2008 Accessories & Equipment

Cellular, Entertainment & Navigation - Ascender, Envoy & Trailblazer

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Antenna Bracket to Roof Panel Screw	2.5 N.m	22 lb in
Amplifier Retaining Bolts	10 N.m	88 lb in
Digital Radio Antenna Retaining Nut	6 N.m	53 lb in
Navigation Control Processor Bracket to Rear Seat Stud Nut	45 N.m	33 lb ft
Noise Cancellation Microphone Screws	0.8 N.m	7 lb in
OnStar® Microphone to Overhead Console screws	0.8 N.m	7 lb in
Personal Message Recorder Screws	0.8 N.m	7 lb in
Radio Antenna Cable Mounting Bolts	8 N.m	70 lb in
Radio Antenna Mast	5 N.m	44 lb in
Radio Antenna Module Retaining Screw	2.5 N.m	22 lb in
Radio Front Speaker Mounting Screws	2 N.m	18 lb in
Radio Rear Speaker Mounting Screws	2 N.m	18 lb in
Radio Upper Speaker Mounting Screws	2 N.m	18 lb in
Radio to Instrument Panel Mounting Screws	2 N.m	18 lb in
Video Display Retaining Bolts	9 N.m	80 lb in
Video Player Bracket Retaining Bolts	10 N.m	88 lb in

SCHEMATIC & ROUTING DIAGRAMS

RADIO/NAVIGATION SYSTEM SCHEMATICS

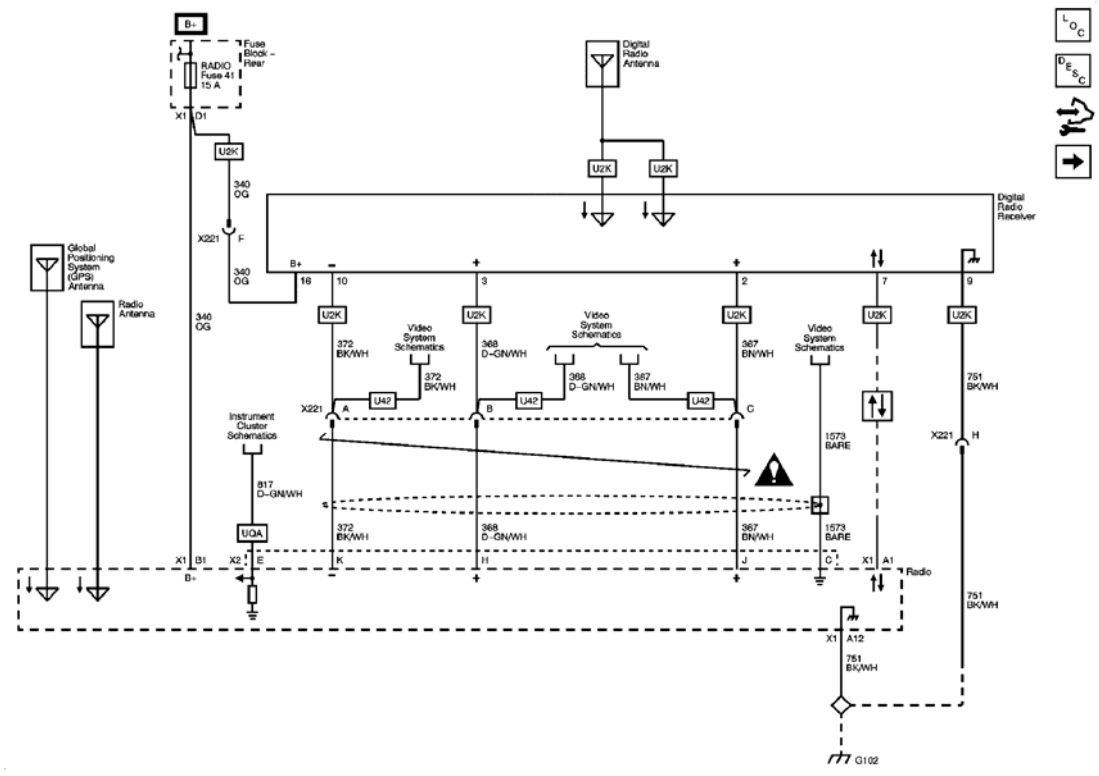


Fig. 1: Power, Ground, Serial Data & Digital Radio Receiver Schematic
Courtesy of GENERAL MOTORS CORP.

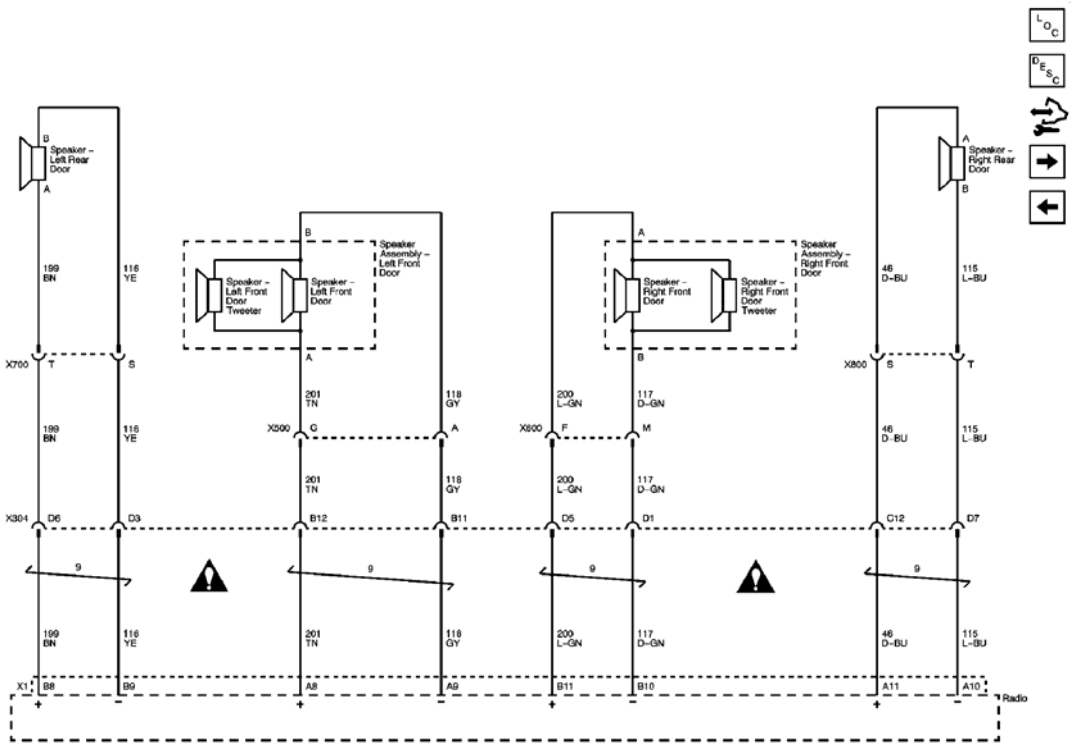


Fig. 2: Base Radio - w/o Rear Seat Audio Controls Schematic
Courtesy of GENERAL MOTORS CORP.

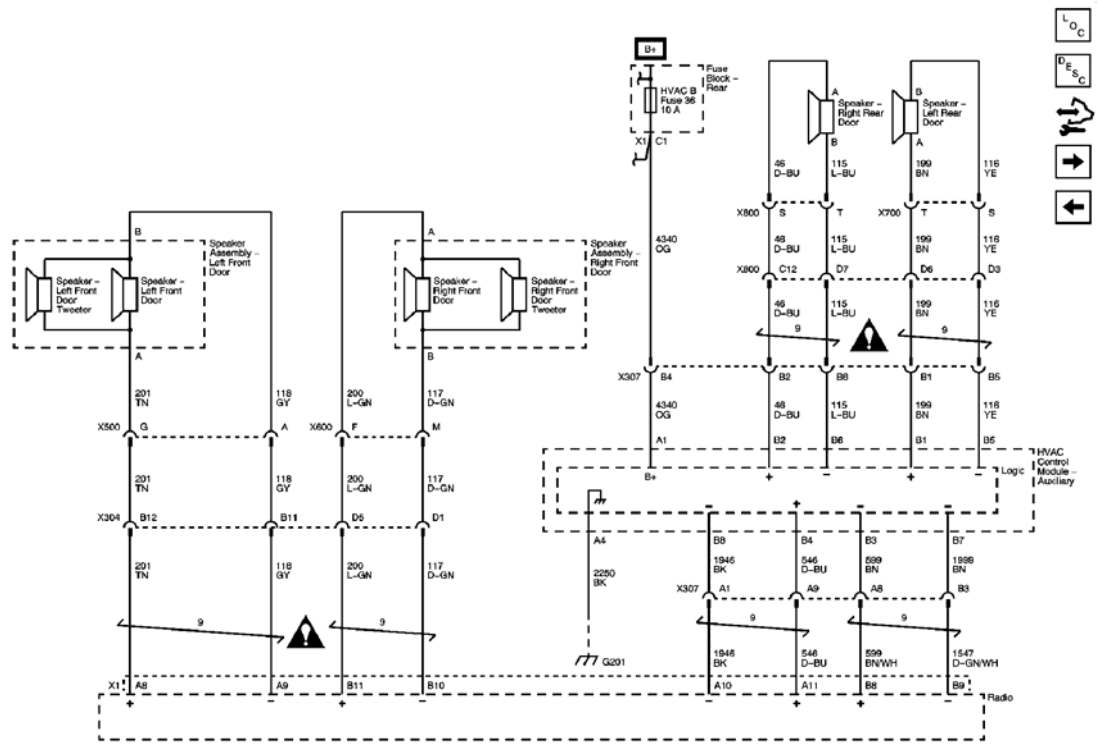


Fig. 3: Base Radio - w/Rear Seat Audio Controls Schematic
Courtesy of GENERAL MOTORS CORP.

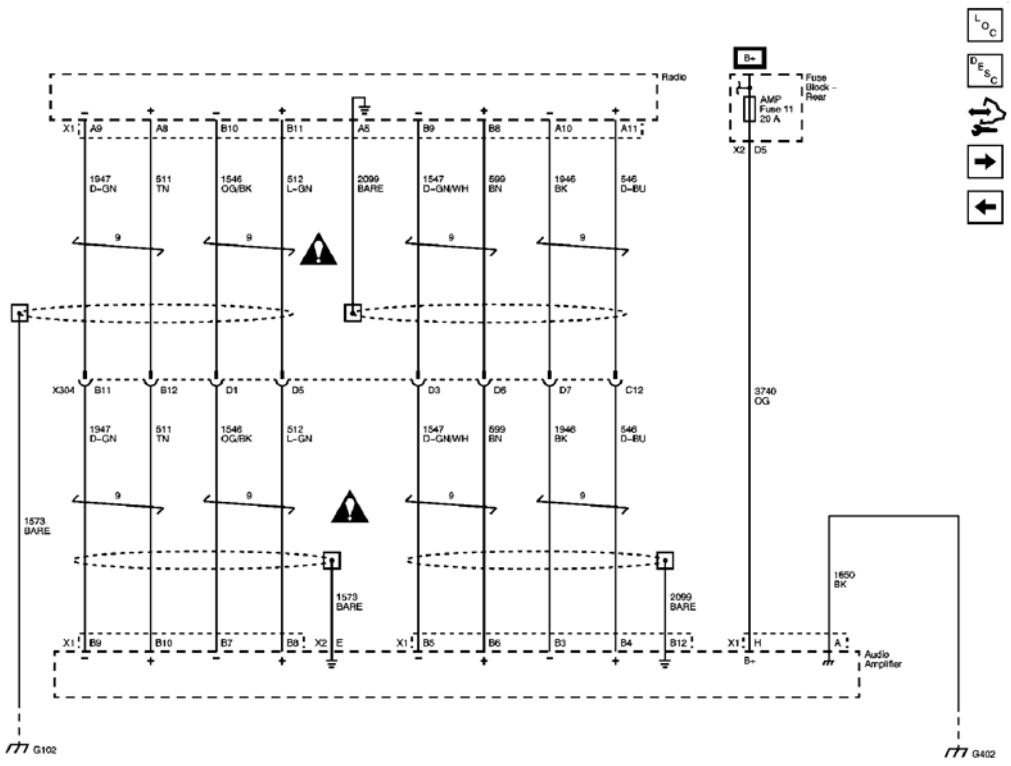


Fig. 4: Audio Amplifier Power, Grounds & Premium Radio Low Level Audio Outputs w/o Rear Seat Audio Controls Schematic

Courtesy of GENERAL MOTORS CORP.

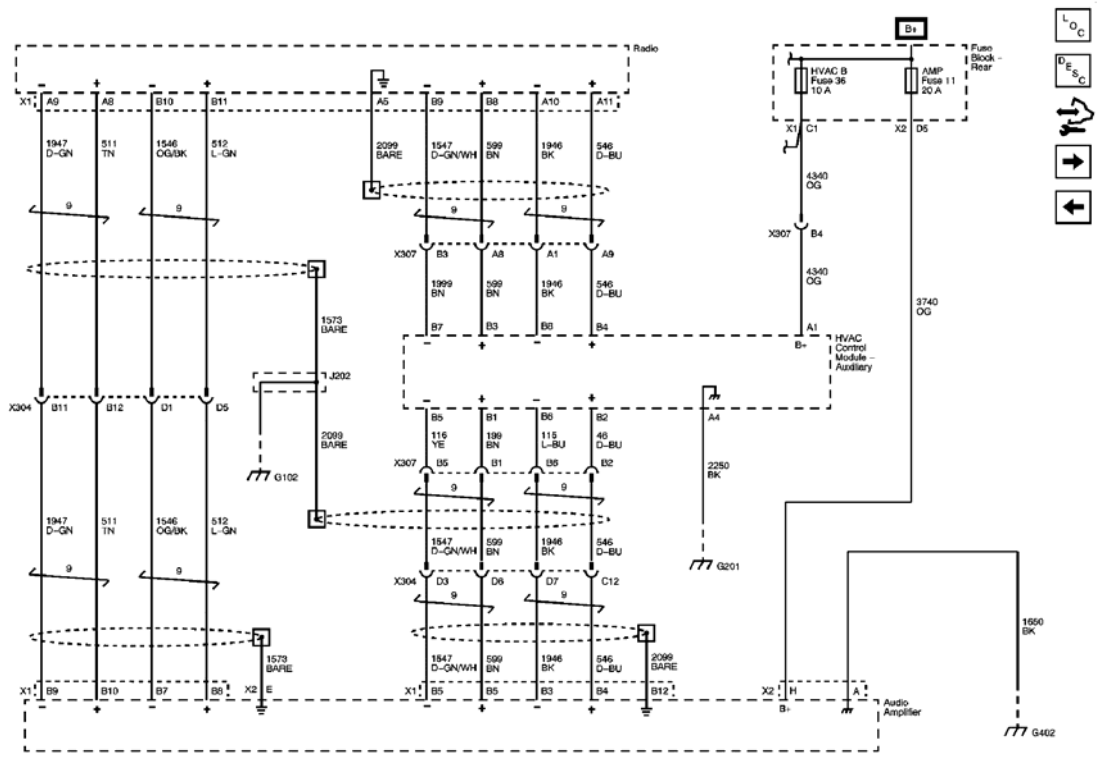


Fig. 5: Audio Amplifier Power, Grounds & Premium Radio Low Level Audio Outputs w/Rear Seat Audio Controls Schematic

Courtesy of GENERAL MOTORS CORP.

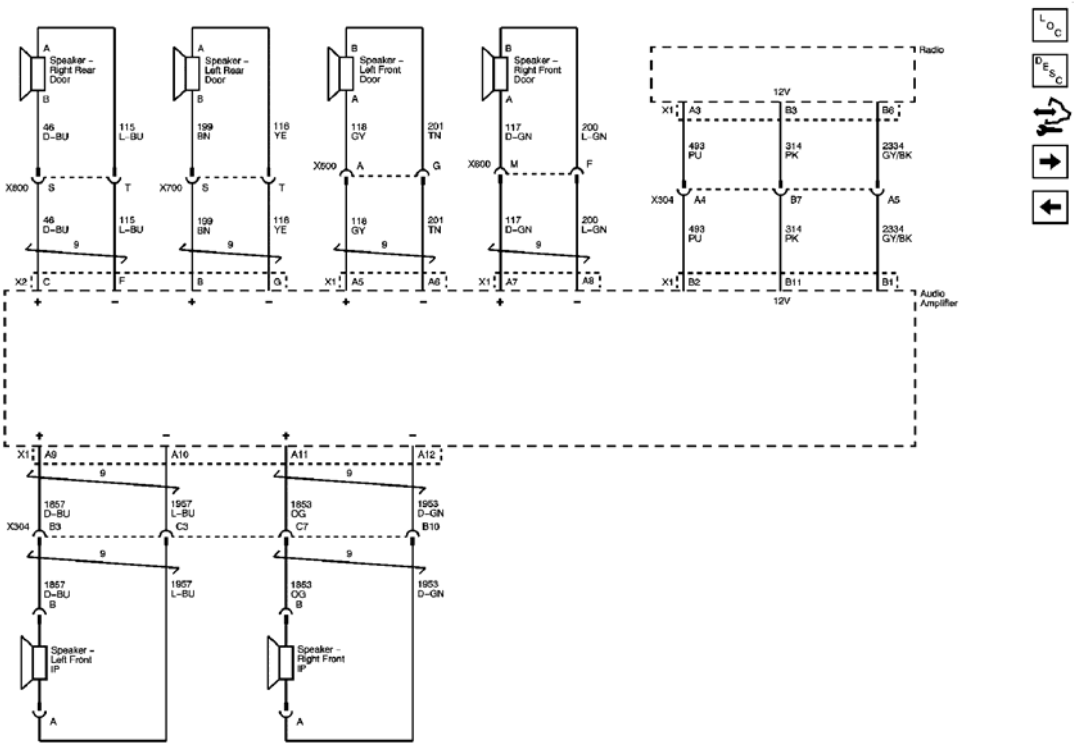


Fig. 6: Premium Radio Amplifier Outputs Schematic
Courtesy of GENERAL MOTORS CORP.

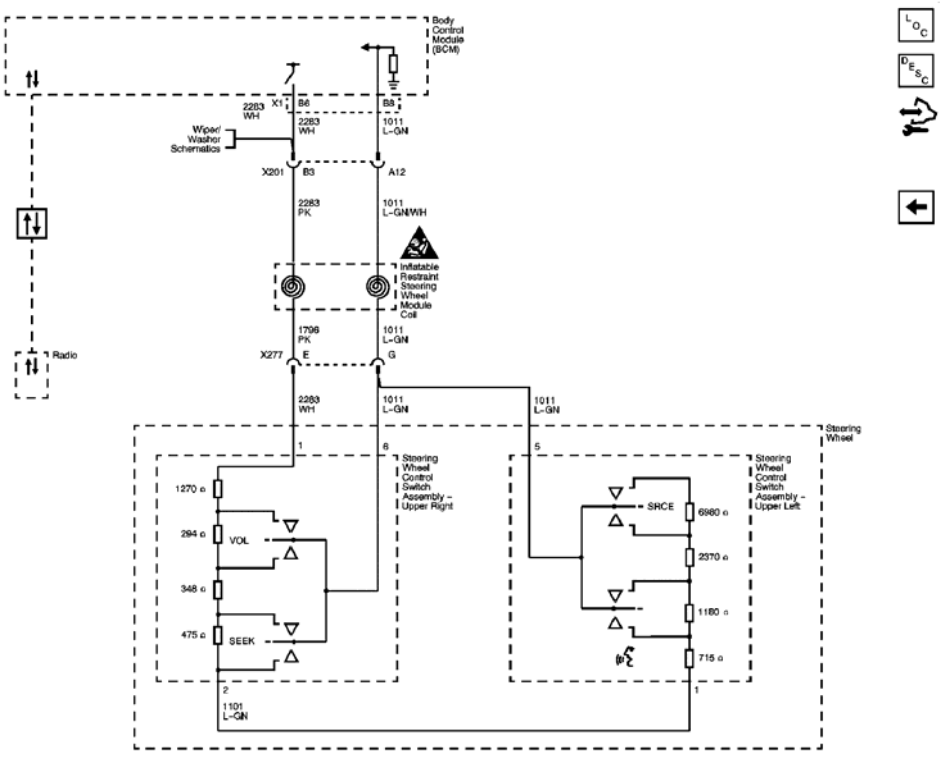


Fig. 7: Steering Wheel Controls Schematic - STW
Courtesy of GENERAL MOTORS CORP.

ONSTAR SCHEMATICS

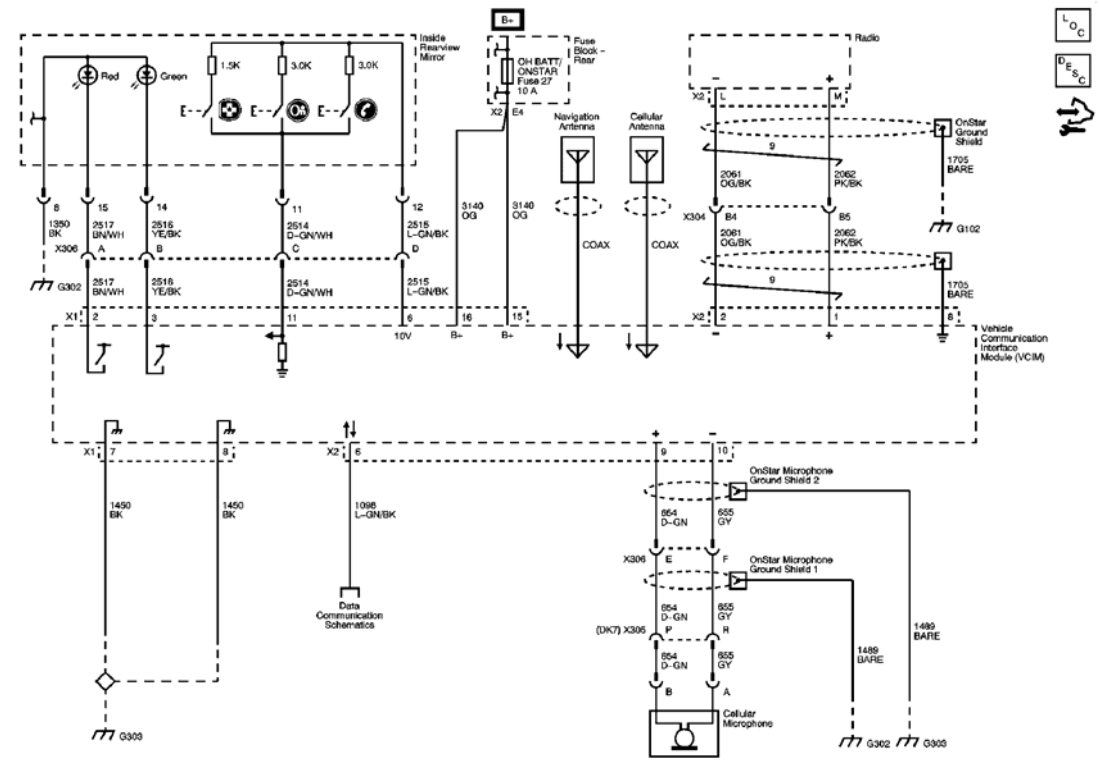


Fig. 8: OnStar Schematic
Courtesy of GENERAL MOTORS CORP.

VIDEO SYSTEM SCHEMATICS

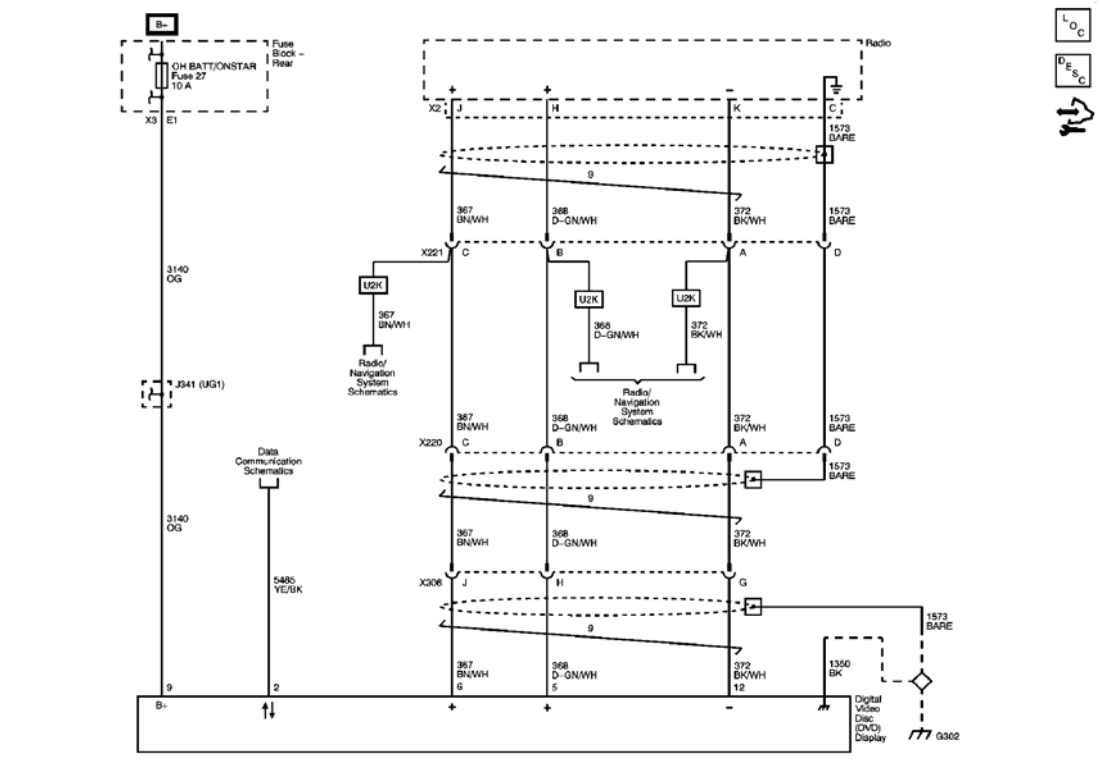


Fig. 9: Video System Schematic
Courtesy of GENERAL MOTORS CORP.

DIAGNOSTIC INFORMATION & PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC B0004	B0004 00: Vehicle Speed Information Circuit Open
DTC B1001	B1001 00: Option Configuration Error
DTC B1025, B1035, B1045, or B1055	B1025 01: Audio Output 1 Left Front Circuit B1035 01: Audio Output 2 Right Front Circuit B1045 01: Audio Output 3 Left Rear Circuit B1055 01: Audio Output 4 Right Rear Circuit
DTC B1259	B1259: Antenna Ground Circuit
DTC B1271	B1271: Theft Locked
DTC B2455	B2455 00: Cellular Phone Microphone Circuit
DTC B2462	B2462: Global Positioning System (GPS) Signal Error
DTC B2470	B2470 00: Cellular Phone Antenna Circuit Malfunction
DTC B2476 or B2482	B2476 00: Cellular Phone Select Service Switch Malfunction

	B2482 00: Cellular Phone Select Service Switch Range/Performance
DTC B2483 or B2484	B2483 00: GPS Sensor Circuit Low B2484 00: GPS Sensor Circuit Open
DTC U1500	U1500: Inter-Device Dedicated Bus Malfunction

DIAGNOSTIC STARTING POINT - CELLULAR, ENTERTAINMENT & NAVIGATION

Begin the system diagnosis with the **Diagnostic System Check - Vehicle** . The Diagnostic System Check - Vehicle will provide the following information:

- The identification of the control modules which command the system
- The ability of the control modules to communicate through the serial data circuit
- The identification of any stored DTCs and their status

The use of the Diagnostic System Check - Vehicle will identify the correct procedure for diagnosing the system and where the procedure is located.

DTC B0004

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 B0004 00

Vehicle Speed Information Circuit Open

Circuit Description

The navigation radio receives the vehicle speed signal from the powertrain control module (PCM) through a dedicated circuit shared with the instrument panel cluster (IPC).

Conditions for Running the DTC

- The navigation radio must detect a power mode transition to ON.
- The vehicle must drive for 4 km (2.5 mi) after receiving a global positioning system (GPS) signal.

Conditions for Setting the DTC

The navigation radio compares the vehicle speed signal from the PCM to the GPS location signal every second. If the GPS signal indicates that the vehicle has traveled 4 km (2.5 mi) but no vehicle speed signal was received,

the radio sets the DTC.

Action Taken When the DTC Sets

The navigation radio uses the GPS signal when the vehicle speed signal from the PCM is unavailable.

The following symptoms may happen if the vehicle speed signal from the PCM is unavailable:

- The vehicle icon may jump to different positions on the map screen.
- The vehicle icon, current position marker may not move on the map screen while the vehicle is being driven.
- The route guidance accuracy may be degraded.

Conditions for Clearing the DTC

- A current DTC clears when the navigation radio detects the vehicle speed signal from the PCM for more than 1 second.
- A history DTC clears after 50 ignition cycles without a vehicle speed signal failure.

Reference Information

Schematic Reference

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

Diagnostic Aids

A short to voltage or ground in the vehicle speed circuit will cause an IPC speedometer problem also. Make sure there are no IPC speedometer concerns.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector X2 at the radio. Disconnect the harness connector X1 at the instrument panel cluster.
2. Test for less than 5 ohms on the vehicle speed signal between the radio harness connector X2 terminal E and the IPC connector X1 terminal 21.
    - If less than the specified range, repair the open/high resistance. If the circuit tests normal, replace the radio.

Repair Procedures

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

- **Inside Rearview Mirror Replacement**
- **Control Module References** for radio replacement, setup, and programming

DTC B1001

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 B1001 00

Option Configuration Error

Circuit Description

This DTC is set as current in all vehicle communication interface module (VCIM) service parts and has been implemented as a reminder to contact the OnStar® Call Center to properly update the customers account once the new module has been installed. This call is initiated automatically after the installation of the replacement VCIM, and the completion of the Setup New VCIM procedure on the scan tool. No external circuits are involved.

Conditions for Running the DTC

The DTC is only run once per ignition cycle after a VCIM service part installation.

Conditions for Setting the DTC

This DTC is set as current in every VCIM service part, until the Setup New VCIM procedure on the scan tool has been performed after a service replacement.

Action Taken When the DTC Sets

- The OnStar® status LED turns red.
- The blue OnStar® Call Center button is disabled.

Conditions for Clearing the DTC

A current DTC clears following the successful completion of the Setup New VCIM procedure via the scan tool.

Diagnostic Aids

Perform the **OnStar Reconfiguration (with TIS 2 Web Gen 4 and later)** to setup the replacement VCIM.

DTC B1025, B1035, B1045 OR B1055

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 B1025 01

Audio Output 1 Left Front Circuit

DTC B1035 01

Audio Output 2 Right Front Circuit

DTC B1045 01

Audio Output 3 Left Rear Circuit

DTC B1055 01

Audio Output 4 Right Rear Circuit

Diagnostic Fault Information

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

Left Front Speaker Output (+)/Left Front Low Level Audio Signal (+)	B1025	1	B1025	-
Left Front Speaker Output (-)/Left Front Low Level Audio Signal (-)	B1025	1	B1025	-
Right Front Speaker Output (+)/Right Front Low Level Audio Signal (+)	B1035	1	B1035	-
Right Front Speaker Output (-)/Right Front Low Level Audio Signal (-)	B1035	1	B1035	-
Left Rear Speaker Output (+)/Left Rear Low Level Audio Signal (+)	B1045	1	B1045	-
Left Rear Speaker Output (-)/Left Rear Low Level Audio Signal (-)Rear Low Level Audio Signal (+)	B1045	1	B1045	-
Right Rear Speaker Output (+)/Right Rear Low Level Audio Signal (+)	B1055	1	B1055	-
Right Rear Speaker Output (-)/Right Rear Low Level Audio Signal (-)	B1055	1	B1055	-
1. No sound from speaker				

Circuit/System Description

Each of the audio output channel circuits (+) and (-), at the radio and at the amplifier (if equipped) have a DC bias voltage that is one half of the battery voltage. When using a DMM, each of the audio output channel circuits will measure approximately 6.5V 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. This voltage will vary depending on what type of audio is being listened to, talk or music, and type of music, as well as the volume setting of the system. Low volume and talk settings will measure around 1V AC and less, where constant music may measure 3V AC and slightly higher. In an amplified audio system, these similar AC voltage measurements may be slightly higher on the output of the amplifier, and the typical AC voltage readings at the output of the radio are less than 1V AC.

Conditions for Running the DTC

The radio is ON.

Conditions for Setting the DTC

A short to voltage or short to ground is detected on the specified (+) or (-) signal circuit

Action Taken When the DTC Sets

The radio disables audio output on the appropriate channel

Conditions for Clearing the DTC

- A current DTC will clear when the conditions for setting are no longer seen

- A history DTC will clear 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**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

Radio ON, adjust the fade and balance controls on the radio to test all four channels individually. Each of the four channels should produce clear and even sound.

Circuit/System Testing

Without Amplifier

1. Ignition OFF, disconnect the harness connector at the appropriate speaker.
2. Radio ON, test for 5.0-7.5 volts between the signal circuit terminal A and ground.
    - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the radio.
    - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the radio.
3. Test for 5.0-7.5 volts between the signal circuit terminal B and ground.
    - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the radio.

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

4. If all circuits test normal, test or replace the speaker.

With Amplifier

1. Ignition OFF, disconnect the X2 and X3 harness connectors at the amplifier.
2. Radio ON, test for 5.0-7.5 volts between the appropriate signal circuit terminal listed below and ground.
   - Left front door or tweeter - Connector X2, terminal 3
   - Right front door or tweeter - Connector X2, terminal 1
   - Left rear speaker - Connector X2, terminal 7
   - Left rear subwoofer - Connector X3, terminal 3
   - Right rear speaker - Connector X2, terminal 5
   - Right rear subwoofer - Connector X3, terminal 2
   - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the radio.
   - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the radio.
3. Radio ON, test for 5.0-7.5 volts between the appropriate signal circuit terminal listed below and ground.
   - Left front door or tweeter - Connector X2, terminal 4
   - Right front door or tweeter - Connector X2, terminal 2
   - Left rear speaker - Connector X2, terminal 8
   - Left rear subwoofer - Connector X3, terminal 7
   - Right rear speaker - Connector X2, terminal 6
   - Right rear subwoofer - Connector X3, terminal 6
   - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the radio.
   - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the radio.
4. If all circuits test normal, replace the amplifier.

Repair Procedures

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

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

DTC B1259

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 B1259

Antenna Ground Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Antenna Signal	1	1	1	-
1. Sets code B1259				

Circuit/System Description

The antenna signal circuit is a coaxial cable that carries the radio signal information received by the antenna. The antenna cable also provides a path for D.C. current for powering the antenna.

Conditions for Running the DTC

This test is run every 300 milliseconds

Conditions for Setting the DTC

The DRR detects an antenna fault.

Action Taken When the DTC Sets

The radio displays "No XM Signal" or "Check Antenna"

Conditions for Clearing the DTC

- The condition must be corrected.
- The 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 Testing

1. Ignition OFF, disconnect the digital radio receiver antenna coax. Connect the test antenna to the digital radio receiver.
2. Turn the ignition ON, radio ON tuned to XM. Verify that DTC B1259 is not current.
    - If the DTC B1259 is still current, replace the DRR.
3. Ignition OFF. Disconnect the DRR antenna from the coaxial cable. Test the resistance of the antenna coaxial cable center conductor from end to end. Verify the resistance is less than 5 ohms.
    - If the resistance is greater than 5 ohms, replace the antenna coaxial cable.
4. Test the resistance of the antenna coaxial cable outer shield from end to end. Verify the resistance is less than 5 ohms.
    - If the resistance is greater than 5 ohms, replace the antenna coaxial cable.
5. Test the resistance of the antenna coaxial cable between the center conductor and the outer conductor. Verify there is infinite resistance between both conductors.
    - If there is less than infinite resistance between the inner conductor and the outer conductor of the coaxial cable, replace the antenna coaxial cable. If the coaxial cable tests normal, replace the digital radio antenna.

Repair Procedures

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

- **Digital Radio Antenna Cable Replacement**
- **Digital Radio Antenna Replacement**
- **Digital Radio Receiver Replacement**

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

Theft Locked

Circuit/System Description

This DTC is generated by the module when the theft lock is activated. This occurs when the VIN as received over the class 2 communication circuit and the VIN as stored in the module memory do not match. This also occurs when no VIN is received over the class 2 circuit. The only circuit required is the class 2 communications line.

Conditions for Running the DTC

This test is run every 300 milliseconds.

Conditions for Setting the DTC

This DTC is generated by the module when the VIN as received over the class 2 communication circuit and the VIN as stored in the module memory do not match. This also occurs if no VIN is received over the class 2 circuit. This DTC test runs when the radio changes from OFF to ON.

Action Taken When the DTC Sets

The radio does not function. The radio will display Locked - THEFTLOCK 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.

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

Ignition ON the ignition, with the engine OFF. With a scan tool, clear the radio theft information and DTC. Cycle the ignition and verify the DTC did not reset.

- If the DTC resets, 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 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 Descriptor

DTC B2455 00

Cellular Phone Microphone Circuit

Circuit/System Description

The vehicle communication interface module (VCIM) detects that the cellular microphone is connected through the cellular microphone signal circuit and the drain wire.

Conditions for Running the DTC

- The ignition must be in the RUN or ACC position.
- The system voltage is at least 9.5 volts and no more than 15.5 volts.
- All the above conditions are present for greater than 10 seconds.

Conditions for Setting the DTC

- The VCIM detects an open in the drain wire circuit or a short to voltage in the cellular microphone signal circuit.
- The above conditions are present for greater than 10 seconds.

Action Taken When the DTC Sets

- The VCIM will not receive any signal from the microphone.
- Calls can be placed but the caller cannot be heard.
- The OnStar® status LED turns red.

Conditions for Clearing the DTC

- The VCIM detects the microphone connected for 5 consecutive 100 millisecond cycles.
- A history DTC clears after 50 malfunction-free ignition cycles.
- The VCIM receives the clear DTC command from the scan tool.

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 cellular microphone and the harness connector X2 at the VCIM.
2. Test for less than 1 ohm of resistance between terminal A and terminal 10.
    - If greater than the specified value, test the drain wire circuit for an open/high resistance.
3. Reconnect the harness connector X2 at the VCIM.
4. Ignition ON, test for less than 9.5 volts at the signal circuit terminal B.
    - If greater than the specified value, test the signal circuit for a short to voltage. If the circuit tests normal, replace the VCIM.
5. If all circuits test normal, test or replace the cellular microphone.

Repair Procedures

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

- **Mobile Telephone Microphone Replacement**
- **Control Module References** for VCIM replacement, setup, and programming

DTC B2462

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 B2462

Global Positioning System (GPS) Signal Error

Circuit Description

The global positioning system (GPS) antenna is connected to the navigation radio by a coaxial cable.

Conditions for Running the DTC

The radio must detect one of the following power modes:

- ACC
- ON
- RAP
- RAP UNLK

Conditions for Setting the DTC

- The navigation radio test the GPS antenna every 10 seconds.
- The radio determines there is an open in the GPS antenna.

Actions Taken When the DTC Sets

- Unable to get GPS location updated, the radio uses the last reported position and the vehicle speed signal to calculate the vehicle position.
- Route guidance may be inaccurate.
- This failure has no effect outside the navigation system.

Conditions for Clearing the DTC

- A current DTC clears when the radio does not detect the failure for more than 10 seconds.
- A history DTC clears after 50 ignition cycles with no repeat of the failure.

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

Circuit/System Testing

1. Ignition OFF, disconnect the GPS coaxial cable from the GPS antenna.
2. Ignition ON, test for 4.0-5.5 volts between the center conductor and the shield of the coaxial cable.
    - If not within the specified range, replace the GPS antenna.
3. Ignition OFF, test for less than 5 ohms or resistance at the GPS coaxial cable center conductor from end to end.
    - If greater than the specified range, replace the GPS coaxial cable.
4. Ignition OFF, test for infinite resistance between the center conductor and the outer conductor of the GPS coaxial cable.
    - If less than the specified range, replace the GPS coaxial cable.
5. If all circuits test normal, replace the radio.

Repair Procedures

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

- **Global Positioning System (GPS) Antenna Replacement**
- **Control Module References** for radio 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 00

Cellular Phone Antenna Circuit Malfunction

Circuit/System Description

The cellular antenna is connected to the vehicle communication interface module (VCIM) with a RG-58 coax cable. The VCIM polls the data from the cellular antenna once every second.

Conditions for Running the DTC

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

Conditions for Setting the DTC

- The VCIM does not detect the presence of a cellular antenna.
- The above conditions are present for greater than 1 second.

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 VCIM detects the presence of a cellular 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**

Circuit/System Verification

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

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

Circuit/System Testing

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

1. Ignition OFF, disconnect the cellular antenna coax from the VCIM module and the cellular antenna.
2. Ignition ON, test for less than 1 volt 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 volt 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 cellular antenna coax cable.
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 cellular antenna coax cable.
8. Test for infinite resistance between the antenna coax center terminal and the outer shield.
    - If less than specified value, replace the cellular antenna coax cable.
9. If coax cable tests normal, test or replace the cellular antenna.

Repair Procedures

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

- **Cellular Communications/Digital Radio Antenna Replacement**
- **Control Module References** for VCIM 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 Descriptor

DTC B2476 00

Cellular Phone Select Service Switch Malfunction

DTC B2482 00

Cellular Phone Select Service Switch Range/Performance

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Keypad Supply Voltage	B2476 00	B2476 00	B2476 00	-
Keypad Green LED Signal	1	1	1	-
Keypad Red LED Signal	1	1	1	-
Keypad Signal	B2482 00	B2482 00	B2482 00	-
Inside Rearview Mirror Ground	-	2	-	-

1. OnStar® Button LED Inoperative
2. OnStar® One Or More Buttons stuck or Inoperative

Circuit/System Description

The OnStar® button assembly located on the inside rearview mirror consists of 3 buttons, Call/Answer, OnStar® Call Center, and OnStar® Emergency. The vehicle communication interface module (VCIM) supplies the OnStar® button assembly with 10 volts via the keypad supply voltage circuit. Each of the buttons, when pressed, completes the circuit across a resister allowing a specific voltage to be returned to the VCIM over the keypad signal circuit. Depending upon the voltage range returned, the VCIM is able to identify which button has been activated.

Conditions for Running the DTC

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

Conditions for Setting the DTC

B2476

The DTC will set when the VCIM detects a short to voltage, short to ground, or an open/high resistance on the keypad supply voltage circuit.

B2482

- The DTC will set when the VCIM detects a short to voltage, short to ground, or an open/high resistance on the keypad signal circuit.
- If one of the OnStar® buttons is pressed or stuck for 15 seconds or greater, the VCIM will set this DTC.

Action Taken When the DTC Sets

- The OnStar® status LED turns red.
- No calls can be placed.
- The VCIM 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 100 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 inside rearview mirror.
2. Ignition ON, test for 9.8-10.2 volts between the keypad supply voltage circuit terminal 12 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 VCIM.
    - If greater than the specified range, test the supply voltage circuit for a short to voltage. If the circuit tests normal, replace the VCIM.
3. Ignition OFF, test for 1 volt between the keypad signal circuit terminal 11 and ground.
    - If greater than the specified range, test the keypad signal circuit for a short to voltage or open/high resistance. If the circuit tests normal, replace the VCIM.
4. Ignition ON, test for 9.8-10.2 volts between the keypad supply voltage circuit terminal 12 and the keypad signal circuit terminal 11.
    - If less than the specified range, test the keypad signal circuit for an open/high resistance. If the

circuit tests normal, replace the VCIM.

Component Testing

1. Ignition OFF, disconnect the harness connector at the inside rearview mirror.
2. Test for infinite resistance between the keypad supply voltage circuit terminal 12 and the keypad signal circuit terminal 11.
   - If less than the specified range, replace the inside rearview mirror.
3. Test for 1.4K-1.6k ohms between the keypad supply voltage circuit terminal 12 and the keypad signal circuit terminal 11 while pressing the black phone button.
   - If not within the specified range, replace the inside rearview mirror.
4. Test for 2.7K-3.3k ohms between the keypad supply voltage circuit terminal 12 and the keypad signal circuit terminal 11 while pressing the blue On-Star® button.
   - If not within the specified range, replace the inside rearview mirror.
5. Test for 11.7K-14.3k ohms between the keypad supply voltage circuit terminal 12 and the keypad signal circuit terminal 11 while pressing the red emergency button.
   - If not within the specified range, replace the inside rearview mirror.

- If the inside rearview mirror tests normal, go to **circuit / system testing**.

Repair Procedures

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

- **Inside Rearview Mirror Replacement**
- **Control Module References** for VCIM replacement, setup, and programming

DTC B2483 OR B2484

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 B2483 00

GPS Sensor Circuit Low

DTC B2484 00

GPS Sensor Circuit Open

Circuit/System Description

The navigation radio receives information from a specific navigation antenna located on the outside of the vehicle. The navigation antenna is connected to the vehicle communication interface module (VCIM) via a shielded coaxial cable. The antenna cable also provides a path for DC current for powering the antenna.

Conditions for Running the DTC

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

Conditions for Setting the DTC

- The VCIM does not detect a navigation signal.
- The above conditions are present for greater than 1 second.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

- The VCIM detects the presence of a navigation 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**

Circuit/System Testing

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

1. Ignition OFF, disconnect the cellular antenna coax from the VCIM module and the cellular antenna.
2. Ignition ON, test for less than 1 volt 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 volt 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 of resistance at the cellular antenna coax center terminal from end to end.
    - If greater than specified value, replace the cellular antenna coax cable.
7. Test for less than 5 ohms of resistance at the cellular antenna coax outer shield from end to end.
    - If greater than specified value, replace the cellular antenna coax cable.
8. Test for infinite resistance between the antenna coax center terminal and the outer shield.
    - If less than specified value, replace the cellular antenna coax cable.
9. If coax cable tests normal, test or replace the cellular antenna.

Repair Procedures

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

- **Cellular Communications/Digital Radio Antenna Replacement**
- **Control Module References** for VCIM replacement, setup, and programming

DTC U1500

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 U1500

Inter-Device Dedicated Bus Malfunction

Circuit/System Description

This DTC indicates an internal fault and is set within the vehicle communication interface module (VCIM). No external circuits are involved.

Conditions for Running the DTC

The microprocessor runs the program to detect an internal fault during module power up and every 10 seconds thereafter until the module re-enters the sleep mode.

Conditions for Setting the DTC

The VCIM detects an internal communication malfunction.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

- A current DTC clears when the malfunction is no longer present.
- A history DTC clears after 50 malfunction-free ignition cycles.

Diagnostic Aids

The diagnostic procedure used for DTC U1500 in OnStar® systems with single module generations of OnStar® differ greatly from previous generations with 2 modules. While these older generations denoted a failure of the 3 wire bus between the modules by setting a U1500, single module OnStar® systems use this DTC to denote an internal module failure. The determination of whether a 1 or 2 module generation of OnStar® is used should be confirmed. Refer to **OnStar Description and Operation**.

Reference Information

Schematic Reference

OnStar 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**
- **OnStar Description and Operation**

Circuit/System Verification

1. Ignition ON, verify DTC U1500 is set as current.
    - If DTC U1500 is not current, refer to **Testing for Intermittent Conditions and Poor Connections** .
2. Replace the VCIM.

Repair Procedures

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

Control Module References for VCIM replacement, setup, and programming

SYMPTOMS - CELLULAR COMMUNICATION

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

1. Perform the **Diagnostic System Check - Vehicle** . Before using the Symptom Tables, verify that all of the following are true:
    - There are no DTCs set.
    - The control module 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**.
3. Perform the **OnStar Symptom Diagnosis**. This symptom table will enable the user to verify the customer complaint and narrow it to its source.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the system. Refer to **Checking Aftermarket Accessories** .
- Inspect the easily accessible or visible system components for obvious damage or conditions which 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:

- **OnStar One or More Buttons Inoperative**
- **OnStar Call Center Remote Function Requests Inoperative**
- **Unable to Contact OnStar Call Center**
- **OnStar Microphone Inoperative - Caller Cannot Be Heard**
- **OnStar Voice Recognition Inoperative**
- **OnStar Steering Wheel Control Functions Inoperative**
- **OnStar Button LED Inoperative**
- **No (or Noisy) OnStar Audio**
- **OnStar Global Positioning System (GPS) Data Not Current or Inaccurate**

SYMPTOMS - ENTERTAINMENT

IMPORTANT: The following steps must be completed before using the Symptom tables.

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

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the Entertainment 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:

- **Audio System Troubleshooting Hints**
- **Radio Poor Reception**
- **Digital Radio Poor or No Reception**
- **Radio Displays LOC, LOCKED, or CODE**

- **Radio Displays CLN or CLEAN**
- **Radio Displays CAL or CAL ERR**
- **Speaker Malfunction**
- **Radio Audio Inoperative at Rear Seat Audio (RSA) Control**

SYMPTOMS - NAVIGATION SYSTEMS

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

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

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the navigation system components. Refer to **Checking Aftermarket Accessories** .
- Inspect the 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:

- **Navigation System - Vehicle Position Indicator Inoperative or Erratic**
- **No Global Positioning System (GPS) Reception**

AUDIO SYSTEM TROUBLESHOOTING HINTS

Tools Required

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

Many conditions that affect radio operation may be corrected without removing the radio from the car. Verify the condition, and follow the diagnostic procedures in order to isolate and correct the condition. In order to properly diagnose any audio system problems, ensure that you have a fully charged battery.

Preliminary Inspections

IMPORTANT: When testing the audio system for poor reception or noise, the vehicle should be outside away from metal buildings and utility lines, with the hood and rear compartment closed.

- Check for any aftermarket equipment that may have been installed on the vehicle. If aftermarket equipment is found disconnect it and check if the audio noise is still present.

  Inspect that the antenna connector and the antenna coaxial cable are clean and tight.

- For reception concerns, first determine if the customer is within the listening area of the stations they are attempting to receive.
- Stations at the lower end of the FM band are more susceptible to audio noises than stations at the higher end.
- If the noise is only from one speaker check for the following before speaker replacement:
  - Isolate the noise using the **J 39916-A** . See **Special Tools**.
  - Inspect the speaker connections to ensure they are clean and tight. Refer to **Testing for Intermittent Conditions and Poor Connections** .
  - Inspect for a loose or incorrectly installed speaker or surrounding trim. Loose trim can cause a buzz or flutter which sounds like a malfunctioning speaker.
- Ignition noise on the FM band may be an indication of an ignition system problem.
- Inspect that all vehicle grounds are clean, tight and free of corrosion.
- Inspect the rear defogger grid lines for large breaks or dark spots.
- Inspect the connections at the radio antenna module (if equipped) to ensure that they are clean and tight.
- Compare the customers vehicle to another of similar model and audio system to determine if the condition is abnormal.

Identifying Concerns

1. In order to isolate the source of the noise/poor reception, identify the ignition switch position that the concern is most noticeable:
   1. Turn the ignition switch to the accessory position.
   2. Turn ON the radio.
   3. Seek up 88-108 FM then 550-1600 AM.
   4. Record the number of valid radio stations where the tuner stops.
   5. Repeat these steps with the ignition ON, and the engine OFF then again with the engine running.
2. Return the ignition switch to the position that the concern was most noticeable.
3. Remove fuses or circuit breakers one at a time until the noise has been eliminated.
4. Identify what systems or components are powered by the fuse.
5. Reinstall all fuses and circuit breakers.
6. Disconnect the components powered by the fuse one at a time until the concern has been eliminated.

Corrective Action

- Inspect the ground integrity of the component or system causing the noise.
- Malfunctioning and marginal components such as relays and solenoids may cause noise and/or poor reception.
- Always use a braided ground strap when applying additional grounds and keep the ground strap as short as possible.
- If the noise source is found to be coming from the vehicle harness:
  - Route the antenna cable separately from the wire harness that is emitting the noise.
  - Use aluminum or nickel tape in order to shield the antenna cable. Attempt variations of the following repairs:
    - Add only aluminum or nickel tape before adding a ground strap to the tape.
    - Wrap a ground strap 360 degrees around the tape, securing the other end of the strap to chassis ground.

IMPORTANT: When installing suppression devices, signal wires such as sensor and communication circuits should not be suppressed. Battery and ignition voltage circuits are the best choices for suppressing.

- Capacitors work best on switch pops and low frequency noise.
- Filters work best on high frequency whines and static.
- After adding any suppression device, inspect all of the vehicle systems (including those not related to the audio system) for proper operation and function.
- Whenever possible, make a test harness that includes filters or capacitors. Always inspect the effectiveness and operation before permanent installation.
- If an audible pop is caused due to operating a switch, perform the following repairs as necessary:
  - Add a capacitor across the contacts of the switch.
  - Add a capacitor from the battery positive voltage (B+) side of the switch to chassis ground.
  - Add a capacitor from the ground side of the switch to chassis ground.
- Use the following available noise suppression devices:
  - 220 micro farad (50 V) capacitor GM P/N 1227895-Works well for ignition system related noise.
  - 0.47 micro farad capacitor GM P/N 1227894-Works well for switches and relays.
  - Feed through capacitor GM P/N 477371-Works well for high current situations.
  - Filter package GM P/N 1224205-Works well for low current situations.
  - Fuel pump suppressor GM P/N 25027405
  - 53.34 cm (21 in) braided ground strap GM P/N 8910791
  - 48.26 cm (19 in) braided ground strap GM P/N 6286800
  - 26.67 cm (10.5 in) braided ground strap GM P/N 6287160
  - 21.59 cm (8.5 in) braided ground strap GM P/N 12091511

Generator Whine Concerns

1. Inspect the ground terminal and cable for high resistance.
2. Inspect the generator and brackets for loose or coated mounting bolts.
3. Inspect that the ground straps between the engine and the frame are clean and tight.
4. If the noise is still present, inspect the charging system for proper operation.
5. Install a filter GM P/N 1224205 in the battery voltage feed circuit to the radio.
6. If the noise is not eliminated, install the filter in each following variation:
    - Install the filter with the single wire side toward the radio and the ground wire attached to chassis ground.
    - Remove the ground to the filter.
    - Reverse the filter so the 2-wire side is toward the radio with the ground wire attached to chassis ground.
    - Remove the ground from the filter.
7. If the filter GM P/N 1224205 causes a delay when turning the radio ON or OFF, or other problems, remove the filter and install a 0.47 micro farad capacitor to chassis ground.
8. Before reassembling the vehicle, remove any unneeded filters.
9. Test the functionality all of the vehicle systems (including those not related to the audio system) for proper operation and function.

