback Display Circuit Operation
- Seatback Display System Components
- Video Screens
- Remote Control
- Wireless Headphones
- Video Inputs Only

Seatback Display Circuit Operation

Seatback Display Power

The Seatback display uses the common radio power enable voltage feed circuit and direct feed for B+ power moding.

Seatback Display Grounds

The vehicle harness provides a ground for the Seatback display system.

Seatback Display Outputs

The Seatback display can only output video to each screen.

Seatback Display Electrical Interface with Radio DVD Player

The Seatback display module will receive a video signal from the radio head unit. The left side (driver) Seatback display will receive a video signal from the radio display 1 video output. The right side (passenger) Seatback display will receive a video signal from the radio display 2 video output.

The video source sent from the radio to the video screens will be controlled via the source button on the remote control or the radio.

The Radio DVD player/Rear Seat Audio System interfaces to the display through the following:

1. Composite Video Signals

NTSC and PAL video formats are supported.

2. Left and Right Audio Signals

3. PWM signal for Brightness Control.

- The brightness control is used to provide the screen brightness signal to the seatback displays.
- Each of the two seatback displays per vehicle share a common brightness control line from the radio
- The pulse width modulated (PWM) brightness control is provided by the radio over a single wire, using ground as the return.

4. PWM signal for Mode Control.

- The mode control is used to control video screen display options, in support of providing different screen sizes, zoom, picture inversion and backlighting.
- Each of the two seatback displays per vehicle share a unique mode control signal from the radio.
- The PWM mode control is provided by the radio over a single wire, using ground as the return.

5. Power Enable Signal.

The power enable signal is used to activate the DVD displays.

The 2 Seatback Displays interface to the Radio DVD player through the following:

IR remote data carried on a twisted wire pair. The IR remote data circuits from left and right seatback displays are spliced together within wiring harness.

Seatback Display System Components

The Seatback display system includes:

- Two video display screens
- Infrared Module (located only in the left screen)
 - Driver side transmits and receives
 - Passenger side only receives
- Two sets of wireless infrared headphones
- A remote control
- Local video input for each Seatback display for playing a video auxiliary device on the Seatback display.

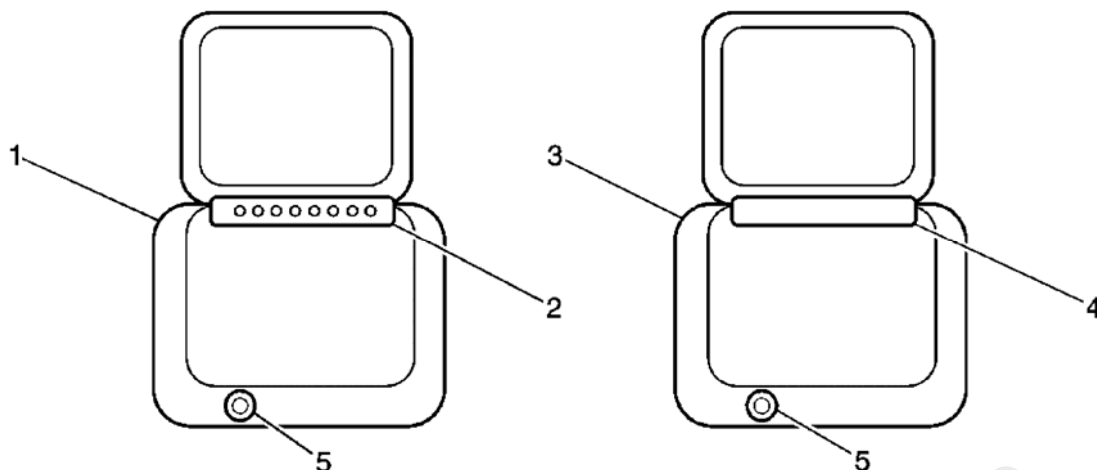


Fig. 43: Seatback Display System
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Left Driver Seatback Display
2	Left IR-Dimly Illuminates 8 Leds, Transmits Audio And Recieves Remote Signal
3	Right Passenger Seatback Display
4	Right IR-LEDS Do Not Illuminate, Receives Remote Signal Only
5	Local video input

Video Screen

The video screens are located in the back of the driver and front passenger seats. The rear Seatback display screen shows video from the radio DVD player, or an AUX input device, such as a video game console or camera. Only the left display console contains the infrared transmitters for the wireless headphones, they may be visible as 8 illuminated LEDs. These 8 LEDs are not on visible on the right video screen. Both consoles contain an infrared receiver for the remote control. They are located in the middle of each of the Seatback display console.

