2004 ACCESSORIES & EQUIPMENT

Navigation Systems - C/K SUV

SCHEMATIC AND ROUTING DIAGRAMS

NAVIGATION SYSTEM SCHEMATICS

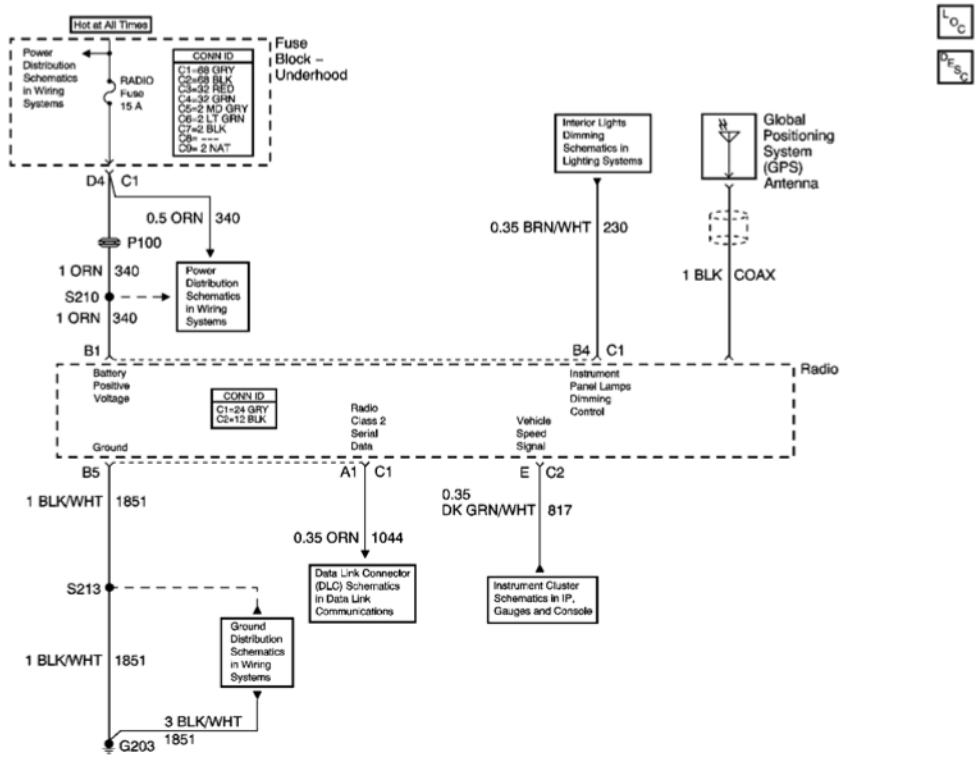

Fig. 1: Navigation System Schematic
Courtesy of GENERAL MOTORS CORP.

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - NAVIGATION SYSTEM

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

- The identification of the control module(s) which command the system
- The ability of the control module(s) to communicate through the serial data circuit
- The identification of any stored diagnostic trouble codes (DTCs) and their status

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

DIAGNOSTIC SYSTEM CHECK - NAVIGATION SYSTEM

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Lack of communication may be due to a partial malfunction of the class 2 serial data circuit or due to a total malfunction of the class 2 serial data circuit. The specified procedure will determine the particular condition.

3: Checks for DTCs for each module of the system.

4: The presence of DTCs which begin with "U" indicate some other module is not communicating. The specified procedure will compile all the available information before tests are performed.

Diagnostic System Check - Navigation System

Step	Action	Yes	No
Schematic Reference: Navigation System Schematics			
1	Install a scan tool. Does the scan tool power up?	Go to **Step 2**	Go to **Scan Tool Does Not Power Up** in Data Link Communications
2	1. Turn ON the ignition, with the engine off. 2. Attempt to establish communication with the navigation radio. Does the scan tool communicate with the control modules?	Go to **Step 3**	Go to **Scan Tool Does Not Communicate with Class 2 Device** in Data Link Communications
3	Select the display DTCs function on the scan tool for the navigation radio. Does the scan tool display any DTCs?	Go to **Step 4**	Go to **Symptoms - Navigation Systems**
4	Does the scan tool display any DTCs which begin with a "U"?	Go to **Step 5**	Go to **Step 6**
5	Does the scan tool display U2153?	Go to **Diagnostic Trouble Code (DTC) List**	Go to **Scan Tool Does Not Communicate with Class 2 Device** in Data Link Communications
6	Does the scan tool display DTC B1000, B1004, B1007, or B1009?	Go to **Diagnostic Trouble Code (DTC) List** in	