VIDEO ENTERTAINMENT SYSTEM TROUBLESHOOTING HINTS

Schematic Reference: Video System Schematics

- Many conditions that affect video system operation may be corrected without removing the radio, the digital video disc (DVD) player or the video entertainment overhead console from the vehicle. Make sure to understand all features of system operation before beginning the diagnosis of the system. Verify the condition and follow the diagnostic procedures in order to isolate and correct the condition.
- Be sure the vehicle battery is fully charged before beginning video entertainment system diagnosis.

Video or Audio Distortion

The manufacturing process for producing DVDs does not have the same quality control processes in place that compact disk manufacturing does. If there are video or audio quality problems with an individual DVD, try playing that disk in another DVD player. If the quality is poor for both players, return the disk to the place of purchase and request an exchange. If the quality problem is only seen in one of the players, examine the disk for scratches dirt or smudges and attempt to clean the disk with one of the disk cleaning systems that are commercially available.

Video or audio distortion during auxiliary playback can often be attributed to the DC to AC inverter that is used to power the auxiliary device. The power inverters tend to introduce noisy signals into the vehicle electrical system.

Video Entertainment System Wireless Headphone Inoperative

IMPORTANT: The following information lists the most probable cause of the concern to the least probable cause followed by the appropriate test for that condition.

1. Volume control on the wireless headphone set is turned all the way down. Adjust the volume control on the headphones.
2. Dead batteries in the wireless headphone set. Turn on power to the headphone set. If the headset indicator does not turn on, replace the batteries in the headset as needed.
3. Faulty headphone set. Test the operation of the system using a known good headphone set. If operation is OK, replace the vehicle headphone set.

Video Entertainment System Remote Control Inoperative

The buttons on the video remote control do not operate the video disc player but the buttons on the video disc player operate normally.

IMPORTANT: The following information lists the most probable cause of the concern to the least probable cause followed by the appropriate test for that condition.

1. Dead batteries in the video remote control. Replace the dead batteries.
2. Faulty remote control. Test the operation of the system using a known good remote control. If operation is OK, replace the remote control.

Discs Will Not Eject

1. Attempt to remove the CDs/DVDs from the radio by pushing the "Eject" button on the radio. If there is a "chatter" noise, go to step two. If there is no chatter noise and the discs will not eject from the radio, send the radio to your authorized Electronic Service Center for repair.
2. Remove the radio from the Instrument Panel of the vehicle but do not remove the electrical connectors. Refer to **Radio Replacement**.
3. Some versions of these radios have a 9.5 mm x 13 mm oval hole on the top cover of the radio, near the back of the case. If the radio being serviced has this hole, proceed to step four. Otherwise the radio will need to be returned to your authorized Electronic Service Center for repair.
4. Push the "Eject" button. While the discs are attempting to eject, insert a plastic pen cap, or similar plastic object into the hole to assist the top disc out of the radio.
5. After the top disc is removed, push the "Eject" button again to remove the bottom disc.
6. Check the operation of the radio to see if a CD or DVD can be inserted and then ejected. If a CD or DVD can be inserted and ejected from the radio, then reinstall the radio into the Instrument Panel. If a CD or DVD cannot be inserted and then ejected from the radio, send the radio to your authorized Electronic Service Center for repair.

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 antenna signal circuit is a coaxial cable that carries the radio signal information received by the antenna. 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

Radio/Audio System Description and Operation

Electrical Information Reference

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

Tools Required

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

Circuit/System Verification

Make sure the vehicle is outside in an area with an unobstructed view of the southern sky. Turn ON XM radio. Tune the radio to satellite channel 1. If the reception is not clear, contact XM at 1-800-852-9696 to verify customer account status or possible network problems.

Circuit/System Testing

IMPORTANT: Check for the proper operation of the OnStar® System before using this diagnostic. Address any concerns with the OnStar® System prior to diagnosing or repairing the XM radio concern.

1. Ignition OFF, disconnect the antenna coax from the digital radio receiver (DRR). Connect the **EL-48028** to the DRR. See **Special Tools**.
2. Turn the ignition ON, radio ON tuned to XM. Verify XM reception has improved.
    - If the reception is not improved, replace the DRR.
3. Ignition OFF. Disconnect the DRR antenna from the coaxial cable. Test the resistance of the antenna coaxial cable center conductor from end to end. Verify the resistance is less than 5 ohms.
    - If the resistance is greater than 5 ohms, replace the antenna coaxial cable.
4. Test the resistance of the antenna coaxial cable outer shield from end to end. Verify the resistance is less than 5 ohms.
    - If the resistance is greater than 5 ohms, replace the antenna coaxial cable.
5. Test the resistance of the antenna coaxial cable between the center conductor and the outer conductor. Verify there is infinite resistance between both conductors.
    - If there is less than infinite resistance between the inner conductor and the outer conductor of the coaxial cable, replace the antenna coaxial cable. If the coaxial cable tests normal, replace the digital radio antenna.

Repair Procedures

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

- **Digital Radio Antenna Cable Replacement**
- **Cellular Communications/Digital Radio Antenna Replacement**
- **Control Module References** for DRR replacement, setup and programming

DIGITAL RADIO RECEIVER SETUP

XM™ Activation

IMPORTANT: After replacement of an XM™ receiver, call XM™ radio to deactivate the receiver that has been removed from the vehicle. The vehicle must be parked in view of a satellite within 24 hours after an activation call.

1. Radio ON, tune to the XM™ channel 0 and record the radio ID. The radio ID will be required for activation of the new receiver.
2. Call XM™ radio to deactivate the faulty receiver and activate the new receiver.
    - US: 1-800-556-3600
    - Canada: 1-877-438-9677
3. Park the vehicle outside in an area with an unobstructed view of the southern sky.
4. Leave the vehicle outside with the ignition switch in the ACC position and the radio ON for 30 minutes to activate XM™ service.
5. Once activated, the radio will receive the remaining XM™ channels.

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 navigation antenna is connected to the vehicle communication interface module (VCIM) with a RG-174 coax cable. The VCIM polls the data from the navigation antenna once every second.

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 driving through tunnels or parking structures while making an OnStar® keypress will restrict the 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

1. Observe the scan tool GPS Signal Status Indicator parameter for at least 10 seconds. Verify the indicator displays Yes.
   - If the indicator does not display Yes, refer to **Circuit / System Testing**.
2. Call and verify the OnStar advisor receive GPS data.
   - If the advisor did not receive GPS data and the call was a 'fail to voice', contact the GM Technical Assistance Center.
   - If the advisor did not receive 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 VCIM.

Circuit/System Testing

IMPORTANT: Vehicle may be equipped with sectioned coax. Test each section and replace only the faulty section, not the entire length or coax.

1. Ignition OFF, disconnect the navigation antenna coax from the VCIM module and the navigation antenna.
2. Ignition ON, test for less than 1 volt between the antenna coax center terminal and ground.
   - If greater than the specified range, replace the antenna coax.
3. Test for infinite resistance between the antenna coax center terminal and ground.
   - If less than the specified value, replace the antenna coax
4. Test for less than 5 ohms of resistance at the antenna coax connector outer shield from end to end.
   - If greater than specified value, replace the antenna coax cable.
5. Test for less than 5 ohms of resistance at the antenna coax center conductor from end to end.
   - If greater than specified value, replace the antenna coax cable.
6. Test for infinite resistance between the antenna coax center terminal and the outer shield.
7. If coax cable tests normal, test or replace the navigation antenna.

Repair Procedures

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

- **Cellular Communications/Digital Radio Antenna Replacement**
- **Control Module References** for VCIM replacement, setup, and programming

ONSTAR MICROPHONE INOPERATIVE - CALLER CANNOT BE HEARD

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 OnStar® vehicle communication interface module (VCIM) receives an audio input signal from the cellular microphone.

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

Ignition ON, press OnStar® Call button. Verify that your voice cannot be heard clearly by the OnStar® Call Center.

Circuit/System Testing

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

2. Ignition ON, test for greater than 9 volts between the signal circuit terminal B and ground.
    - If less than specified value, test the cellular microphone signal circuit for a short to ground, open/high resistance. If the circuit tests normal, replace the VCIM.
3. Test for greater than 9 volts between the cellular microphone signal circuit terminal B and the drain circuit terminal A.
    - If less than specified value, test the drain wire for an open/high resistance. If the circuit tests normal, replace the VCIM.
4. If all circuit test normal, test or replace the cellular microphone assembly.

Repair Procedures

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

- **Mobile Telephone Microphone Replacement**
- **Control Module References** for VCIM replacement, setup, and programming

NAVIGATION SYSTEM - VEHICLE POSITION INDICATOR INOPERATIVE OR ERRATIC

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 vehicle speed signal (VSS) circuit from the instrument cluster to the navigation radio provides vehicle speed information to the radio for the purpose of updating the vehicle position indicator on the navigation screen.

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 Verification

Radio ON, press the NAV button to switch to the navigation screen on the radio. Drive the vehicle for at least 15 seconds at greater than 15 mph. Verify that the navigation screen shows that the vehicle is moving.

Circuit/System Testing

1. Ignition OFF, disconnect connector X2 at the radio.
2. Test for the vss signal between terminal E and ground while driving the vehicle.
    - If the vss signal is not present test the vss circuit for an open.
3. If the circuit tests normal, replace the radio.

Repair Procedures

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

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

NO (OR NOISY) ONSTAR AUDIO

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 vehicle communication interface module (VCIM) is a 3-watt cellular device that allows the user to communicate data and voice signals over the national cellular network. It is powered by a fused battery positive voltage circuit, connected through the vehicle wiring to the inside rearview mirror containing the 3-button assembly and the radio. The VCIM receives its cellular signals by means of coax cables to the cellular and navigation antennas. Ground for the module is accomplished by means of dedicated circuits that are routed with body wiring systems to chassis ground points. The module houses 2 modems, one to process global positioning system (GPS) data, and the other for cellular information. Satellites orbiting earth are constantly transmitting signals of their current location, from which the OnStar® system is able to pinpoint its own location. The

navigation antenna receives these GPS signals and provides the data to the VCIM to be processed. The VCIM communicates with the rest of the vehicle over the class 2 or GMLAN serial data bus, depending upon the serial data architecture of the vehicle. The ignition state is determined by the VCIM through class 2 or GMLAN messaging. The module also has the capability of commanding the horn, initiating door lock/unlock, and operating the exterior lamps using the serial data circuits. When an OnStar® keypress is made, a serial data message is sent to the audio system to mute all radio functions and transmit OnStar® originated audio. After the audio system is muted, the OnStar® signals are transmitted to the audio system on the left audio signal circuit (+) and the audio common signal circuit. The cellular modem connects the OnStar® 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 antenna and cellular antenna coax.

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

1. Ignition ON, radio ON, set volume to comfortable level and press OnStar Center Call button.
2. Verify Connecting to OnStar message is heard clearly through the audio system.
   - If OnStar message is not heard, go to **Circuit/System Testing**.
3. Tune radio to a known good station and verify that audio is heard clearly through all speaker channels.
   - If no, refer to **Speaker Malfunction**.
4. If the radio is replaced, the new radio must have the setup procedure performed. Refer to **Radio Setup**.

Circuit/System Testing

IMPORTANT:

- **If the audio common circuit is shorted to voltage the VCIM has been damaged and requires replacement.**

- **If the vehicle is equipped with the On-Star TTY Interface Module (OTIM), disconnect the OTIM components and restore the connections with the VCIM before continuing diagnosis. If the concern is no longer present with OTIM disconnected, Replace the OTIM system.**

1. Disconnect connector X2 from the VCIM.
2. Test for high resistance at the left audio signal circuit (+) terminal 1 for an open or for a short to ground or for a short to voltage.
3. Test for a high resistance, or for a short to voltage at the audio common circuit terminal 2 for an open.
4. If the circuits test normal, test or replace the VCIM.

Repair Procedures

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

- **Cellular Communications/Digital Radio Antenna Replacement**
- **Control Module References** for VCIM 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 (GPS) antenna is connected to the navigation radio by a shielded coaxial cable. The GPS antenna is powered through the same coaxial cable used to send signals to the navigation system. The antenna cable also provides a path for DC current for powering the GPS 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

IMPORTANT: The global positioning system (GPS) requires a clear line of sight to the sky to operate properly. In most cases the GPS will not have reception near tall buildings or inside structures.

1. Ignition OFF, disconnect the coax harness connectors at the navigation radio and the GPS antenna.
2. Test for less than 5 ohms between the two ends of the coax cable center conductor.
   - If greater than the specified range, replace the GPS antenna coax cable.
3. Test for less than 5 ohms between the two ends of the coax cable outer shield.
   - If greater than the specified range, replace the GPS antenna coax cable.
4. Test for infinite resistance between the coax center conductor and the outer shield.
   - If less than the specified range, replace the GPS antenna coax cable.
5. Connect the coax harness connector at the navigation radio.
6. Ignition ON, test for 4.0-5.5 volts between the coax center conductor and the outer shield.
   - If not within the specified range, replace the navigation radio.
7. If all circuits test normal, replace the GPS antenna.

Repair Procedures

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

- **Global Positioning System (GPS) Antenna Replacement**
- **Control Module References** for Radio replacement, setup, and programming

ONSTAR BUTTON LED INOPERATIVE

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 Signal	1	1	1	-
Keypad Red LED Signal	1	1	1	-
Keypad Signal	B2482 00	B2482 00	B2482 00	-
Inside Rearview Mirror Ground	-	2	-	-

1. OnStar Button LED Inoperative
2. OnStar One Or More Buttons Inoperative

Circuit Description

The OnStar® status LEDs are located to the right of the emergency button on the inside rearview mirror 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 vehicle communication interface module (VCIM) via the keypad green LED signal circuit and the keypad red LED signal 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

1. Ignition ON, command the Green LED ON and OFF with a scan tool while observing the green LED on the inside rearview 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 inside rearview mirror. The red LED should turn ON and OFF when commanded.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the inside rearview mirror.
2. Ignition OFF, doors closed, interior lamps OFF, test for less than 5 ohms between the inside rearview mirror ground circuit terminal 8 and ground.
    - If greater than specified range, test the ground circuit for an open/high resistance.
3. Ignition ON, command the appropriate LED OFF with a scan tool. Test for less than 1 volt between the appropriate LED signal circuit terminal and ground.
    - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the VCIM.
4. Command the appropriate LED ON with a scan tool. Test for greater than 9 volts between the appropriate LED signal circuit terminal and ground.
    - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the VCIM.
5. If all circuits test normal, replace the inside rearview mirror.

Repair Procedures

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

- **Inside Rearview Mirror Replacement**
- **Control Module References** for VCIM replacement, setup, and programming

ONSTAR CALL CENTER REMOTE FUNCTION REQUESTS INOPERATIVE

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 vehicle communication interface module (VCIM) is a 3-watt cellular device that allows the user to communicate data and voice signals over the national cellular network. It is powered by a fused battery positive voltage circuit, connected through the vehicle wiring to the inside rearview mirror containing the 3-button assembly and the radio. The VCIM receives its cellular signals by means of coax cables to the cellular and navigation antennas. Ground for the module is accomplished by means of dedicated circuits that are routed with

body wiring systems to chassis ground points. The module houses 2 modems, one to process global positioning system (GPS) data, and the other for cellular information. Satellites orbiting earth are constantly transmitting signals of their current location, from which the OnStar® system is able to pinpoint its own location. The navigation antenna receives these GPS signals and provides the data to the VCIM to be processed. The VCIM communicates with the rest of the vehicle over the class 2 or GMLAN serial data bus, depending upon the serial data architecture of the vehicle. The ignition state is determined by the VCIM through class 2 or GMLAN messaging. The module also has the capability of commanding the horn, initiating door lock/unlock, and operating the exterior lamps using the serial data circuits. When an OnStar® keypress is made, a serial data message is sent to the audio system to mute all radio functions and transmit OnStar® originated audio. After the audio system is muted, the OnStar® signals are transmitted to the audio system on the left audio signal circuit (+) and the audio common signal circuit. The cellular modem connects the OnStar® 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 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 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.

1. Observe that the horn, lights, and the doors locks on the vehicle operate properly.
    - If the applicable system does not operate properly, go to **Diagnostic Starting Point - Horns** or **Diagnostic Starting Point - Lighting Systems** or **Diagnostic Starting Point - Vehicle Access**
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 the remote functions do not work, use the scan tool to access the STID and ESN and contact the General Motors Technical Assistance Center

Repair Procedures

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

Cellular Communications/Digital Radio Antenna Replacement

ONSTAR ONE OR MORE BUTTONS INOPERATIVE

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 OnStar® button assembly consists of 3 buttons, Call/Answer, OnStar® Call Center, and OnStar® Emergency. Ten volts is supplied to the button assembly on the keypad supply voltage circuit. Each of the buttons, when pressed, completes the circuit across a resister allowing a specific voltage to be returned to the vehicle communication interface module (VCIM) on the keypad signal circuit. Depending upon the voltage range returned, the VCIM is able to identify which button has been pressed.

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

All Onstar® keypad buttons should operate normally when pressed.

Circuit/System Testing (One or More Buttons Inoperative)

If some OnStar® buttons are inoperative but not all, replace the inside rearview mirror.

Circuit/System Testing (All Buttons Inoperative)

1. Ignition OFF, disconnect the harness connector at the inside rearview mirror.
2. Ignition ON, test for 9.8-10.2 volts between the keypad supply voltage circuit terminal 12 and ground.
    - If less or more than the specified value, repair short to ground, open or replace the VCIM.
3. Ignition OFF, reconnect the harness connector at the inside rearview mirror.
4. Disconnect the X1 VCIM harness connector.
5. Test for 500 to 20K ohms of resistance between X1 VCIM harness connector terminal 6 and 11 when each of the keypad button is pressed.
    - If resistance is within the specified value when any of the keys are pressed replace the VCIM.
6. Disconnect the harness connector at the inside rearview mirror.
7. Test for infinite resistance between the inside rearview mirror connector terminal 11 and ground.
    - If less than infinite resistance repair short to ground on the keypad signal circuit.
8. Test for less than 1 ohm between the X1 VCIM connector terminal 11 and the inside rearview mirror connector terminal 11.
    - If more than the specified value repair open or high resistance on the keypad signal circuit.
    - If all circuits test normal, replace the keypad.

Repair Procedures

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

- **Inside Rearview Mirror Replacement**
- **Control Module References** for VCIM replacement, setup, and programming

ONSTAR RECONFIGURATION (WITH TIS 2 WEB GEN 4 & LATER)

IMPORTANT:

- **The vehicle communication interface module (VCIM) has a specific set of unique numbers that tie the module to a specific vehicle. These numbers, the 10-digit station identification (STID) and 11-digit electronic serial number (ESN), are used by OnStar® and the cellular network to identify the specific vehicle. Because these numbers are exclusive to the vehicle identification number of the vehicle, these parts should NOT be exchanged with those of another vehicle. After replacing the VCIM, it is essential to reconfigure the OnStar® system. Failure to reconfigure the system will result in an additional customer visit for repair. DO NOT press and hold the white dot button on the keypad as it will not reset this version of the OnStar® system and may result in a DTC to be set, a red LED and limited or incomplete OnStar® services. Use of the TIS 2 Web SPS application and the Tech 2 are required in order to perform the VCIM configuration and setup procedure for this vehicle. The configuration and set-up procedure is now a two step process which enables an automated activation by the OnStar Center, without a button press by the technician to the center.**
- **It may take up to 24 hours for the OnStar® service to become fully activated after performing the TIS 2 Web and Tech 2 setup procedures. Perform the OnStar® Activation procedure only once. Repeat attempts at performing the procedure may result in a delay of the activation process.**

1. Connect the Tech 2 to the vehicle.
2. Connect the Techline Information System (TIS) terminal to the Tech 2.
3. Select the OnStar® Activation programming option using the service programming system (SPS).
4. Upon completion of the OnStar® Activation programming event, disconnect the TIS terminal from the Tech 2 and perform the VCIM/OnStar Set-up Procedure using the Tech 2. The set up procedure is located under the special function menu option.
5. The default language for the new VCIM is English. Changing the language capability to French or Spanish is supported by service programming system (SPS) and by Tech 2 special functions. Changing the language capability is also dependent on the generation of the replacement OnStar module.

Inform the customer that it may take up to 24 hours for the OnStar® service to become fully activated after performing the TIS 2 Web and Tech 2 setup procedures.

ONSTAR STEERING WHEEL CONTROL FUNCTIONS INOPERATIVE

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 (OPC) feature is in use. If the "Talk" or "Mute" button (depending upon the vehicle) on the steering wheel controls is depressed during an OPC call, the vehicle communication interface module (VCIM) receives the message on the class 2 or GMLAN serial data bus from either the radio, driver information module, or body control module (BCM). This message is interpreted as a request to turn any spoken numbers into dual tone multi-frequency (DTMF) 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, dash integration module (DIM), or BCM. In the event the OnStar® steering wheel control functions are inoperative, technicians should refer to **Steering Wheel Controls Inoperative** , to begin diagnosis of the steering wheel control concern.

ONSTAR SYMPTOM DIAGNOSIS

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 vehicle communication interface module (VCIM) is a 3-watt cellular device that allows the user to communicate data and voice signals over the national cellular network. It is powered by a fused, battery positive, voltage circuit connected through the vehicle wiring to the 3-button assembly and the radio, and attached by means of coax cables to the cellular and navigation antennas. Ground for the module is accomplished by means of dedicated circuits that are routed with body wiring systems to chassis ground points. The module houses 2 modems, one to process global positioning system (GPS) data, and the other for cellular information. Satellites orbiting earth are constantly transmitting signals of their current location, from which the OnStar® system is able to pinpoint its own location. The navigation antenna receives these GPS signals and provides the data to the VCIM to be processed. The VCIM communicates with the rest of the vehicle over the class 2 or GMLAN serial data bus, depending upon the serial data architecture of the vehicle. The ignition state is determined by the VCIM through class 2 or GMLAN messaging. The module also has the capability of commanding the horn, initiating door lock/unlock and operating the exterior lamps using the serial data circuits. When an OnStar® keypress is made, a serial data message is sent to the audio system to mute all radio functions and transmit OnStar® originated audio. After the audio system is muted, the OnStar® signals are transmitted to the audio system on the left audio signal circuit, and the audio common signal circuit. The cellular modem connects the OnStar® 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 antenna and cellular antenna coax.

Diagnostic Aids

- The customer concern may have been due to a lack of cellular service in a given area or a failure in the National Cellular Network infrastructure that has since been corrected.
- If the prompt OnStar Request Ended is heard without pressing the white dot button at the end of an OnStar® keypress, the OnStar® system at one time made a successful cellular connection, but was unable to complete the call. If repeated calls are placed with this result, contact the General Motors Technical Assistance Center.
- An inaccurate or aged GPS position may have been due to the temporary loss of GPS signal reception by

the vehicle in instances, such as driving through tunnels or parking structures which restrict the navigation antenna from a clear view of the satellites in the sky.

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

IMPORTANT:

- **To successfully diagnose and repair the OnStar® system it is necessary to comprehend its operation. Technicians should read and understand the OnStar Description and Operation before attempting to repair an OnStar® system. This symptom below will enable the user to verify the customer complaint and narrow it to its source. If there is a concern with voice recognition or OnStar® steering wheel control function, technicians should proceed directly to the applicable diagnostic in Symptoms - Cellular Communication.**
- **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.**
- **It is necessary to inform the OnStar® Call Center advisor that this call is for vehicle diagnostic purposes.**

1. Ignition ON, observe that the OnStar® status LED turns green.
    - If the LED does not turn green, refer to **OnStar Button LED Inoperative**.
2. Radio ON, set the volume to a comfortable level.
3. Press the OnStar® Call Center button and observe that the OnStar LED blinks.

- If the OnStar® LED does not blink, refer to **OnStar One or More Buttons Inoperative**.

4. Listen that the radio muted and the Connecting to OnStar message played through the audio system.
   - If the radio did not mute or the Connecting to OnStar message did not play, refer to **No (or Noisy) OnStar Audio**.
5. Wait approximately 10 seconds, then end the call by pressing the white dot button and observe the OnStar LED stops blinking.
   - If the OnStar® LED continues blinking, refer to **OnStar One or More Buttons Inoperative**.
6. Press the OnStar® Call Center button and ensure that a connection was made with OnStar®.
   - If the Unable to Contact OnStar® was heard, refer to **Unable to Contact OnStar Call Center**.
   - If the OnStar® Request Ended was heard, go to **Diagnostic Aids**.
7. Ensure that OnStar® Call Center advisor can hear your voice clearly.
   - If the advisor cannot hear you clearly, refer to **OnStar Microphone Inoperative - Caller Cannot Be Heard**.
8. Ensure that OnStar® Call Center advisor received a data transfer from the vehicle.
9. Ensure with the OnStar® Call Center advisor the vehicle has been configured.
   - If the vehicle has not been configured, refer to **OnStar Reconfiguration (with TIS 2 Web Gen 4 and later)**
10. Verify with the OnStar® Call Center advisor that the vehicle identification number (VIN) which they have on record matches the actual VIN.
11. Verify that your position with the OnStar® Call Center advisor is within a reasonable distance from the actual location of the vehicle.
    - If not within a reasonable distance, refer to **OnStar Global Positioning System (GPS) Data Not Current or Inaccurate**.
12. Verify with the OnStar® Call Center advisor that the GPS position is marked as Current.
    - If not current, refer to **OnStar Global Positioning System (GPS) Data Not Current or Inaccurate**.
13. Ensure that the customer concern is the inability of the OnStar® Call Center to perform remote functions.
    - If the OnStar® Call Center is able to perform remote functions, go to **Diagnostic Aids**.
14. Refer to **OnStar Call Center Remote Function Requests Inoperative**.

Repair Procedures

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

Control Module References for VCIM replacement, setup, and programming

RADIO AUDIO INOPERATIVE AT REAR SEAT AUDIO (RSA) CONTROL

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.

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 Testing

1. Center the balance and fade adjustment on the radio.
    - If adjustment of the fade and balance eliminates the concern, review the operation of the radio with the customer.
2. Disconnect the X2 connector of the rear HVAC control module. Connect a DMM between the suspect speaker output circuits (input to the RSA) from the radio. Turn ON the radio and verify there is AC voltage present.
    - If AC voltage is not present, go to **Speaker Malfunction**.
3. Test or repair open, short to ground or short to voltage on the RSA ground circuit and battery positive voltage circuit.
    - If all circuits test normal, replace the rear HVAC control module.

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 Testing

Ignition ON, with a scan tool, reprogram the radio.

- If the radio still displays 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 CLN OR CLEAN

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

Special Tools

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

Circuit/System Verification

Clean the tape head path using **J 39916-A** CD and Cassette Diagnostic Audio Kit. See **Special Tools**.

- If the radio display CLN or CLEAN, 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.

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

Ignition ON, with a scan tool, reprogram the radio.

- If the radio still displays LOCKED 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 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.

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

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.

Diagnosing a poor reception concern will require a systematic approach to isolating the cause. Individual components should each be tested before proceeding with any repair or replacement.

Using a Test Antenna

Use a test mast antenna to check for poor vehicle antenna operation. Disconnect the antenna coax from the radio and plug the test antenna into radio. Make sure the test antenna base is grounded to the vehicle chassis and keep hands off the mast. Check radio reception in an area away from electrical interferences. Tune to several weak and strong AM and FM stations. If the radio reception improved, the problem exists with the vehicle antenna and/or lead-in 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

Circuit/System Testing

Antenna Coaxial Cable Testing

1. The antenna coax is made up of two parts; a coax between the radio and the radio antenna module, and a coax between the radio antenna module and the antenna, which is part of the vehicle rear glass. Disconnect both coax from the radio, radio antenna module, and rear glass.

IMPORTANT: For steps 2-6, perform the tests on each of the disconnected coax cables.

   - If greater than the specified range, replace the antenna coax.
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 terminal from end to end.
   - If greater than the specified range, replace the antenna coax.
4. Test for less than 5 ohms on the antenna coax outer shield from end to end.
   - 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.

Radio Antenna Module Test

1. Inspect the radio antenna module grounding surfaces and the mounting hardware for any corrosion that may cause a poor ground.
   - If corrosion is noted, clean the grounding surfaces or hardware.
2. Ignition OFF, disconnect the harness connector at the radio antenna module.
3. Radio ON, test for B+ between the signal circuit terminal 1 and ground.
   - If less than the specified value, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the radio.
4. If all circuits test normal, test or replace the radio antenna module.

Repair Procedures

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

- **Antenna Cable Replacement**

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

RADIO SETUP

For uplevel radios, setup is completed using the Service Programming System (SPS). Refer to **Service Programming System (SPS)** .

If exchanging the same radio, from one vehicle to another, the VIN from the vehicle receiving the radio needs to be programmed with the scan tool.

For the base radio, use the program VIN procedure available in Special Functions menu of the scan tool. After programming the VIN cycle the ignition key with the retained accessory power (RAP) disabled.

IMPORTANT: The radio setup files will configure the radio amplifier (if equipped), internal equalization settings, and program the vehicle identification number (VIN). Without the following setup procedure, the sound quality and volume of the radio may be degraded.

SPEAKER REPLACEMENT REFERENCE

Component	Repair Instruction
Front Upper Speakers	Refer to **Front Upper Speaker Replacement**
Front Door Speaker	Refer to **Radio Front Side Door Speaker Replacement**
Rear Door Speakers	Refer to **Radio Rear Side Door Speaker Replacement**

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.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Speaker Output (+)/Left Front Low Level Audio Signal (+)	B1025	1	B1025	-
Left Front Speaker Output (-)/Left Front Low Level Audio Signal (-)	B1025	1	B1025	-

Right Front Speaker Output (+)/Right Front Low Level Audio Signal (+)	B1035	1	B1035	-
Right Front Speaker Output (-)/Right Front Low Level Audio Signal (-)	B1035	1	B1035	-
Left Rear Speaker Output (+)/Left Rear Low Level Audio Signal (+)	B1045	1	B1045	-
Left Rear Speaker Output (-)/Left Rear Low Level Audio Signal (-)Rear Low Level Audio Signal (+)	B1045	1	B1045	-
Right Rear Speaker Output (+)/Right Rear Low Level Audio Signal (+)	B1055	1	B1055	-
Right Rear Speaker Output (-)/Right Rear Low Level Audio Signal (-)	B1055	1	B1055	-
1. No sound from speaker				

Circuit/System Description

Each of the audio output channel circuits (+) and (-), at the radio and at the amplifier (if equipped) have a DC bias voltage that is one half of the battery voltage. When using a DMM, each of the audio output channel circuits will measure approximately 6.5V 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. This voltage will vary depending on what type of audio is being listened to, talk or music, and type of music, as well as the volume setting of the system. Low volume and talk settings will measure around 1V AC and less, where constant music may measure 3V AC and slightly higher. In an amplified audio system, these similar AC voltage measurements may be slightly higher on the output of the amplifier, and the typical AC voltage readings at the output of the radio are less than 1V AC.

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

Without Amplifier

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

- If audio is inoperative from all speakers, replace the radio.
- If audio is inoperative from one or more, but not all, speakers or the audio emitted from the speakers is not clear, refer to **Speaker Circuit Malfunction - without Amplifier**.

With Amplifier

Radio ON, verify clear audio is heard from each audio 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 **Speaker Circuit Malfunction - with Amplifier**.

Circuit/System Testing

Speaker Circuit Malfunction - without Amplifier

1. Ignition OFF, inspect the appropriate speaker and the surrounding interior trim for proper and secure mounting. Improper speaker mounting or loose trim may cause an audible buzz or distortion.
    - If the speaker or surrounding interior trim is found to be loose or improperly secured, correctly secure the item.
2. Disconnect the harness connector at the appropriate speaker.
3. Radio ON, test for 5.0-7.5 volts between the signal circuit terminal A and ground.
    - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the radio.
    - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the radio.
4. Test for 5.0-7.5 volts between the signal circuit terminal B and ground.
    - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the radio.
    - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the radio.

5. If all circuits test normal, test or replace the speaker.

Amplifier Circuit Malfunction

1. Ignition OFF, disconnect the X3 harness connector at the amplifier.
2. Test for less than 10 ohms of resistance between the ground circuit terminal 8 and ground.
    - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Ignition ON, verify 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. If the circuit tests normal and the circuit fuse is open, replace the amplifier.
4. Disconnect the X1 harness connector at the amplifier.
5. Radio ON, test for 0.6-1.0 volts between the signal circuit terminal 8 and ground.
    - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the radio.
    - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the radio.
6. If all circuits test normal, replace the amplifier.

Speaker Circuit Malfunction - with Amplifier

1. Ignition OFF, inspect the appropriate speaker and the surrounding interior trim for proper and secure mounting. Improper speaker mounting or loose trim may cause an audible buzz or distortion.
    - If the speaker or surrounding interior trim is found to be loose or improperly secured, correctly secure the item.
2. Disconnect the X2 and X3 harness connectors at the amplifier.
3. Radio ON, test for 5.0-7.5 volts between the appropriate signal circuit terminal listed below and ground.
    - Left front door or tweeter - Connector X2, terminal 3
    - Right front door or tweeter - Connector X2, terminal 1
    - Left rear speaker - Connector X2, terminal 7
    - Left rear subwoofer - Connector X3, terminal 3
    - Right rear speaker - Connector X2, terminal 5
    - Right rear subwoofer - Connector X3, terminal 2
    - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the radio.
    - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the radio.
4. Radio ON, test for 5.0-7.5 volts between the appropriate signal circuit terminal listed below and ground.
    - Left front door or tweeter - Connector X2, terminal 4
    - Right front door or tweeter - Connector X2, terminal 2
    - Left rear speaker - Connector X2, terminal 8

- Left rear subwoofer - Connector X3, terminal 7
- Right rear speaker - Connector X2, terminal 6
- Right rear subwoofer - Connector X3, terminal 6
  - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the radio.
  - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the radio.

5. Ignition OFF, connect the X2 and X3 harness connectors at the amplifier. Disconnect the harness connector at the appropriate speaker.
6. Radio ON, test for 5.0-7.5 volts between the signal circuit terminal A and ground.
   - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the amplifier.
   - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the amplifier.
7. Test for 5.0-7.50 volts between the signal circuit terminal Band ground.
   - If greater than the specified range, test the signal circuit for a short to voltage. If the circuit tests normal, replace the amplifier.
   - If less than the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the amplifier.
8. If all circuits test normal, test or replace the speaker.

Repair Procedures

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

- **Speaker Replacement Reference**
- **Control Module References** for amplifier or radio replacement

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 vehicle communication interface module (VCIM) is a 3-watt cellular device that allows the user to communicate data and voice signals over the national cellular network. It is powered by a fused, battery positive, voltage circuit connected through the vehicle wiring to the 3-button assembly and the radio, and attached by means of coax cables to the cellular and navigation antennas. Ground for the module is accomplished by means of dedicated circuits that are routed with body wiring systems to chassis ground points.

The module houses 2 modems, one to process global positioning system (GPS) data, and the other for cellular information. Satellites orbiting earth are constantly transmitting signals of their current location, from which the OnStar® system is able to pinpoint its own location. The navigation antenna receives these GPS signals and provides the data to the VCIM to be processed. The VCIM communicates with the rest of the vehicle over the class 2 or GMLAN serial data bus, depending upon the serial data architecture of the vehicle. The ignition state is determined by the VCIM through class 2 or GMLAN messaging. The module also has the capability of commanding the horn, initiating door lock/unlock, and operating the exterior lamps using the serial data circuits. When an OnStar® keypress is made, a serial data message is sent to the audio system to mute all radio functions and transmit OnStar® originated audio. After the audio system is muted, the OnStar® signals are transmitted to the audio system on the cellular telephone voice signal circuit, and returned to the module on the cellular telephone voice low reference circuit. The cellular modem connects the OnStar® 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 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. If repeated calls are placed with this result, contact General Motors Technical Assistance Center.

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 fro scan tool information

Circuit/System Verification

IMPORTANT:

- **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.**
- **Placing an emergency call to the OnStar® Call Center should only be made if the diagnosis of the system leads to step 4. Immediately after an OnStar® advisor picks up the call, they should be told that this call is for diagnostic purposes only and there is no emergency.**

1. Press the OnStar® Call Center button. Verify a connection is not made with the OnStar® Call Center.
   - If a connection is made with the OnStar® Call Center, go to **Diagnostic Aids**.
2. Listen for other tones or cellular messages rather than the normal progression tones or the Unable to Contact OnStar® prompt.
   - If no other tones or cellular messages are heard other than the normal progression tones or the Unable to Contact OnStar® prompt, go to **Component Testing**.
3. Record all messages heard from the OnStar® Call Center button press.
4. Press the OnStar® emergency button. Verify a connection to the OnStar® Call Center is made within 10 minutes.
   - If a connection is not made within specified time, go to **Component Testing**.
5. Hear all messages during the course of the tests available, and contact the General Motors Technical Assistance Center.

Component Testing

IMPORTANT: Vehicle may be equipped with sectioned coax. Test each section and replace only the faulty section, not the entire length or coax.

1. Verify that there is no exterior damage to the cellular antenna.
   - If damaged, test or replace the cellular antenna assembly.
2. Disconnect the cellular antenna coax from the VCIM.
3. Disconnect the cellular antenna coax from the cellular antenna.
4. Test for infinite resistance between the center conductor of the coax and the outer metal shield.
   - If different than specified value, replace the cellular antenna coax.
5. Test for less than 1 ohm at the cellular antenna coax center conductor from end to end.
   - If greater than specified value, replace the cellular antenna coax cable.

6. Contact the General Motors Technical Assistance Center.

Repair Procedures

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

Cellular Communications/Digital Radio Antenna Replacement

ONSTAR VOICE RECOGNITION INOPERATIVE

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 vehicle communication interface module (VCIM) is a 3-watt cellular device that allows the user to communicate data and voice signals over the national cellular network. It is powered by a fused, battery positive, voltage circuit connected through the vehicle wiring to the 3-button assembly and the radio, and attached by means of coax cables to the cellular and navigation antennas. Ground for the module is accomplished by means of dedicated circuits that are routed with body wiring systems to chassis ground points. The module houses 2 modems, one to process global positioning system (GPS) data, and the other for cellular information. Satellites orbiting earth are constantly transmitting signals of their current location, from which the OnStar® system is able to pinpoint its own location. The navigation antenna receives these GPS signals and provides the data to the VCIM to be processed. The VCIM communicates with the rest of the vehicle over the class 2 or GMLAN serial data bus, depending upon the serial data architecture of the vehicle. The ignition state is determined by the VCIM through class 2 or GMLAN messaging. The module also has the capability of commanding the horn, initiating door lock/unlock and operating the exterior lamps using the serial data circuits. When an OnStar® keypress is made, a serial data message is sent to the audio system to mute all radio functions and transmit OnStar® originated audio. After the audio system is muted, the OnStar® signals are transmitted to the audio system on the cellular telephone voice signal circuit, and returned to the module on the cellular telephone voice low reference circuit. The cellular modem connects the OnStar® 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 antenna and cellular antenna coax.

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

IMPORTANT: The vehicle must be located in a quiet area.

1. Ignition ON, press OnStar® Call button. Verify that your voice cannot be heard clearly by the OnStar® Call Center.
    - If your voice can not be heard clearly, refer to **OnStar Microphone Inoperative - Caller Cannot Be Heard**.
2. Press the OnStar® Call answer button. Verify that OnStar® system did not recognize any of your hands-free voice commands.
3. Press the OnStar® Call answer button. Verify that OnStar® system did not recognize any of another person voice commands either.
    - If the voice commands are not recognized by OnStar® system, refer to **OnStar Description and Operation**.
4. If the system is operational, but cannot identify certain word commands due to pronunciation, for tips on proper pronunciation refer to **OnStar Description and Operation**.

Repair Procedures

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

Control Module References for VCIM replacement, setup, and programming

REPAIR INSTRUCTIONS

ONSTAR BUTTON ASSEMBLY REPLACEMENT

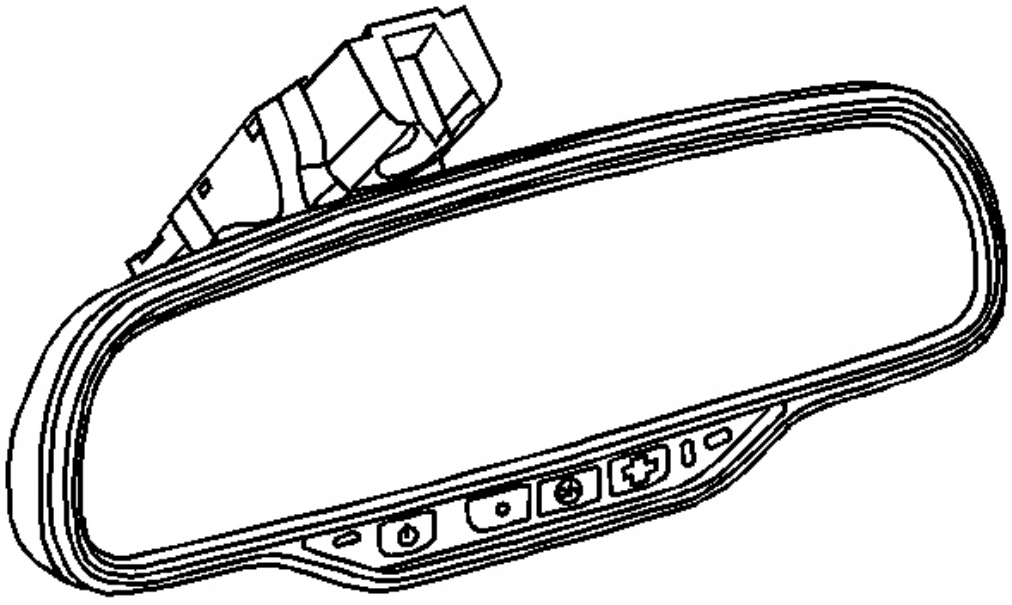


Fig. 10: OnStar Button Assembly
Courtesy of GENERAL MOTORS CORP.

The OnStar ® button assembly located on the inside rearview mirror can not be serviced separately. Should the button assembly need to be replaced, the entire inside rearview mirror assembly will need to be replaced. Refer to **Inside Rearview Mirror Replacement** .

MOBILE TELEPHONE MICROPHONE REPLACEMENT

Removal Procedure

1. Remove the overhead console. Refer to **Roof Console Replacement** .

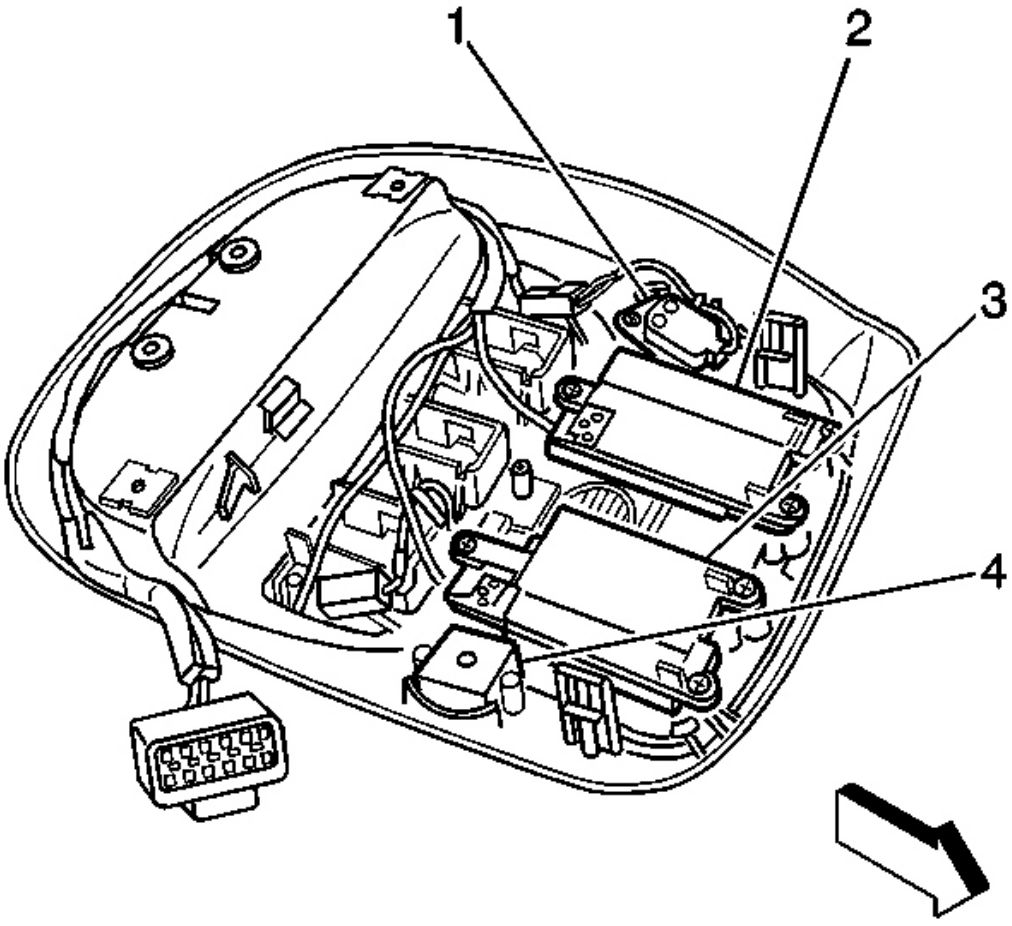


Fig. 11: Identifying OnStar Microphone Components
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the microphone electrical connector to the OnStar® microphone (1).

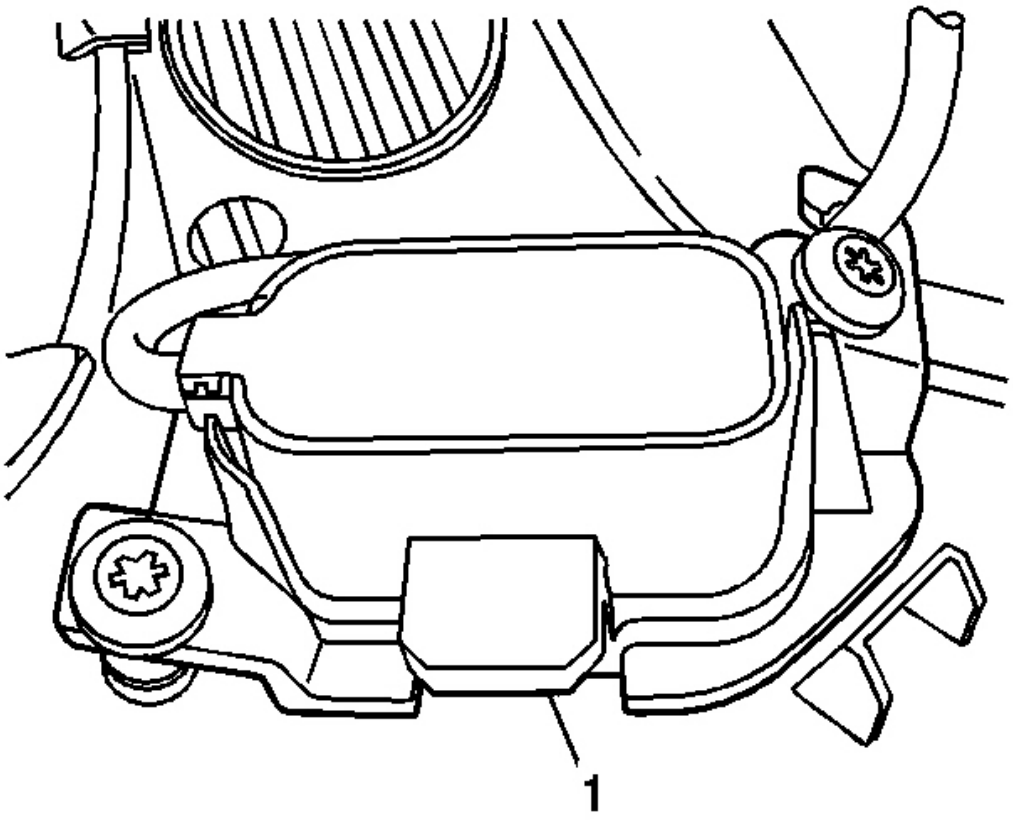


Fig. 12: Identifying Quick Release Tab On Microphone
Courtesy of GENERAL MOTORS CORP.

3. If only the microphone removal is required, disengage the quick release tab (1) and remove the OnStar® microphone from the overhead console.
4. If removing the mounting bracket is required, remove the 2 retaining screws to the OnStar® microphone and remove the bracket from the overhead console.

Installation Procedure

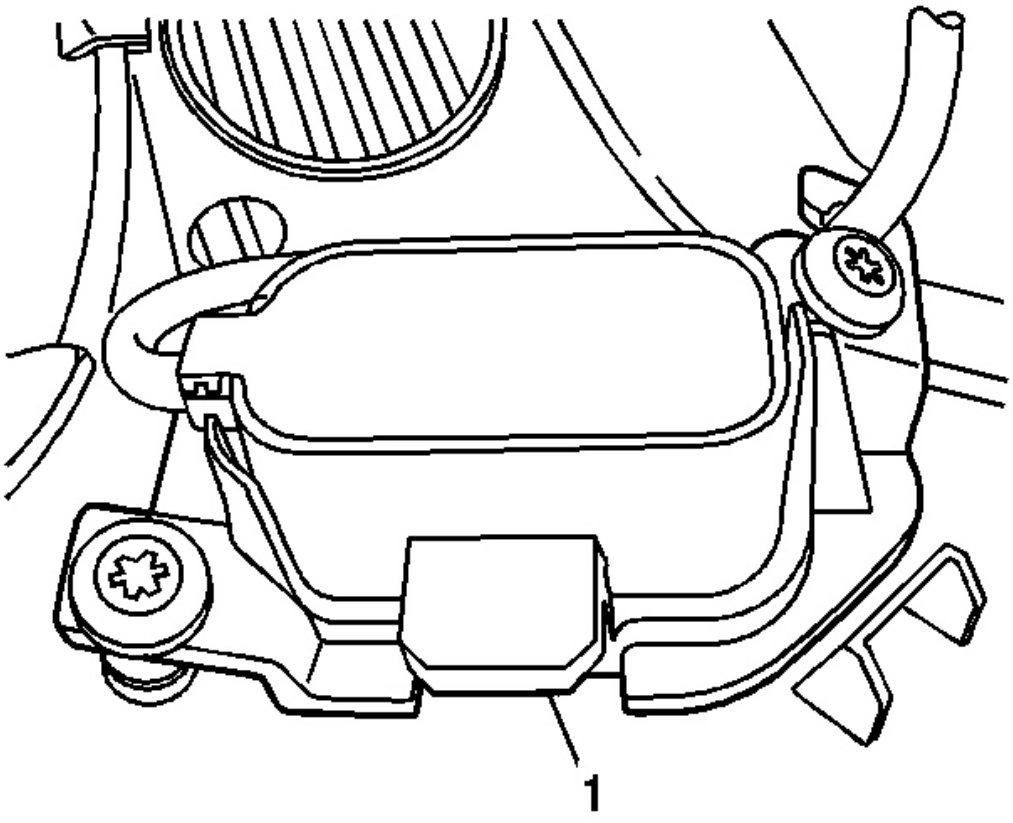


Fig. 13: Identifying Quick Release Tab On Microphone
Courtesy of GENERAL MOTORS CORP.

1. If installation of the mounting bracket is required, install the mounting bracket to the overhead console.

   NOTE: Refer to Fastener Notice .

2. Install the 2 OnStar® microphone retaining screws.

   Tighten: Tighten the screws to 0.8 N.m (7 lb in).

3. Install the microphone to the mounting bracket ensuring the quick release tab (1) is fully seated.

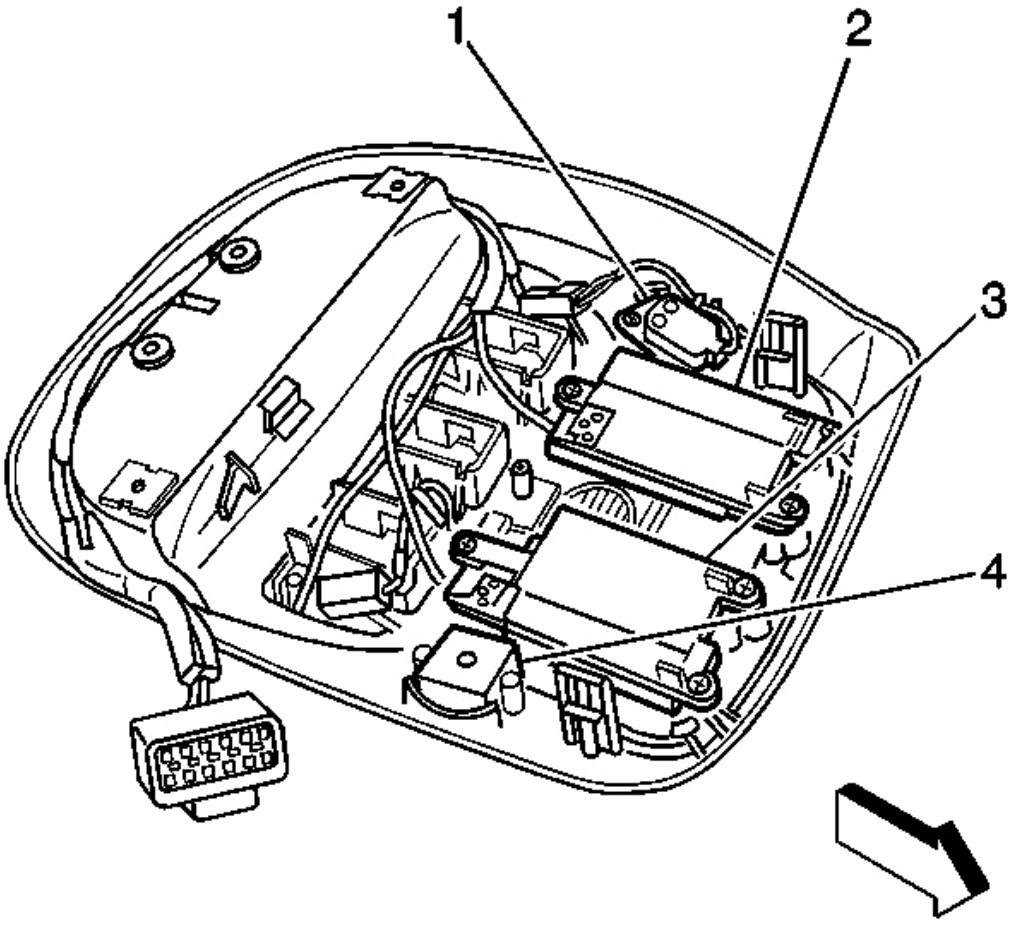


Fig. 14: Identifying OnStar Microphone Components
Courtesy of GENERAL MOTORS CORP.