IR Module

Eight infrared light emitting diode (LED) transmitters are used to send audio signals to the wireless headphones that are included in the system. These LEDs are located on the driver's side Seatback display, and aimed to provide signal to any rear seating position. During operation, the LEDs may be visible through the lens on the driver's side display, but not on the passenger side. This is normal operation; the illuminated LEDs are located on the driver's side Seatback display only.

Remote Control

To use the remote control, aim it at the transmitter window at either the right or left seatback consoles and press the button. Direct sunlight or very bright light may affect the ability of the entertainment system to receive signals from the remote control. If the remote control does not seem to be working, the batteries may need to be

replaced. Objects blocking the line of sight may affect the function of the remote control.

If a CD, DVD, or MP3 disc is in the radio DVD slot, the remote control button can be used to turn on the video screen display and start the disc. The radio can also turn on the video screen display.

If the remote control is to be stored for a long period of time, remove the batteries and keep them in a cool, dry place. Do not store the remote control in heat or direct sunlight. This could damage the remote control. Keep the remote control stored in a cool, dry place.

Wireless Headphones

Wireless headphones allow for rear seat passengers to use the display DVD without disturbing the listening of front seat passengers. The wireless headphones receive audio signals from the infrared (IR) transmitter on the left Seatback display. This transmission is line of sight only, so audio quality will be degraded if anything blocks the transmitter signal from reaching the headphones, or if the headphones are placed in the front of the vehicle. The infrared transmitter located on the left Seatback display will have red LEDs dimly illuminated when activated.

The wireless headphones include 2 channels. This allows rear seat passengers to utilize both screens individually without disturbing one another. On some wireless headphone models, you will see a red LED illuminated when the headphone is turned ON.

Each set of headphones has a rotary volume control. To adjust the volume, adjust this control. The headphones may automatically turn OFF if they lose the infrared signal from the system for approximately 4 minutes in order to preserve their battery power. The signal may be lost if the system is turned off or if the headphones are out of range of the infrared signal transmitters that are located near the video display screen.

Wireless Headphones without Rear Seat Audio (RSA)

The wireless headphones setup on the Seatback display system without Rear Seat Audio (RSA) is unique. If the RSA system is not included with vehicle, the audio that can be heard on the wireless headphone channel 2 will only be from a device (IPOD, MP3 player, game system, etc.) that is connected to the rear seat auxiliary audio jacks. Wireless headphone channel 1 will provide audio from any disc in the DVD player, including DVD audio, CD audio, and MP3 or WMA audio discs.

Video Inputs

The local video input is the standard yellow RCA color-coded jacks. The RCA jack is located on the front lower side of the Seatback display housing. Any composite video signal (from a video game, camera, stand-alone DVD player, etc.) attached to this input will override the video from the vehicle DVD or rear auxiliary jack. Power for auxiliary devices is not supplied by the radio system. To use the video input of the rear seat entertainment system, connect the auxiliary device cables to the video jacks and power ON both the auxiliary devices and the Seatback display screen. Any use of this input will have to access audio from the external device only.

Rear Seat Audio (RSA) (if equipped)

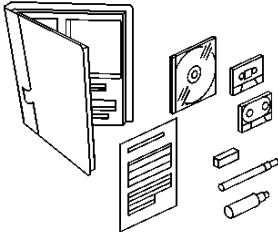
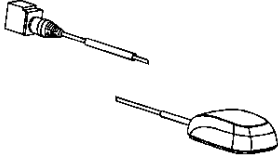
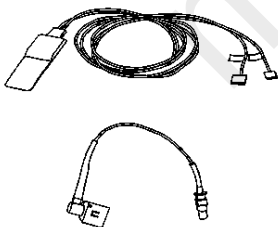
The RSA is integrated into the rear HVAC control module. Audio, video source are controlled by the radio

through serial data communication. Some sources are; radio (AM/FM), XM™ (if equipped), CD, and if the vehicle has these features, DVD, front auxiliary, and rear auxiliary.

The rear speaker channels pass through the RSA. The rear seat audio can be muted by the RSA when in use.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description
	J 39916-A CD and Cassette Diagnostic Audio Kit
	EL-48028 Digital Radio Test Antenna
	EL-49903 OnStar Antenna Diagnostic Tool Kit