4. Connect the electrical connector to the OnStar® microphone (1).
5. Install the overhead console. Refer to **Roof Console Replacement** .

COMMUNICATION INTERFACE MODULE REPLACEMENT (TRAILBLAZER, ENVOY)

Removal Procedure

IMPORTANT: The vehicle communication interface module (VCIM) has a specific set of unique numbers that tie the module to each vehicle. These numbers, the 10-digit station identification (STID) and the 11-digit electronic serial number (ESN), are used by the National Cellular Network and OnStar® to

identify the specific vehicle. Because these numbers are tied to the vehicle identification number of the vehicle, you must never exchange these parts with those of another vehicle.

1. Position the right rear seat bottom to a cargo position.

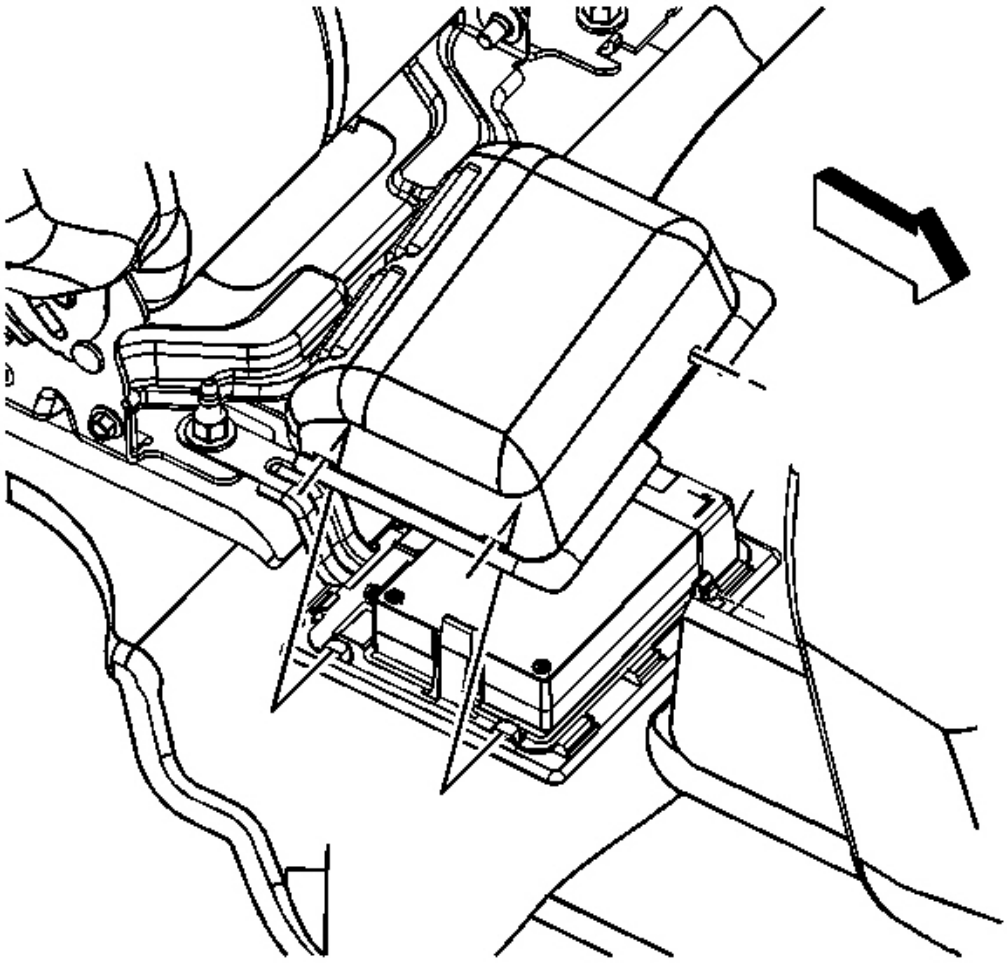


Fig. 15: View Of Communication Interface Module (VCIM) Protective Cover
Courtesy of GENERAL MOTORS CORP.

2. Remove the protective cover from the VCIM.

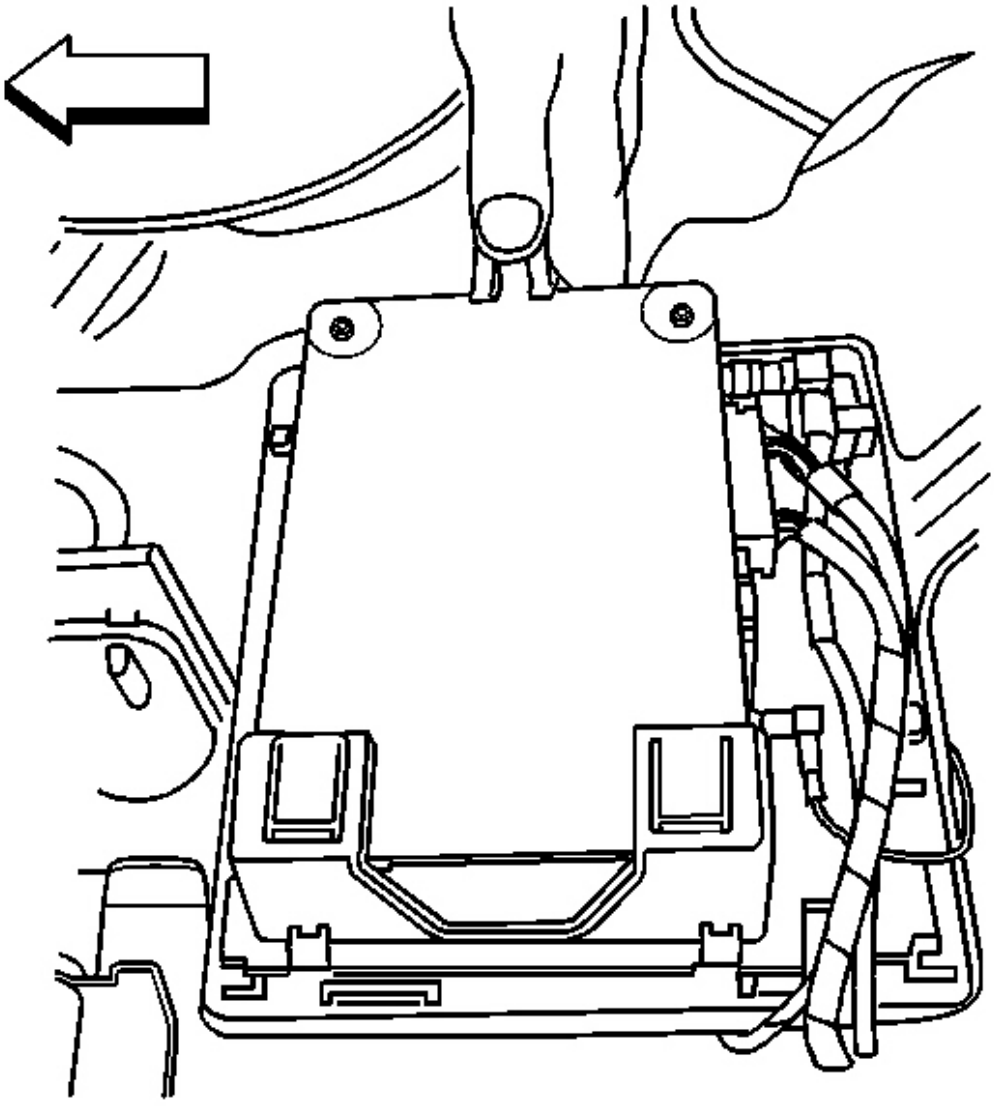


Fig. 16: Releasing Module Retaining Tab
Courtesy of GENERAL MOTORS CORP.

3. Remove the module from the upper bracket by releasing the retaining tab.

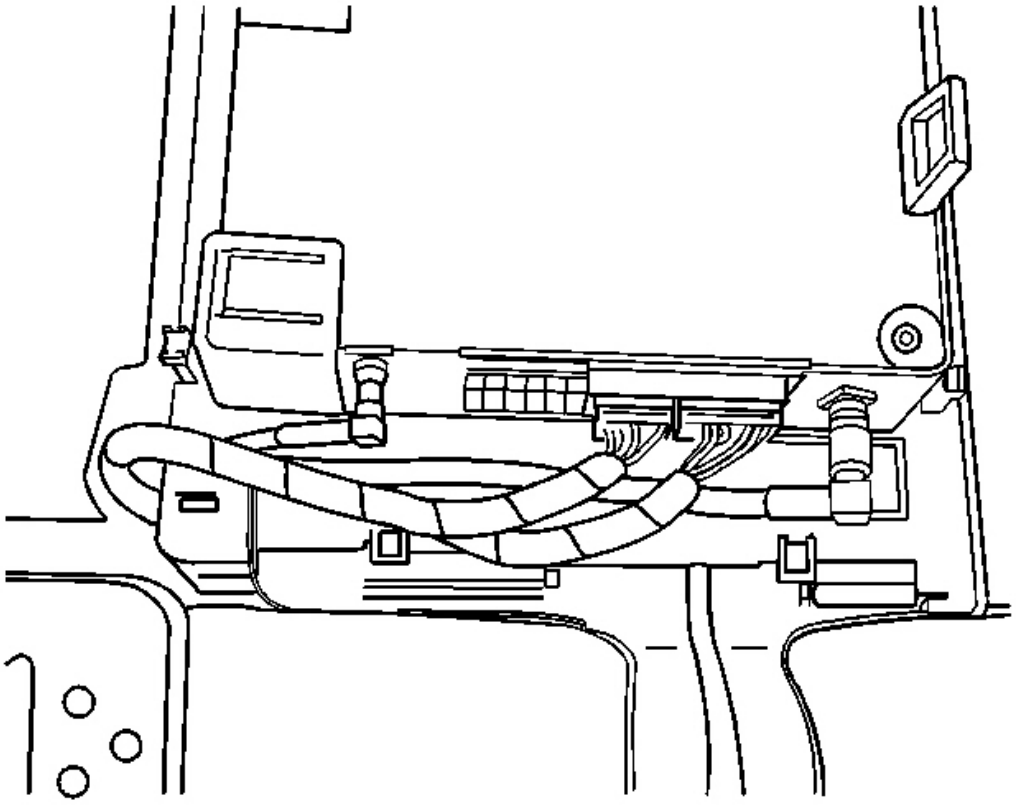


Fig. 17: Identifying VCIM Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

4. Remove the electrical connectors from the VCIM.
5. Remove the VCIM from the vehicle.

Installation Procedure

1. If replacing the VCIM, record the 10-digit STID number, and the 11-digit ESN from the labels on the new module.

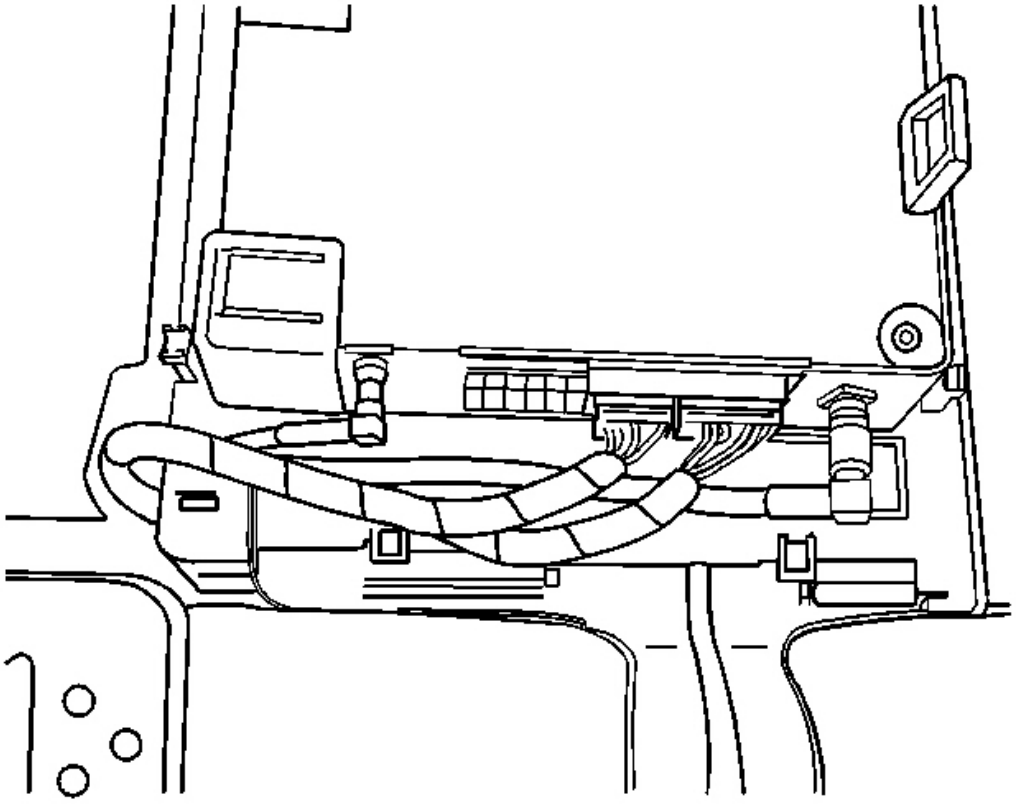


Fig. 18: Identifying VCIM Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

2. Install the module to the upper bracket ensuring the retaining tab is fully seated.

NOTE: **In order to avoid damage to the circuit board, do NOT over-tighten the thumb screws. Using your fingers, apply only a light pressure.**

3. Connect the 2 electrical connectors.

Tighten: Tighten the module thumb screw to a maximum of 0.2 N.m (2 lb in).

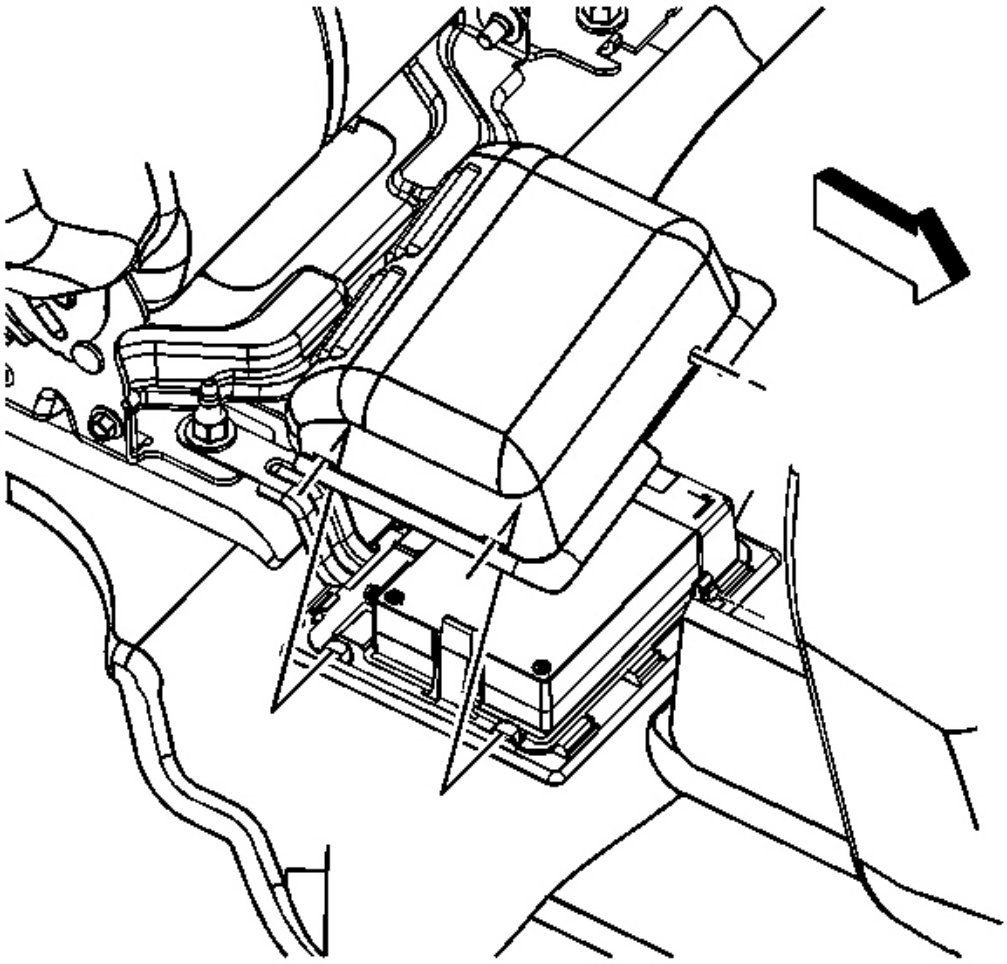


Fig. 19: View Of Communication Interface Module (VCIM) Protective Cover
Courtesy of GENERAL MOTORS CORP.

4. Install the protective cover to the module.
5. Position the right rear seat bottom to a passenger position.

IMPORTANT: After replacing the VCIM, you must reconfigure the OnStar® system. Failure to reconfigure the system will result in an additional customer visit for repair. In addition, pressing and holding the white dot button on the keypad will NOT reset this version of the OnStar® system. This action will cause a DTC to set.

6. Reconfigure the OnStar® system. Refer to **OnStar Reconfiguration (with TIS 2 Web Gen 4 and later)**.

ONSTAR MODULE BRACKET ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the right rear seat cushion. Refer to **Rear Seat Cushion Replacement** .
2. Remove the communication interface module. Refer to **Communication Interface Module Replacement (TrailBlazer, Envoy)**.

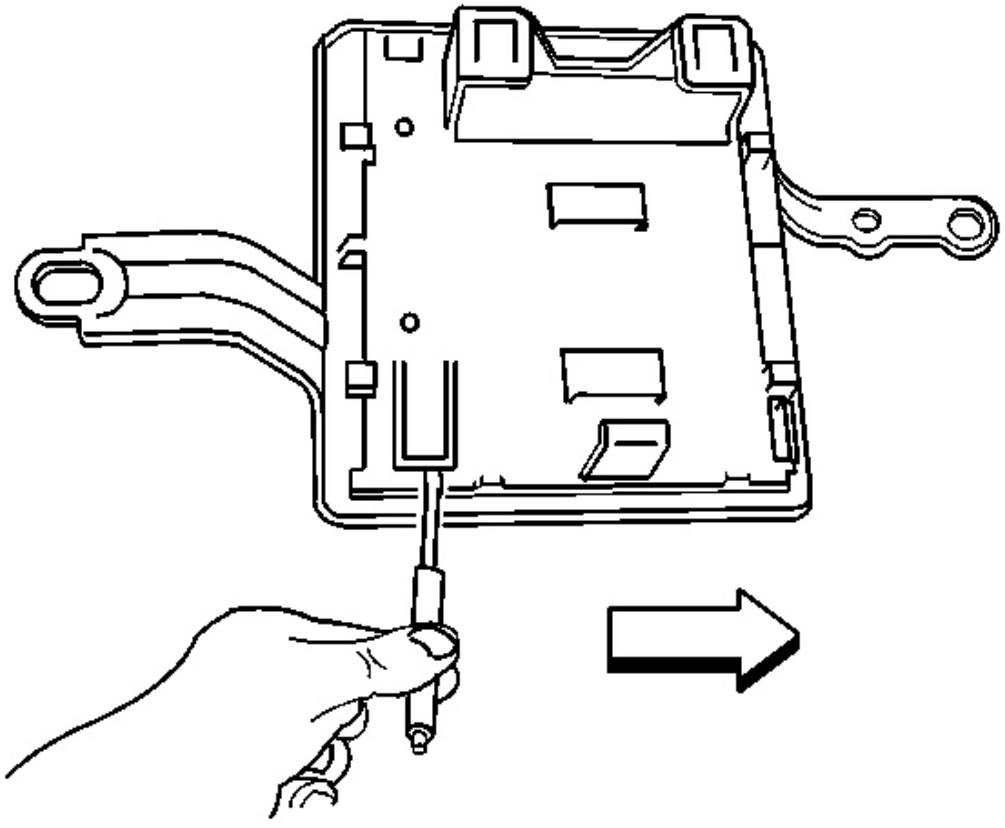


Fig. 20: Releasing Retaining Tab On Upper Bracket
Courtesy of GENERAL MOTORS CORP.

3. Using a flat bladed tool, release the retaining tab on the upper bracket.
4. Slide the upper bracket inboard until the retaining tabs are released from the processor bracket.
5. Remove the upper bracket from the processor bracket.

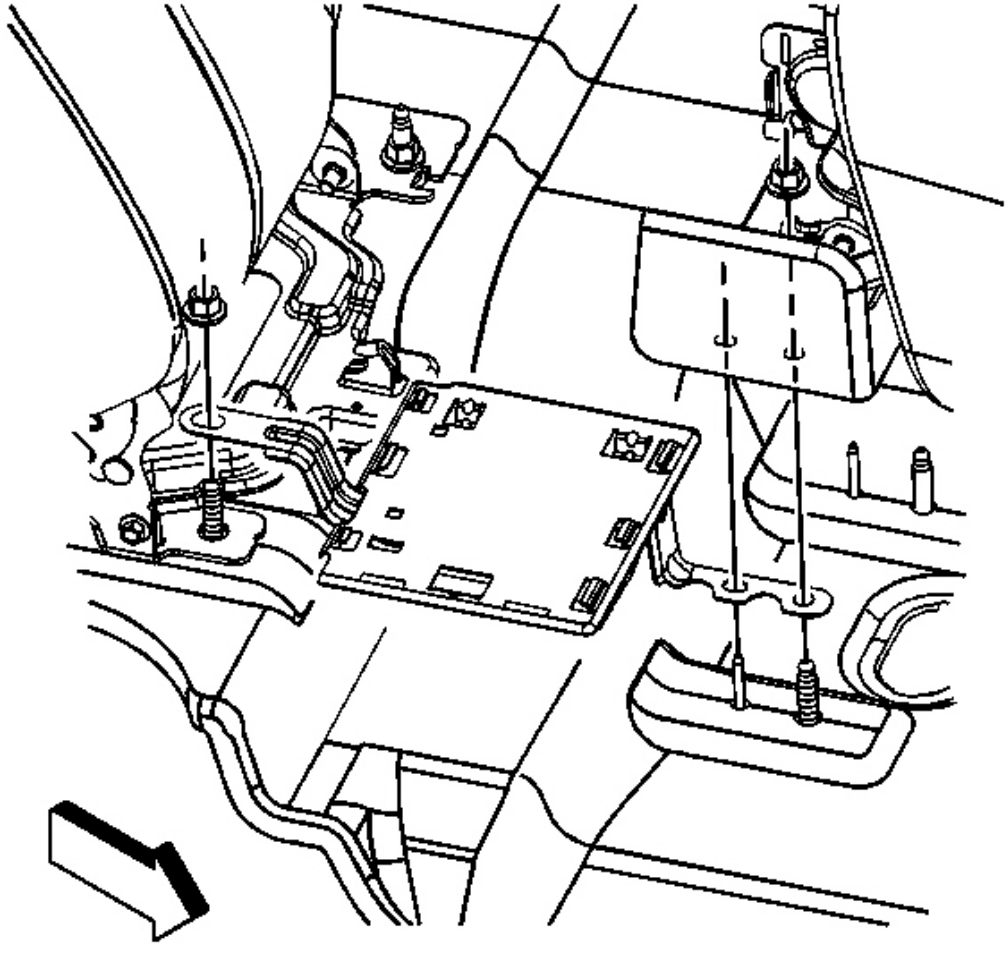


Fig. 21: View Of Processor Bracket Retaining Nut
Courtesy of GENERAL MOTORS CORP.

6. Remove the nut that retains the processor bracket to the rear seat back stud.
7. Remove the processor bracket from the vehicle.

Installation Procedure

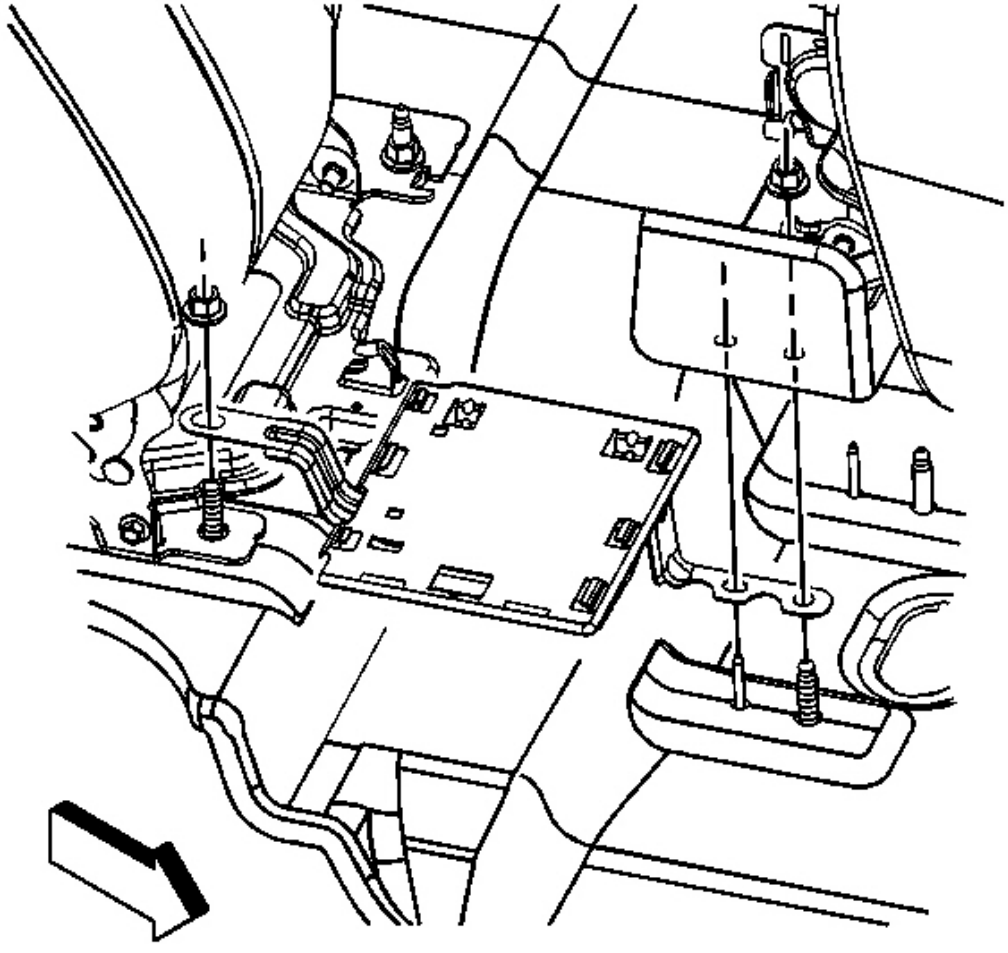


Fig. 22: View Of Processor Bracket Retaining Nut
Courtesy of GENERAL MOTORS CORP.

1. Install the processor bracket to the rear seat studs.

   NOTE: Refer to Fastener Notice .

2. Install the nut to the rear seat back stud.

   Tighten: Tighten the nut to 45 N.m (33 lb ft).

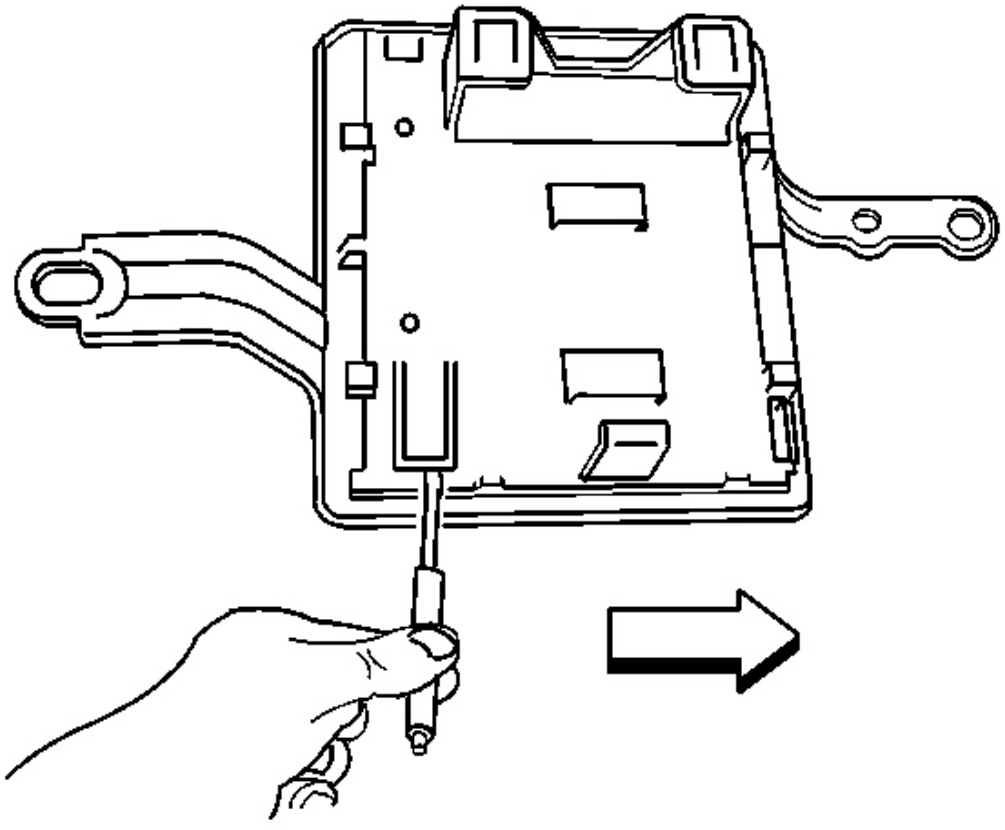


Fig. 23: Releasing Retaining Tab On Upper Bracket
Courtesy of GENERAL MOTORS CORP.

3. Position the upper bracket to the processor bracket.
4. Slide the upper bracket outboard until all the retaining tabs are seated to the processor bracket.
5. Install the communication interface module. Refer to **Communication Interface Module Replacement (TrailBlazer, Envoy)**.
6. Install the right rear seat cushion. Refer to **Rear Seat Cushion Replacement** .

COMPACT DISC CARE & CLEANING

Care of CDs

Handle CDs carefully. Store them in their original cases or other protective cases and away from direct sunlight and dust. The CD player scans the bottom surface of the disc. If the surface of a CD is damaged, such as cracked, broken, scratched, or wrinkled labeling, the CD will not play properly or not at all. If the surface of a

CD is soiled, take a soft, lint free cloth or dampen a clean, soft cloth in a mild, neutral detergent solution mixed with water, and clean it. Make sure the wiping process starts from the center to the edge. Do not touch the bottom side of a CD while handling it. This could damage the surface. Pick up CDs by grasping the outer edges or the edge of the hole and the outer edge.

Care of the CD Player

The use of CD lens cleaners for CD players is not advised, due to the risk of contaminating the internal lens of the CD optics with lubricants.

Stuck CDs

Interrupting the battery power by pulling the fuse will sometimes release a stuck CD. If a CD is stuck, and removed, inspect it for warps, cracks, etc. If the CD is damaged, do not replace the radio.

Labeling CDs

Paper labels can eventually warp and wrinkle, and this will cause the disc to jam inside the CD player. Try labeling the top of the discs with a soft magic marker instead.

RADIO REPLACEMENT

Removal Procedure

1. Remove the lower closeout/insulator panel (GMC only). Refer to **Instrument Panel Insulator Panel Replacement (GMC/Chevrolet)** .
2. Remove the accessory trim plate. Refer to **Instrument Panel Cluster Trim Plate Bezel Replacement (Chevrolet)** or **Instrument Panel Cluster Trim Plate Bezel Replacement (GMC, Buick)** or **Instrument Panel Accessory Trim Plate Replacement (GMC)** .

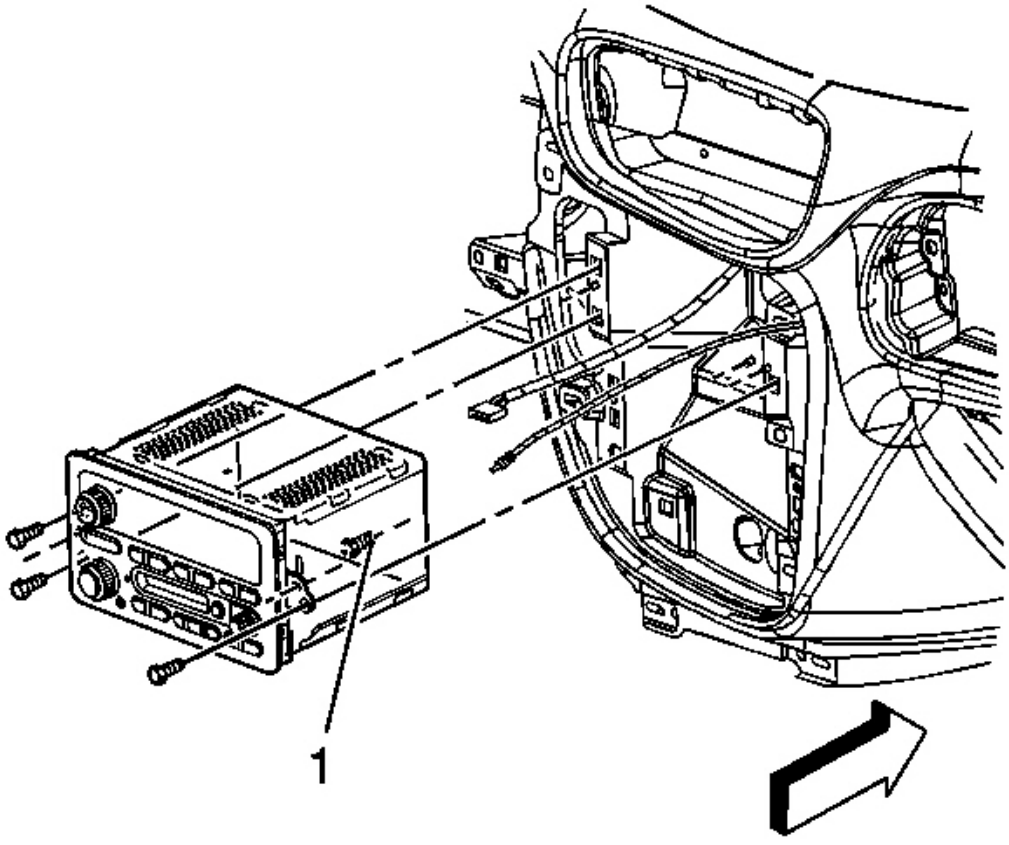


Fig. 24: Identifying Rear Alignment Locator
Courtesy of GENERAL MOTORS CORP.

3. Remove the 3 screws that retain the radio to the instrument panel (I/P).
4. Partially remove the radio disengaging the radio rear alignment locator (1) to gain access to the electrical connectors.
5. Disconnect the radio antenna cable.
6. Disconnect the electrical connectors to the radio.
7. Remove the radio from the vehicle.

Installation Procedure

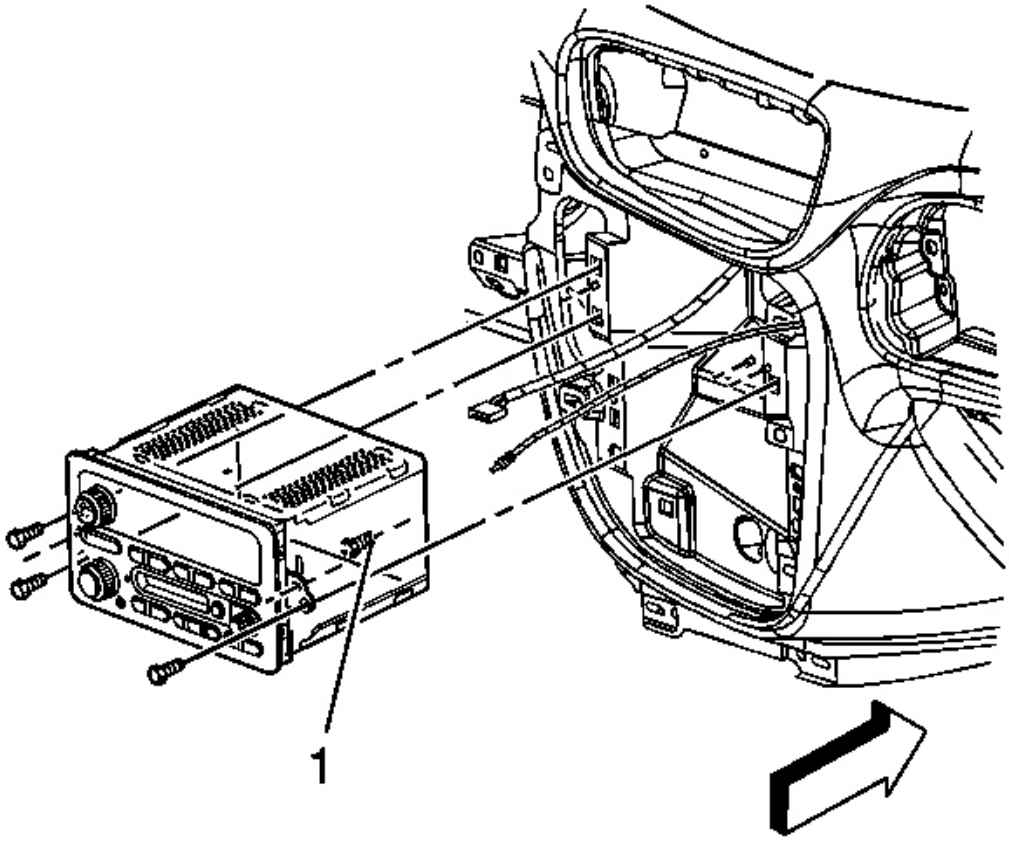


Fig. 25: Identifying Rear Alignment Locator
Courtesy of GENERAL MOTORS CORP.

1. Position the radio to the I/P.
2. Connect the electrical connectors to the radio.
3. Connect the radio antenna cable to the radio.
4. Position the radio rear alignment locator (1) into the I/P substrate.

NOTE: **Refer to Fastener Notice .**

5. Install the 3 screws that retain the radio to the I/P.

   Tighten: Tighten the screws to 2 N.m (18 lb in).

6. Install the accessory trim plate. Refer to **Instrument Panel Cluster Trim Plate Bezel Replacement**

(Chevrolet) or **Instrument Panel Cluster Trim Plate Bezel Replacement (GMC, Buick)** or **Instrument Panel Accessory Trim Plate Replacement (GMC)** .

7. Install the lower closeout/insulator panel (GMC only). Refer to **Instrument Panel Insulator Panel Replacement (GMC/Chevrolet)** .
8. If a replacement radio is installed, setup the radio. Refer to **Control Module References** .

DIGITAL RADIO RECEIVER REPLACEMENT

Removal Procedure

IMPORTANT: Do NOT swap digital radio receivers between vehicles. Swapping digital receivers between vehicles will activate the digital radio Theftlock®, and "XM Theftlock®" will display.

1. Lower the right closeout insulator panel. Refer to **Instrument Panel Insulator Panel Replacement - Right Side** .

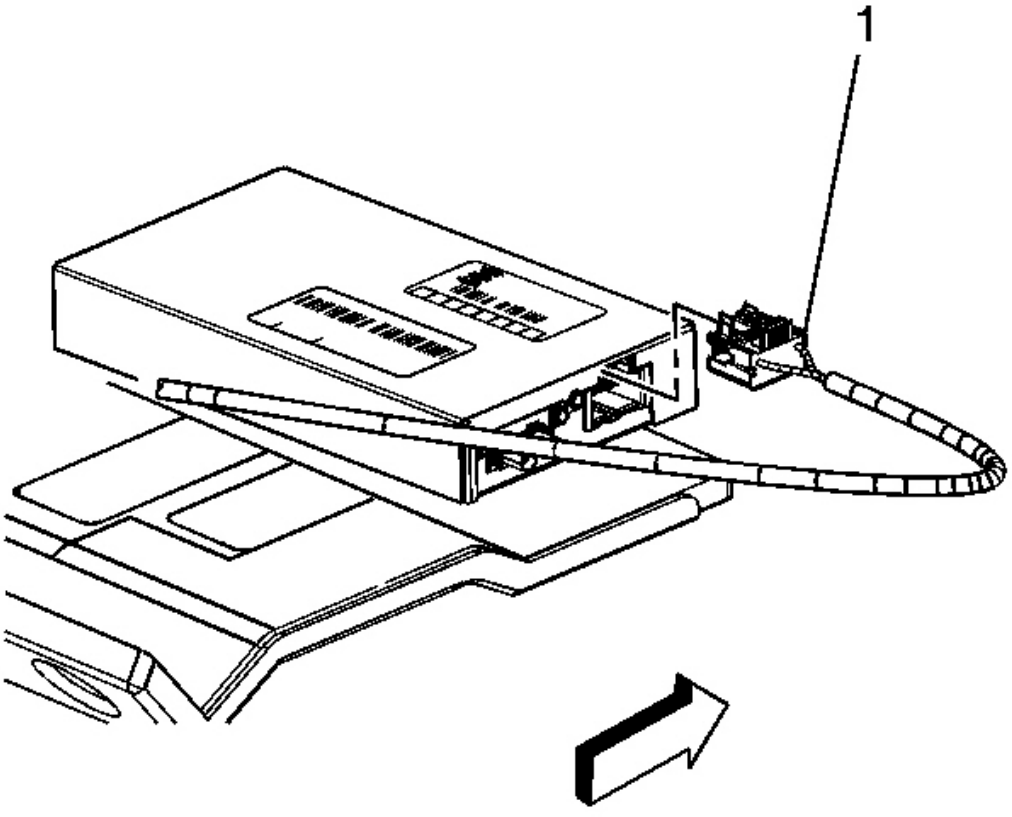


Fig. 26: View Of Electrical Connector & Receiver
Courtesy of GENERAL MOTORS CORP.

2. Remove the electrical connector (1) from the receiver.

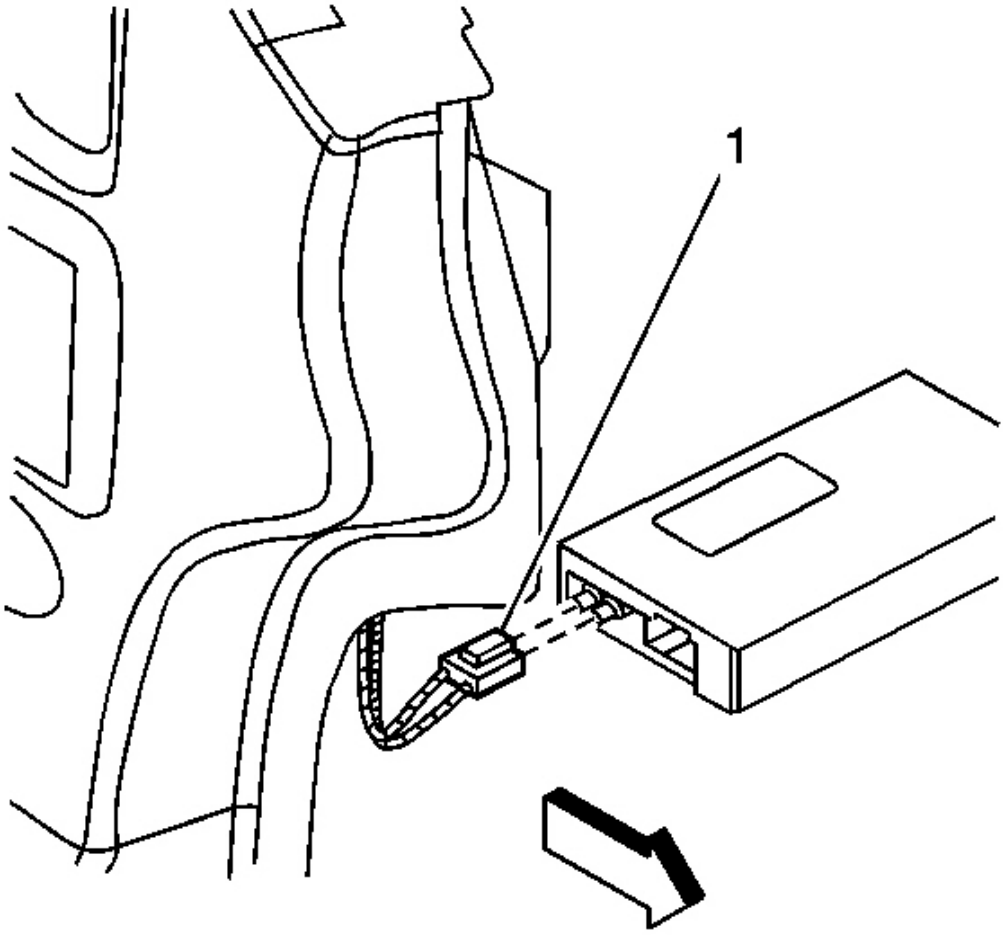


Fig. 27: View Of Antenna Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Remove the antenna electrical connector (1) from the receiver.

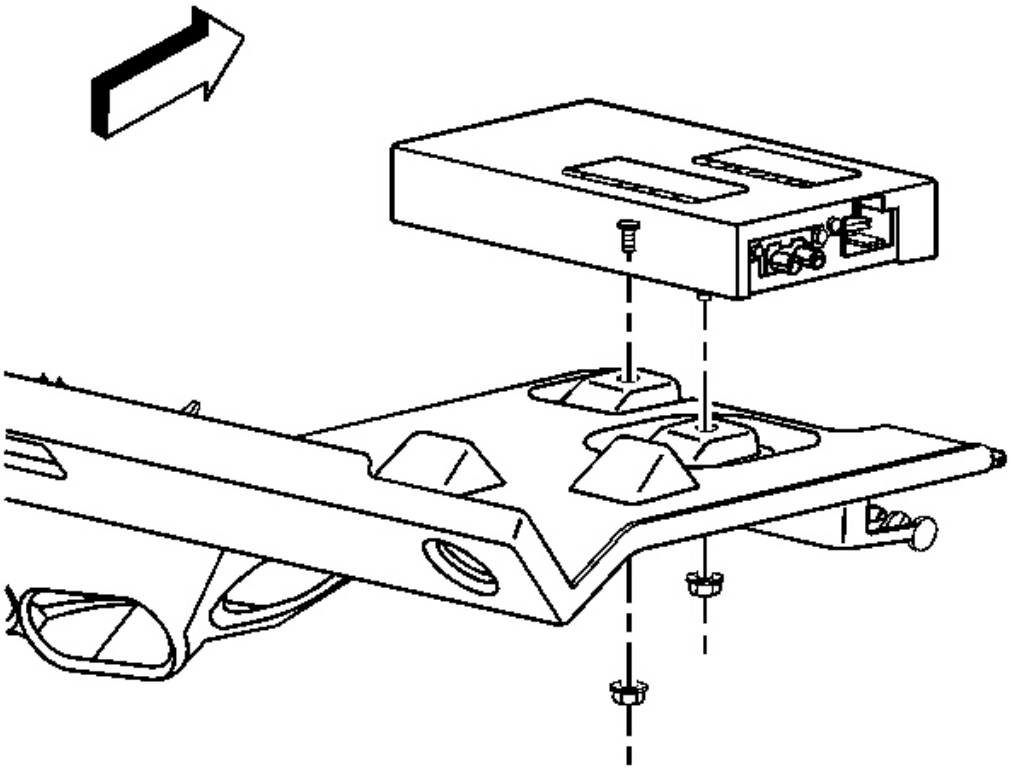


Fig. 28: Module Mounting View
Courtesy of GENERAL MOTORS CORP.

4. Remove the nuts retaining the receiver to the insulator panel.
5. Remove the receiver from the vehicle.

Installation Procedure

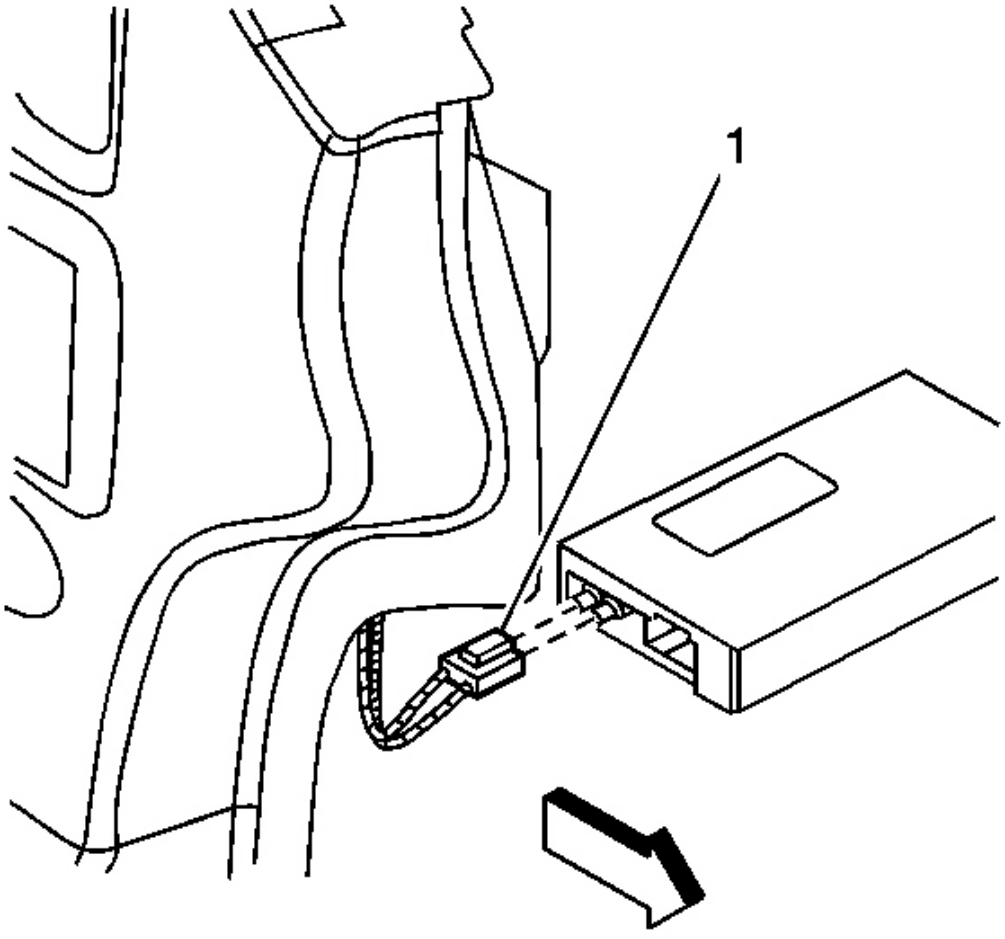


Fig. 29: View Of Antenna Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Position the receiver near the insulator panel.
2. Install the antenna electrical connector (1) to the receiver.

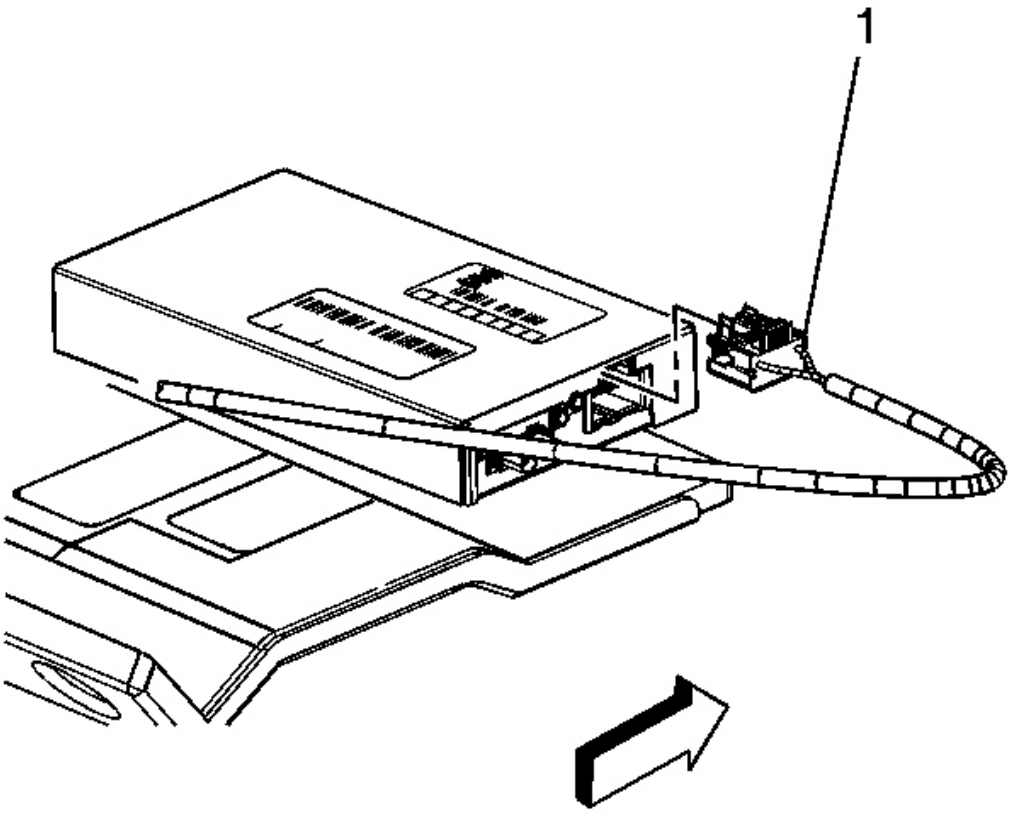


Fig. 30: View Of Electrical Connector & Receiver
Courtesy of GENERAL MOTORS CORP.

3. Install the electrical connector (1) to the receiver.

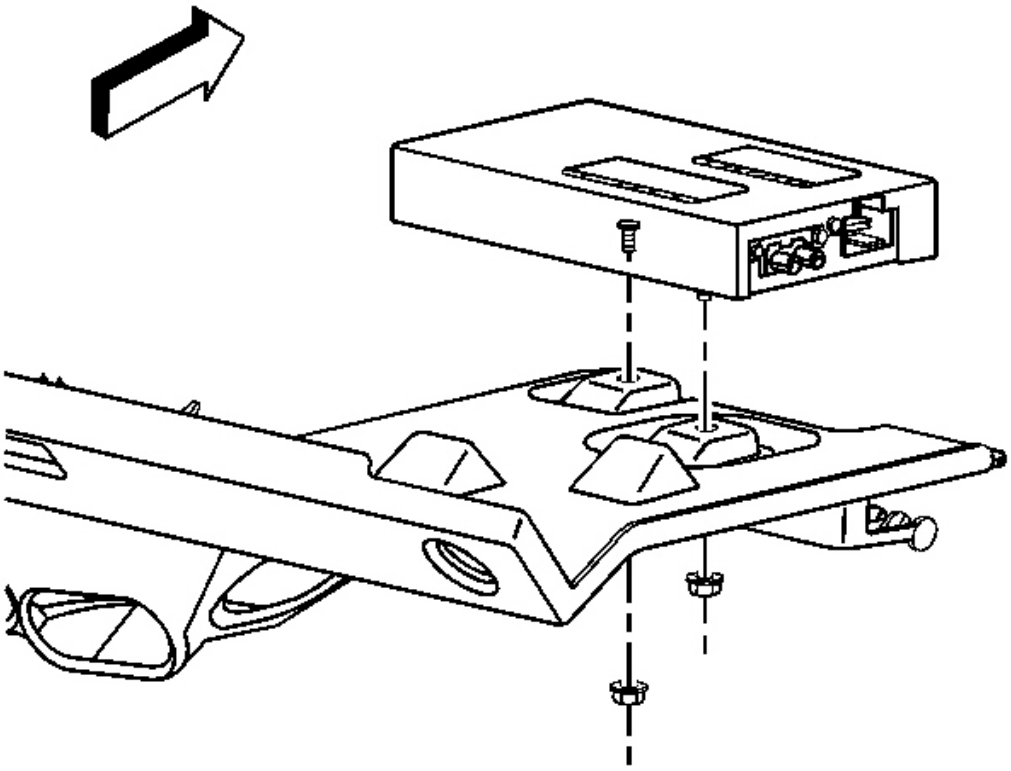


Fig. 31: Module Mounting View
Courtesy of GENERAL MOTORS CORP.

4. Install the receiver to the insulator panel.

   NOTE: Refer to Fastener Notice .

5. Install the nuts retaining the receiver to the insulator panel.

   Tighten: Tighten the nuts to 5 N.m (44 lb in).

6. Install the right closeout insulator panel. Refer to **Instrument Panel Insulator Panel Replacement - Right Side** .
7. Perform the setup procedure for the digital radio receiver. Refer to **Digital Radio Receiver Setup**.

RADIO VOLUME COMPENSATOR INTERIOR NOISE MICROPHONE REPLACEMENT

Removal Procedure

1. Remove the overhead console. Refer to **Roof Console Replacement** .

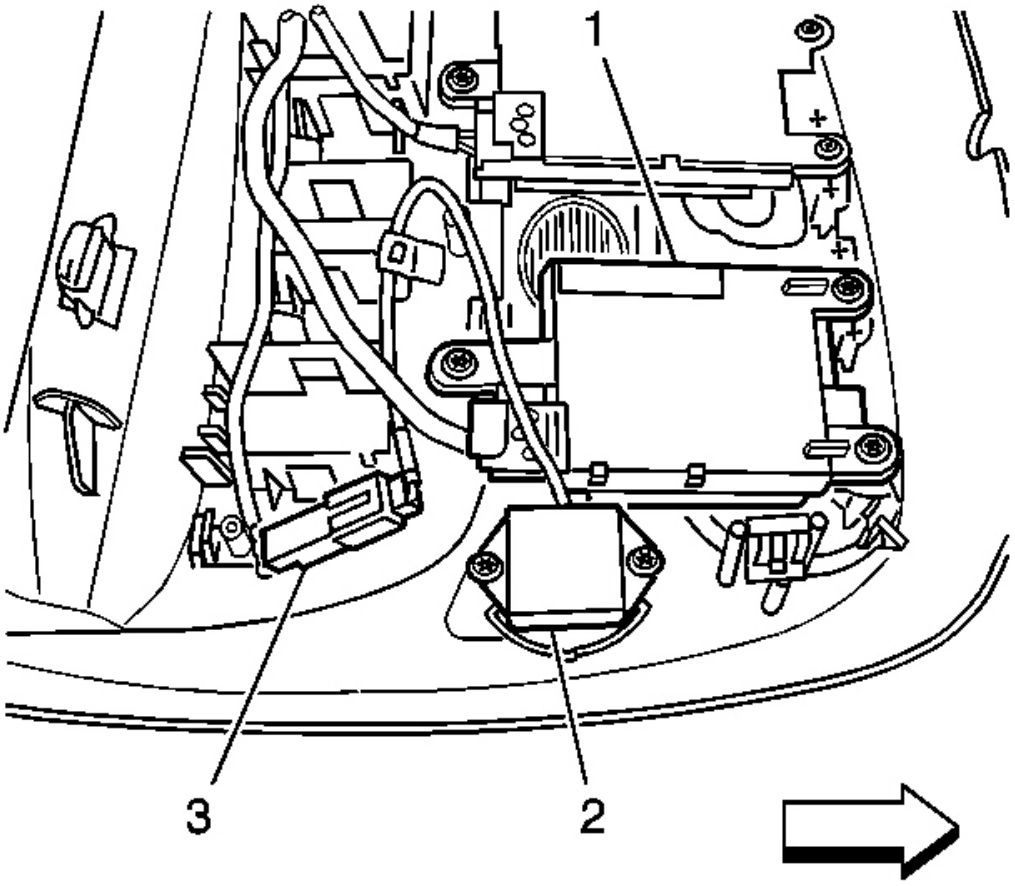


Fig. 32: Identifying Microphone, Electrical Connector & Personal Message Recorder
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the microphone electrical connector (3).
3. Remove the 2 retaining screws to the microphone.
4. Remove the microphone (2) from the overhead console.

Installation Procedure

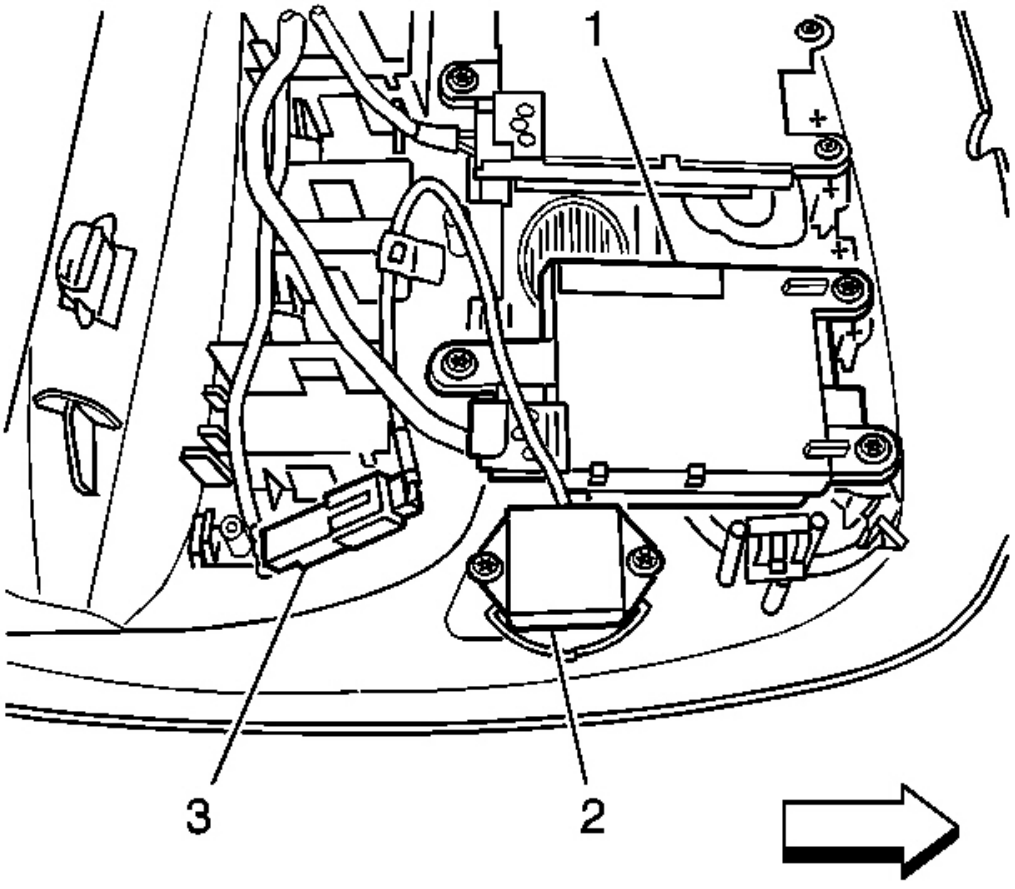


Fig. 33: Identifying Microphone, Electrical Connector & Personal Message Recorder
Courtesy of GENERAL MOTORS CORP.

1. Install the microphone (2) to the overhead console.

NOTE: **Refer to Fastener Notice .**

2. Install the 2 microphone retaining screws.

Tighten: Tighten the screws to 0.8 N.m (7 lb in).

3. Connect the microphone electrical connector (3).
4. Install the overhead console. Refer to **Roof Console Replacement** .

PERSONAL MESSAGE PLAYER/RECORDER REPLACEMENT

Removal Procedure

1. Remove the overhead console. Refer to **Roof Console Replacement** .

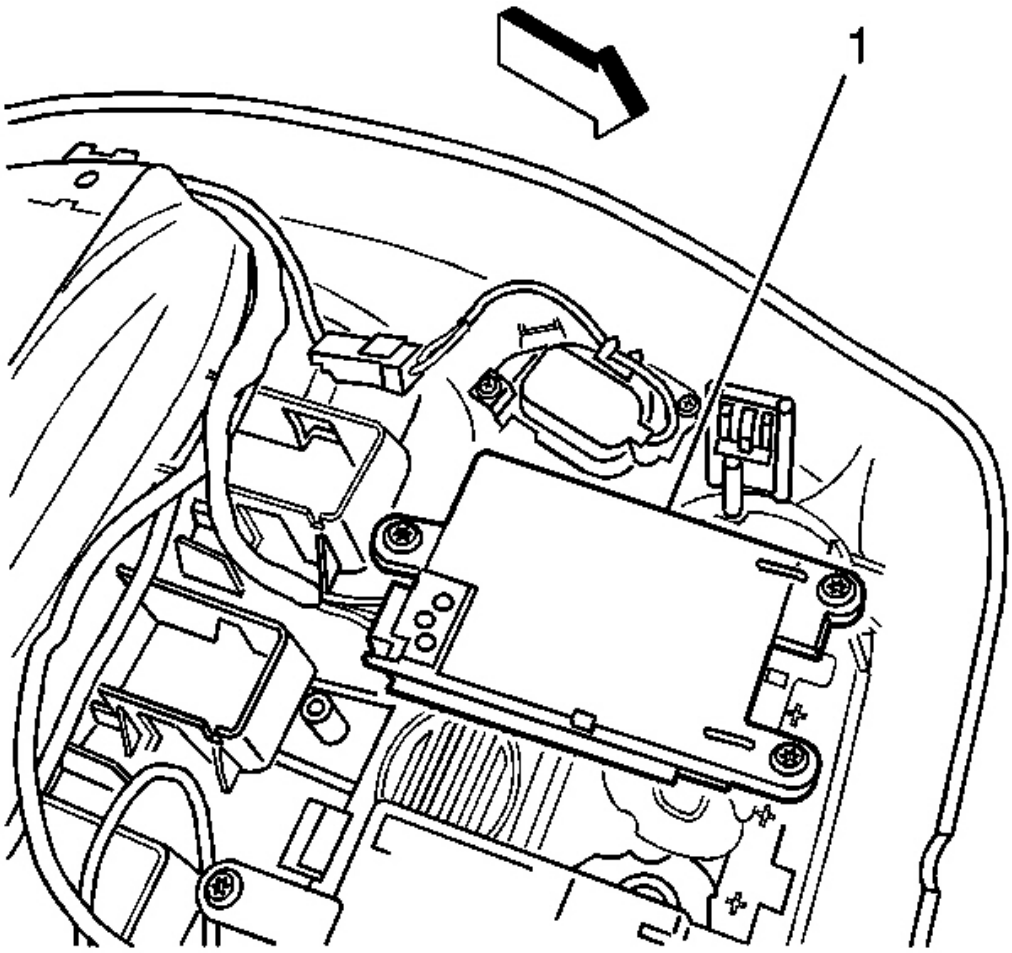


Fig. 34: Identifying Personal Message Recorder
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connector from the personal message recorder (1).
3. Remove the personal message recorder retaining screws.
4. Remove the personal message recorder from the overhead console.
5. Remove the button assembly from the overhead console.

Installation Procedure

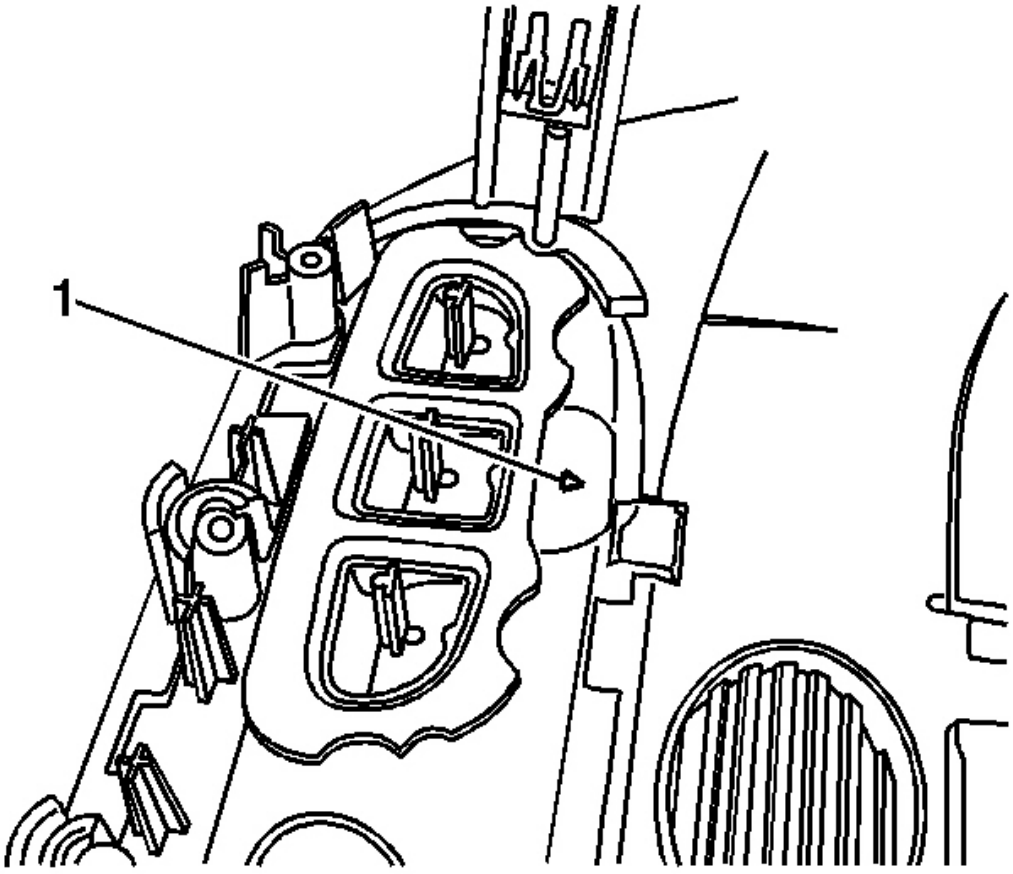


Fig. 35: Locating Opening For Personal Message Recorder
Courtesy of GENERAL MOTORS CORP.

1. Install the button assembly to the overhead console.
2. Install the personal message recorder to the overhead console ensuring the light indicator is fully recessed into the opening (1).

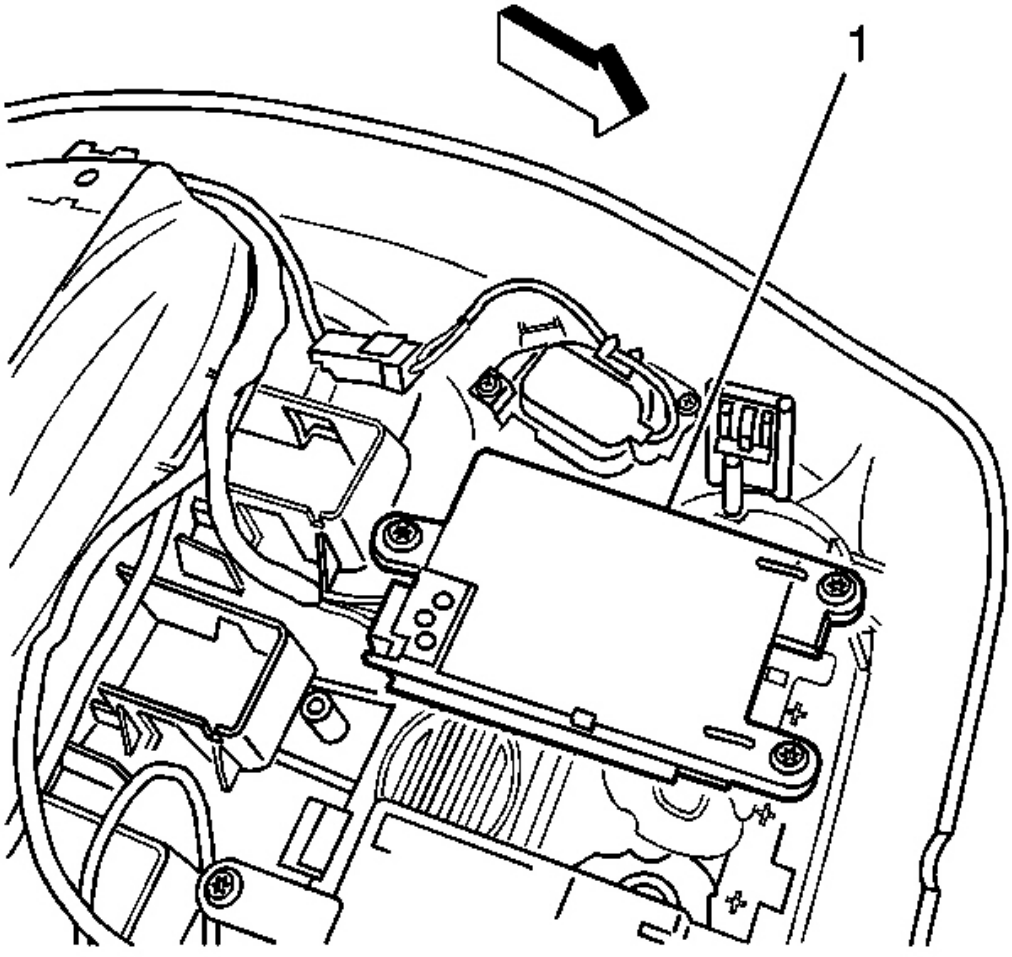


Fig. 36: Identifying Personal Message Recorder
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

3. Install the screws that retain the personal message recorder to the overhead console.

   Tighten: Tighten the screws to 0.8 N.m (7 lb in).

4. Connect the electrical connector to the personal message recorder (1).
5. Install the overhead console. Refer to **Roof Console Replacement** .

RADIO SPEAKER AMPLIFIER REPLACEMENT (ENVOY XL)

Removal Procedure

1. Remove the Left rear quarter trim panel. Refer to **Rear Quarter Trim Panel Replacement - Left Side** .

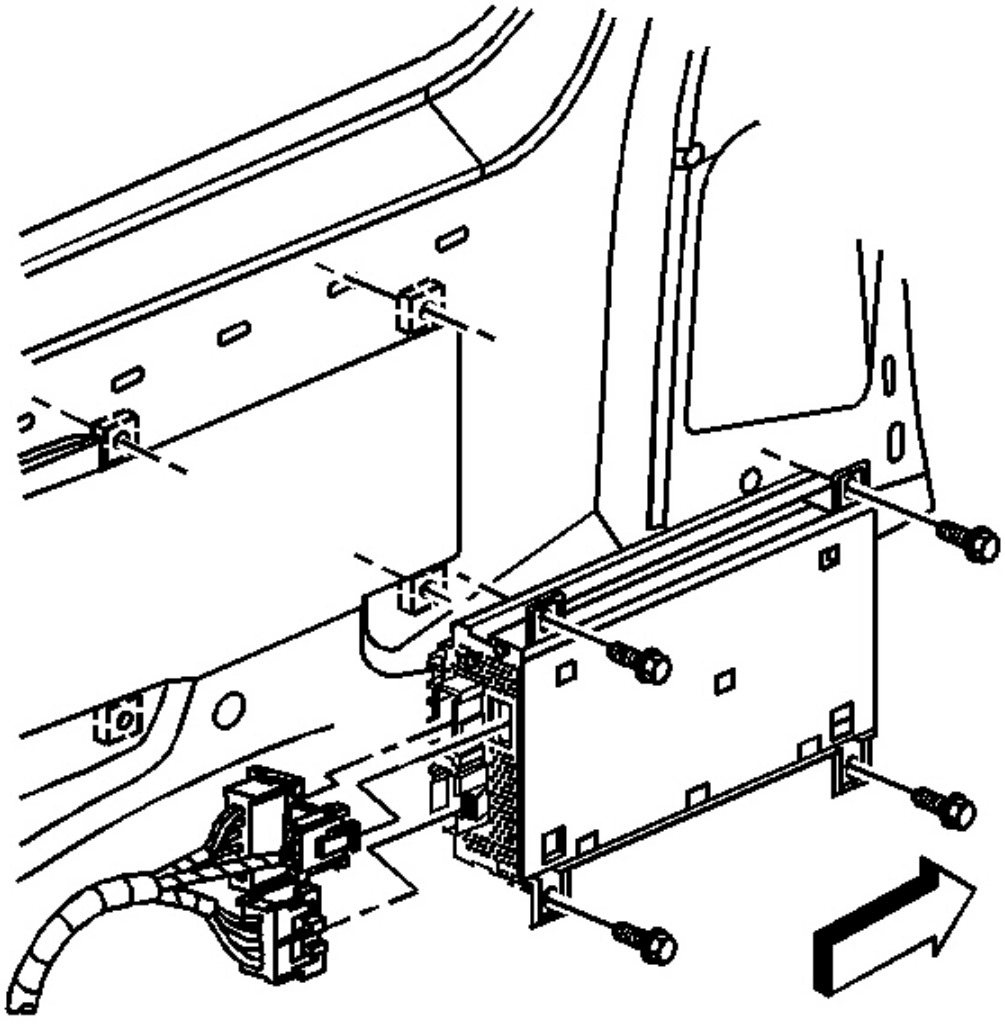


Fig. 37: Locating Amplifier Retaining Bolts & Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connectors from the radio speaker amplifier.
3. Remove the 4 bolts that retain the radio speaker amplifier to the body.
4. Remove the radio speaker amplifier from the body.

Installation Procedure

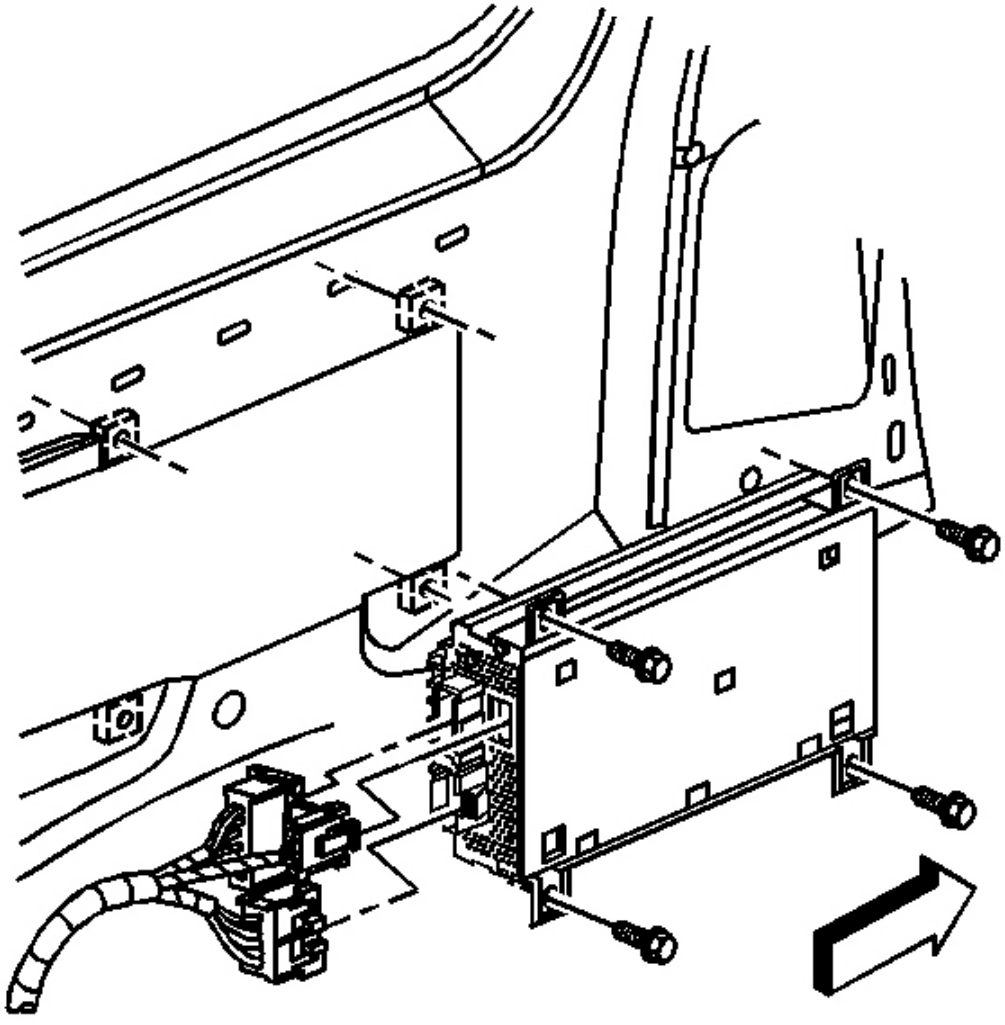


Fig. 38: Locating Amplifier Retaining Bolts & Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

1. Install the radio speaker amplifier to the body.

   NOTE: Refer to Fastener Notice .

2. Install the 4 bolts that retain the radio speaker amplifier to the body.

Tighten: Tighten the bolts to 10 N.m (88 lb in).

3. Connect the electrical connectors to the radio speaker amplifier.
4. Install the left rear quarter trim panel. Refer to **Rear Quarter Trim Panel Replacement - Left Side** .

RADIO SPEAKER AMPLIFIER REPLACEMENT

Removal Procedure

1. Remove the upper right quarter trim panel. Refer to **Rear Quarter Upper Trim Panel Replacement (TrailBlazer, Envoy)** .
2. Remove the lower right quarter trim panel. Refer to **Rear Quarter Trim Panel Replacement - Right Side** .

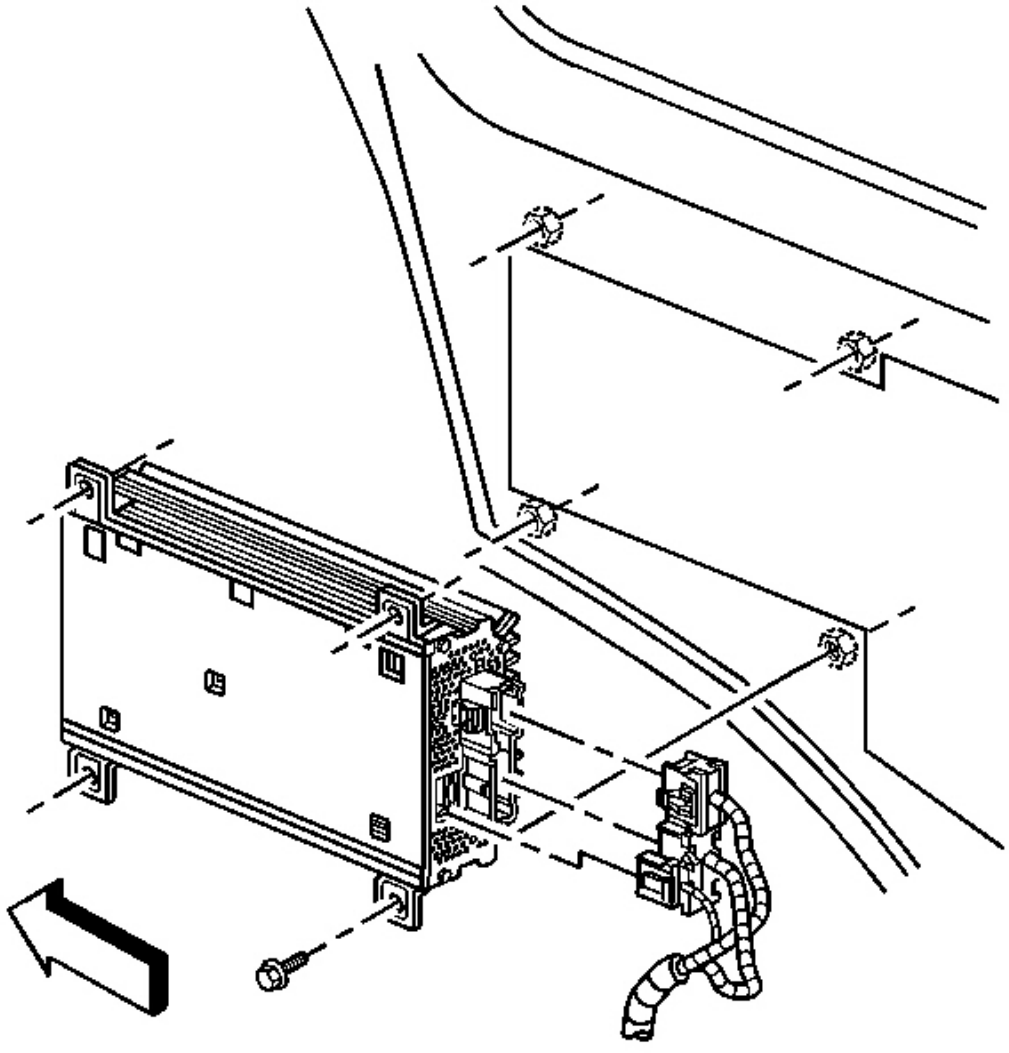


Fig. 39: View Of Radio Speaker Amplifier
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the electrical connectors from the radio speaker amplifier.
4. Remove the 4 bolts that retain the radio speaker amplifier to the body.
5. Remove the radio speaker amplifier from the body.

Installation Procedure

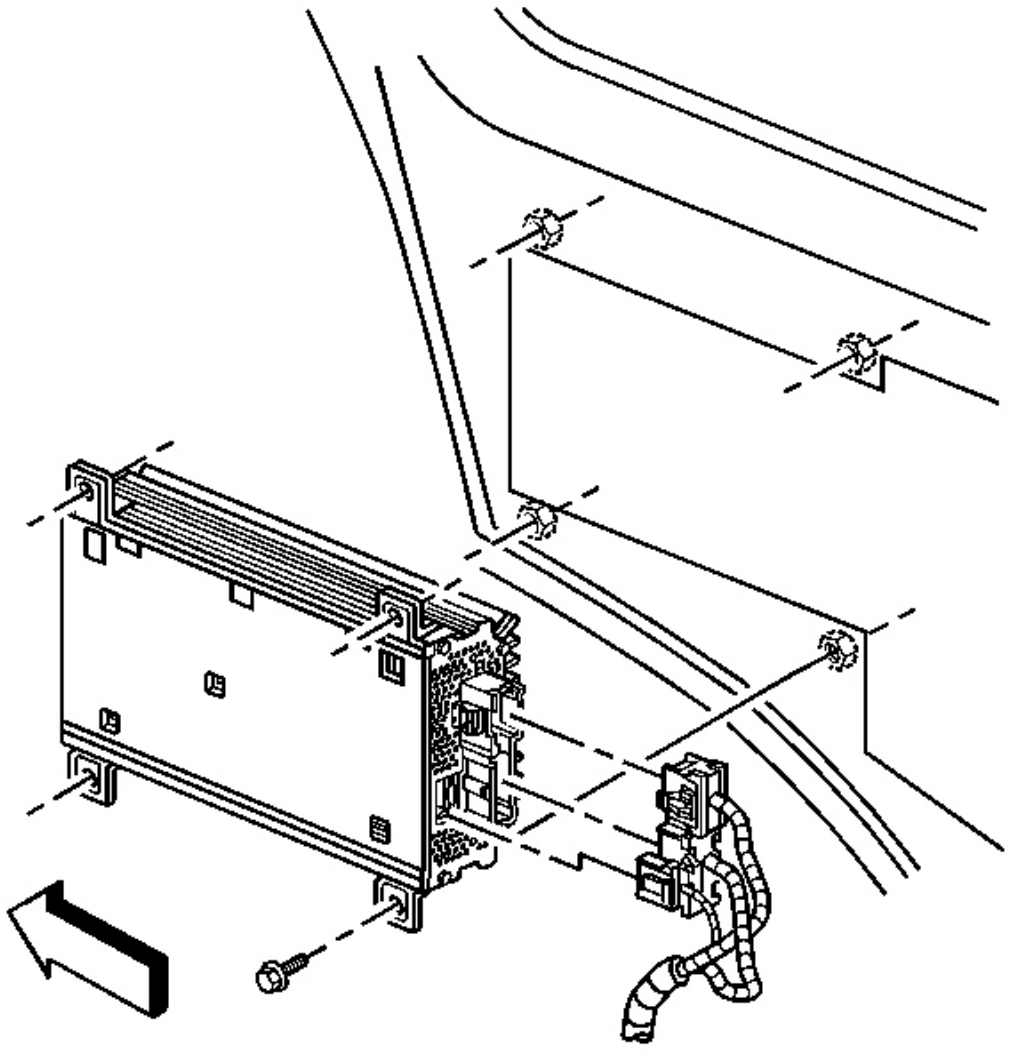


Fig. 40: View Of Radio Speaker Amplifier
Courtesy of GENERAL MOTORS CORP.

1. Install the radio speaker amplifier to the body.

   NOTE: Refer to Fastener Notice .

2. Install the 4 bolts that retain the radio speaker amplifier to the body.

   Tighten: Tighten the bolts to 10 N.m (88 lb in).

3. Connect the electrical connectors to the radio speaker amplifier.
4. Install the lower right quarter trim panel. Refer to **Rear Quarter Trim Panel Replacement - Right Side** .
5. Install the upper right quarter trim panel. Refer to **Rear Quarter Upper Trim Panel Replacement (TrailBlazer, Envoy)** .

NAVIGATION CONTROL PROCESSOR BRACKET REPLACEMENT (ENVOY XL)

Removal Procedure

1. Fold and tumble the right rear seat to a cargo position.
2. Leaving the electrical connectors attached, remove the communication interface module from the vehicle communication interface module (VCIM) bracket. Refer to **Communication Interface Module Replacement (TrailBlazer, Envoy)**.

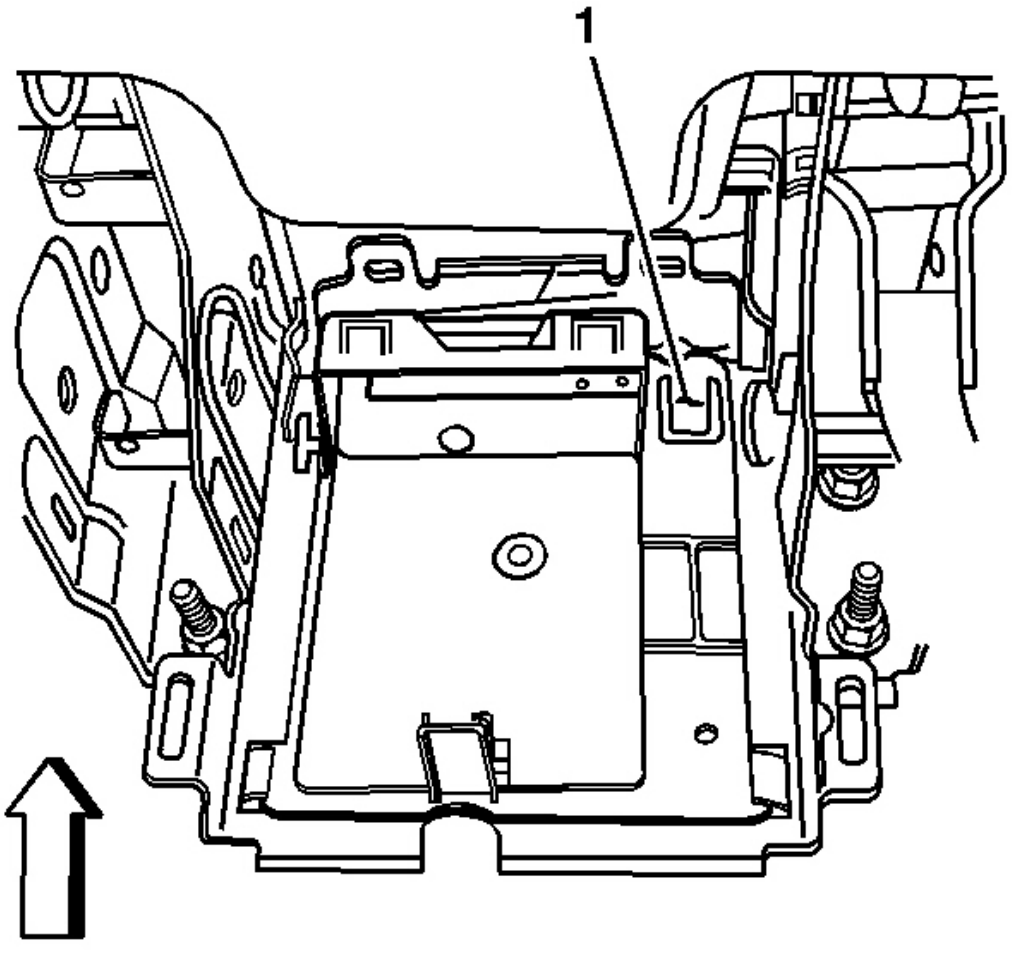


Fig. 41: Locating Retaining Tab On VCIM Bracket
Courtesy of GENERAL MOTORS CORP.

3. Using a flat bladed tool, release the retaining tab (1) on the VCIM bracket.
4. Slide the VCIM bracket rearward until the retaining tabs are released from the seat bracket.
5. Remove the VCIM bracket from vehicle.

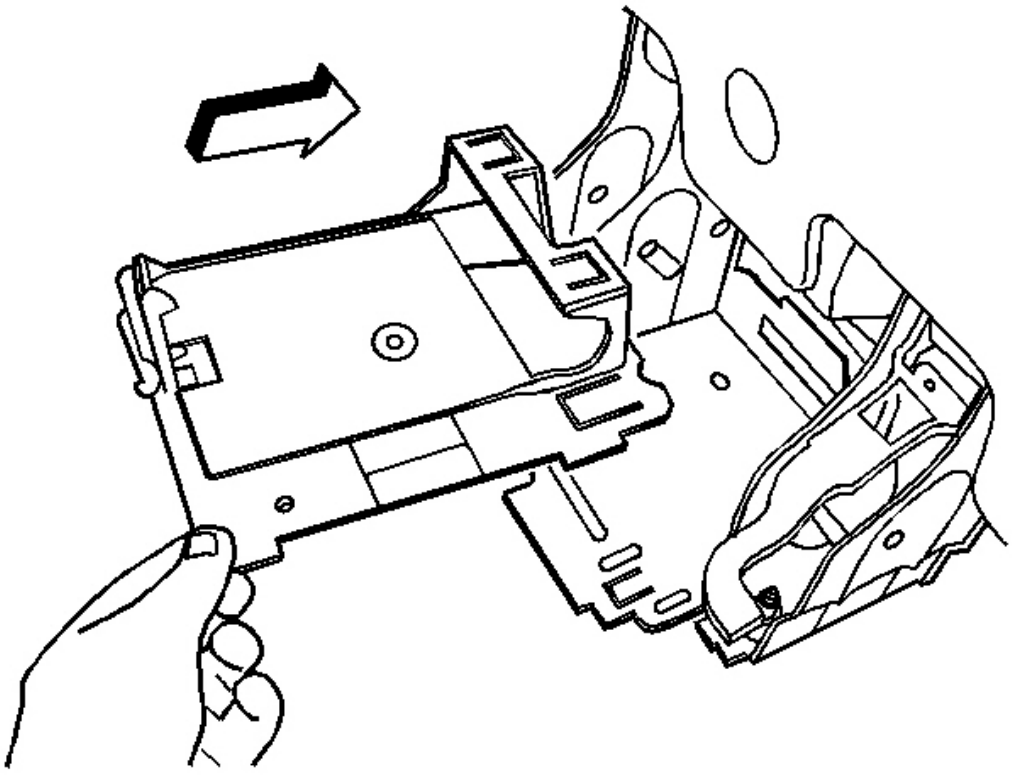


Fig. 42: Sliding VCIM Bracket To Seat Bracket
Courtesy of GENERAL MOTORS CORP.

6. Slide the VCIM bracket rearward until the retaining tabs are released from the seat bracket.
7. Remove the VCIM bracket from vehicle.

Installation Procedure

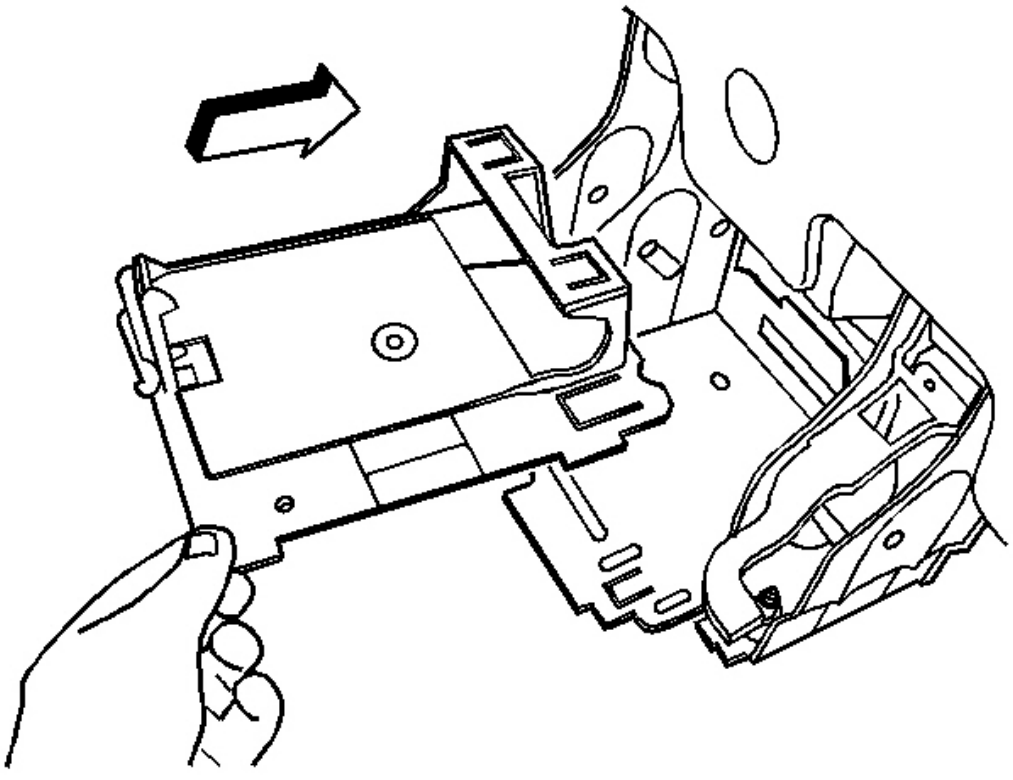


Fig. 43: Sliding VCIM Bracket To Seat Bracket
Courtesy of GENERAL MOTORS CORP.

1. Position the VCIM bracket to the seat bracket.
2. Slide the VCIM bracket forward until the retaining tabs become locked to the seat bracket.

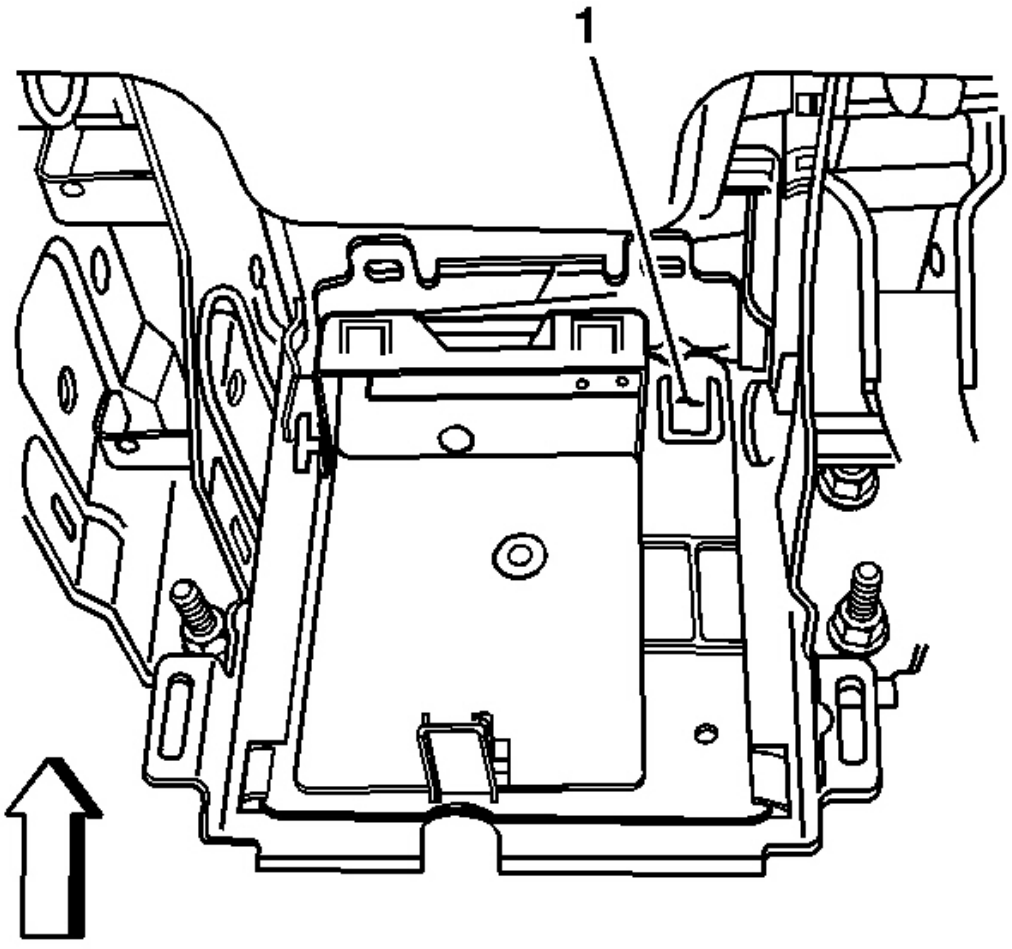


Fig. 44: Locating Retaining Tab On VCIM Bracket
Courtesy of GENERAL MOTORS CORP.

3. Ensure the retaining tab (1) on the VCIM bracket is properly seated.
4. Install the communication interface module. Refer to **Communication Interface Module Replacement (TrailBlazer, Envoy)**.
5. Position the right second row seat to a passenger position.

NAVIGATION CONTROL PROCESSOR BRACKET REPLACEMENT

Removal Procedure

1. Remove the right rear seat cushion. Refer to **Rear Seat Cushion Replacement** .

2. Remove the communication interface module. Refer to **Communication Interface Module Replacement (TrailBlazer, Envoy)**.

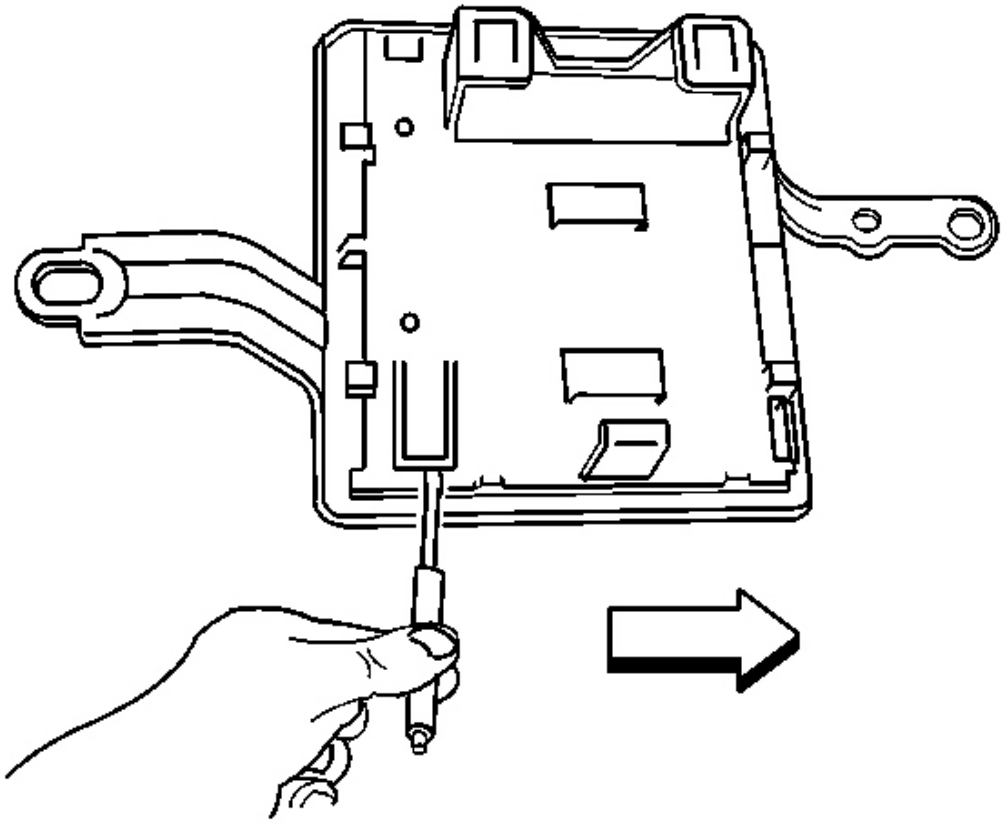


Fig. 45: Releasing Retaining Tab On Upper Bracket
Courtesy of GENERAL MOTORS CORP.

3. Using a flat bladed tool, release the retaining tab on the upper bracket.
4. Slide the upper bracket inboard until the retaining tabs are released from the processor bracket.
5. Remove the upper bracket from the processor bracket.

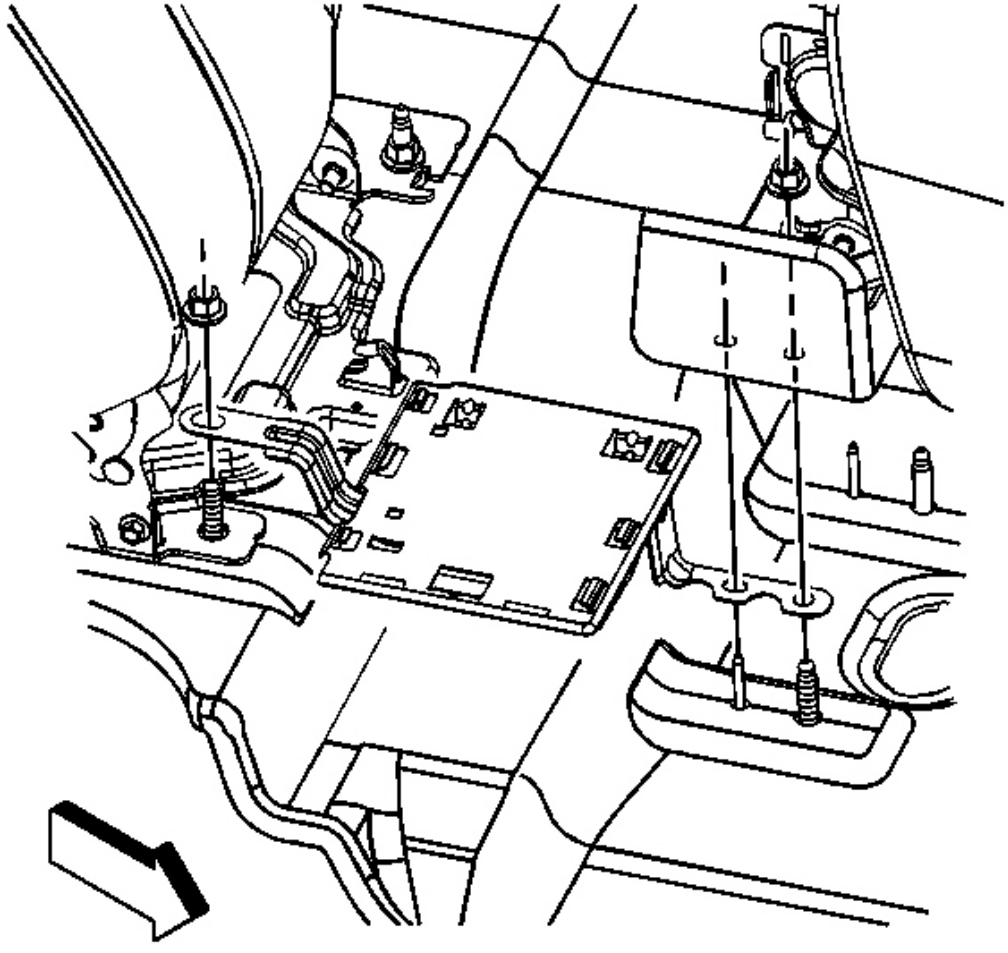


Fig. 46: View Of Processor Bracket Retaining Nut
Courtesy of GENERAL MOTORS CORP.

6. Remove the nut that retains the processor bracket to the rear seat back stud.
7. Remove the processor bracket from the vehicle.

Installation Procedure

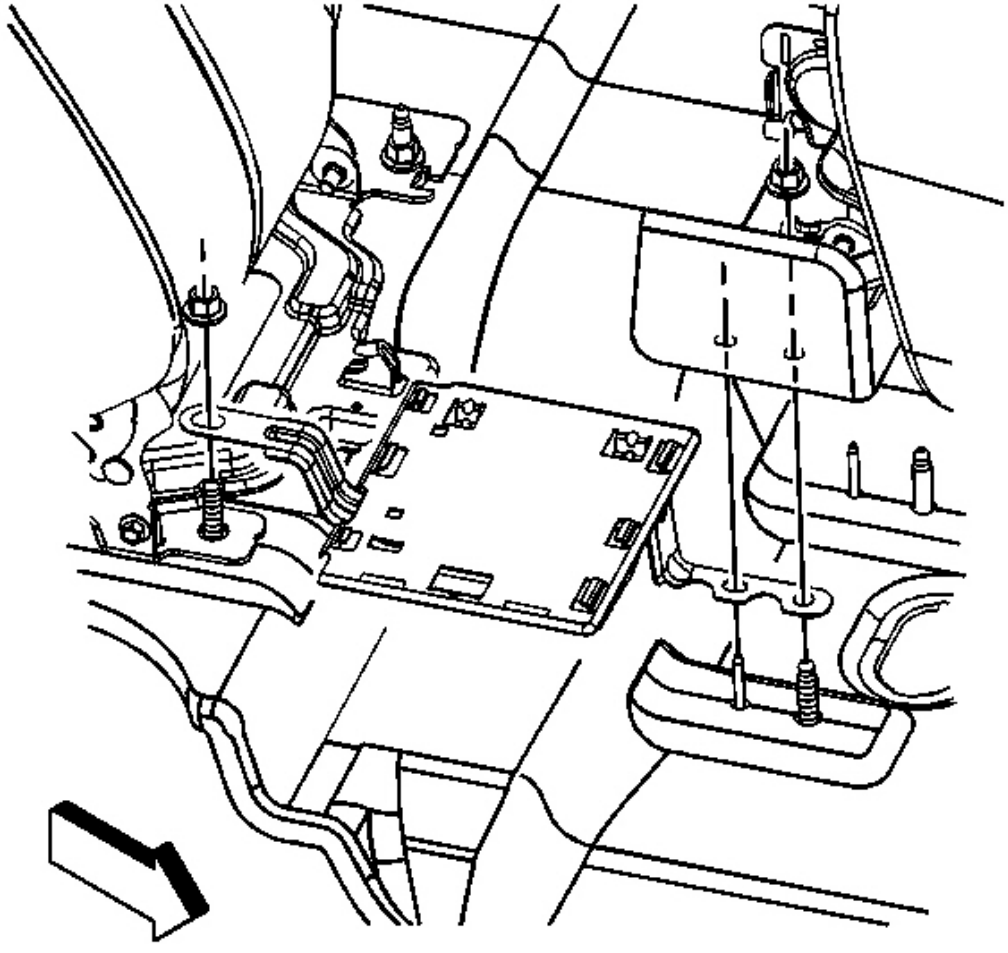


Fig. 47: View Of Processor Bracket Retaining Nut
Courtesy of GENERAL MOTORS CORP.

1. Install the processor bracket to the rear seat studs.

   NOTE: Refer to Fastener Notice .

2. Install the nut to the rear seat back stud.

   Tighten: Tighten the nut to 45 N.m (33 lb ft).

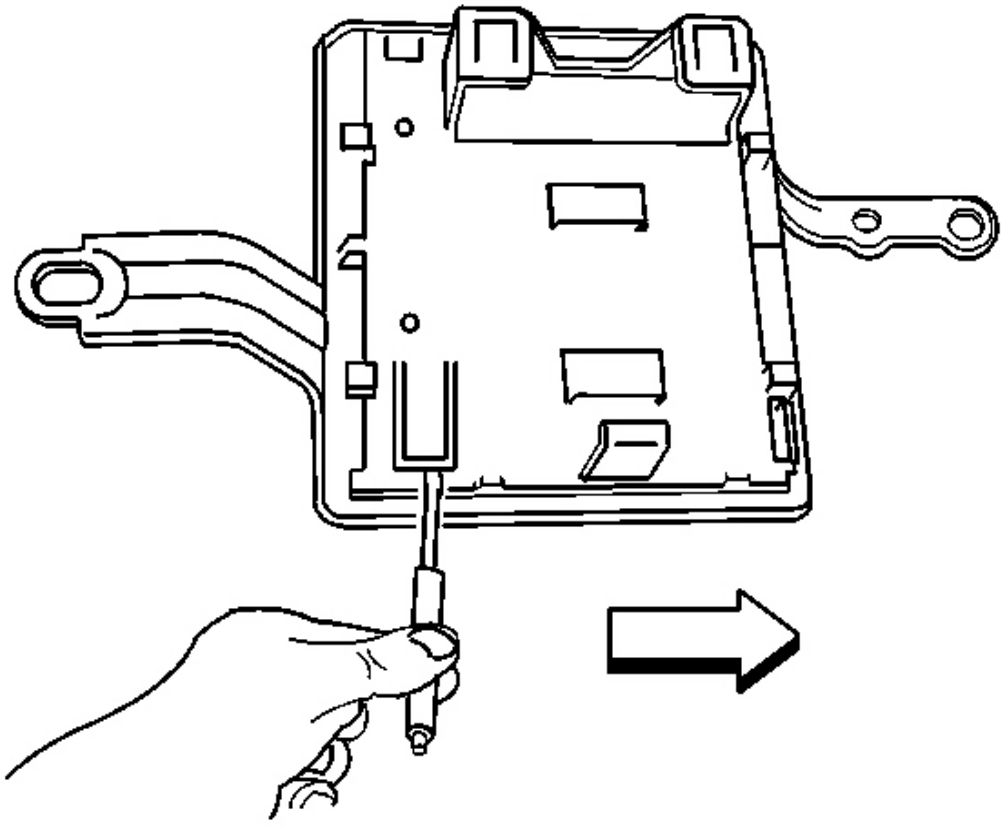


Fig. 48: Releasing Retaining Tab On Upper Bracket
Courtesy of GENERAL MOTORS CORP.

3. Position the upper bracket to the processor bracket.
4. Slide the upper bracket outboard until all the retaining tabs are seated to the processor bracket.
5. Install the communication interface module. Refer to **Communication Interface Module Replacement (TrailBlazer, Envoy)**.
6. Install the right rear seat cushion. Refer to **Rear Seat Cushion Replacement** .

CELLULAR COMMUNICATIONS/DIGITAL RADIO ANTENNA REPLACEMENT

Removal Procedure

1. Lower the front portion of the headliner. Refer to **Headlining Trim Panel Replacement** .

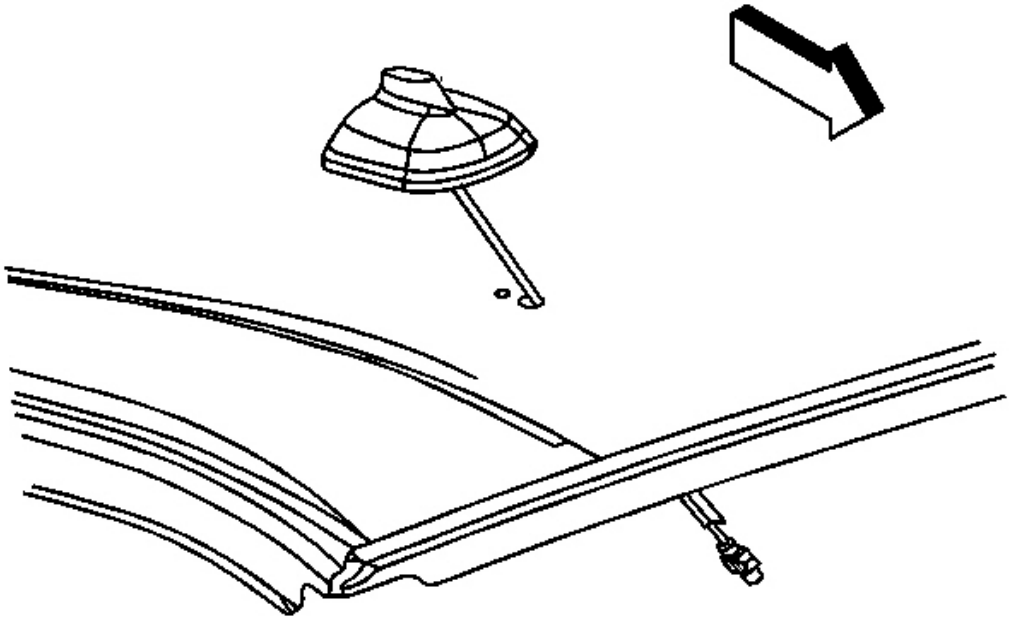


Fig. 49: View Of Digital Radio Antenna Assembly
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connectors from the digital radio antenna assembly.
3. Remove the retaining bolt and retainer from the antenna.
4. Squeeze the plastic retainer to release the antenna assembly from the roof panel.
5. Using an upward motion, remove the antenna assembly from the roof.

Installation Procedure

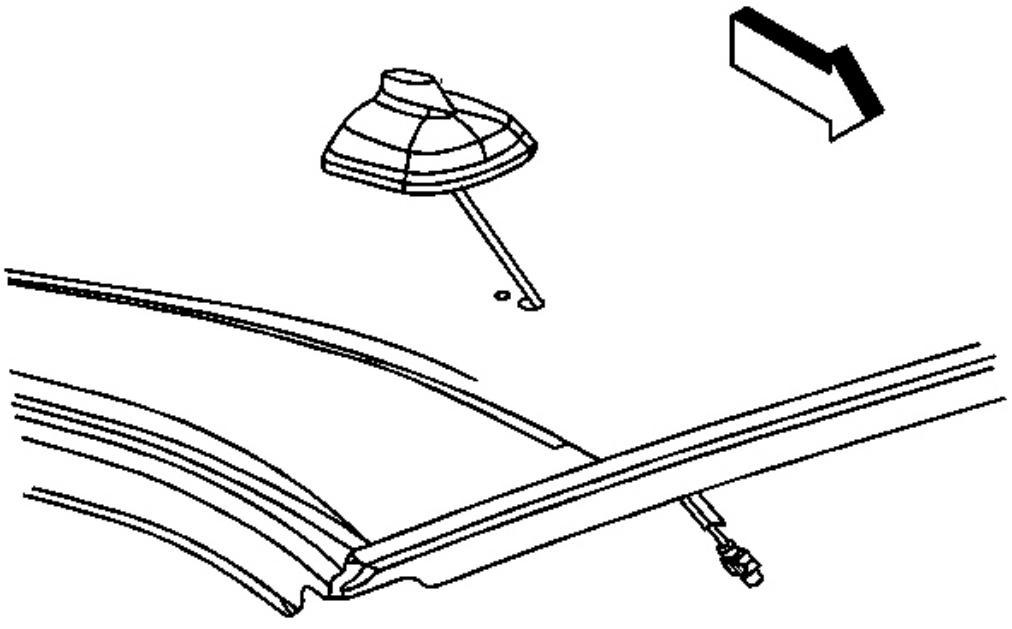


Fig. 50: View Of Digital Radio Antenna Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the antenna assembly to the top of the roof.
2. Lower the antenna assembly to the roof panel, ensuring the anti-rotation pin is properly indexed.

NOTE: **Refer to Fastener Notice .**

3. Install the retainer and retainer bolt.

   Tighten: Tighten the bolt to 6 N.m (53 lb in).

4. Connect the antenna electrical connectors.
5. Install the headliner. Refer to **Headlining Trim Panel Replacement** .

CELLULAR & NAVIGATION ANTENNA ASSEMBLY REPLACEMENT

Removal Procedure

1. Lower the front portion of the headliner. Refer to **Headlining Trim Panel Replacement**

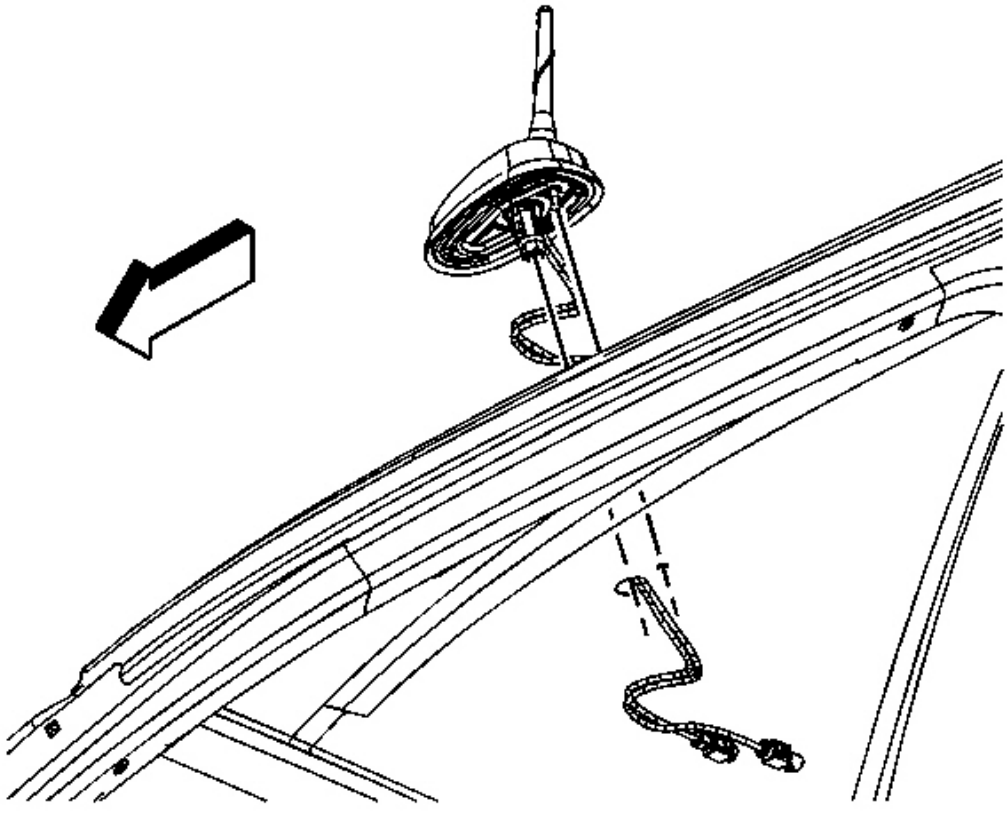


Fig. 51: View Of Antenna Assembly & Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connectors from the antenna assembly.
3. Loosen the retaining nut until the assembly can be removed from the roof panel.
4. Using an upward motion, remove the antenna assembly from the roof.

Installation Procedure

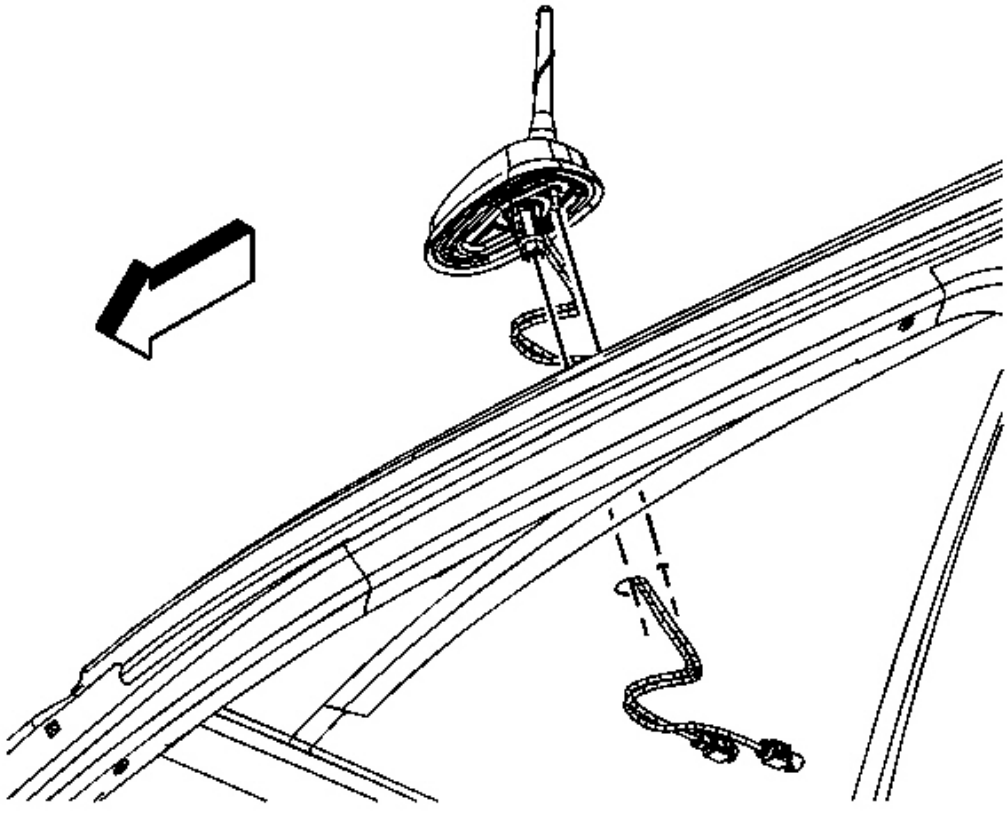


Fig. 52: View Of Antenna Assembly & Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

1. Install the antenna assembly from the top of the roof.
2. Lower the antenna assembly to the roof panel, ensuring the anti-rotation pin is properly indexed.

NOTE: **Refer to Fastener Notice .**

3. Tighten the retaining nut.

   Tighten: Tighten the nut to 6 N.m (53 lb in).

4. Connect the antenna electrical connectors.
5. Install the headliner. Refer to **Headlining Trim Panel Replacement** .

FIXED ANTENNA MAST REPLACEMENT

Removal Procedure

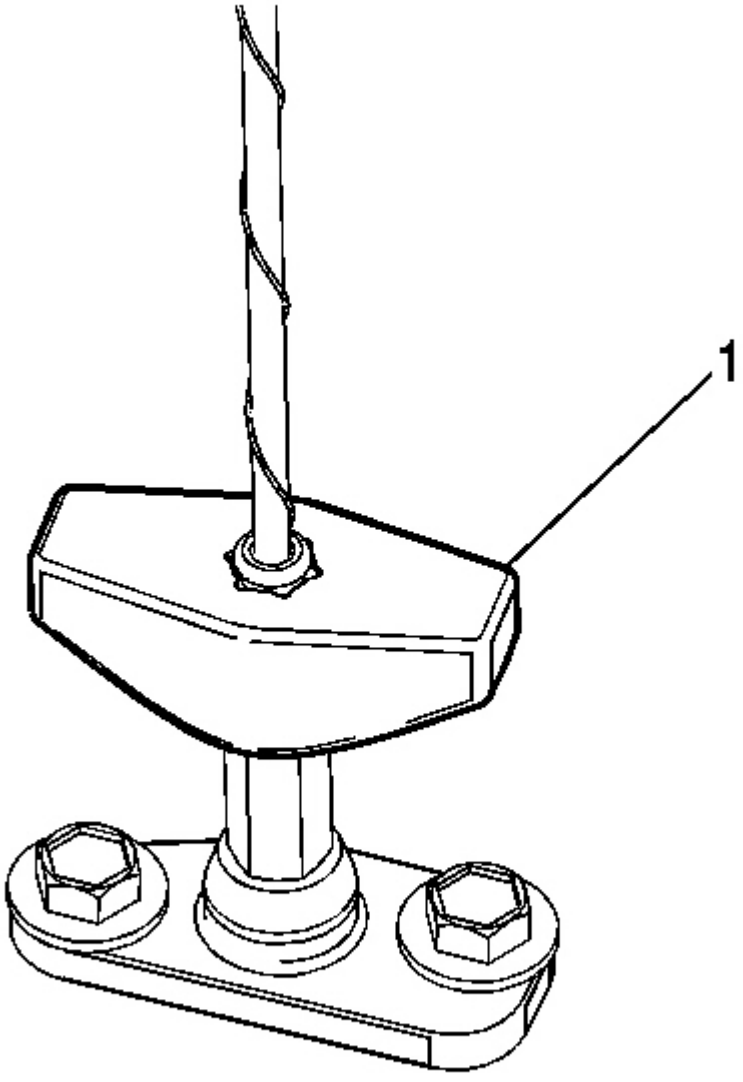


Fig. 53: View Of Antenna Mast Removal Tool
Courtesy of GENERAL MOTORS CORP.

1. Use the tool (1) provided with the vehicle to unscrew the antenna mast.

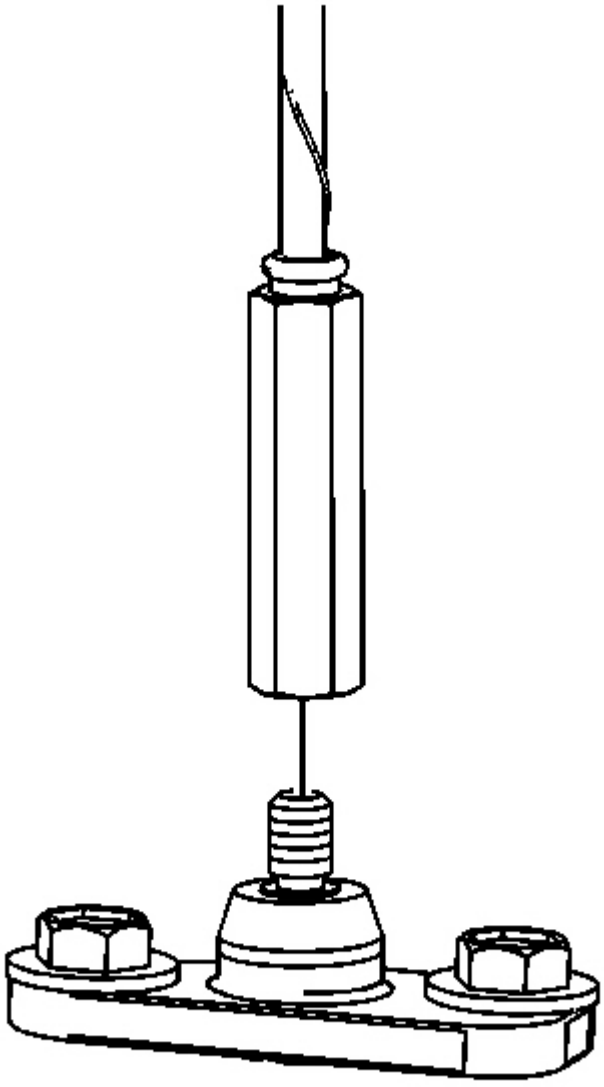


Fig. 54: View Of Antenna Mast & Base
Courtesy of GENERAL MOTORS CORP.

2. Remove the antenna mast from the antenna base.

Installation Procedure

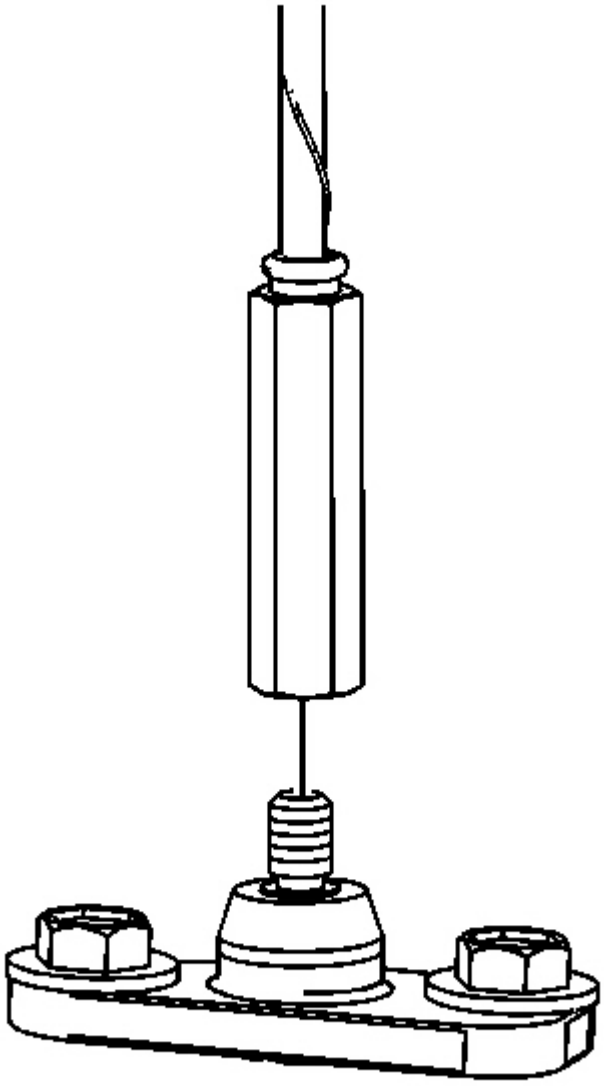


Fig. 55: View Of Antenna Mast & Base
Courtesy of GENERAL MOTORS CORP.

1. Install the antenna mast to the antenna base.

IMPORTANT: Install the antenna mast using the mast tool. Ensure the antenna mast is fully seated to the antenna base.

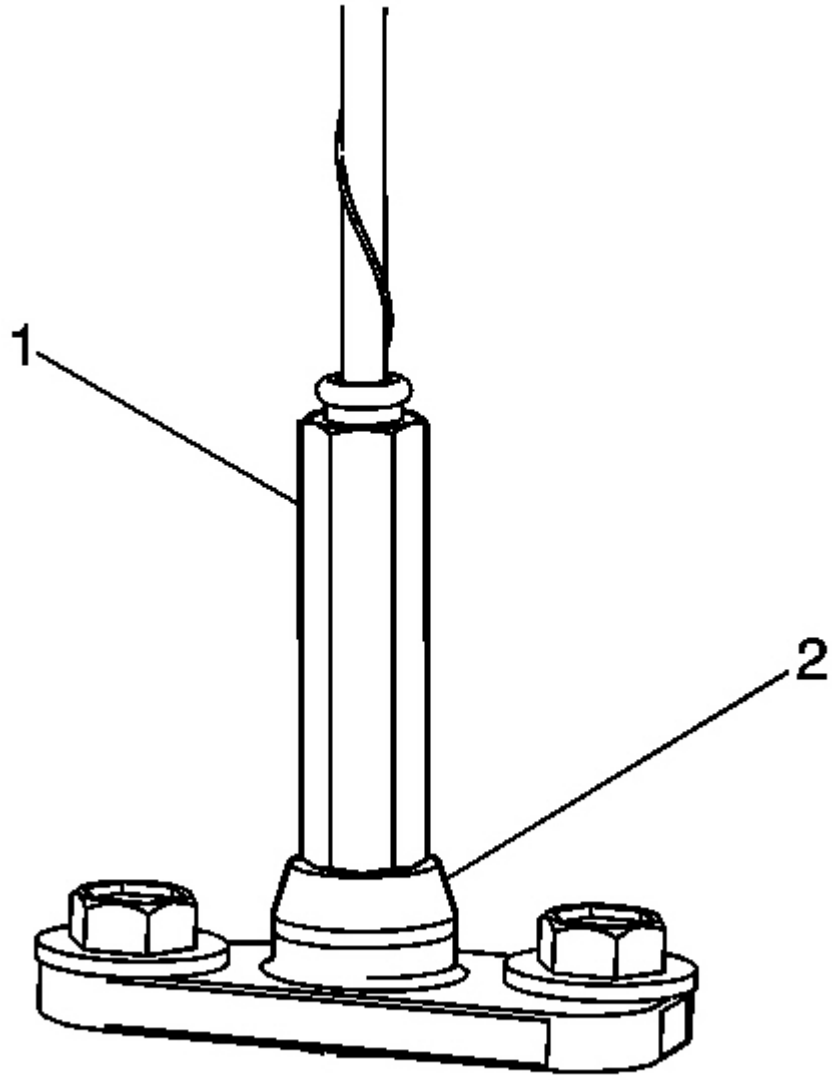


Fig. 56: View Of Antenna Mast Installation
Courtesy of GENERAL MOTORS CORP.

2. Using the mast tool, tighten the antenna mast (1) until fully seated to the antenna base (2).

DIGITAL RADIO ANTENNA REPLACEMENT

Removal Procedure

1. Lower the front portion of the headliner. Refer to **Headlining Trim Panel Replacement** .

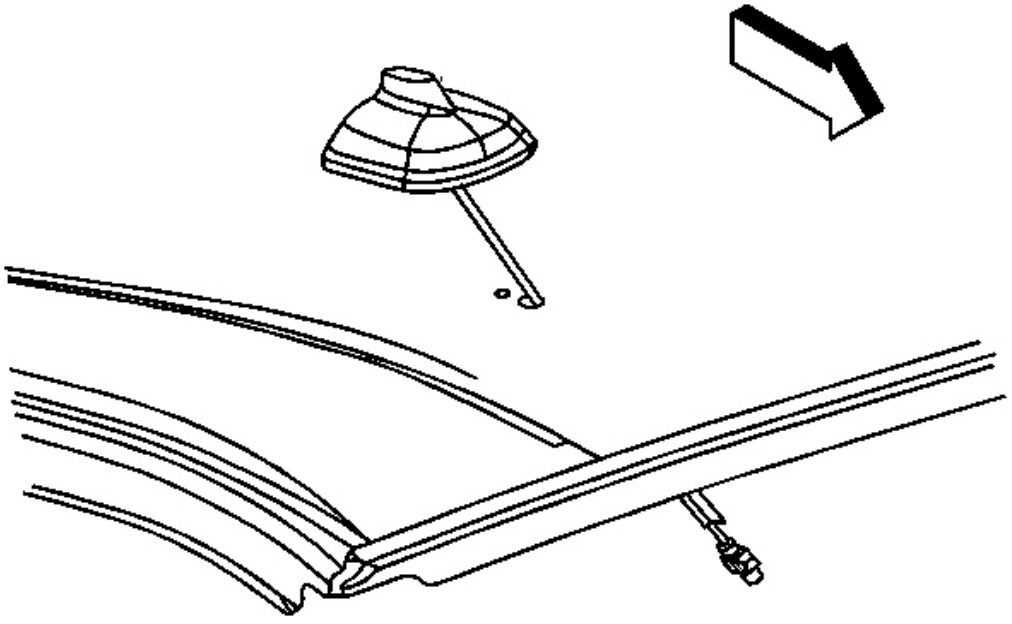


Fig. 57: View Of Digital Radio Antenna Assembly
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connectors from the digital radio antenna assembly.
3. Loosen the retaining nut until the assembly can be removed from the roof panel.
4. Using an upward motion, remove the antenna assembly from the roof.

Installation Procedure

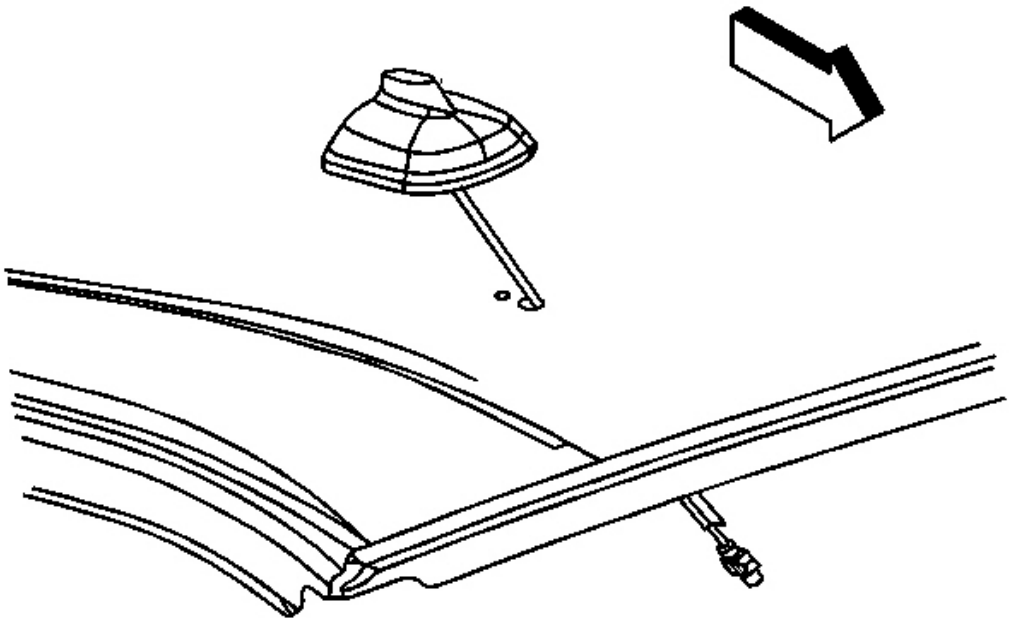


Fig. 58: View Of Digital Radio Antenna Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the antenna assembly from the top of the roof.
2. Lower the antenna assembly to the roof panel, ensuring the anti-rotation pin is properly indexed.

NOTE: Refer to Fastener Notice .

3. Tighten the retaining nut.

   Tighten: Tighten the nut to 6 N.m (53 lb in).

4. Connect the antenna electrical connectors.
5. Install the headliner. Refer to **Headlining Trim Panel Replacement** .

GLOBAL POSITIONING SYSTEM (GPS) ANTENNA REPLACEMENT

Removal Procedure

IMPORTANT: It is not necessary to lower the steering column to remove the radio antenna module.

1. Remove the navigational radio. Refer to **Radio Replacement**.

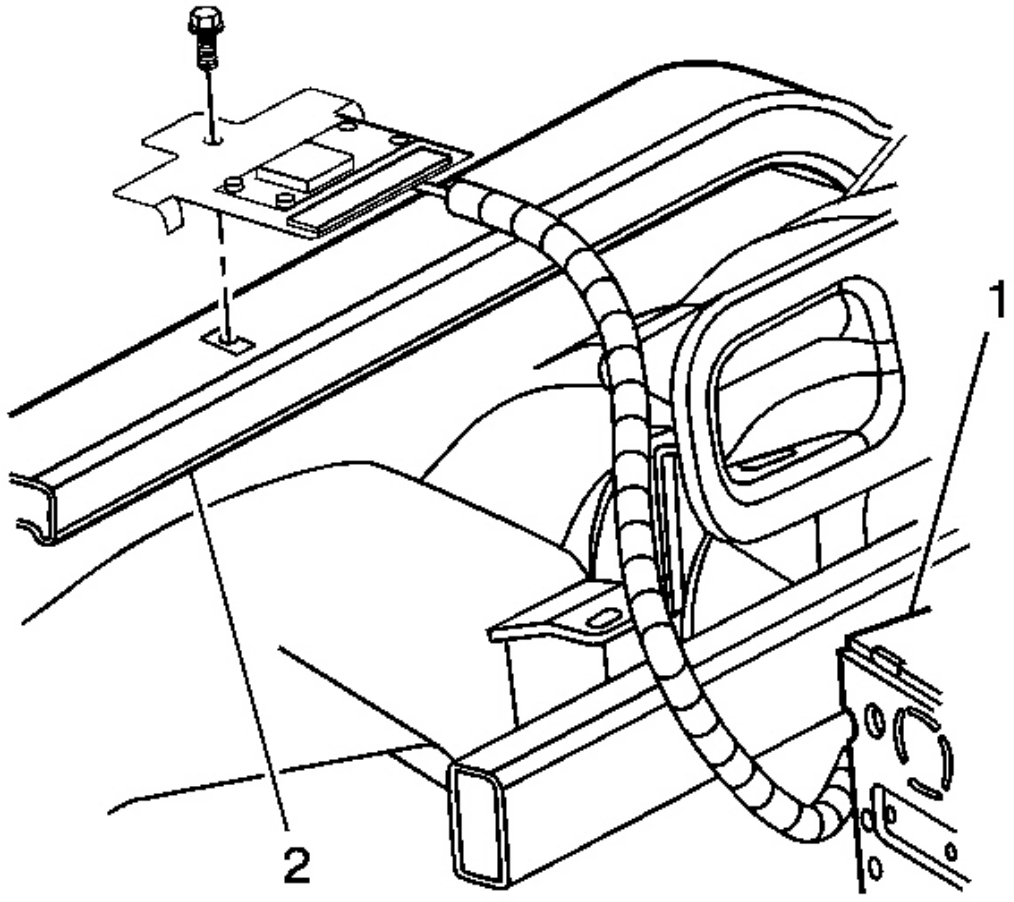


Fig. 59: Identifying Navigational Radio Electrical Connector & Cross Beam
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the electrical connector from the navigational radio (1).
3. Partially remove the instrument panel (I/P) assembly from the I/P structure, to gain access to the antenna module retaining screw. Refer to **Instrument Panel Assembly Replacement** .
4. Remove the screw retaining the radio antenna module to the cross-car beam (2).
5. Remove the antenna module from the vehicle.

Installation Procedure

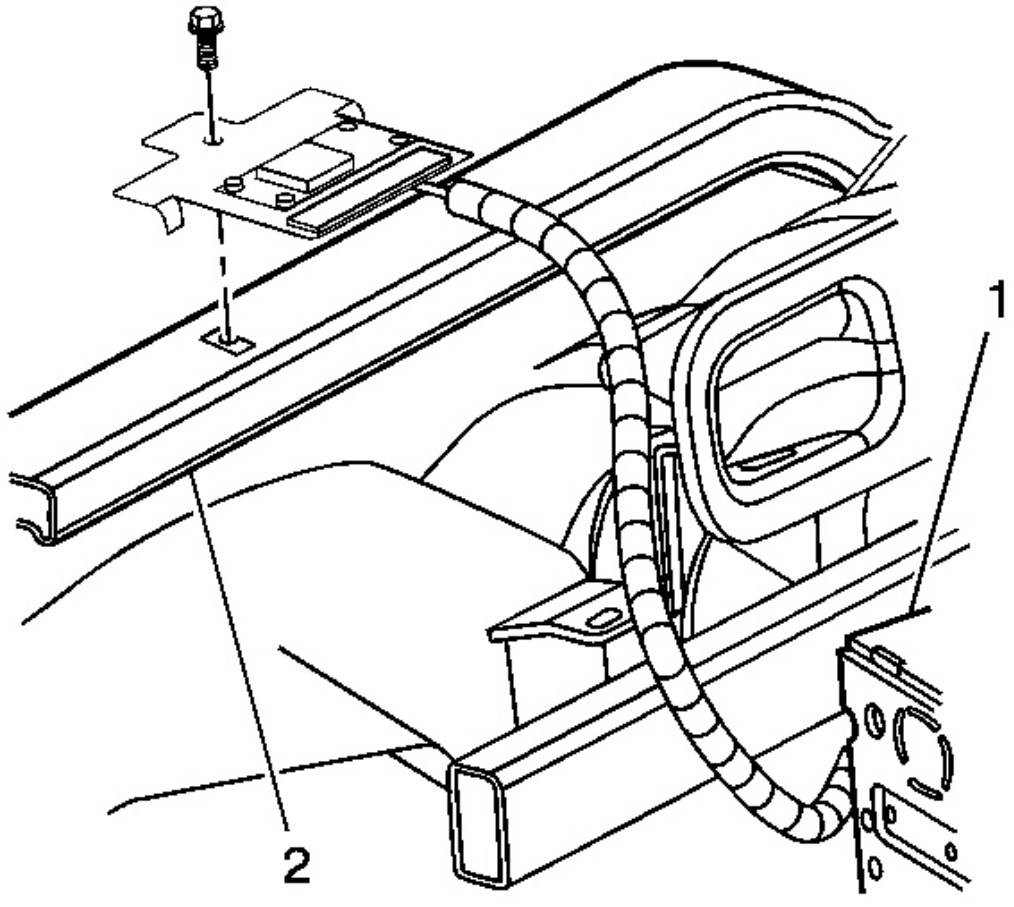


Fig. 60: Identifying Navigational Radio Electrical Connector & Cross Beam
Courtesy of GENERAL MOTORS CORP.

1. Install the antenna module to the vehicle.
2. Install the screw retaining the antenna module to the cross-car beam (2).

NOTE: **Refer to Fastener Notice .**

3. Tighten the screw.

   Tighten: Tighten the screw to 2.5 N.m (22 lb in).

4. Install the I/P assembly. Refer to **Instrument Panel Assembly Replacement** .
5. Connect the electrical connector to the navigational radio (1).

6. Install the navigational radio. Refer to **Radio Replacement**.

DIGITAL RADIO ANTENNA CABLE REPLACEMENT

Removal Procedure

1. Remove the right windshield garnish molding. Refer to **Windshield Pillar Garnish Molding Replacement** .
2. Remove the instrument panel (I/P) trim pad. Refer to **Instrument Panel Upper Trim Pad Replacement** .
3. Remove the right sunshade and inboard retaining clip. Refer to **Sunshade Replacement** .
4. Lower the front portion of the headliner. Refer to **Headlining Trim Panel Replacement** .
5. Disconnect the electrical connectors from the digital radio antenna assembly. Refer to **Digital Radio Antenna Replacement**.
6. Remove the right front door sill plate. Refer to **Front Side Door Sill Plate Replacement** .

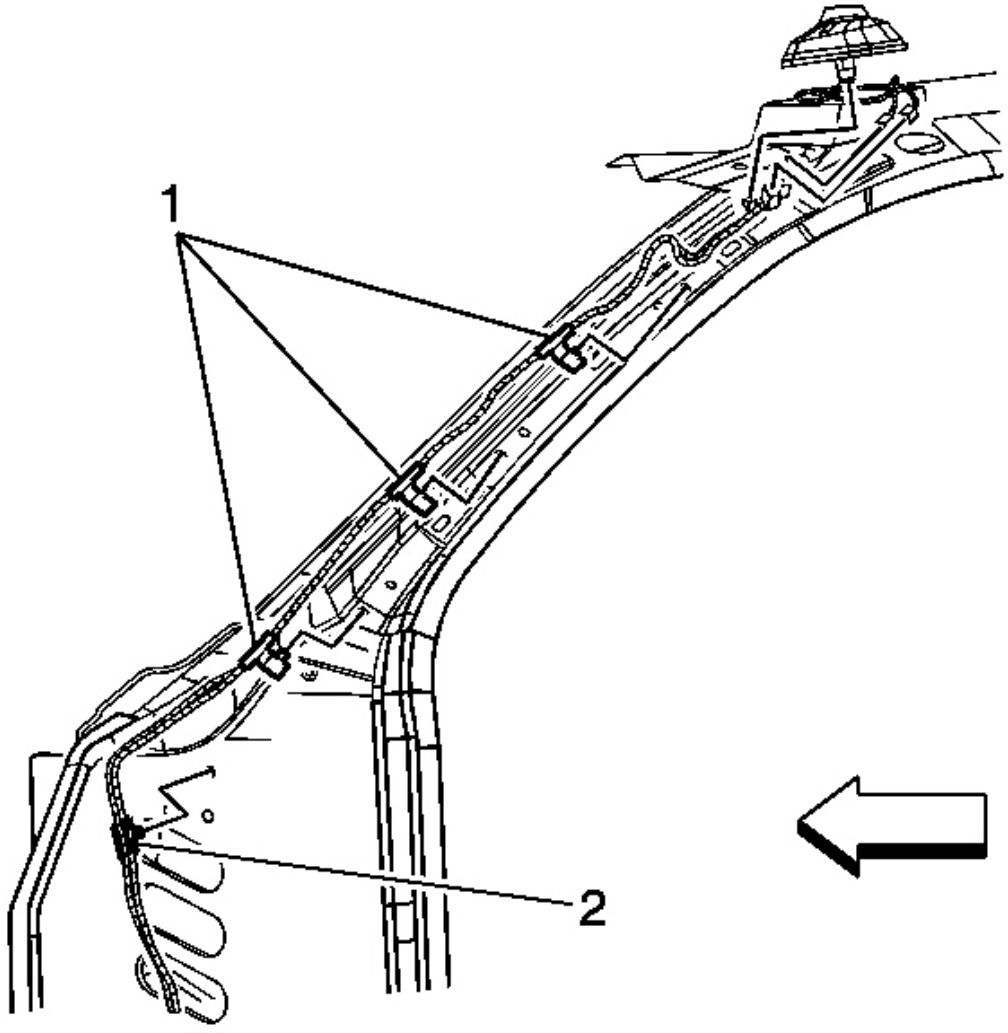


Fig. 61: Identifying Coaxial Cable & Right Windshield Pillar
Courtesy of GENERAL MOTORS CORP.

7. Remove the coaxial cable from the right windshield pillar (1).
8. Lower the right closeout insulator panel. Refer to **Instrument Panel Insulator Panel Replacement - Right Side** .
9. Disconnect the coaxial cable from the digital radio receiver.

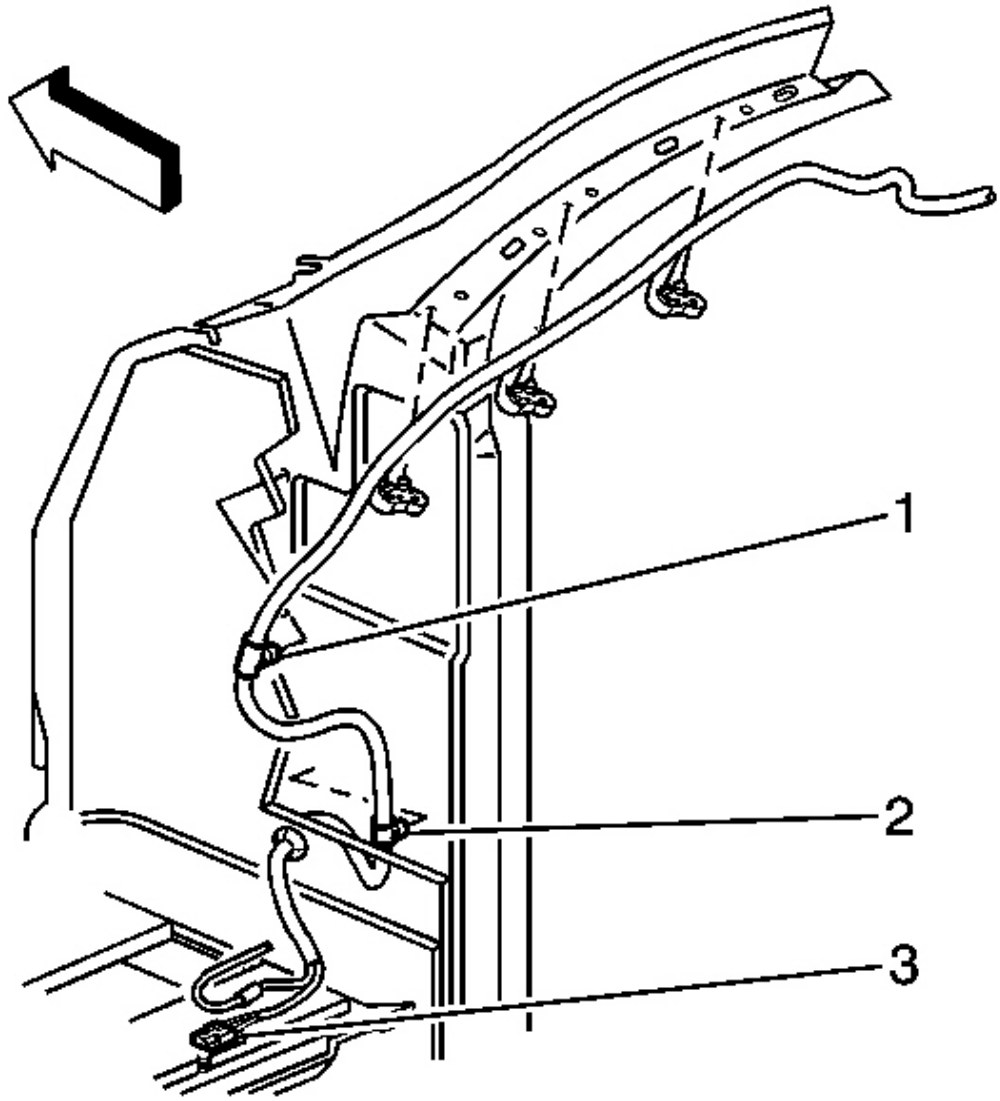


Fig. 62: View Of Coaxial Cable & Rose Buds
Courtesy of GENERAL MOTORS CORP.

10. Remove the lower rose bud (2) from the cowl.
11. Securely attach a mechanics wire to the end of the coaxial cable (3).
12. The coaxial cable is routed through the cowl insulator access hole and positioned between the cowl and the I/P. In order to release the upper rose bud (1), grasp the coaxial cable near the bottom of the windshield and carefully pull upward.

13. Leaving the mechanics wire routed behind the I/P, remove the mechanics wire from the coaxial cable.
14. Remove the coaxial cable from the vehicle.

Installation Procedure

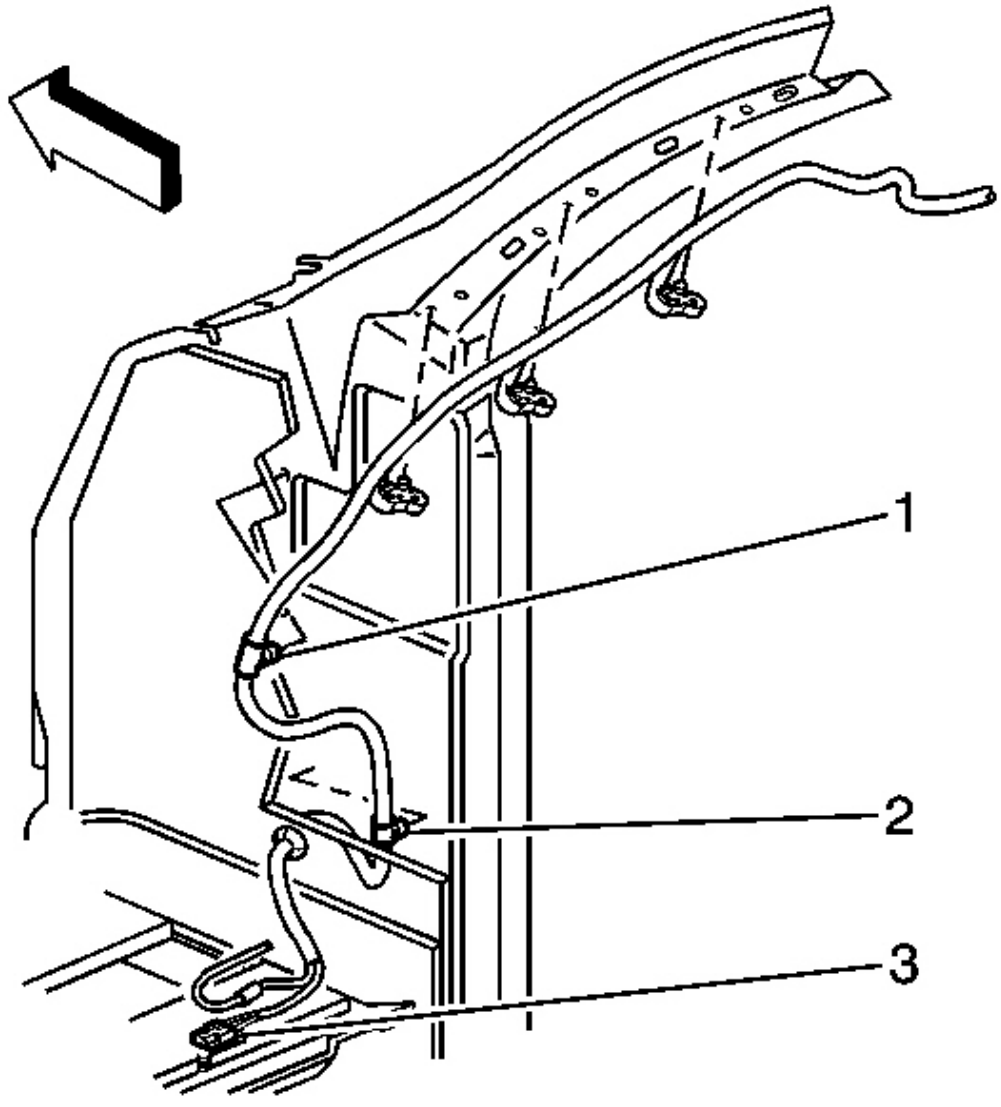


Fig. 63: View Of Coaxial Cable & Rose Buds
Courtesy of GENERAL MOTORS CORP.

1. Securely attach the mechanics wire already routed behind the I/P to the end of the coaxial cable (3).
2. If equipped, carefully remove the rose bud (1) from the coaxial cable.
3. Grasp and gently pull the mechanics wire through the cowl insulator, routing the coaxial cable behind the I/P.
4. Attach the lower rose bud (2) to the cowl.

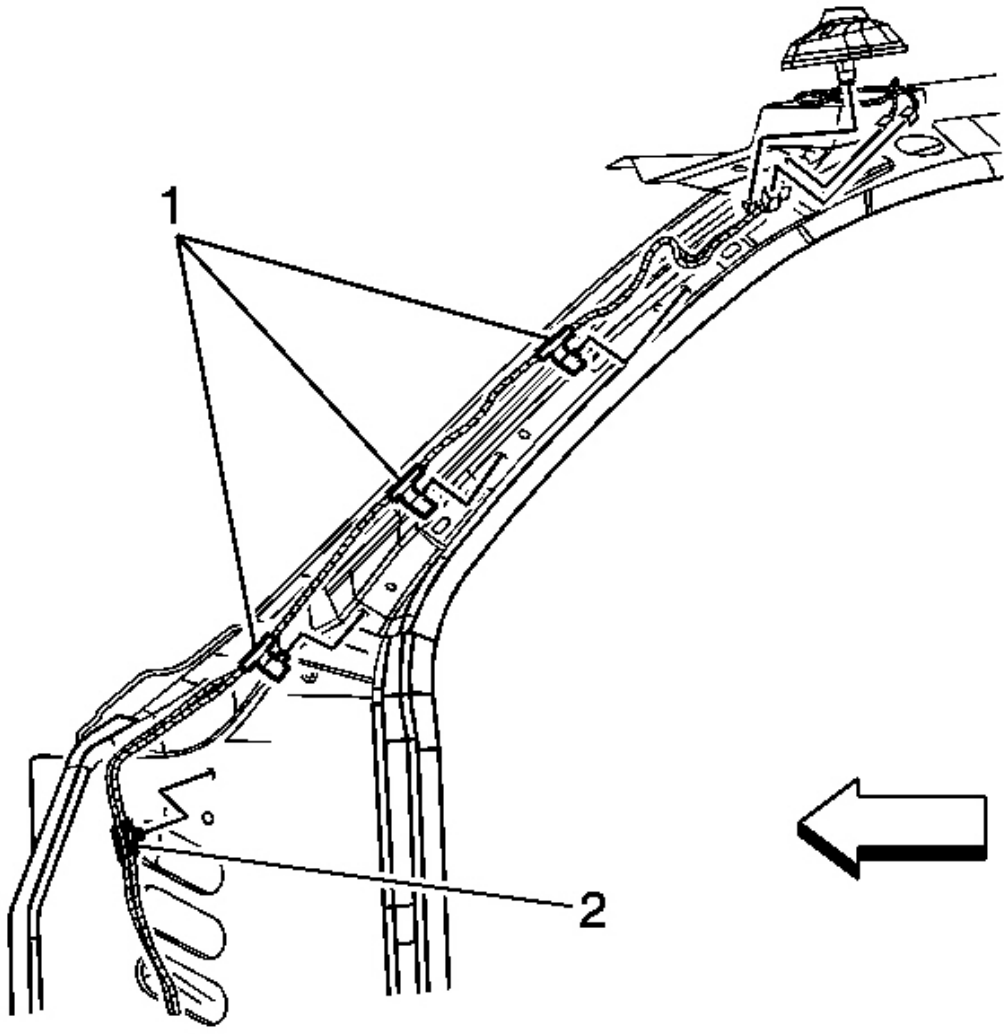


Fig. 64: Identifying Coaxial Cable & Right Windshield Pillar
Courtesy of GENERAL MOTORS CORP.

5. Connect the coaxial cable to the digital radio receiver.

6. Attach the coaxial cable to the right windshield pillar (1).
7. Install the right front door sill plate. Refer to **Front Side Door Sill Plate Replacement** .
8. Install the right closeout insulator panel. Refer to **Instrument Panel Insulator Panel Replacement - Right Side** .
9. Connect the electrical connectors to the digital radio antenna assembly. Refer to **Digital Radio Antenna Replacement**.
10. Install the headliner. Refer to **Headlining Trim Panel Replacement** .
11. Install the right sunshade and inboard retaining clip. Refer to **Sunshade Replacement** .
12. Install the I/P trim pad. Refer to **Instrument Panel Upper Trim Pad Replacement** .
13. Install the right windshield garnish molding. Refer to **Windshield Pillar Garnish Molding Replacement** .

MOBILE TELEPHONE ANTENNA COAXIAL CABLE REPLACEMENT

Removal Procedure

1. Turn the ignition to the OFF position.
2. Remove the right rear seat cushion. Refer to **Rear Seat Cushion Replacement** .
3. Remove the communication interface module. Refer to **Communication Interface Module Replacement (TrailBlazer, Envoy)**.
4. Remove the navigation control processor bracket. Refer to **Navigation Control Processor Bracket Replacement (Envoy XL)** or **Navigation Control Processor Bracket Replacement (TrailBlazer/Envoy/Rainier)**.
5. Pass the cellular telephone coax cable through the carpet opening.
6. Remove the seat back, left and right side. Refer to **Rear Seat Number 1 Back Replacement** .
7. Remove the front door sill plates. Refer to **Front Side Door Sill Plate Replacement** .
8. Remove the rear door sill plates. Refer to **Rear Side Door Sill Plate Replacement** .
9. Remove the center pillar trim panels. Refer to **Center Pillar Garnish Molding Replacement** .
10. Remove the rear quarter upper trim panels. Refer to **Rear Quarter Upper Trim Panel Replacement (TrailBlazer, Envoy)** .
11. Remove the lower rear quarter trim panels. Refer to **Rear Quarter Trim Panel Replacement - Left Side** , or to **Rear Quarter Trim Panel Replacement - Right Side** .
12. Remove the left coat hook. Refer to **Coat Hook Replacement** .
13. Remove the tool kit carrier.
14. Remove the child restraint tether anchors. Refer to **Child Restraint Tether Anchor Replacement - Rear No. 1** .
15. Lift and fold the carpet over the bucket seats.

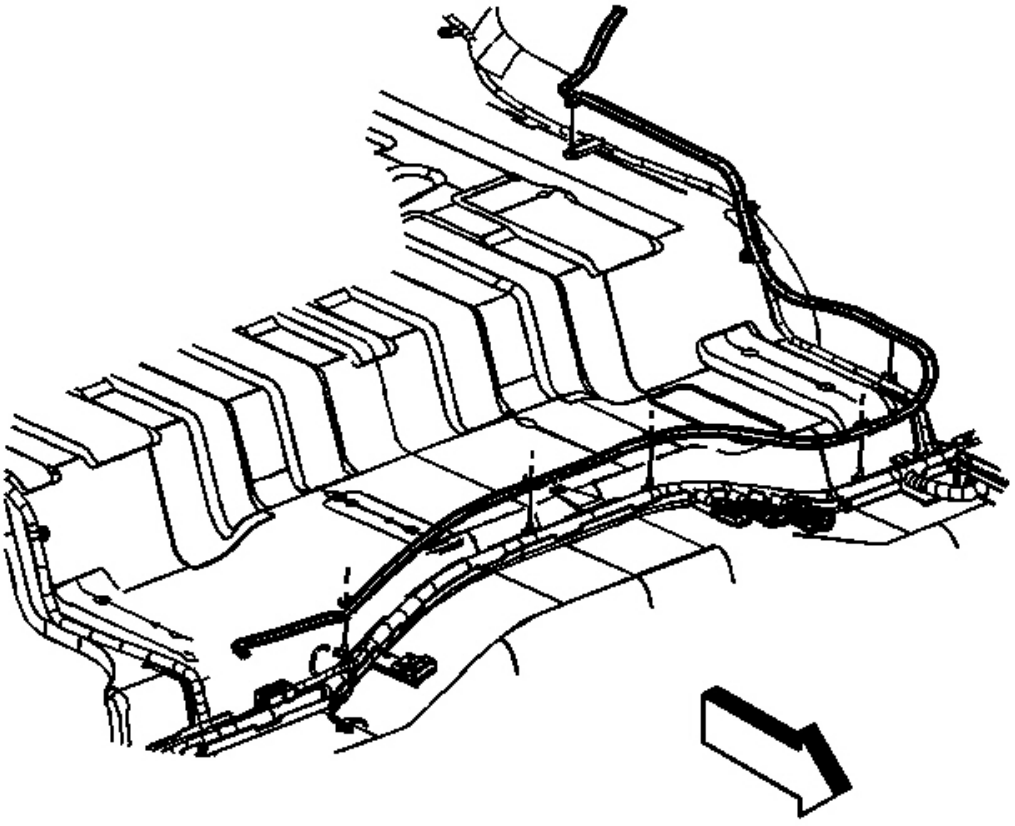


Fig. 65: View Of Coax Cable & Fasteners In Floor Panel
Courtesy of GENERAL MOTORS CORP.

16. Remove the coax cable fasteners from the floor panel.

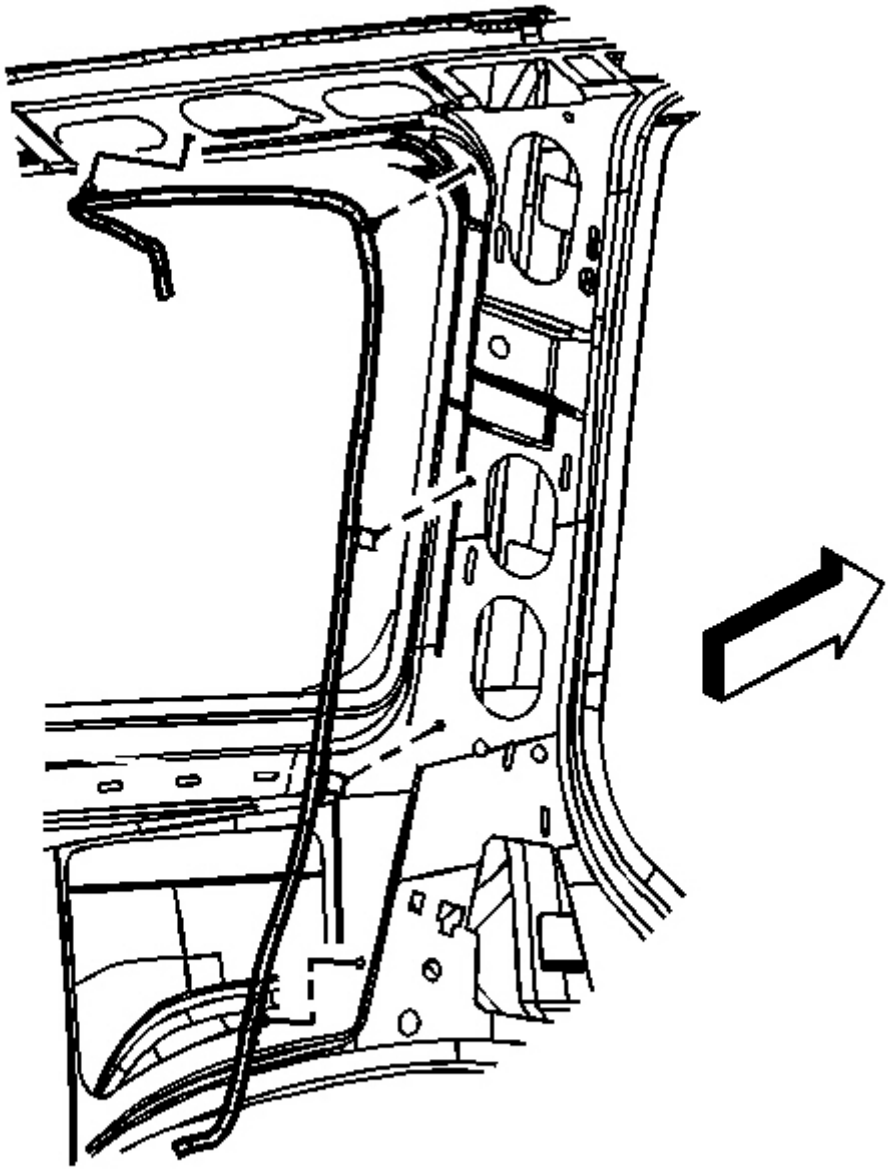


Fig. 66: View Of Coax Cable & Fasteners In Third Left Pillar
Courtesy of GENERAL MOTORS CORP.

17. Remove the coax cable fasteners from the left third pillar.

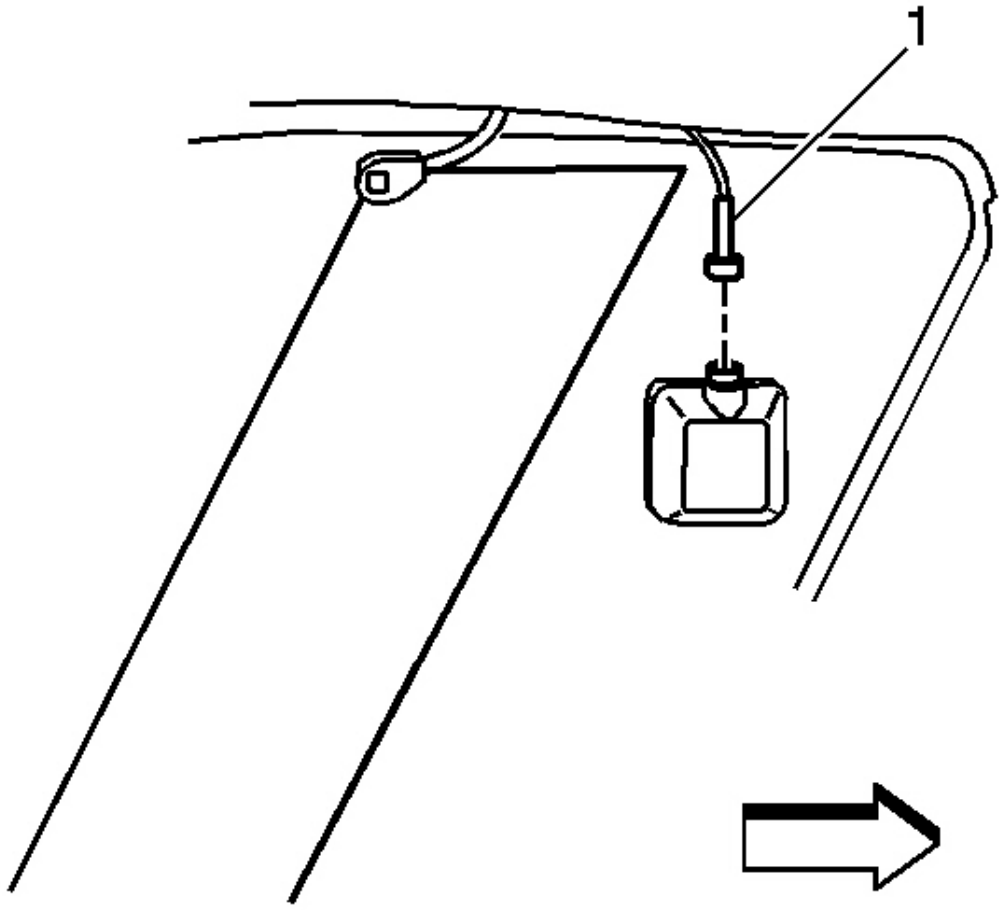


Fig. 67: Identifying Coax Cable & Window Mounted Coupling
Courtesy of GENERAL MOTORS CORP.

18. Disconnect the coax cable (1) from the window mounted coupling.

Installation Procedure

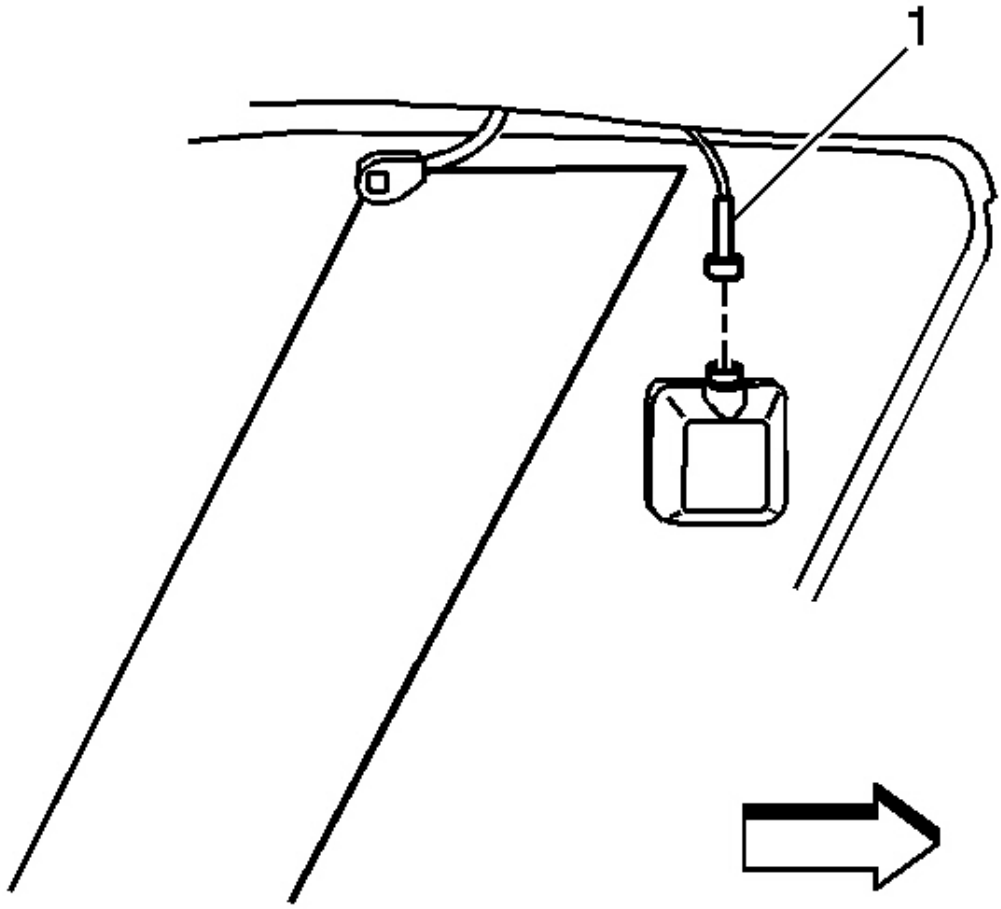


Fig. 68: Identifying Coax Cable & Window Mounted Coupling
Courtesy of GENERAL MOTORS CORP.

1. Connect the coax cable (1) to the window mounted coupling.

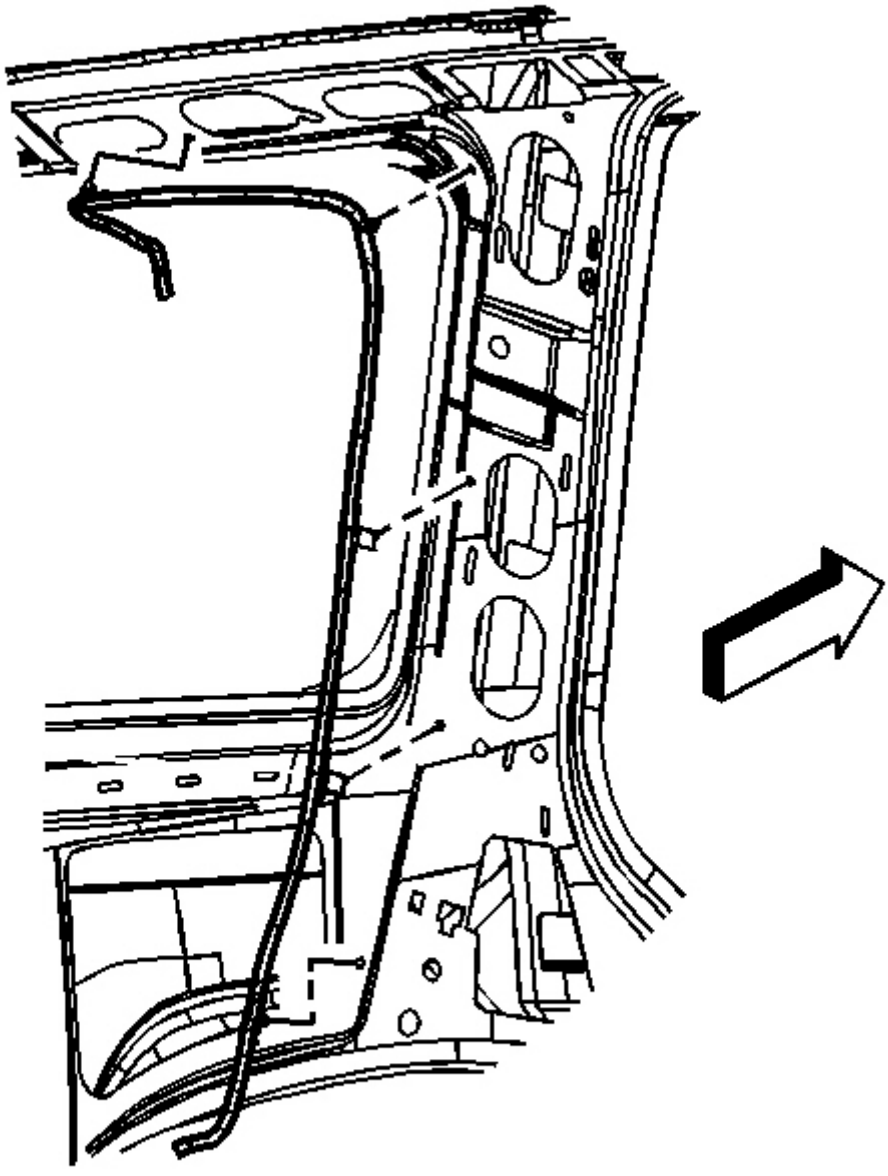


Fig. 69: View Of Coax Cable & Fasteners In Third Left Pillar
Courtesy of GENERAL MOTORS CORP.

2. Attach the coax cable fasteners to the left third pillar.

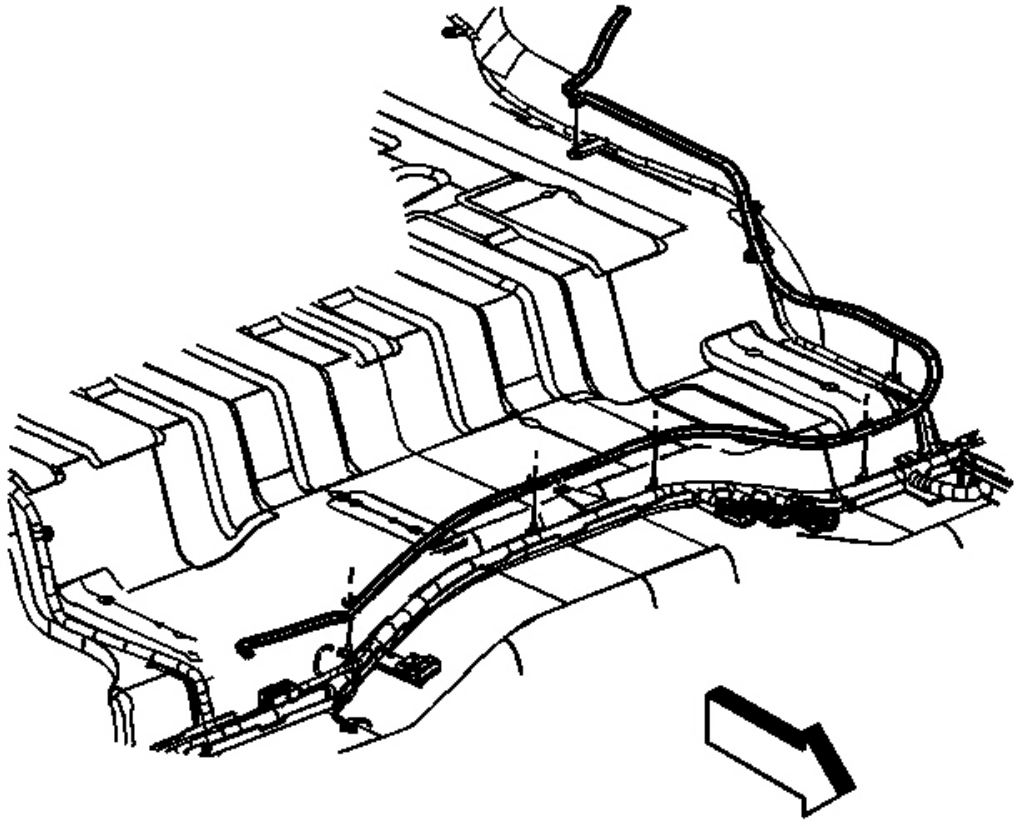


Fig. 70: View Of Coax Cable & Fasteners In Floor Panel
Courtesy of GENERAL MOTORS CORP.

3. Attach the coax cable fasteners to the floor panel.
4. Position the carpet to the floor panel, aligning the holes in the carpet to the seat studs on the floor panel.
5. Pass the cellular telephone coax cable through the carpet opening
6. Install the child restraint tether anchors. Refer to **Child Restraint Tether Anchor Replacement - Rear No. 1** .
7. Install the tool kit carrier.

NOTE: **Refer to Fastener Notice .**

8. Install the 3 tool carrier nuts to the floor studs.

Tighten: Tighten the nuts to 7 N.m (62 lb in).

9. Install the lower rear quarter trim panels. Refer to **Rear Quarter Trim Panel Replacement - Left Side** , or to **Rear Quarter Trim Panel Replacement - Right Side** .
10. Install the rear quarter upper trim panels. Refer to **Rear Quarter Upper Trim Panel Replacement (TrailBlazer, Envoy)** .
11. Install the center pillar trim panels. Refer to **Center Pillar Garnish Molding Replacement** .
12. Install the left coat hook. Refer to **Coat Hook Replacement** .
13. Install the rear door sill plates. Refer to **Rear Side Door Sill Plate Replacement** .
14. Install the front door sill plates. Refer to **Front Side Door Sill Plate Replacement** .
15. Instal the seat back, right and left side. Refer to **Rear Seat Number 1 Back Replacement** .
16. Install the navigation control processor bracket to the floor panel. Refer to **Navigation Control Processor Bracket Replacement (Envoy XL)** or **Navigation Control Processor Bracket Replacement (TrailBlazer/Envoy/Rainier)**.
17. Install the communication interface module. Refer to **Communication Interface Module Replacement (TrailBlazer, Envoy)**.
18. Install the right rear seat cushion. Refer to **Rear Seat Cushion Replacement** .
19. Adjust the right seat cushion to a passenger position.

ANTENNA CABLE REPLACEMENT

Removal Procedure

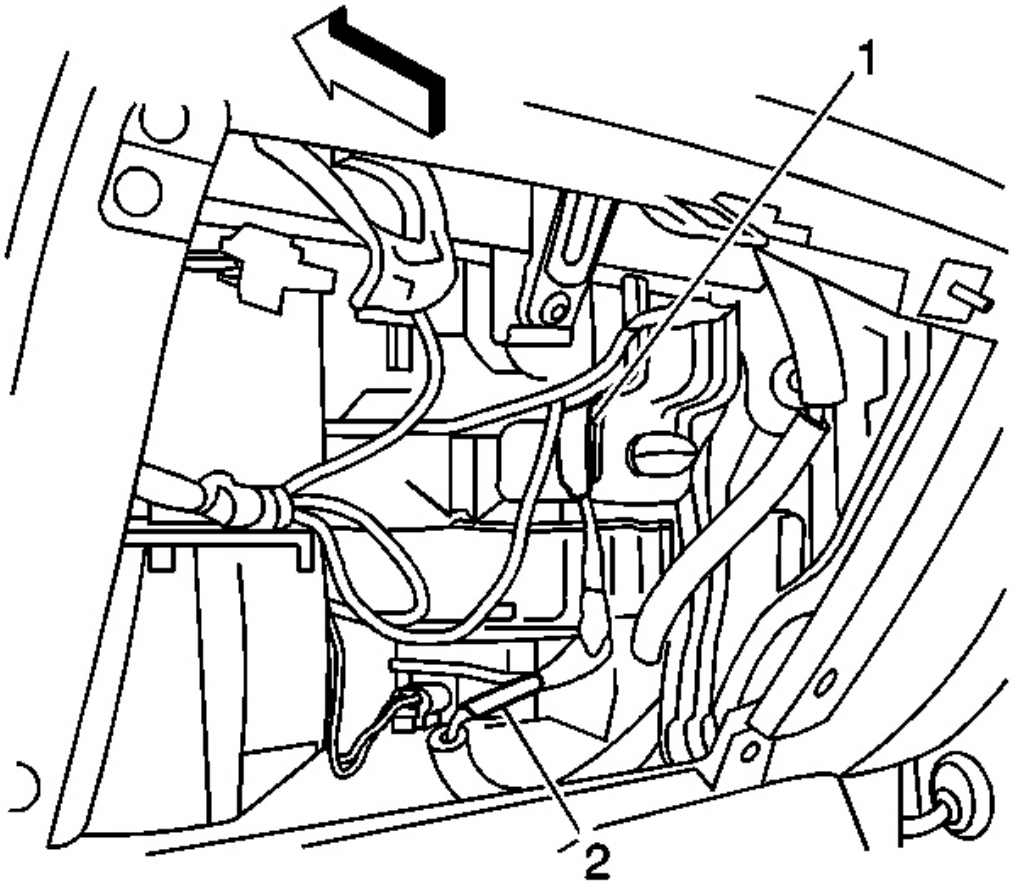


Fig. 71: View Of Radio Antenna Cable To Radio Extension Cable
Courtesy of GENERAL MOTORS CORP.

1. Open the instrument panel (I/P) compartment to a full down position.
2. Disconnect the radio antenna cable (2) from the radio extension cable.
3. Remove the lower rear portion of the wheelhouse panel. Refer to **Wheelhouse Panel Replacement (Front End)** .

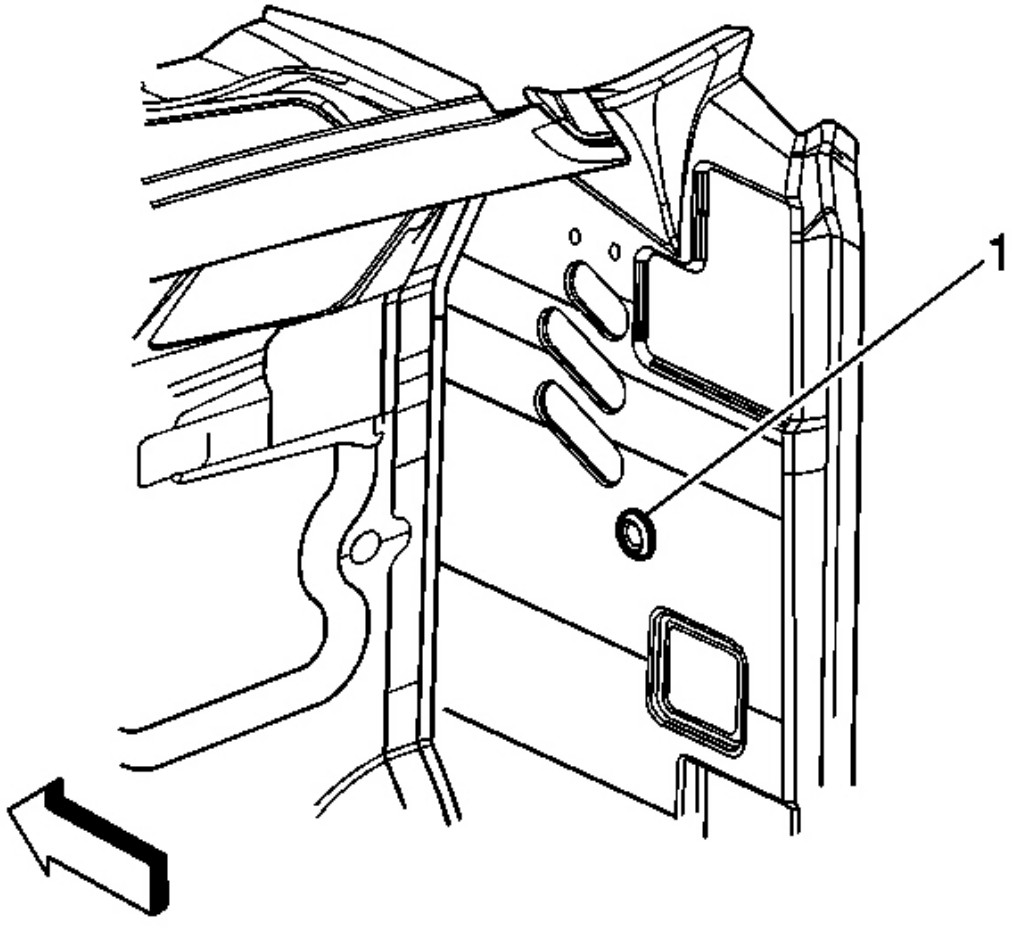


Fig. 72: Identifying Cowl Opening
Courtesy of GENERAL MOTORS CORP.

4. Reach up behind the wheelhouse panel and remove the antenna cable and grommet assembly from the cowl opening (1).
5. Pass the end of the radio antenna cable assembly through the cowl opening (1).
6. Remove the antenna mast. Refer to **Fixed Antenna Mast Replacement**.
7. Open the hood.

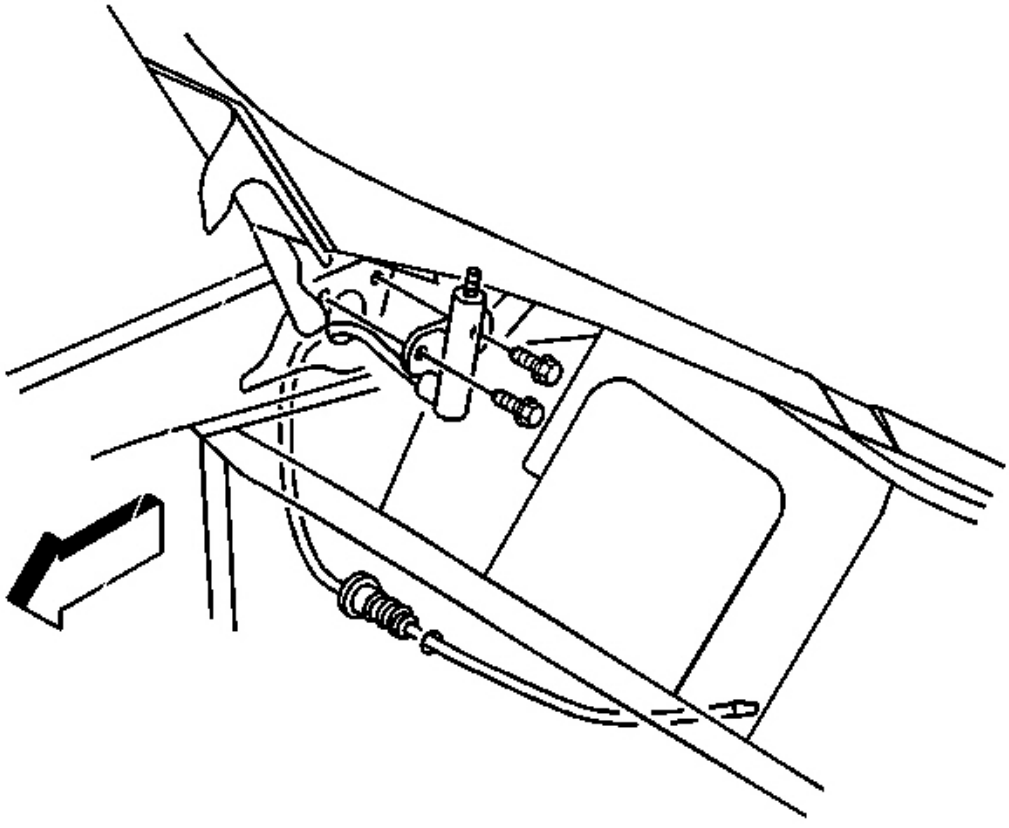


Fig. 73: View Of Radio Antenna Cable Assembly
Courtesy of GENERAL MOTORS CORP.

8. Remove the radio antenna cable assembly retaining screws.
9. Pass the antenna cable and grommet assembly through the fender opening.
10. Remove the radio antenna cable assembly from the vehicle.

Installation Procedure

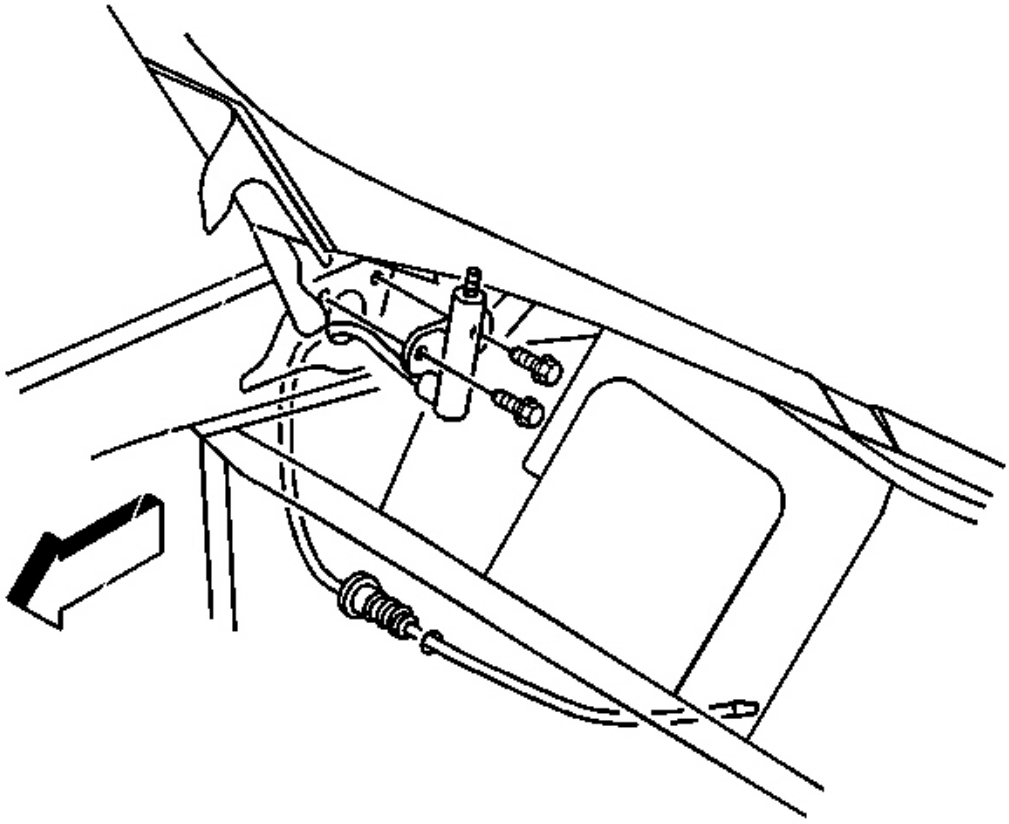


Fig. 74: View Of Radio Antenna Cable Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the radio antenna cable assembly to the vehicle.
2. Pass the antenna cable and grommet assembly through the fender opening.

NOTE: Refer to Fastener Notice .

3. Install the radio antenna cable assembly retaining screws.

   Tighten: Tighten the radio antenna cable assembly screws to 2.8 N.m (25 lb in).

4. Close the hood.
5. Install the antenna mast. Refer to **Fixed Antenna Mast Replacement**.

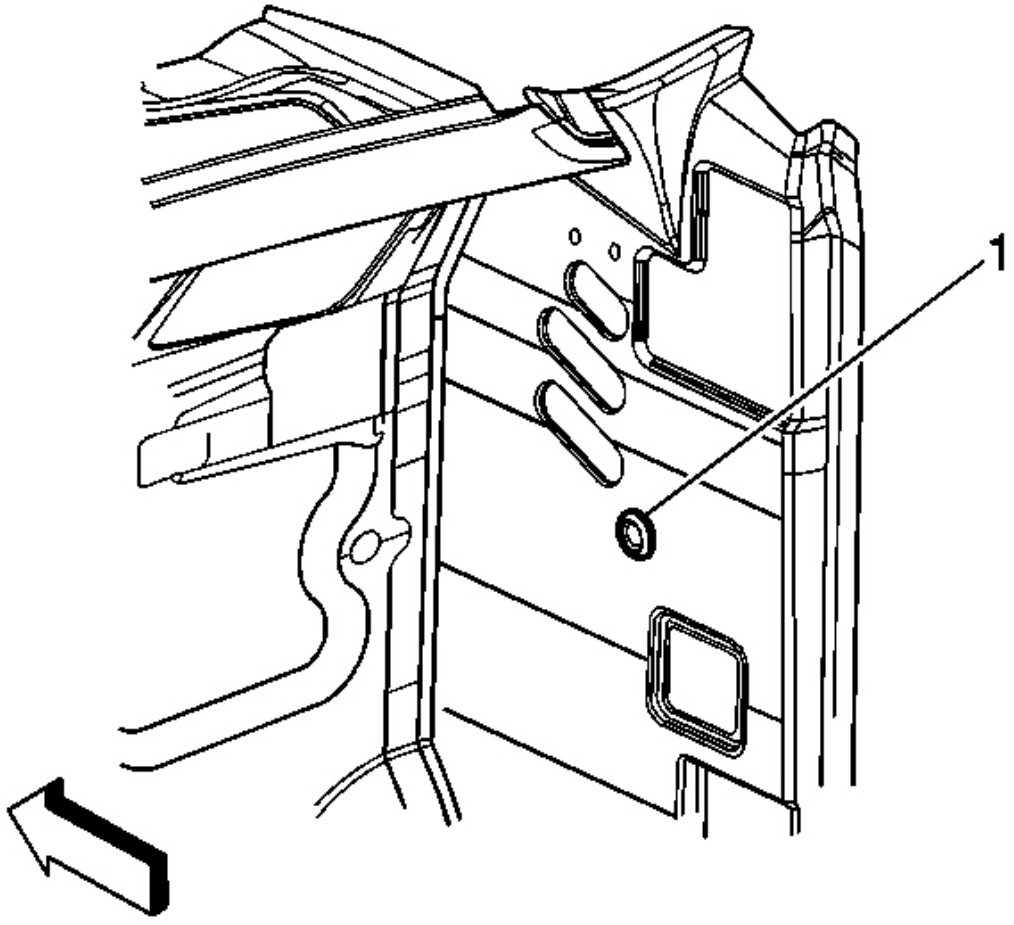


Fig. 75: Identifying Cowl Opening
Courtesy of GENERAL MOTORS CORP.

6. Reach up behind the wheelhouse panel and pass the end of the radio antenna cable assembly through the cowl opening (1).
7. Install the antenna cable grommet assembly to the cowl opening.
8. Install the wheelhouse panel. Refer to **Wheelhouse Panel Replacement (Front End)** .

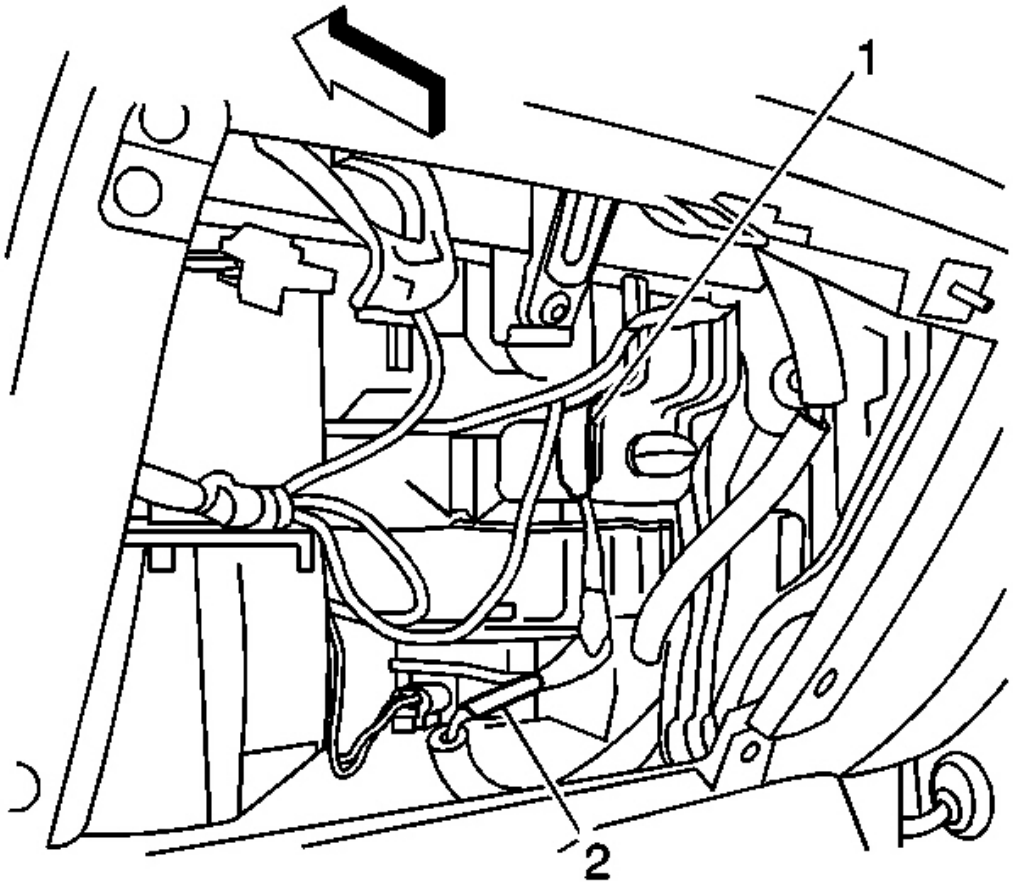


Fig. 76: View Of Radio Antenna Cable To Radio Extension Cable
Courtesy of GENERAL MOTORS CORP.

9. Install the radio antenna cable (2) to the radio extension cable.
10. Close the I/P compartment.

RADIO ANTENNA CABLE EXTENSION CABLE REPLACEMENT

Removal Procedure

1. Remove the inflatable restraint instrument panel (I/P) module. Refer to **Inflatable Restraint Instrument Panel Module Replacement** .

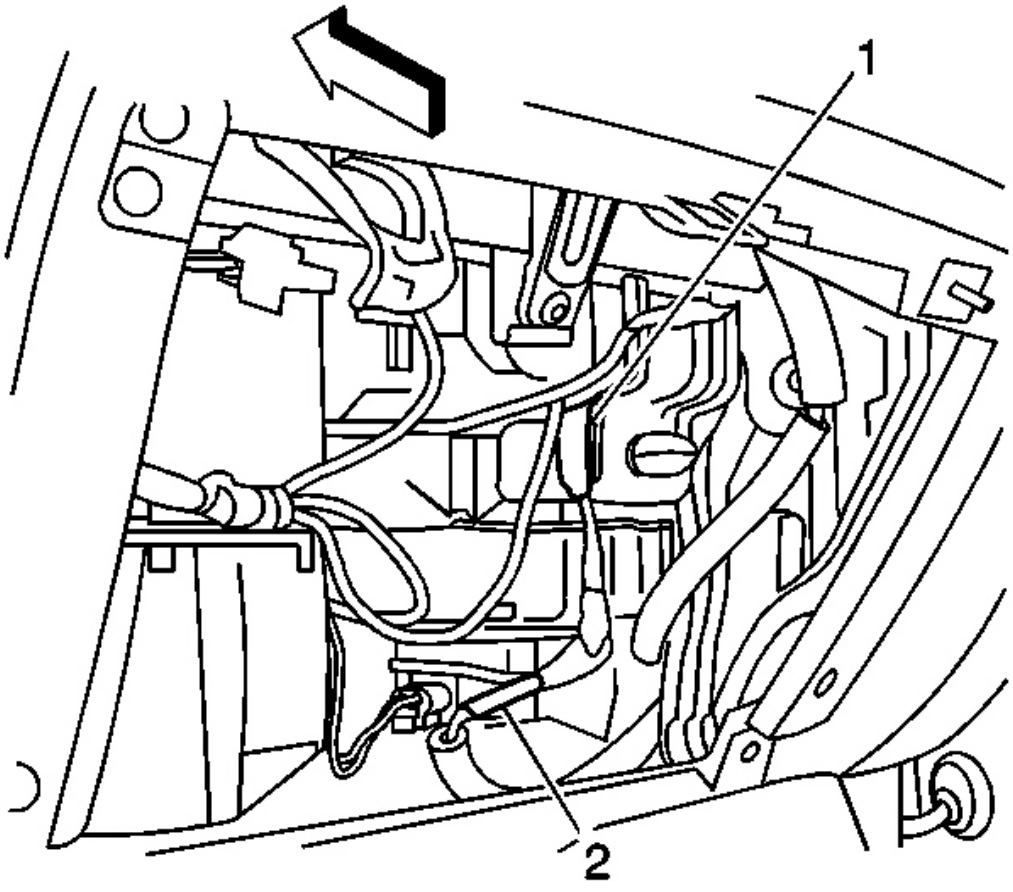


Fig. 77: View Of Radio Antenna Cable To Radio Extension Cable
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the antenna cable (2) from the radio extension cable.

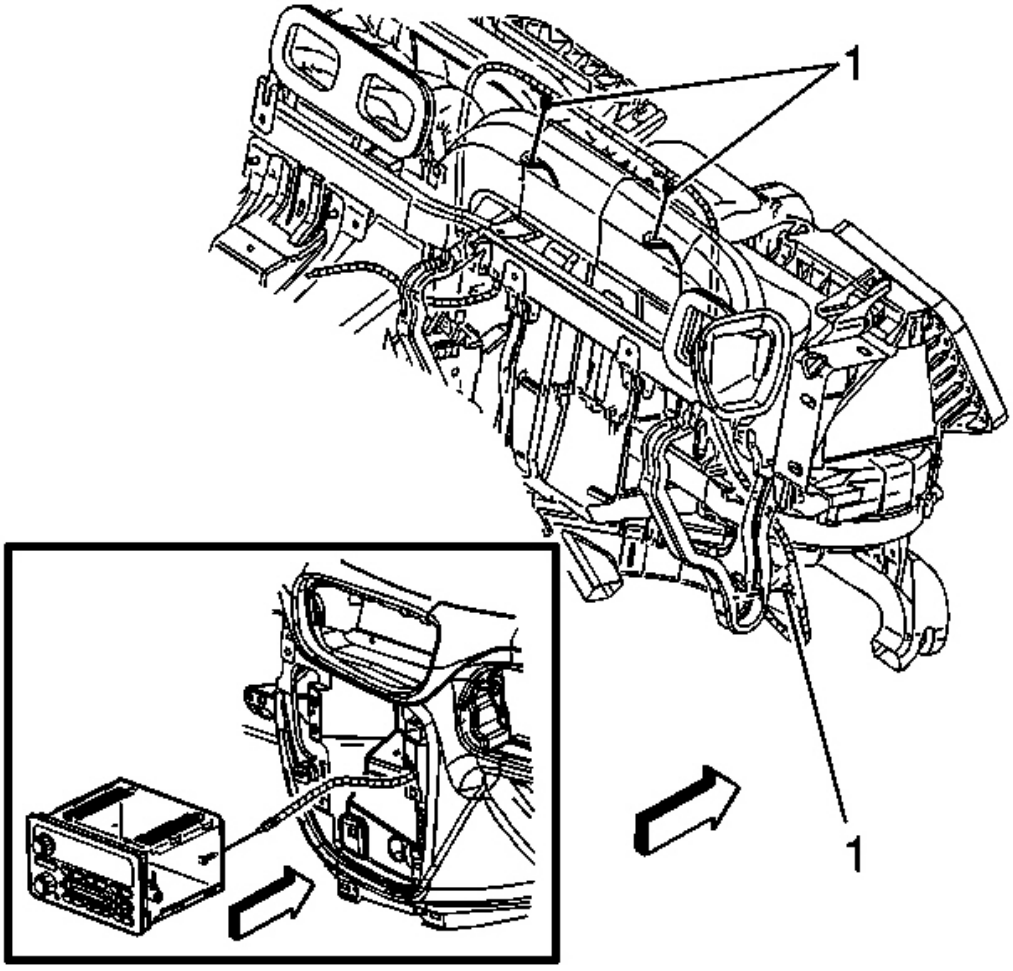


Fig. 78: Locating IP Support Bar Cable Attachments
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Note the location of the radio extension cable before removal.

3. Remove the cable attachments (1) from the I/P support bars.
4. Reach through the I/P compartment to disconnect the antenna cable from the radio.
5. Remove the radio extension cable from the vehicle.

Installation Procedure

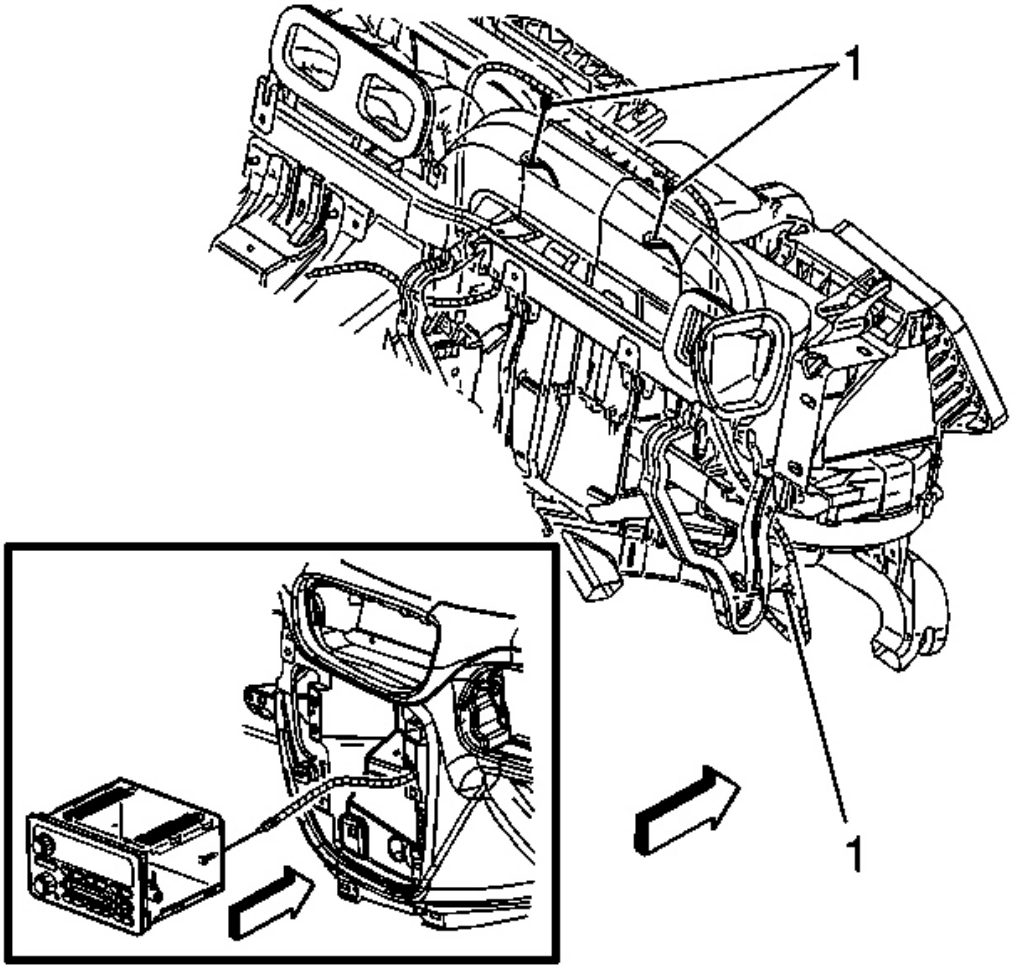


Fig. 79: Locating IP Support Bar Cable Attachments
Courtesy of GENERAL MOTORS CORP.

1. Position the radio extension cable to the I/P support bars as previously noted.
2. Reach through the I/P compartment to connect the antenna cable to the radio.
3. Install the radio extension cable attachments (1) to the I/P support bars.

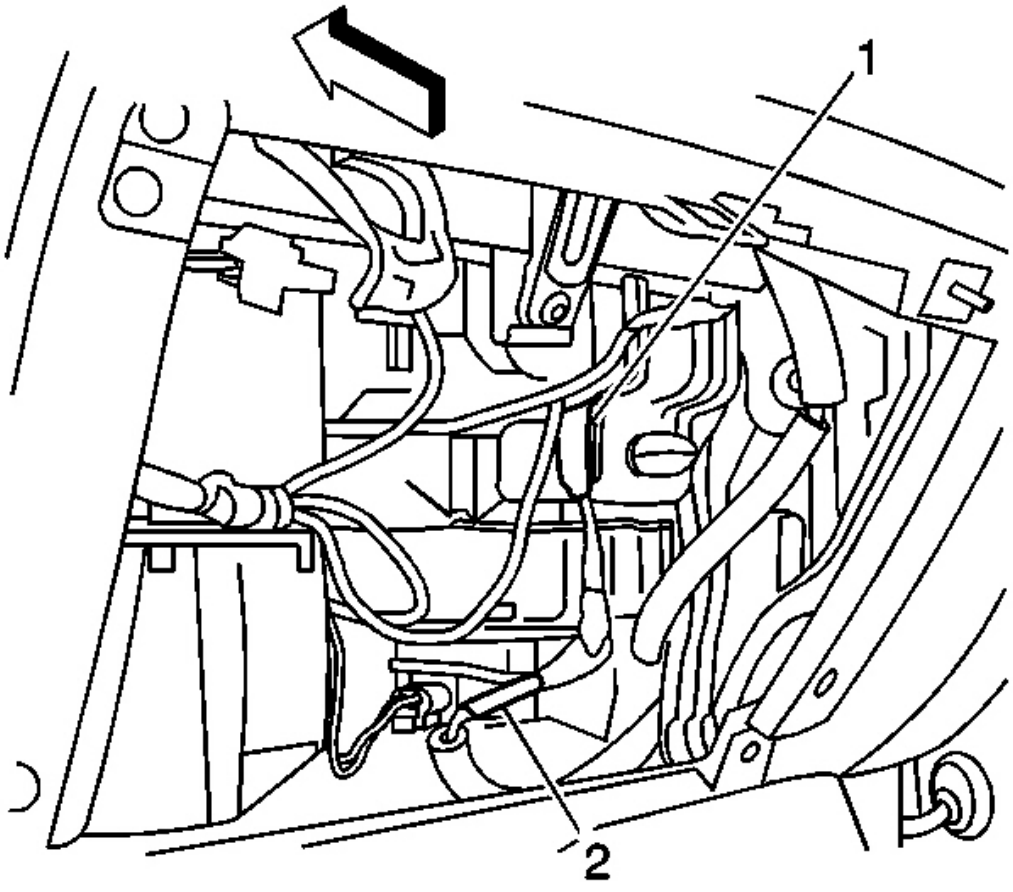


Fig. 80: View Of Radio Antenna Cable To Radio Extension Cable
Courtesy of GENERAL MOTORS CORP.

4. Connect the antenna cable (2) to the radio extension cable.
5. Install the inflatable restraint module. Refer to **Inflatable Restraint Instrument Panel Module Replacement** .

VIDEO PLAYER BRACKET REPLACEMENT

Removal Procedure

1. Remove the video display assembly. Refer to **Video Display Replacement (With Sunroof)** or **Video Display Replacement (Without Sunroof)**.

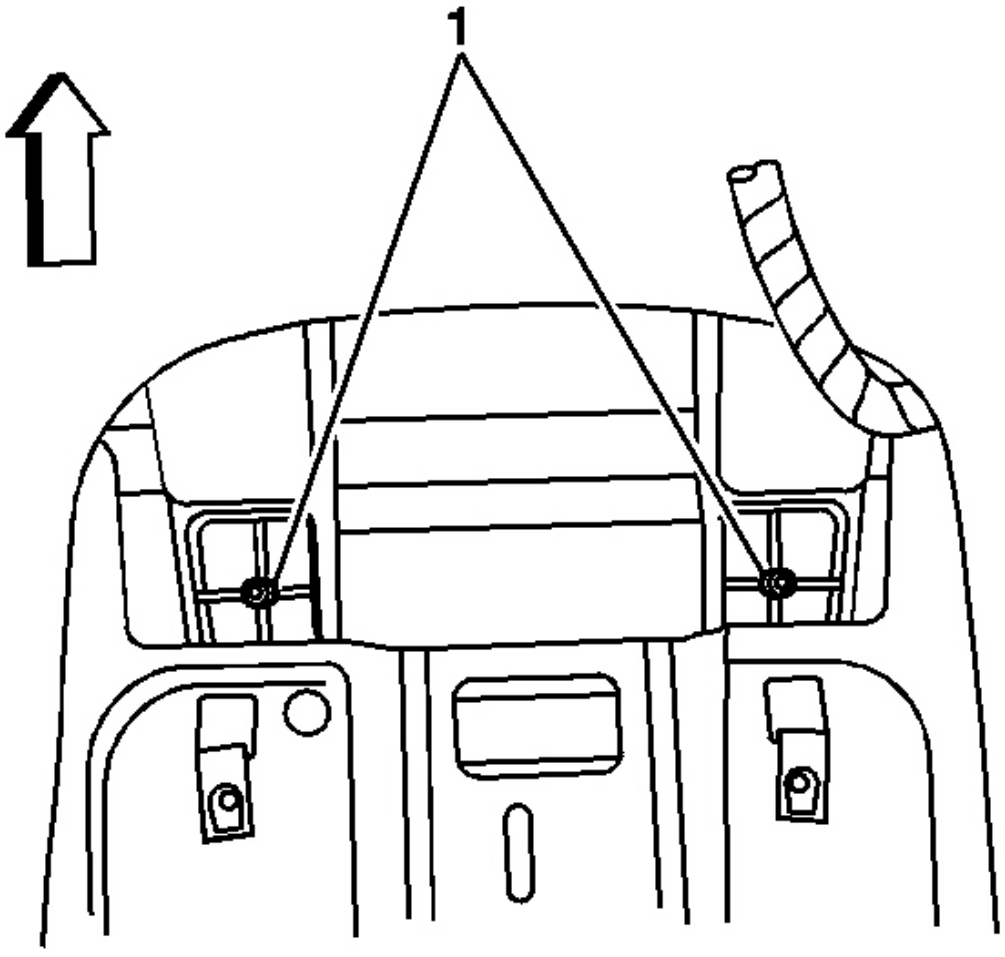


Fig. 81: Identifying Rear Overhead Console Carrier Screws
Courtesy of GENERAL MOTORS CORP.

2. Remove the two rear overhead console carrier screws (1).

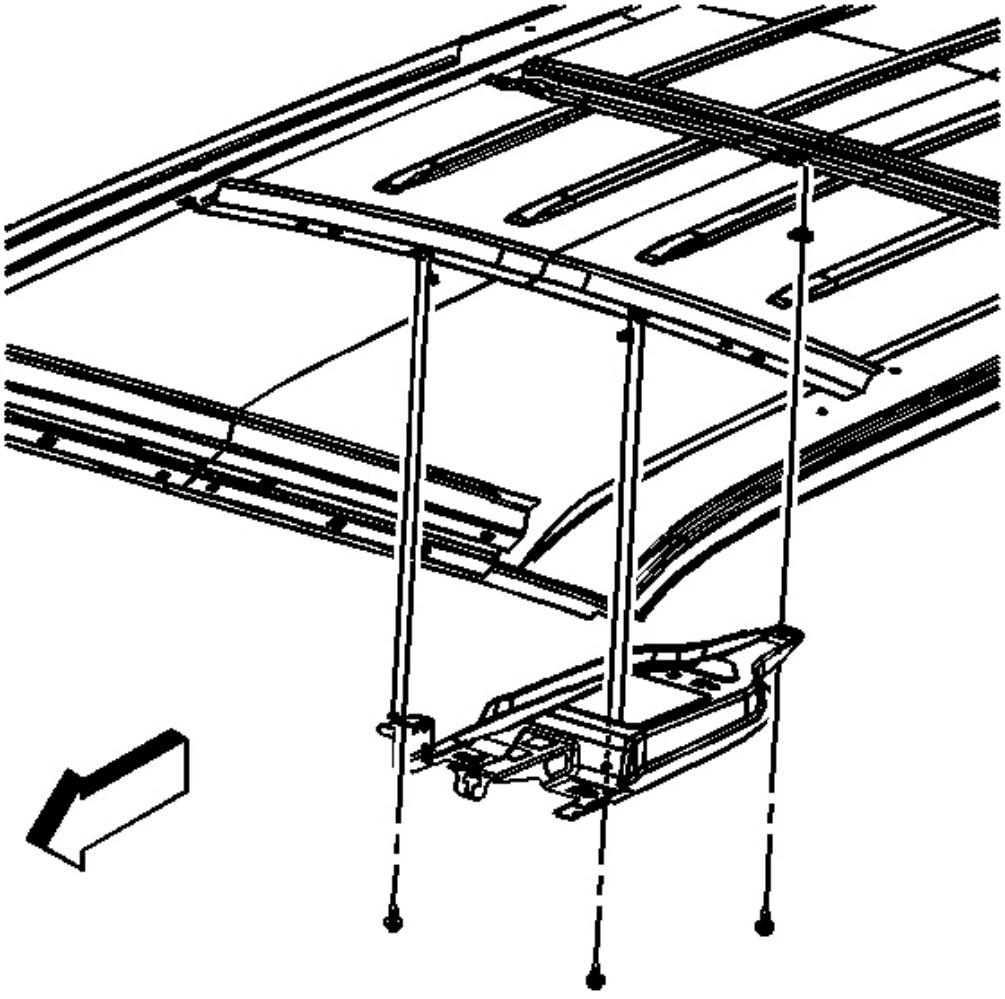


Fig. 82: View Of Front Bracket Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

3. Remove the front bracket retaining bolts.

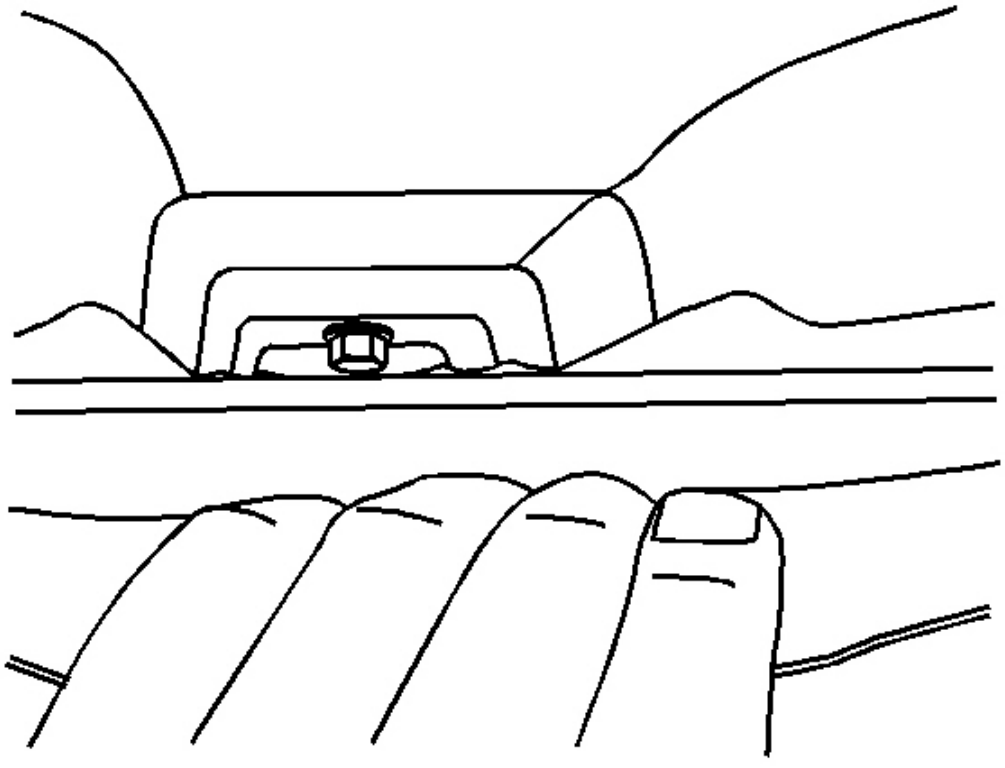


Fig. 83: Exposing Rear Bracket Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

4. Carefully pull down on the rearward edge of the headliner in order to expose the rear bracket retaining bolt.
5. Remove the rear retaining bolt.
6. Carefully remove the bracket from the vehicle through the headliner opening.

Installation Procedure

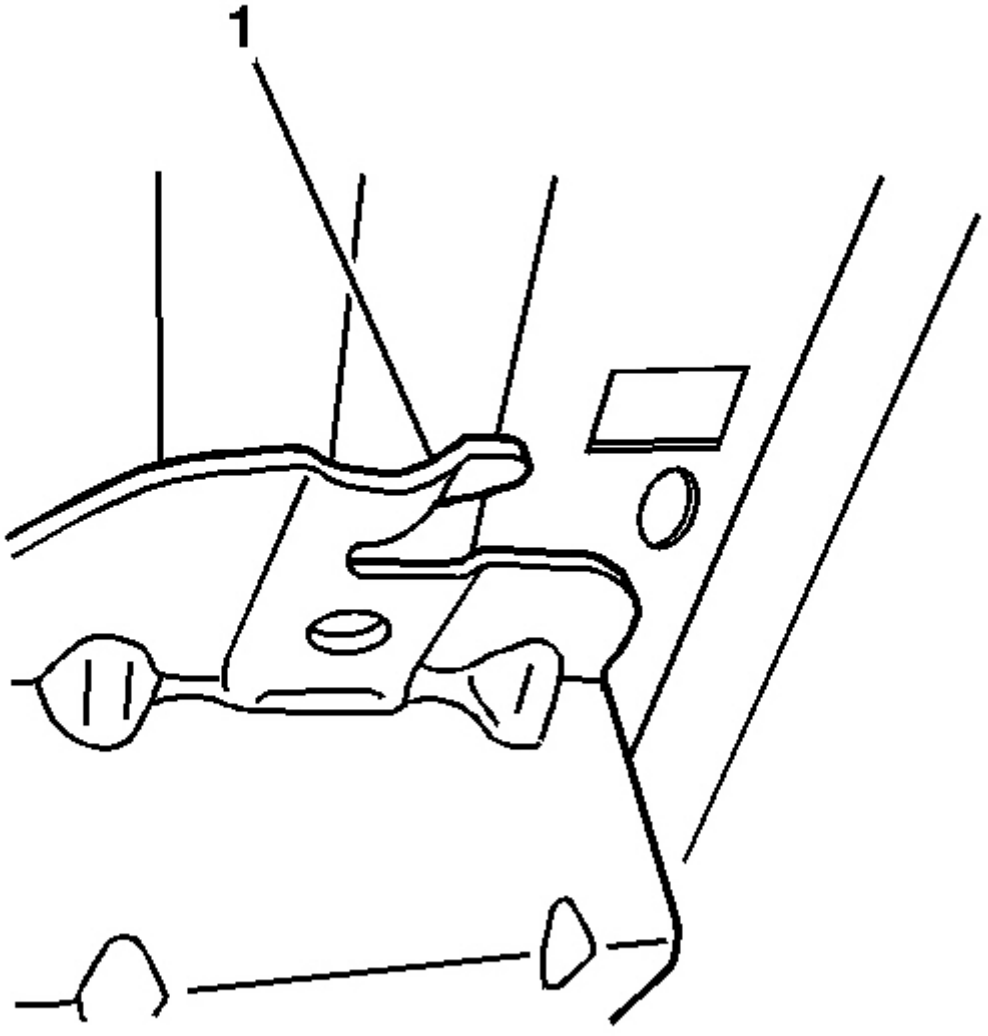


Fig. 84: Ensuring Bracket Locating Tabs Are Fully Seated To Roof Bow
Courtesy of GENERAL MOTORS CORP.

1. Carefully install the bracket to the vehicle through the headliner opening, ensuring the locating tabs (1) are fully seated to the roof bow.

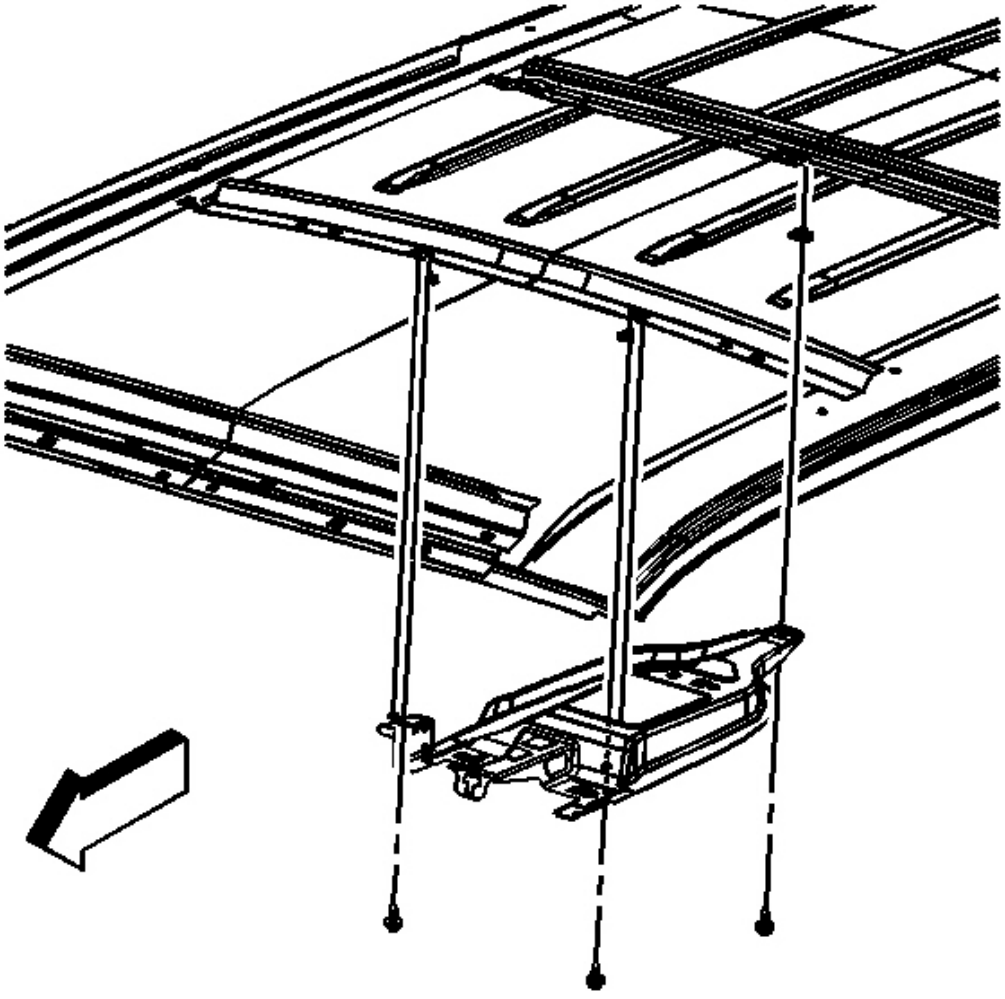


Fig. 85: View Of Front Bracket Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

2. Partially install the front bracket retaining bolts.

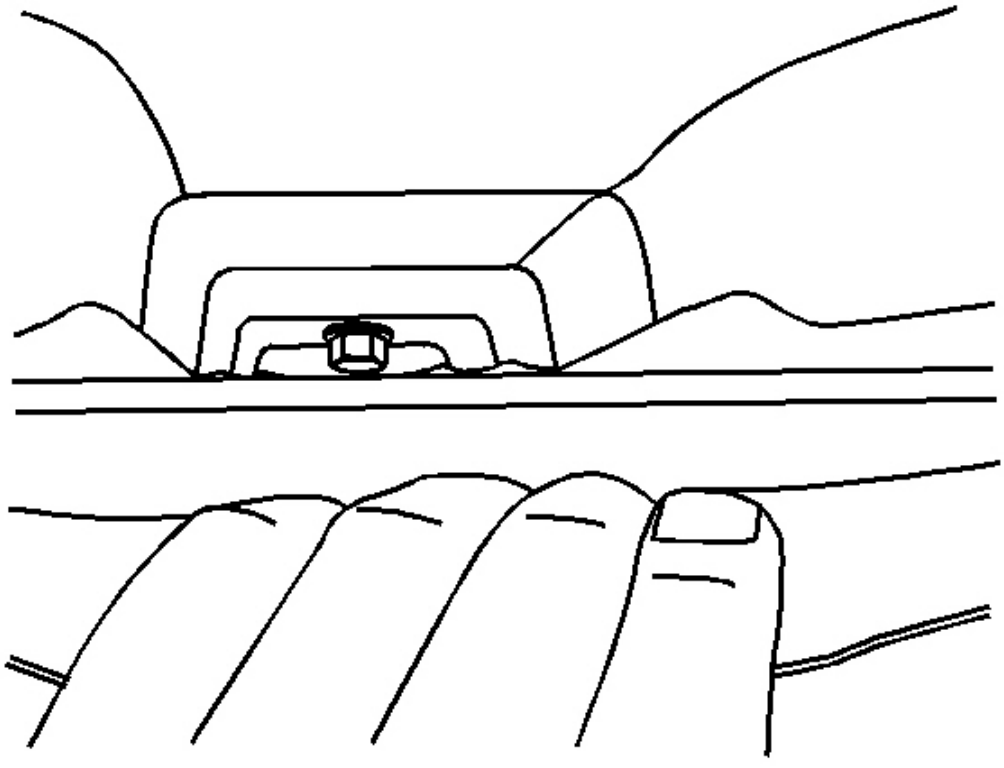


Fig. 86: Exposing Rear Bracket Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

3. Carefully pull down on the rearward edge of the headliner in order to expose the rear bolt installation area.
4. Partially install the rear bracket retaining bolt.

NOTE: **Refer to Fastener Notice .**

5. Fully seat the retaining bolts.

Tighten: Tighten the bolts to 10 N.m (88 lb in).

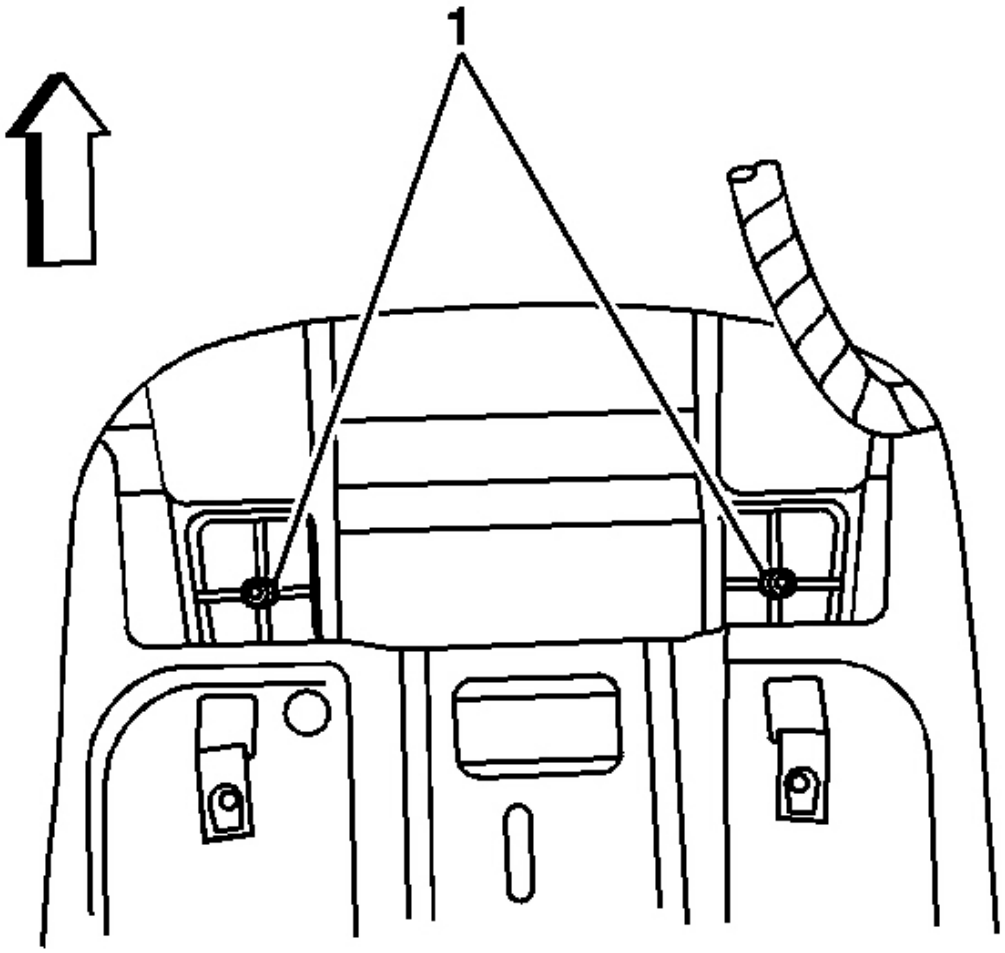


Fig. 87: Identifying Rear Overhead Console Carrier Screws
Courtesy of GENERAL MOTORS CORP.

6. Install the two rear overhead console carrier screws (1).

   Tighten: Tighten the screws to 1.2 N.m (10 lb in).

7. Install the video display assembly. Refer to **Video Display Replacement (With Sunroof)** or **Video Display Replacement (Without Sunroof)**.
8. Verify the video display for proper operation.
9. Close the video display screen.
10. Install the bolt cover bezel.

VIDEO DISPLAY REPLACEMENT (WITH SUNROOF)

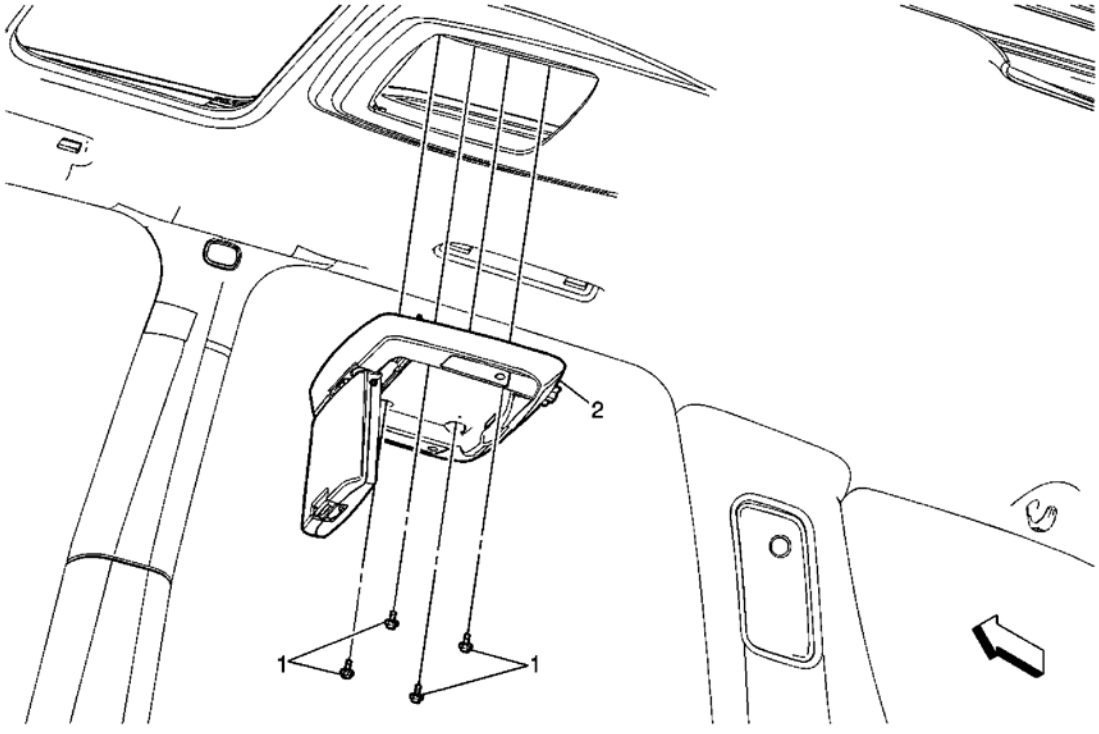


Fig. 88: View Of Video Display
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
NOTE: **Refer to Fastener Notice .** **Fastener Tightening Specifications:** Refer to **Fastener Tightening Specifications**.	
1	Video Display Retaining Bolts (Qty: 4) **Tighten:** 9 N.m (80 lb in)
2	Video Display **Tip:** • Pull down on the assembly to disengage the two fir-tree type retainers used as an assembly aid. • Disconnect all electrical connectors before attempting removal.

VIDEO DISPLAY REPLACEMENT (WITHOUT SUNROOF)

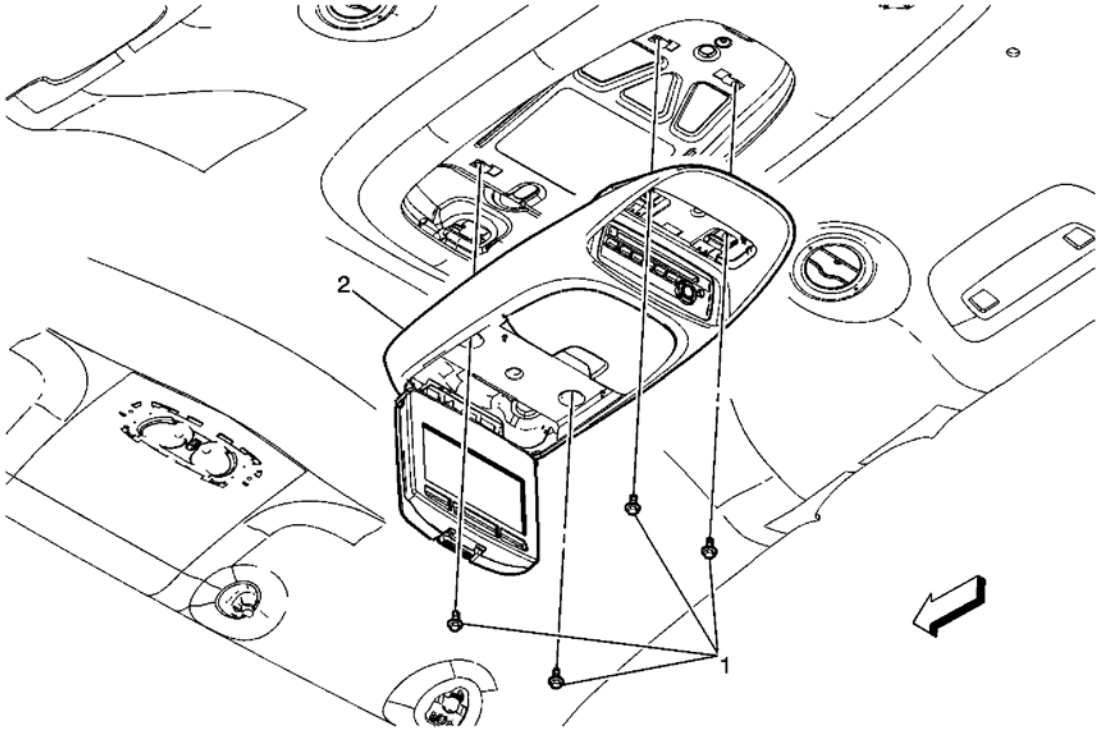


Fig. 89: View Of Video Display (Without Sunroof)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
NOTE: **Refer to Fastener Notice .** **Fastener Tightening Specifications:** Refer to **Fastener Tightening Specifications**.	
1	Video Display Retaining Bolts (Qty: 4) **Tighten:** 9 N.m (80 lb in) **Tip:** To reveal the rear bolts use a small flat bladed screwdriver or pick tool to remove the trim cover at the rear of the unit.
2	Video Display **Tip:** Disconnect all electrical connectors before attempting removal.

FRONT UPPER SPEAKER REPLACEMENT

Removal Procedure

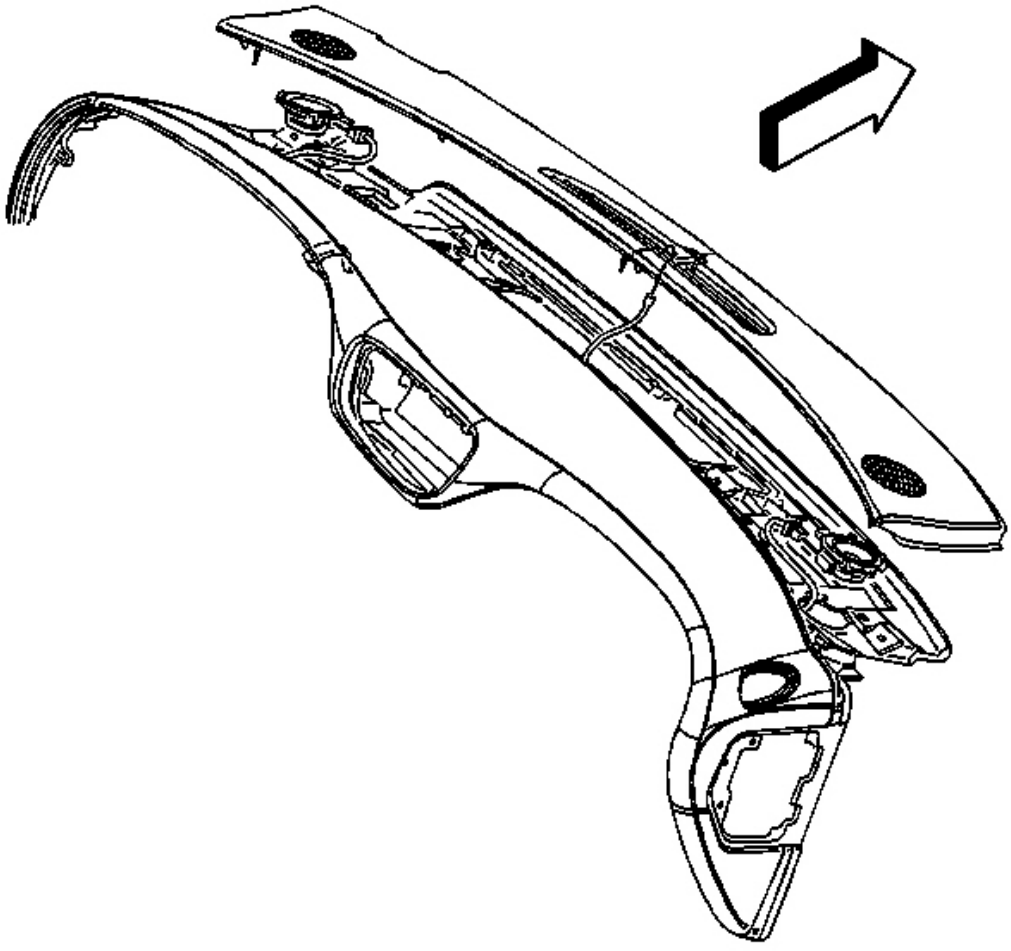


Fig. 90: View Of Instrument Panel (I/P) Upper Trim Pad
Courtesy of GENERAL MOTORS CORP.

1. Remove the trim pad. Refer to **Instrument Panel Upper Trim Pad Replacement** .

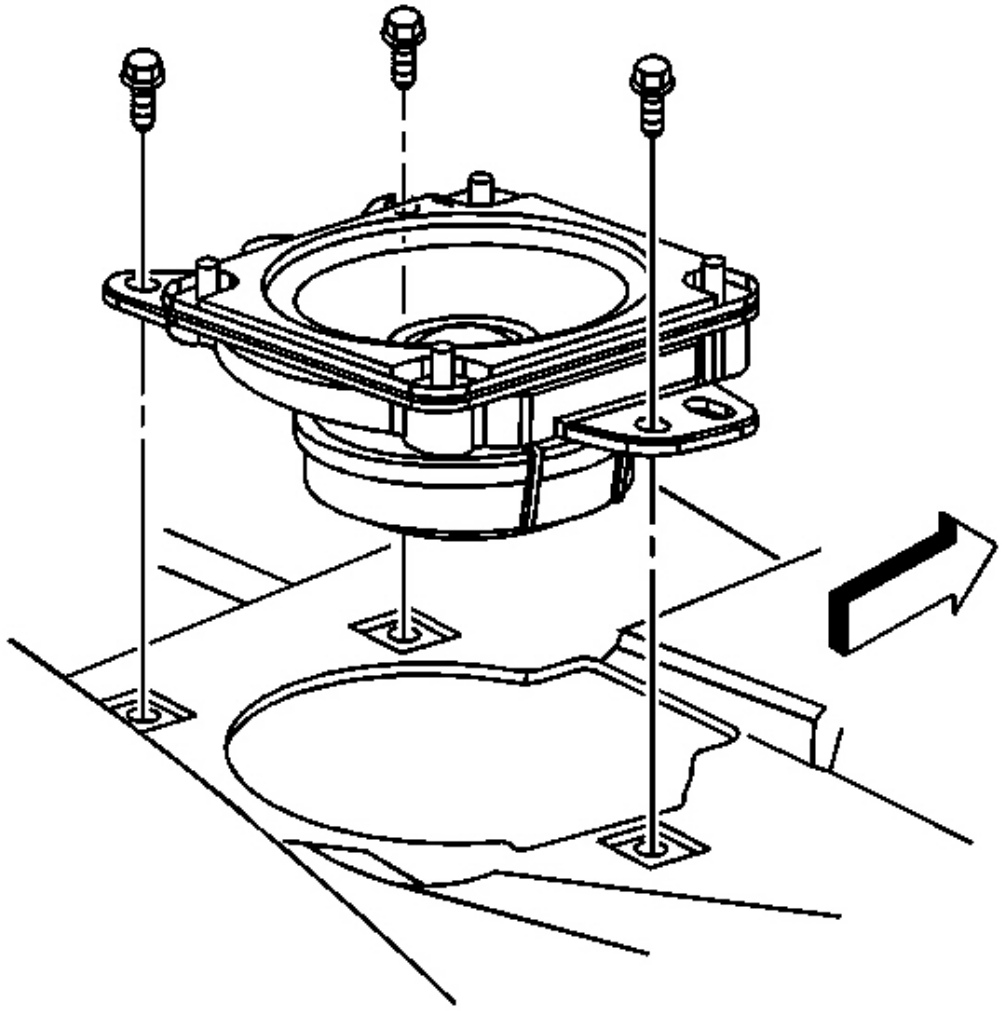


Fig. 91: View Of Speaker & Retaining Screws To Instrument Panel (IP) Substrate
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Ensure that the speaker electrical connector does not fall into the speaker opening.

2. Remove the 3 screws that retain the speaker to the instrument panel (I/P) substrate.
3. Disconnect the speaker electrical connector.
4. Remove the speaker from the I/P.

Installation Procedure

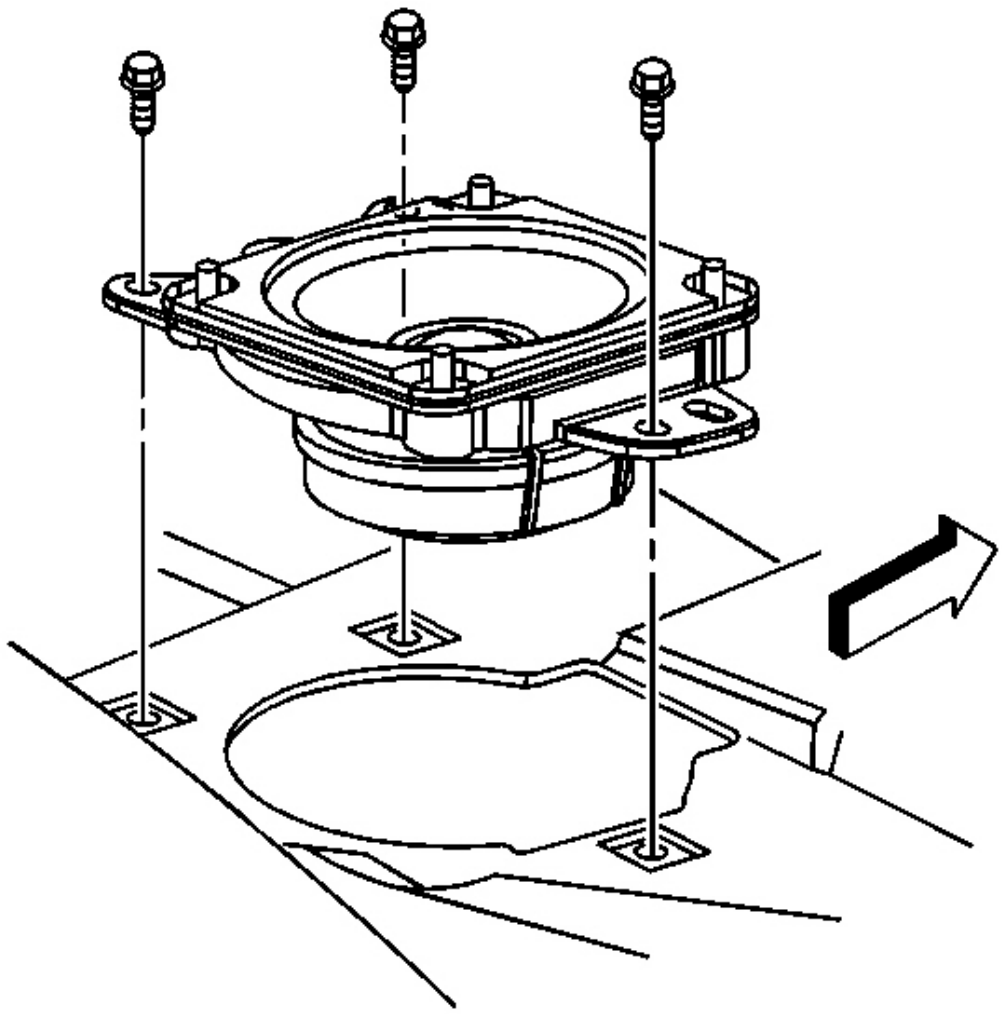


Fig. 92: View Of Speaker & Retaining Screws To Instrument Panel (IP) Substrate
Courtesy of GENERAL MOTORS CORP.

1. Install the speaker to the I/P.
2. Connect the speaker electrical connector.

NOTE: Refer to Fastener Notice .

3. Install the 3 speaker retaining screws.

Tighten: Tighten the screws to 2 N.m (18 lb in).

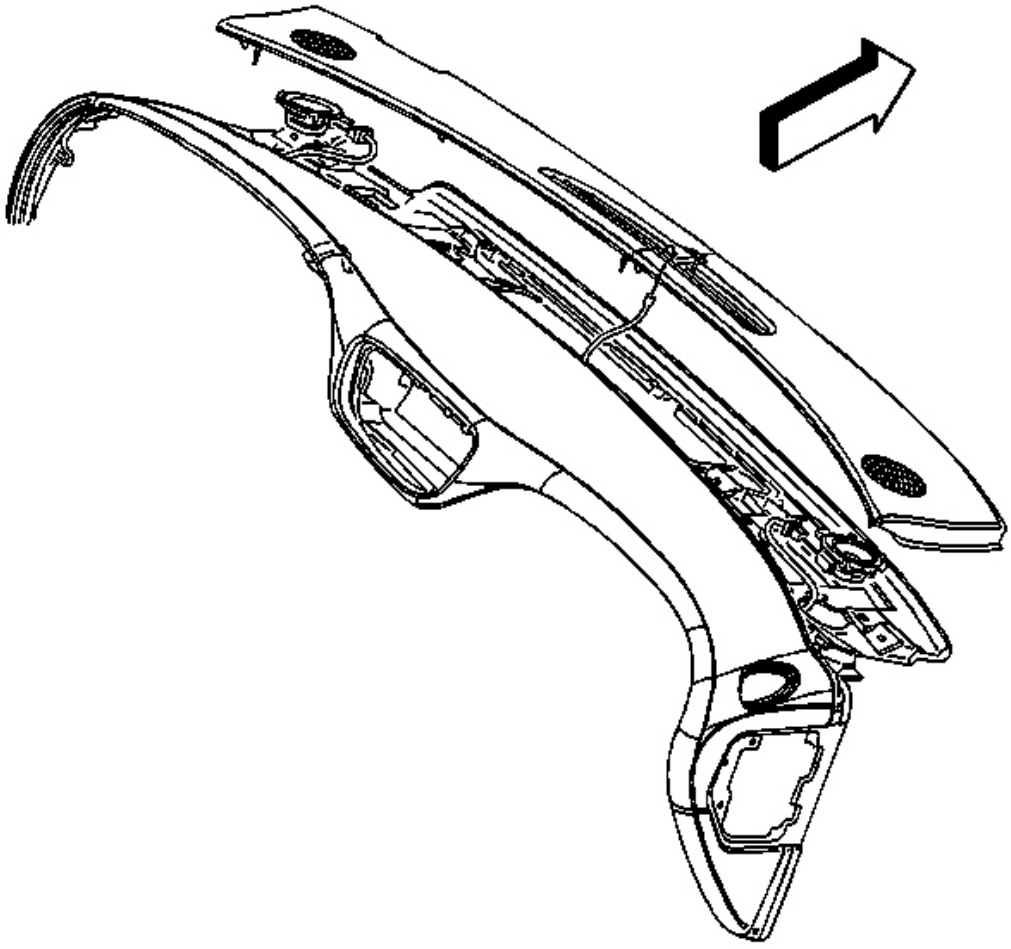


Fig. 93: View Of Instrument Panel (I/P) Upper Trim Pad
Courtesy of GENERAL MOTORS CORP.

4. Install the trim pad. Refer to **Instrument Panel Upper Trim Pad Replacement** .

RADIO FRONT SIDE DOOR SPEAKER REPLACEMENT

Removal Procedure

1. Remove the front door trim panel. Refer to **Front Side Door Trim Panel Replacement** .

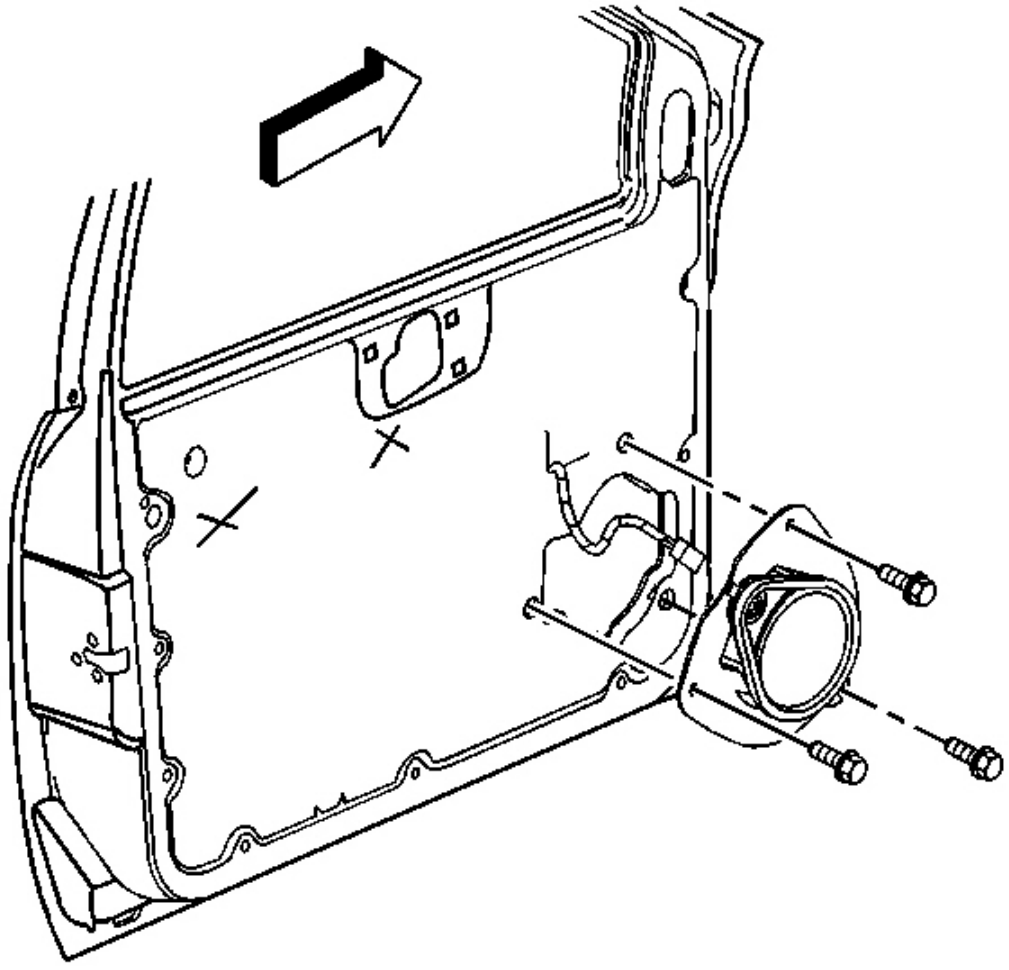


Fig. 94: View Of Speaker, Retaining Bolts & Electrical Connector Front Door
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the speaker electrical connector.
3. Remove the 3 speaker retaining bolts.
4. Remove the speaker from the door.

Installation Procedure

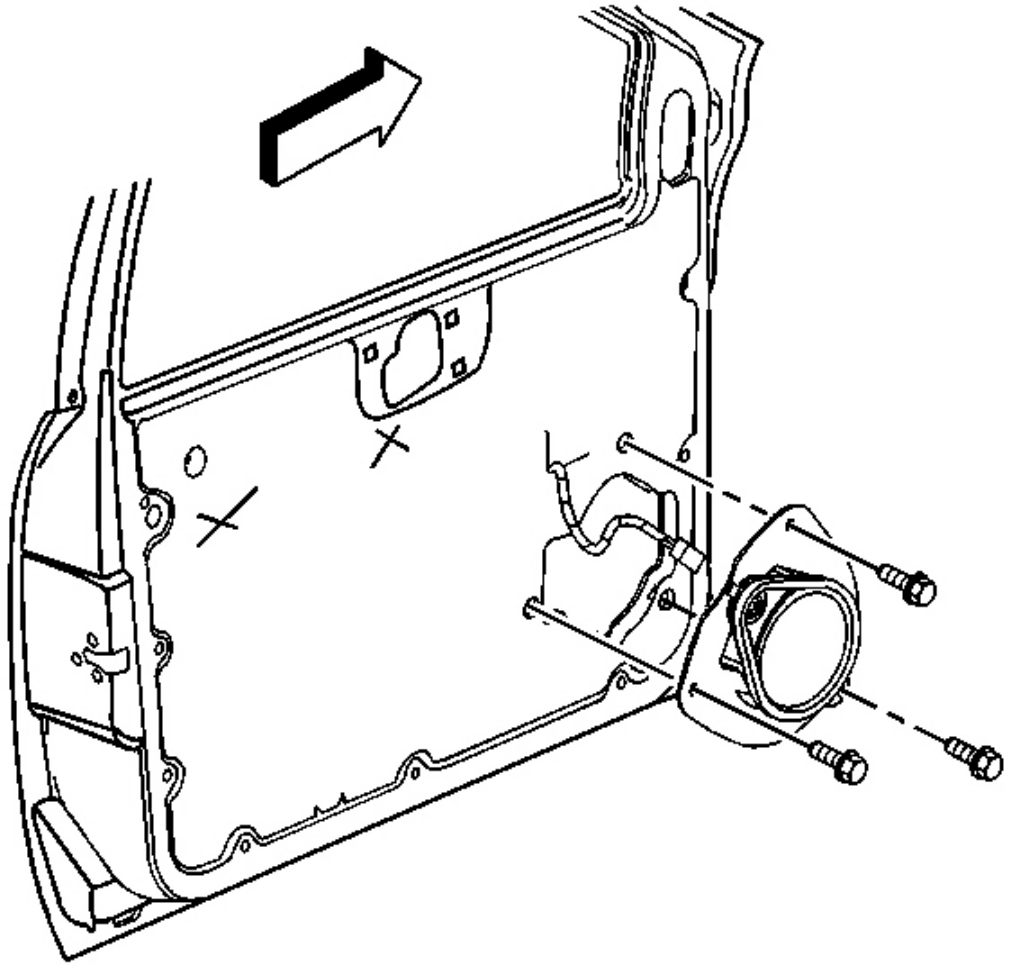


Fig. 95: View Of Speaker, Retaining Bolts & Electrical Connector Front Door
Courtesy of GENERAL MOTORS CORP.

1. Install the speaker to the door.

   NOTE: Refer to Fastener Notice .

2. Install the 3 speaker retaining bolts.

   Tighten: Tighten the bolts to 2 N.m (18 lb in).

3. Connect the speaker electrical connector.

4. Install the front door trim panel. Refer to **Front Side Door Trim Panel Replacement** .

RADIO REAR SIDE DOOR SPEAKER REPLACEMENT

Removal Procedure

1. Remove the rear door trim panel. Refer to **Rear Side Door Trim Panel Replacement** .
2. Remove the water deflector. Refer to **Rear Side Door Water Deflector Replacement** .

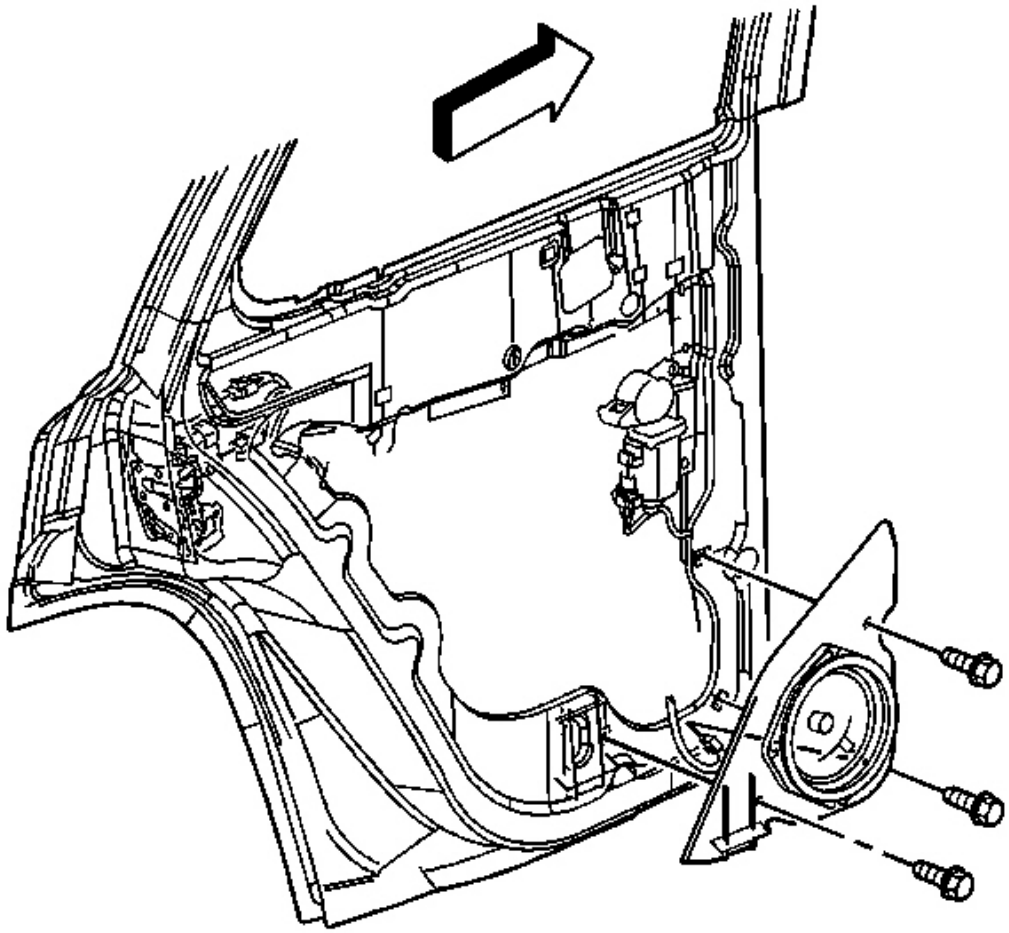


Fig. 96: View Of Rear Speaker, Electrical Connector & Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the speaker electrical connector.

4. Remove the 3 speaker retaining bolts.
5. Remove the speaker from the door.

Installation Procedure

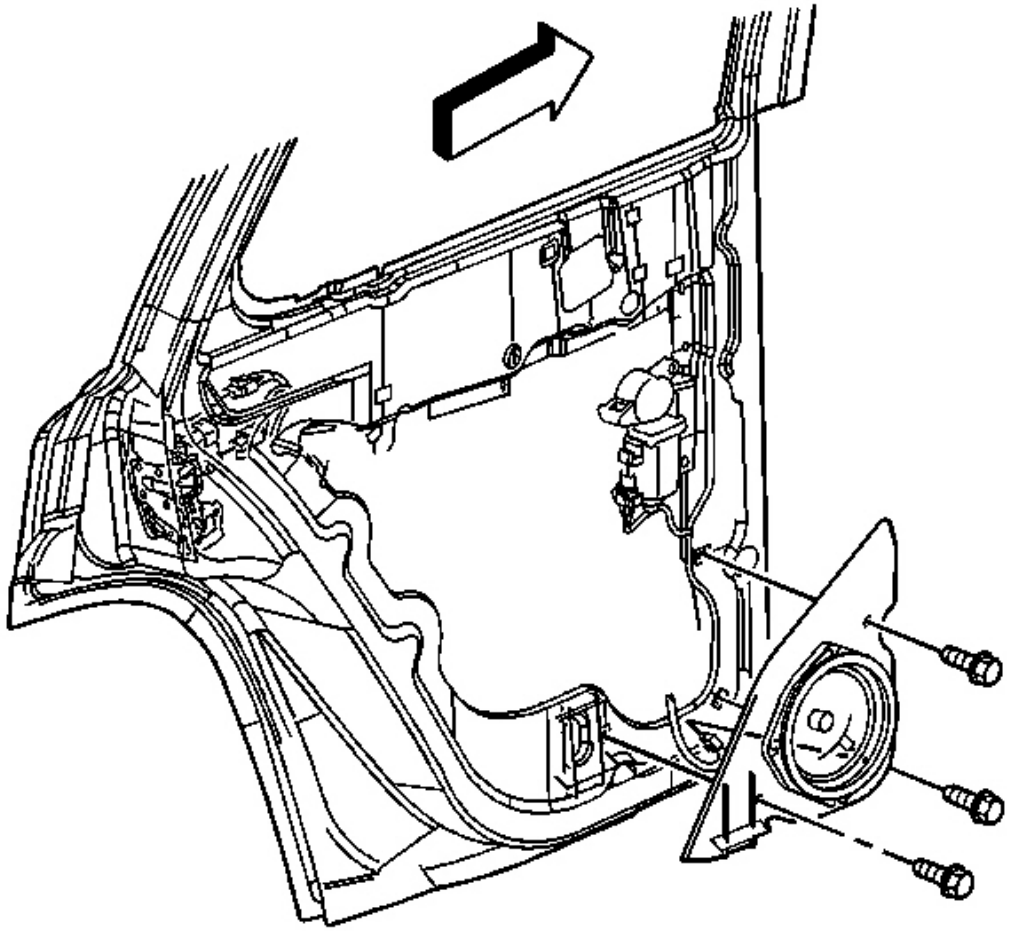


Fig. 97: View Of Rear Speaker, Electrical Connector & Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the speaker to the door.

NOTE: Refer to Fastener Notice .

2. Install the 3 speaker retaining bolts.

Tighten: Tighten the bolts to 2 N.m (18 lb in).

3. Connect the speaker electrical connector.
4. Install the water deflector. Refer to **Rear Side Door Water Deflector Replacement** .
5. Install the rear door trim panel. Refer to **Rear Side Door Trim Panel Replacement** .

DESCRIPTION & OPERATION

NAVIGATION SYSTEM DESCRIPTION & OPERATION

Navigation Display Head	
Controls	**Function**
Power	Push PWR/VOL knob to turn the radio ON
NAV	Displays the map guidance screen
NAV RPT	Repeats the last voice guidance message
SETUP	Displays the setup function for the navigation radio
Soft Key Buttons	Push to select the options listed on the navigation screen

Navigation System Components

The navigation system contains the following components:

- Navigation radio
- Global positioning system (GPS) antenna

Navigation Radio

This component acts as the operator interface for the audio 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, located in the center of the instrument panel, provides the following:

- A display screen-All navigation and audio functions are displayed on this screen.
- The navigation system map with routing information displayed on the navigation radio screen
- Audio system options and controls, displayed on the navigation radio screen
- Provides verbal guidance to the operator
- The DVD provides the map data for navigation and map route guidance
- Connection to the global positioning system (GPS) antenna, which provides the vehicle position information

Global Positioning System (GPS) Antenna

The global positioning system (GPS) antenna is located at the top center of the dash pad. The GPS antenna is powered through the same coaxial cable used to send the signals to the navigation radio. The GPS antenna collects data from the GPS satellites and routes this information to the navigation radio to be formatted into

current position.

GPS Reception

The global positioning system (GPS) shows the current position of the vehicle. Tall buildings, large trucks, or a tunnel can obstruct GPS signals. Metallic objects on the dash can also cause interference. A GPS icon is located in the top left corner of the map display. If the GPS is valid, the icon will be green if not the icon will be gray. The GPS info screen will also show the condition of the GPS. If GPS reception in not received, it will show out of range. If the reception is received, the coordinates of your location will be shown.

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.

Points of Interest (POI)

Points of interest (POI) are locations that are frequently visited. Points of interest can be displayed on the map or set as a destination. The following is a few of the available POI:

- Gas station
- Restaurant
- Museum
- College
- Police

Map DVD

The map DVD is loaded in the DVD slot above the display screen. Music CDs can also be played from this slot, however, route guidance and navigation will not be available when playing a music CD. The map DVD must be in for navigation and route guidance.

ONSTAR DESCRIPTION & OPERATION

This vehicle uses the Generation 7.0 version of the OnStar® system. This system consists of the following components:

- Vehicle communication interface module (VCIM)
- OnStar® button assembly
- Microphone
- Cellular antenna
- Navigation antenna

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

New Features

New Features for this version of OnStar® include Turn by Turn Navigation and the Advisor Record Feature. 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. Turn by Turn Navigation instructions are displayed to the driver by the radio display or the driver information center (DIC). The Advisor Record Feature allows the driver to store any information given to you during a call with an OnStar® Advisor.

Vehicle Communication Interface Module (VCIM)

The vehicle communication interface module (VCIM) is a 3-watt cellular device that allows the user to communicate data and voice signals over the national cellular network. It is powered by a fused battery positive voltage circuit, connected through the vehicle wiring to the 3-button assembly and the radio, and attached by means of coax cables to the cellular and navigation antennas. Ground for the module is accomplished by means of dedicated circuits that are routed with body wiring systems to chassis ground points. The module houses 2 modems, one to process global positioning system (GPS) data, and the other for cellular information. Satellites orbiting earth are constantly transmitting signals of their current location, from which the OnStar® system is able to pinpoint its own location. The navigation antenna receives these GPS signals and provides the data to the VCIM to be processed. The VCIM communicates with the rest of the vehicle over the class 2 or GMLAN serial data bus, depending upon the serial data architecture of the vehicle. The ignition state is determined by the VCIM through serial data messaging. The module also has the capability of commanding the horn, initiating door lock/unlock and operating the exterior lamps using the serial data circuits. When an OnStar® keypress is made, a serial data message is sent to the audio system to mute all radio functions and transmit OnStar® originated audio. After the audio system is muted, the OnStar® signals are transmitted to the audio system on the cellular telephone voice signal circuit, and returned to the module on the cellular telephone voice low reference circuit. The cellular modem connects the OnStar® 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 antenna and cellular antenna coax.

OnStar® Button Assembly

The OnStar® button assembly may be part of the rearview mirror on some vehicles or a separate unit on others. 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 the personal calling feature, if equipped.
- 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 vehicle communication interface module (VCIM) supplies 10 volts to the OnStar® button assembly, on the keypad supply voltage circuit. When pressed, each button completes a circuit across a resister allowing a specific voltage to be returned to the vehicle communication interface module (VCIM) on the keypad signal circuit. Depending upon the voltage range returned, the VCIM is able to identify which button has been pressed.

The OnStar® status LED is located to the right of the emergency button on a mirror-mounted assembly and to the left of the answer/end call button when the assembly is mounted on the dash or overhead console. 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. The OnStar® LED is controlled by the VCIM over the keypad red LED signal circuit and the keypad green LED signal circuit.

OnStar® Microphone

The OnStar®, or cellular microphone can be a part of the rearview mirror assembly, or on some vehicle lines, can be a separate, stand alone unit. In either case, the vehicle communication interface module (VCIM) supplies voltage to the microphone on the cellular microphone signal circuit, while voice data from the user is sent back to the VCIM by means of either a cellular microphone low reference circuit or a drain wire.

Cellular and Navigation 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, navigation, and digital radio antenna, which also incorporates the functionality of the digital radio receiver satellite and terrestrial antennas (XM)

The cellular antenna is the component that allows the OnStar® system to send and receive data over airwaves by means of cellular technology. This antenna is connected at the base to a coax cable that plugs directly into the vehicle communication interface module (VCIM). The navigation antenna is used to collect the constant signals of the orbiting satellites. Within the antenna, is housed a low noise amplifier that allows for a more broad and precise reception of this data. The current global positioning system (GPS) location is collected by the module every time a keypress is made. The OnStar® Call Center also has the capability of pinging the vehicle during an OnStar® call, which commands the module 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. In the event the VCP loses, or is removed from power, this history location is used by the OnStar® Call Center as a default. Actual GPS location may take up to 10 minutes to register in the event of a loss of power. This antenna requires a clear and unobstructed path to the satellites in the sky. Window tinting on vehicles may interfere with the GPS sensor functions, depending upon the location of the GPS antenna and the amount of darkening and/or metallic particles that are embedded in the film of the tinting material.

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. This cycle enables the vehicle communication interface module (VCIM) to perform remote functions, such as door unlock, as commanded over the air by the OnStar® Call Center, when requested by the customer, and to continue to maintain an acceptable level of battery electrical drain.

This Generation version of OnStar® 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

When in an analog cellular market, the high power state is in effect whenever the ignition is in the ON or RUN position, and enables the OnStar® system to send and receive cellular calls and perform all remote functions. The low power state is entered once the vehicle ignition is placed in the OFF position and the retained accessory power (RAP) function has been turned OFF, or times out. This state will last for 1 minute and allows incoming cellular calls to be received. After the 1 minute window, the OnStar® system moves to the sleep state. This state will not recognize or receive incoming cellular calls. At a predetermined time recorded within the VCIM, up to 9 minutes, 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. After these 9 minutes, the system will again enter the low state of power and listen for any incoming calls that the OnStar® Call Center may be sending. In the event a call is being sent, 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 permanently enter the sleep state until the ignition is once again turned to the ON or RUN position.

In a digital cellular service market the high power state is in effect whenever the ignition is in the ON or RUN position, and also enables the OnStar® system to send and receive cellular calls and perform all remote functions. The digital standby power state is in effect after the vehicle has been shut off and the RAP has timed out. 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 8 hours. After 8 hours, the OnStar® module will follow the standard sleep state as though in an analog cellular market (9 minutes OFF, 1 minute of digital standby, based on the time of the global positioning system (GPS) signals).

In the event the OnStar® system loses, or is temporarily removed from battery power, the system will remain in the sleep state while the key in the OFF position. It will not begin to cycle until the vehicle passes into an open outside area with the ignition ON, where a GPS signal can be acquired, providing a reference for time. The OnStar® Call Center is able to maintain a record of exactly what time each vehicle will enter the 1 minute low power state by synchronizing their clocks with those of the vehicle, based on GPS signals.

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 vehicle has been successfully deactivated, customers will experience

the following when attempting to contact OnStar® from their vehicle:

- During an OnStar® Call Center button press, the customer will be connected to 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.
- During an emergency button press, a demo message will be played indicating the service has been deactivated.
- OnStar® personal calling (OPC) 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.

It is of particular note, that when an OnStar® system is successfully deactivated, it will NOT attempt to connect to the OnStar® Call Center in the event of a collision or if the vehicle's front air bags deploy for any other reason.

Certain vehicles that have never had an active OnStar® account, 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.

OnStar® Reconfiguration Procedure

Within the vehicle communication interface module (VCIM) are a set of unique numbers that identify the OnStar® customer and the specific vehicle the module resides in. These numbers, the station identification number (STID) and the electronic serial number (ESN) are transmitted over the cellular network when an OnStar® keypress is made and are essential for proper identification and connection to the OnStar® Call Center. In the event the VCIM requires replacement, the OnStar® reconfiguration procedure must be performed. This procedure allows for the new STID and ESN within the replacement module to overwrite the old numbers and update customer and vehicle information at the OnStar® Call Center. The reconfiguration process is explained within the VCIM replacement procedure, or the OnStar® Reconfiguration Procedure found in the diagnostic information and procedures section.

The default language for the new VCIM is English. Refer to the scan tool, to change to French or Spanish.

OnStar® Cellular, GPS & 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 global positioning system (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 carriers equipment, and the location where the call is placed. Making an OnStar® keypress 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 (STID) and electronic serial number (ESN), are not recognized by the cellular carriers local signal receiving towers. OnStar® cellular connection issues such as these require the assistance of the General Motors Technical Assistance Center OnStar® Group, which coordinates with cellular carriers to resolve connection issues.

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.

OnStar® Personal Calling

The hands free, OnStar® personal calling (OPC) cellular phone feature is an additional option to the OnStar® system. This feature is already embedded within the vehicle communication interface module (VCIM), however, it must be activated by an OnStar® advisor. This is done most often during the initial OnStar® configuration, if the home location of the vehicle is in a geographic area where OnStar® personal calling is available. In the event this feature is not enabled, customers may connect to the OnStar® Call Center by pressing the blue OnStar® button, and asking an advisor if OPC is available in their area. Users of the OnStar® system can verify the system has been configured for OnStar® Personal Calling by pressing the answer/end call button, waiting for the system to respond "OnStar® Ready" then speaking the word "dial." If the system responds with a failure message, the system has not been configured for OPC. All other responses confirm that OPC has been enabled.

Operation of the Hands Free Cellular Phone

Onstar® personal calling (OPC) 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 OPC, the customer must also purchase units as outlined in the owners guide provided with the OnStar® system. When the customer purchases minutes, an OnStar® advisor loads these minutes into the vehicle communication interface module (VCIM) over the airwaves at the time of the request, or through a discrete cellular call to the vehicle at a later time. Once loaded into the module, the units may be used for non-international, outbound cellular phone calls, and connection with the OnStar® virtual advisor. 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 also have an expiration date, depending upon the type of units purchased. This date is established when the download is performed, and any remaining units expire when the date within the VCIM, global positioning system (GPS) satellites, has passed. At any time, the user can press the answer/end call button, say "Units" and verify the number of units remaining.

During a hands free call, the microphone and audio system operate the same way as a standard OnStar® call. When the answer/end call button is pressed, the audio system will mute; the OnStar® system will then return the prompt "OnStar® Ready." At this point there are specific commands set to initiate a cellular call. If the

vehicle receives a call when the radio is ON, the audio system will mute and an audible ring will be heard though the speakers. The call will be answered when the answer/end call button is pressed.

The VCIM interprets all of the voice-activated commands. A complete list of these commands is supplied in the information provided to the customer. If the information is not available to reference, at any command prompt the caller can say "HELP" and the VCIM will return an audible list of available commands. If the customer concern is not being understood or not being heard by the OnStar® system, the user should place a call to the OnStar® call center to verify proper operation of the microphone. Following this description is an example of the commands and the OnStar® system responses. A complete list of commands is supplied in the information provided to the customer with the OnStar® system.

OnStar® Steering Wheel Controls

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 (OPC) feature is in use. If the Talk or Mute button, depending upon the vehicle, on the steering wheel controls are depressed during an OPC call, the vehicle communication module (VCIM) receives the message on the serial data bus from either the radio, the driver information module, or the body control module (BCM). This message is interpreted as a request to turn any spoken numbers into dual tone multi-frequency (DTMF) 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, driver information module, or BCM.

OPC Features

The following is an abbreviated list of features that may have an impact for the technician when servicing or diagnosing an OnStar® system. For a full list of OnStar® personal calling (OPC) features, consult the owner's guide provided to the customer with the OnStar® system.

Voice Feedback

The OnStar® personal calling (OPC) system has the capability of responding to the user with either an automated voice response or with a tone or beep. These 2 types of responses can be switched back and forth by pressing the answer/end call button, waiting for the system to respond "OnStar® Ready" and speaking the phrase "voice feedback." The system will then respond, "voice feedback is now ON/OFF."

OPC Security/System Lock

Customers have the capability to lock their OnStar® personal calling (OPC) 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.

Nametags

Customers have the ability to store telephone numbers within the module, referenced by a nametag for the convenience of frequently dialed numbers. This process is initiated by pressing the answer/end call button, waiting for the system response, then speaking the response "store". The system will respond with "number please" at which time the user should enter the number desired to be stored. Once complete, saying the word "store" again lets the system know you are finished entering the number. At this time, the system will elicit the user to assign a nametag to that number. From this point forward, the user can dial this number by initiating the OnStar® personal calling (OPC) feature, speaking the word "call," and repeating the nametag assigned. To delete a nametag, the user should initiate OPC, say "delete" then speak the nametag to be removed. In the event a nametag cannot be deleted in spite of repeated attempts from several speakers, the OnStar® module will require replacement.

Mobile Identification Number & Mobile Directory Number

The vehicle communication interface module (VCIM) utilizes 2 numbers for cellular device identification, call routing and connection, a mobile identification number (MIN) and a mobile directory number (MDN). The MIN represents the number used by the cellular carrier for call routing purposes while the MDN represents the number dialed to reach the cellular device. Although technicians have the capability to change these numbers by means of the scan tool, this should ONLY be done at the direction of and with explicit instruction from General Motors Technical Assistance Center (GM TAC).

Placing a Call

To Dial a Number

What You Do	What You Hear
Press the white dot button	"OnStar® Ready"
Say "Dial"	"Phone number to dial, please"
Say the entire phone number you wish to dial with no pauses	OnStar® will repeat the number, then ask "Yes or No"
Say "Yes" if the phone number was correct, or "No" to try again	"Dialing," and your call will be connected

After 3 unsuccessful tries, or if you simply like it better, you can use the "Digit Dial" command to input digits one at a time. Digit Dial is set up to dial phone numbers like previous OnStar® Personal Calling Systems.

To Dial a Number Using Digit Dial

What You Do	What You Hear
Press the white dot button	"OnStar® Ready"
Say "Digit Dial"	"First digit to dial, please"
Say the number to be dialed, one digit at a time	OnStar® will confirm each digit by repeating it back to you
When finished, say "Dial" again	"Dialing," and your call will be connected

To Place a Call Using a Stored Nametag

What You Do	What You Hear
Press the white dot button	"OnStar® Ready"
Say "Call"	"Nametag, please"
Say (stored name)	"Calling"

To Place a Call Using the "Redial" Command

What You Do	What You Hear
Press the white dot button	"OnStar® Ready"
Say "Redial"	"Redialing"

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

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

General Tips for Better Speech Recognition

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

	• 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".

Personal Calling Commands

Command	Tip for Better Result
'add'	Emphasize the 'd' at the end of the word.
'call'	Emphasize the 'l' at the end of the word.
'cancel'	Emphasize the 'l' at the end of the word. If you are speaking the 'can' syllable very quickly, try to lengthen it a little.
'clear'	Emphasize the 'r' at the end of the word.
'delete'	Emphasize the 't' at the end of the word. Do not swallow the 'd' at the start of the word.
'dial'	Emphasize the 'l' at the end of the word.
'digit dial' (Gen 6)	Combine the words smoothly and emphasize each syllable.
'directory'	Speak all 4 syllables clearly. Do not swallow the last part of the word.
'help'	Emphasize the 'h' sound at the start of the word. Emphasize the 'p' sound at the end of the word.
'my number'	Emphasize all 3 syllables.
'no'	Speak loudly and slowly. Emphasize the 'n' sound at the start of the word. Draw out the 'o' sound at the end of the word.
'redial'	Try to emphasize and lengthen the first syllable: reee-dial
'security'	Speak 4 syllables clearly. Do not swallow the 'i' sound in the middle of the word.
'store'	Emphasize the 'o' sound in the middle of the word in order to distinguish from 'star'. Emphasize the 'st' sound at the start of the word in order to distinguish from 'four'.
'units'	Speak loudly and clearly.
'verify'	Speak 3 syllables clearly. Do not swallow the 'i' sound in the middle of the word.
'Virtual Advisor'	Emphasize both words.

'voice feedback'	Emphasize both words.
'yes'	Emphasize the 'y' sound at the start of the word. Emphasize the 's' sound at the end of the word.
'zero', 'oh'	If the system does not understand 'oh', try 'zero', or vice versa.
'one'	Emphasize the 'n' at the end of the word.
'two'	Round your lips for the 'ooo' part of the word. If you are clipping the 'ooo' very short, try to lengthen it, but do not draw it out excessively. Speak in a low pitch. Do not use a rising tone like asking a question; a falling tone like giving an answer is better.
'three'	End the word 'three' in a smile, to draw back your lips. Lengthen the 'eee' sound if you are clipping it very short.
'four'	Emphasize the 'r' at the end of the word.
'five'	Emphasize the 'v' sound.
'six'	Emphasize the 'ks' sound at the end of the word.
'seven'	Emphasize the 'n' at the end of the word. Lengthen the 'sev' syllable.
'eight'	Emphasize the 't' at the end of the word. Lengthen the 'eee' sound at the start of the word.
'nine'	Emphasize the 'n' sounds to distinguish from 'five'.
'star'	Emphasize the 'r' at the end of the word. Emphasize the 'ah' sound in order to distinguish from 'store'.
'pound'	Emphasize the 'p' at the start of the word. Emphasize the 'd' at the end of the word.

RADIO/AUDIO SYSTEM DESCRIPTION & OPERATION

The Entertainment System on this vehicle is configured with a radio, antenna, and speakers.

The following list shows the radios available for this vehicle:

- Radio (UB0) - AM/FM with CD
- Radio (UB1) - AM/FM, Cassette and CD
- Radio (UC6) - AM/FM, Integral Multi Disc CD Changer
- Navigation Radio (UM8) - RADIO - AM/FM Stereo, Seek/Scan, CD, ETR, Navigation, Clock

Radio Features

Controls	Functions
All Radios, except UM8	
Power	Push PWR/PUSH/VOL knob to turn the radio ON.
Volume	The volume is adjusted by rotating the PWR/PUSH/VOL knob.
Automatic Volume Control	Press the AUTOVOL button.
Tune	Turn the TUNE/SELECT/PUSH RCL knob.
Seek	Momentarily press the SEEK/SCAN button.
Scan	Hold the SEEK/SCAN button at least 4 seconds.

Presets	Six AM, Six FM1 and Six FM2
Preset Saving	Press and hold desired button until an audible beep is heard.
Set Clock	Press and hold the HR or MN button until an audible beep indicates the time set mode has been entered. Once the beep is heard, the time can be set by tapping each button to incrementally adjust the time. Holding down each button will rapidly change the time.
Recall	Push the TUNE/SELECT/PUSH RCL knob.
Fade or Balance	Press the BAL/FADE button to select and adjust w/SELECT knob.
Bass, Treble or Midrange	Press the TONE button to select and adjust w/SELECT knob.
Automatic Tone	Press AUTO TONE button.
Navigation Display Head, UM8	
Power	Push PWR/VOL knob to turn the radio on.
NAV	Displays the map guidance screen.
NAV RPT	Repeats the last voice guidance message.
SETUP	Displays the setup function for the Navigation Radio.
Scroll/Select knob	Push to display menu/Move up/down and left/right to highlight selection/Push to select.
Soft Key Buttons	Push to select the options listed on the navigation screen.

Cassette Features

Controls	UB1 Radio
Eject	EJECT button
Fast Forward	Preset button 1
Reverse	Preset button 4
Auto Reverse	Yes
Side	Preset button 5
Previous	Preset button 1
Next	Preset button 2
Dolby	Preset button 6
Repeat	NA

Compact Disc Features

Controls	UB1 Radio	UB0 Radio	UC6 Radio
Eject	EJECT button		
Fast Forward	Preset button 1		

Reverse	Preset button 4
Disc	Preset button 5
Previous	Preset button 1
Next	Preset button 2
Dolby	Preset button 6
Repeat	NA
Random	Preset button 6

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

- AM/FM Reception
- Theft Deterrent
- Integral Multi Disc CD Changer (IMDX)
- Amplifier
- Automatic Volume Control
- Radio Data System (RDS)
- Tape/CD Player Error Messages
- Rear Seat Audio (RSA)
- XM Satellite Radio

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 mi).

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 mi). 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

XM Satellite 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.

Theft Deterrent

The theft deterrent system is a feature on all base and uplevel radios. There is no need to program a security code into the radio as in past model years. The theft deterrent system now utilizes class 2 serial data to determine if the radio is in the appropriate vehicle. Each time the radio receives the "run" power mode message, it compares the VIN information it has stored to the VIN information received from a module on the class 2 serial data circuit responsible for transmitting that information. If a mis-match occurs, the radio display will indicate to the user the radio is locked. Once this takes place the radio will not respond to any button presses and become inoperative. The two scenarios able to cause this condition are:

- A radio is installed from another vehicle.
- A module which communicates on the class 2 serial data circuit which supplies VIN information to the radio is replaced and not properly setup with the correct VIN information for that vehicle.

The only way to unlock the radio is by using a scan tool.

The digital radio receiver utilizes class 2 serial data to determine if it is in the appropriate vehicle. Each time the digital radio receiver receives the "run" power mode message, it compares the VIN information received from

the body control module (BCM) on the class 2 serial data circuit. If a mis-match occurs, the radio display will indicate to the user the digital radio receiver is locked. The digital radio receiver cannot be unlocked, it must be replaced. The two scenarios able to cause this condition are:

- A digital radio receiver is installed from another vehicle.
- The BCM is replaced and not properly setup with the correct VIN information for that vehicle.

Integral Multi Disc CD Changer (IMDX)

The integral multi disc CD changer has the capability of storing and playing up to six (6) compact discs. The integral multi disc CD changer has a shock-absorbing system. Only under extreme operating temperatures or severe shock or vibration should the compact disc player skip or mute. If the customer travels an abnormally rough road, a skip condition may be normal. Test drive the vehicle on a normal road with a known good CD. If the condition is still present, replace the radio.

The use of CD lens cleaner discs is not advised, due to the risk of contaminating the lens of the CD optics with lubricants internal to the CD mechanism.

Single Disc Loading

To operate the integral multi disc CD changer in the single play mode, press the "LOAD" button for less than two seconds. The LED to the right of the disc door will turn green to indicate the CD can be loaded. Insert the disc into the slot, label side up. The player will pull the disc in.

Multi Disc Loading

To operate the changer in the multi disc mode, press the "LOAD" button for more than two seconds and the LED to the right of the disc door will flash. Once the light stops flashing and turns green you can load a disc. Insert the disc into the slot, label side up. The player will pull the disc in. Once the disc is loaded, the light will begin flashing again. Once the light stops flashing and turns green you can load another disc.

Removing CDs

Use the eject button to remove a disc or discs. Perform the following to eject:

- To remove a single disc, press and release the eject button. The message "REMOVE CD" is displayed.
- To remove multiple discs, press and hold the eject button for two seconds. An audible beep is heard and the LED to the right of the disc door begins to flash indicating a disc is being ejected. The message "REMOVE CD" is displayed.

Amplifier

The amplifier does not communicate over the serial data circuits and therefore the amplifier will not set DTCs.

Automatic Volume Control

With automatic volume, the audio system adjusts automatically to make up for road and wind noise by

increasing the volume as vehicle speed increases. The Bose amplifiers and base radios use a vehicle speed signal, received via serial data circuits to adjust volume. To adjust volume based on speed, press the AUTO VOL button to select LOW, MEDIUM, or HIGH. To turn AUTO VOL off, press until AVOL OFF is displayed.

Radio Data System (RDS)

All uplevel audio systems are equipped with technology known as the radio data system (RDS). RDS is a system that sends data along with the audio of the FM station you are currently tuned to. RDS is a standard that defines how a FM broadcast station may send digital data along with the audio program. Think of it as a one way wireless modem, allowing the broadcaster to send information about his program to your receiver.

RDS data is carried in what is known as a "sub-carrier". A sub-carrier is a frequency that the FM broadcaster is authorized to use to send data or other audio programs that are not audible in the main audio program. RDS information can be used to display program information and to control the radio.

To receive the RDS signal, all that is needed is an FM receiver with a RDS circuit. A special integrated circuit capable of dealing with the RDS signal is in the RDS circuit and passes it along to the receiver's microprocessor where it is decoded and acted upon.

RDS Basic Information

RDS basic information:

- RDS functions are provided in the FM broadcast band only.
- 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.
- 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.

Broadcast RDS information can be used in a variety of ways by the receiver and listener, but basically falls into two categories: Display and Control.

Displaying Program Information

RDS displays textual 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.

RDS is always on. When tuned to a non-RDS station, your radio will display frequency information as you would normally expect. When tuned to a RDS station, your radio will change from displaying the frequency of the FM station to displaying the call letters of the station or display the nickname of the station. This feature is

known as the Program Service Name.

Controlling the Radio

RDS can control the radio when data the receiver can use responds to timely information performing the following:

- Interrupt the playback of your cassette or CD for traffic or emergency bulletins.
- Search for stations by type of program.
- Automatically follow networked programming from transmitter to transmitter as you travel from one listening area to another.
- Set your clock to the time that the RDS Broadcast station broadcasts.

Viewing & Selecting RDS Information for Display

Press the TUNE knob once for less then 2 seconds when the radio displays the program service name and the frequency of the station will be displayed. Press the knob again, and the program type (PTY) will be displayed. Pressed again, and the program name will be displayed (if the broadcaster is broadcasting one). The program name is an eight-character name that the broadcaster may use to further identify the type of programming currently being broadcast.

Using the RDS Traffic Feature

Some RDS broadcasters may carry traffic information programming to inform you of current traffic conditions in your listening area and is indicated by the icon in the radio display. RDS enables the broadcaster to get this information to you even when you are listening to a tape or compact disc. This feature can be enabled or disabled by the listener. Press the "TRAF" button to find a station that claims to carry traffic information. You may do this even when playing a cassette tape or compact disc. This action will operate in the background without interrupting the current playback. If the radio is not currently tuned to an RDS traffic station, the radio will immediately SEEK an RDS traffic station. If the radio finds an RDS traffic station, the" TRAF" icon will appear in the radio display as will brackets around the (TRAF) icon. If the radio cannot find an RDS traffic station after searching through the entire FM band, the radio will display "NO TRAFFIC".

Alternate Frequency (AF) Switching

RDS permits broadcaster's to send information to the radio that allows the radio to automatically switch frequency to the best quality station in that broadcaster's network.

Since the radio is displaying the broadcaster call letters or nickname, the listener will not see the frequency during an AF switch unless you have changed the default display to be frequency instead of Program Service name.

To enable or disable AF switching perform the following:

- Press and hold the AM/FM button for two seconds or more.
- The radio will display AF ON or AF OFF depending on the current condition of AF and a confirmation beep will be heard.

When AF is enabled and you recall a RDS station stored on preset, the radio determines if the station stored is of acceptable quality. If not, the radio checks all available AF's for your station. If the radio fails to locate your program, AF SEARCH will be displayed as the radio scans across the band looking for your program or an affiliated network. If the radio cannot find the original station or an acceptable alternate frequency NOT FOUND will be displayed and the radio returns to the original frequency for the preset.

RDS Clock Time

Broadcasters can choose to send clock time information in the RDS data. This information can be used to update the clock time on the radio. RDS clock time is broadcasted once a minute. To set the clock using RDS clock data perform the following:

- Press and hold the HR and MIN buttons together for two or more seconds to update the time.
- The display will show UPDATED after receiving the broadcasted time data.
- If the broadcaster is not broadcasting the time data, the radio will display NO UPDATE and the time remains unchanged.

Radio Error Messages

The radio displays the following error messages:

CHECK CD

Displays when the player encounters a focus or tracking error.

CHK CDXX

Displays when the CD changer encounters a focus or tracking error, If equipped.

CHK TAPE

Displays if a tape has been inserted but is unable to be played due to an error.

NO DISC

Displays when the radio expected a disc to be inserted.

NONE

Displays when the radio is unable to detect the vehicle speed data information via the class 2 serial data circuit.

Voice Recorder

To record a message, press the button with the circle on it and begin speaking. Press the button with the circle on it again to stop recording. System allows you to record up to 4 minutes of messaging.

You may also press and hold the button with the circle on it while you are speaking and then let it go when you are finished.

To play back messages, press the button with the right arrow on it. Pressing the right arrow button more than once will return you to previously recorded messages. If you press and hold this button for more than 1 second, all of the recorded messages will be played back.

To delete messages, press the button with the square on it while the message is playing. If you press and hold the right arrow button and the circle button at the same time for a half of a second, all of the messages will be deleted.

Rear Seat Audio (RSA)

The rear seat audio (RSA) and rear HVAC control functions are combined into one dual function control unit. The rear seat audio (RSA) control allows the rear seat passengers to listen to a different music source than the front seat passengers. The rear seat passengers can only control the music sources that the front seat passengers are not listening to. For example, the rear seat passengers may listen to the cassette or CD through headphones while the driver listens to the radio through the front speakers. The rear seat passengers have control of the volume for each headphone. The primary radio controls always override the RSA controls.

Power (PWR)

Press the PWR button in order to turn the rear seat audio system ON or OFF. The rear speakers mute when the power is turned ON unless you have a Bose equipped vehicle. The rear seat audio functions are operable even when the primary radio power is OFF.

Volume (VOL)

Rotate the volume knob in order to increase or decrease the volume. The left volume knob controls the left headphone and the right volume knob controls the right headphone.

Source Switching

Press the PROG or SRCE button in order to switch between playing a cassette or a CD and listening to the radio. There must be a cassette tape and/or compact disc in the player.

Seek (SEEK)

Press the SEEK button in order to seek to the next station. The display will show your selection.

Preset Scan

Press and hold the SEEK button in order to scan station presets.

Next

While listening to a CD or cassette, press the SEEK button in order to hear the next track.

XM Satellite Radio

XM is a national satellite radio service that offers up to 100 coast to coast channels including music, news, sports, talk and children's programming. XM provides digital quality audio and text information, including song title and artist name. A service fee is required in order to receive the XM service. For more information, contact XM at www.xmradio.com or call 1-800-852-9696.

Digital Radio Receiver

The radio controls communicate with the digital radio receiver via the class 2 communication circuit. The digital radio receiver sends low level audio signals to the radio.

Viewing Messages

Press the TUNE/SELECT/RCL knob while in XM mode to view various pieces of information related to the current song or channel. By pressing TUNE/SELECT/RCL knob, you may view four different categories of information: Artist Name/Feature, Song/Program Title, Channel Category, and other Additional Information that may be broadcast on that channel. Additional Information messages may not always be available. Each of the four information types may have multiple pages of text. To reach a category, press TUNE/SELECT/RCL knob consecutively until the desired type is displayed. If there are multiple pages of text for the selected information type, the radio will automatically display all the pages for that type at a rate of approximately one page every three seconds before timing out and returning to the default display. You may override this feature by pressing the TUNE/SELECT/RCL knob to review all of the pages at your own pace.

Selecting a Program Type

The TUNE/SELECT/RCL knob can be used to scroll through the list of available program types (PROG TYPE). Press the PROG TYPE button, then turn the TUNE/SELECT/RCL knob to scroll through the available program types. When the desired program type is shown on the display, press the SCAN button. The radio will seek the next station of that type.

XM Advisory Messages

Radio Display Message	Condition
XM Updating	Updating encryption code
No XM Signal	Loss of signal
Loading XM	Acquiring channel audio (after 4 second delay)
Channel Off Air	Channel not in service
Channel Unavail	Channel no longer available
No Artist Info	Artist Name/Feature not available
No Title Info	Song/Program Title not available
No CAT Info	Category name not available
Not Found	No channel available for the chosen category
No Information	No text/informational message available
XM Theftlocked	Theft Lock active
XM Radio ID	Electronic serial number (ESN) channel 0

Unknown	Radio ID not known (should only be if hardware failure
Check XM Receiver	Hardware failure

VIDEO ENTERTAINMENT SYSTEM DESCRIPTION & OPERATION

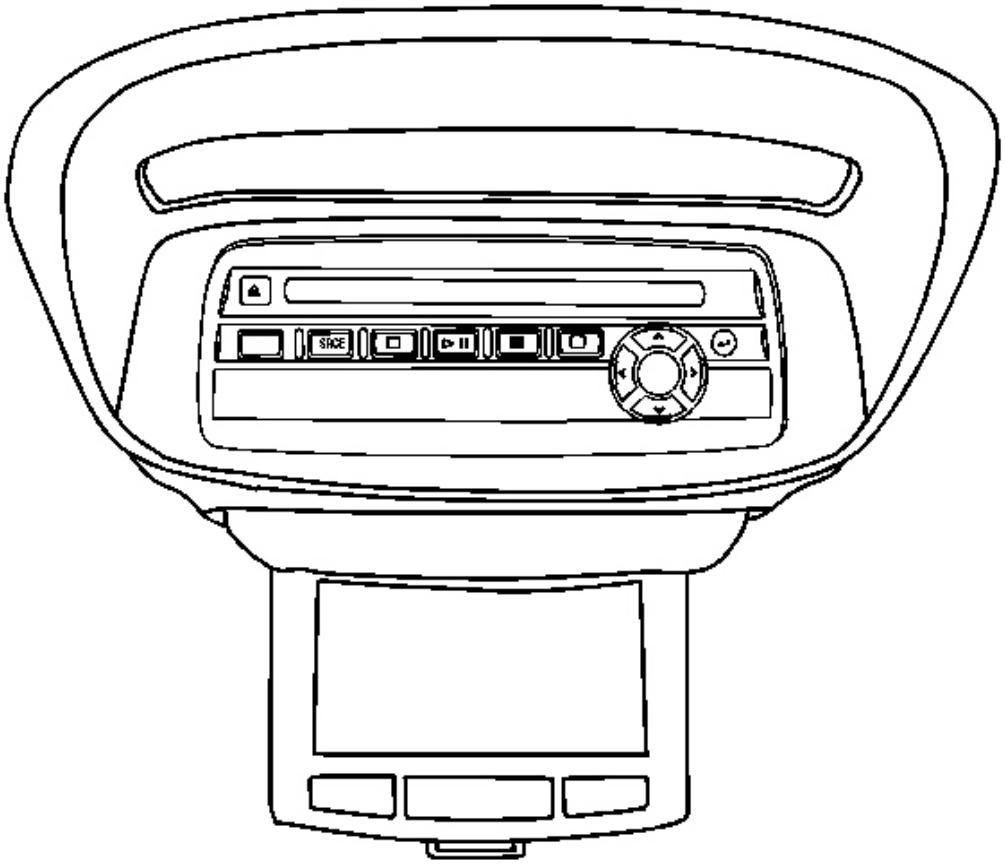


Fig. 98: View Of Rear Seat Entertainment System
Courtesy of GENERAL MOTORS CORP.

Rear Seat Entertainment System

The rear seat entertainment (RSE) system augments the vehicle's in-dash audio system with:

- A Digital Versatile Disc (DVD) player
- A video display screen

- Two sets of wireless infrared headphones
- A remote control and
- Stereo audio and video inputs in the overhead console for playing an auxiliary device

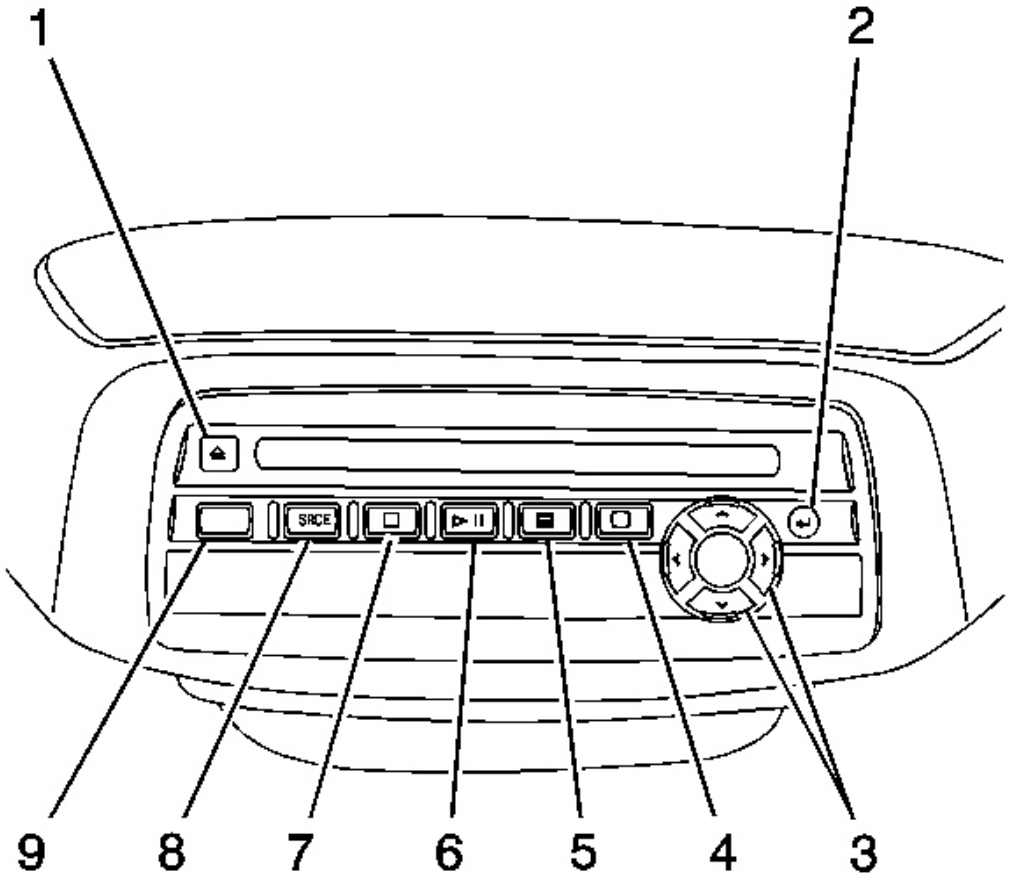


Fig. 99: DVD Player
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Eject Button
2	Enter Button
3	Menu Navigation Buttons
4	DVD Menu Button
5	Video Screen Display Menu Button

6	Play / Pause Button
7	Stop Button
8	Source Button
9	Power Button

DVD Player

The DVD player and the video display screen are located in the overhead console. 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. The DVD player will also play audio CDs. Home recorded CDs, CD-R or CD-RW formats, will not play in this DVD player.

DVD Player Buttons

The following buttons operate the DVD player.

Eject

Press this button to eject the DVD or CD media.

Enter

Press this button to select items within a menu.

Menu Navigation

Use the arrow keys to navigate through a menu. The up arrow will skip to the next chapter or track; the down arrow acts as a previous chapter or track access key; the right arrow acts as fast forward, and the left arrow acts as rewind.

Menu

Press this button to access the DVD menu. This button does not operate with media other than DVD.

Display Menu

Press this button to modify the video screen display characteristics.

Play / Pause

Press this button to turn the DVD player on to play media, pause media, and to toggle between play and pause of media.

Stop

Press this button to stop play of media in the DVD player.

Source

Press this button to toggle between DVD player and auxiliary source.

Power

Press this button to turn the RSE system power On or Off.

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.

Stopping & Resuming Play

To stop a disc, press and release the stop/eject button on the DVD player or the remote control. To resume playback, press the play/pause button on the DVD player or the remote control. The movie should resume play from where it was stopped. If the disc has been ejected, or if the stop button has been pressed 2 times, the disc will resume play at the beginning of the main title.

Ejecting the Disc

Press the eject button on the DVD player to eject the disc.

If a disc is ejected from the DVD player but is not removed, the DVD player will reload the disc within 25 to 30 seconds. The disc will then be stored in the DVD player. The DVD player will not resume play of this disc automatically upon its reload.

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.

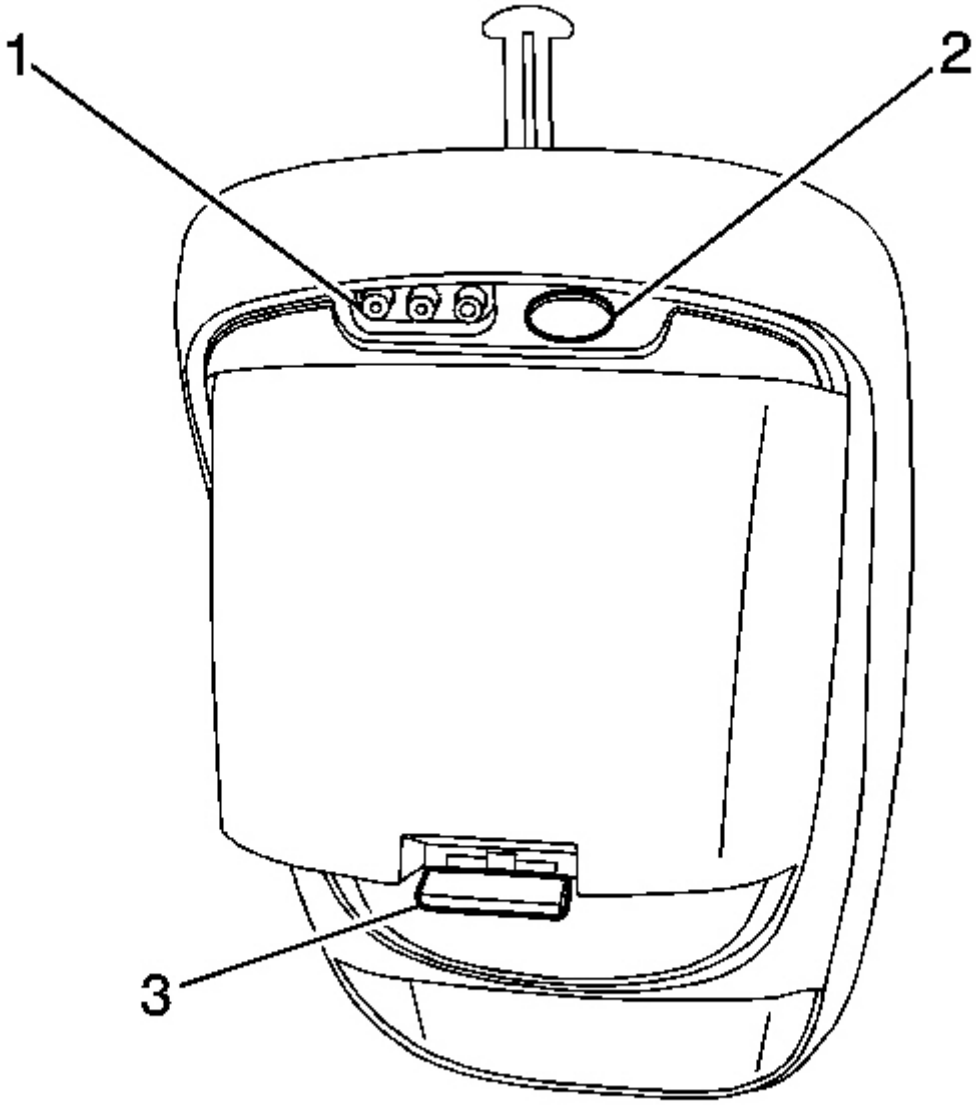


Fig. 100: Identifying Parental Control
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Auxiliary Inputs
2	Parental Control Button
3	DVD Screen Latch

Parental Control Button

This button is located on the forward part of the DVD console, near the driver of the vehicle. Press this button while media is playing in the DVD player to freeze the video and mute the audio. The video screen will display the message Parental Control ON and the power indicator light on the DVD player will flash at one-second intervals. While in this mode, all other button operations from the remote control and the DVD player, with the exception of the eject function, will be disabled. The driver will then be able to gain the attention of the rear seat passengers. Press this button again to restore normal operation of the DVD player. This button may also be used to turn the DVD power on and automatically resume play of the media within the DVD player if the vehicle is in an enabled power mode.

Video Screen

To use the video screen, push forward on the release latch and the screen will be free to rotate down. Adjust the screen's position as desired. The display menu button will allow different screen display modes, such as normal, full screen, zoom or cinema. When the video screen is not in use, push it up into its latched position.

The DVD player and video screen will continue to operate when the screen is in either the up (closed) or down (viewing) position. The video screen contains the infrared transmitters for the wireless headphones as well as the infrared receiver for the remote control. Therefore, if the screen is in the closed position the infrared signals will not be available for the operation of the headphones and the remote control.

Avoid directly touching the video screen, as damage may occur.

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.

Remote Control Buttons

DVD Player Power On / Off

Press this button to turn the RSE system power On or Off.

RSERC Illumination

Press this button to turn the remote control backlight ON.

Title

Press this button to return the DVD media to the root menu of the DVD.

Menu

Press this button to access the DVD menu. This button does not operate with media other than DVD.

Display Menu

Press this button to modify the video screen display characteristics.

Return

The return button shall operate only when a DVD is being played and a menu is active. The return function allows the user to exit the current active menu and return to the previous superior menu.

Enter

Press this button to select items within a menu.

Audio

Pressing this button shall call-up a menu that shall operate only when a DVD is being played. The format and content of this function is defined by the disc and is dependent on the disc.

Angle

Pressing this button shall call-up a menu that shall operate only when a DVD is being played. The format and content of this function is defined by the disc and is dependent on the disc.

Subtitle

Pressing this button shall call-up a menu that shall operate only when a DVD is being played. The format and content of this function is defined by the disc and is dependent on the disc.

Source

Press this button to toggle between DVD player and auxiliary source.

Fast Forward

Press this button to fast forward the DVD in 5x speed. To stop fast forwarding, press this button again. This button may not work when the DVD is playing the copyright or the preview.

Fast Reverse

Press this button to fast rewind the DVD in 5x speed. To stop fast rewinding, press this button again. This button may not work when the DVD is playing the copyright or the preview.

Previous Track/Chapter

Press this button to return to the start of the current track/chapter. Press this button again to backup to the previous track/chapter. This button may not work when the DVD is playing the copyright material.

Next Track/Chapter

Press this button to advance to the beginning of the next track/chapter. The button may not work when the DVD is playing copyright material.

Stop

Press this button to stop play of media in the DVD player

Play / Pause

Press this button to turn the DVD player on, to play media, to pause media, and to toggle between play and pause of media.

Cancel

Pressing this button within 3 seconds of inputting a numeric selection shall clear all numeric inputs.

Numeric Keypad

The RSERC numeric keypad shall provide the operator with the capability of direct chapter / title / track number selection.

Menu Navigation

Use the arrow keys to navigate through a menu. The up arrow will skip to the next chapter or track; the down arrow acts as a previous chapter or track access key; the right arrow acts as fast forward, and the left arrow acts as rewind.

Battery Replacement

To change the batteries, do the following:

1. Remove the battery compartment door located on the bottom of the remote control.
2. Remove the batteries from the compartment.
3. Replace the 2 AA-size batteries in the proper orientation.

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 and would not be covered by your vehicle warranty. Keep the remote control stored in a cool, dry place.

Wireless Headphones

The RSE system includes 2 sets of wireless infrared headphones.

Each set of headphones has an ON/OFF control. To use the headphones activate the ON/OFF control. A red indicator light will illuminate on the headphones. If the light does not illuminate, the batteries may need to be

replaced. See Battery Replacement in this section for more information. To turn the headphones OFF activate the ON/OFF control once again.

Each set of headphones has a rotary volume control. To adjust the volume, adjust this control. The headphones will 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 below the video display screen.

Battery Replacement

To change the batteries, do the following:

1. Loosen the screw on the battery compartment door located on the LEFT headphone earpiece.
2. Remove the batteries from the compartment.
3. Replace the 2 AAA-size batteries in the proper orientation.

If the headphones are to be stored for a long period of time, remove the batteries and keep them in a cool, dry place. Do not store the headphones in heat or direct sunlight. This could damage the headphones and would not be covered by your vehicle warranty. Keep the headphones stored in a cool, dry place.

Stereo RCA Jacks

The RCA jacks are located on the forward portion of the overhead console next to the parental control button. The RCA jacks allow you to connect audio and video from an auxiliary device such as a camcorder or a video game player to your RSE system just as you would to a standard television. Standard RCA cables are needed to connect the auxiliary device to the RCA jacks. The yellow connector transmits video while the red and white connectors transmit right and left stereo audio respectively. Please refer to the manufacturer's instructions for proper connection of your auxiliary device.

To use the auxiliary inputs on the RSE system, connect an external auxiliary device to the color-coded RCA jacks and turn both the auxiliary device and the RSE system power on. If the RSE system had been previously in the DVD player mode, the user will need to press the SRCE button on the faceplate or remote control to change to the auxiliary mode. Successive actuations of the SRCE button will toggle the RSE system between the auxiliary and DVD player modes.

Audio Output

Audio from the RSE system 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)

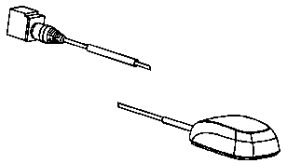
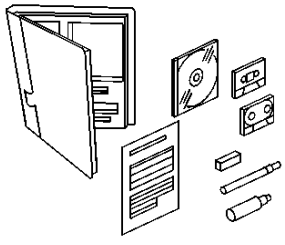
The RSE system will always transmit the audio signal by infrared to the wireless headphones, if there is audio available. The RSE system is capable of outputting audio to the vehicle speakers by pressing the CD button on the vehicle's radio. The RSE system may be selected as an audio source on the radio if the RSE system power is

on. 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. If the RSE system power is not on, the RSE system will not be an available source on the radio head unit. Please refer to the operating instructions for the vehicle radio for more information on its operation.

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. Please refer to the operating instructions for the Rear Seat Audio Controller for more information on its operation.

SPECIAL TOOLS & EQUIPMENT

SPECIAL TOOLS

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