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		Body Control System	Go to **Step 7**
7	Does the scan tool display DTC B1327 or B1328?	Go to **Diagnostic Trouble Code (DTC) List** in Engine Electrical	Go to **Diagnostic Trouble Code (DTC) List**

SCAN TOOL DATA LIST

Radio Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Ignition ON/Engine OFF/Radio ON			
8-Digit GM Part Number	ID Information	Numeric	Varies
Amplifier	System Configuration	Present / Not Present	Varies
Amp Type	System Configuration	Bose / Non-Bose	Bose
Antenna Enable	Radio Information	Active/Inactive	Active
Band Number	Radio Information	AM / FM1 / FM2	Varies
Calibration ID	ID Information	Numeric	Varies
CD Changer	System Configuration	Connected / Not Connected	Not Connected
Channel Number	Radio Information	Alphanumeric	Varies
Driver Number	System Configuration	Driver 1/Driver 2	Driver 1
Fan Control	Radio Information	Varies	Varies
Julian Date of Build	ID Information	Numeric	Varies
New VIN Counter	Radio Information	Numeric	0
Phone	System Configuration	Present / Not Present	Present
Power Mode Config.	System Configuration	-	Run
Preset Control	Radio Information	Preset # / Not a Preset	Varies
PROM ID	ID Information	Numeric	Varies
Signal Strength	Radio Information	dB	51 dB
Theft Armed	System Configuration	Learned VIN / No VIN	Learned VIN
Theft Lock	System Configuration	Unlocked / Locked	Unlocked
Year Module Built	ID Information	Numeric	Varies

SCAN TOOL DATA DEFINITIONS

8-Digit GM Part Number

The scan tool displays an 8 digit numeric number. The part number of the module.

Amplifier

The scan tool displays Present or Not Present. The scan tool displays Present when the amp sense wire

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has been grounded to signal that an amplifier is present.

Amp Type

The scan tool displays Bose/Non-Bose, the type of amplifier installed in the vehicle.

Antenna Enable

The scan tool displays Active/Inactive.

Band Number

The scan tool displays AM/FM1/FM2. The current band that the radio is in.

Calibration ID

The scan tool displays 0-9999. The number designating what calibrations the module contains.

CD Changer

The scan tool displays Connected/Not Connected. The scan tool displays Connected when the radio receives Class 2 information from the CD changer.

Channel Number

The scan tool displays the channel the radio is tuned to.

Driver Number

The scan tool displays Driver 1-2. The memory position the driver has selected as received by Class 2 lines.

Fan Control

The scan tool displays the status of the fan.

Julian Date of Build

The scan tool displays 0-999. The day of the year that the module was built.

New VIN Counter

The scan tool displays 0-99. The number of times a new VIN number has been set in the radio.

Phone

The scan tool displays Present or Not Present. The scan tool displays Connected when the radio receives

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Class 2 information from the phone module.

Power Mode Config.

The scan tool displays the current power mode of the vehicle.

Preset Control

The scan tool displays Preset 1-6 when the radio is on a preset station, or Not A Preset when the radio is not on a preset station.

PROM ID

The scan tool displays 0-9999. The identification number of the modules internal PROM.

Signal Strength

The scan tool displays the strength of the received signal in dB.

Theft Armed

The scan tool displays Learned VIN/No VIN. The Scan tool displays Learned VIN when the theft mode has been turned ON by recognizing a valid VIN.

Theft Lock

The scan tool displays Locked/Unlocked. The scan tool displays Unlocked when the radio receives the correct VIN information from the PCM via Class 2.

Year Module Built

The scan tool displays a 1990- 2020, the production year the module was manufactured.

DIAGNOSTIC TROUBLE CODE (DTC) LIST

Diagnostic Trouble Code (DTC) List

DTC	Diagnostic Procedure	Modules
B0004	DTC B0004	Navigation Radio
B2462	DTC B2462	Navigation Radio

DTC B0004

Circuit Description

The navigation radio receives the vehicle speed signal from the PCM through a dedicated circuit shared with the instrument cluster.

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Conditions for Running the DTC

- The navigation radio must detect a power mode transition to ON.
- The radio does not set this DTC if B1327 or B1328 is current.
- The vehicle must drive for 4 km (2.5 mi) after receiving a 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 one second.
- A history DTC clears after 50 ignition cycles without a vehicle speed signal failure.

Diagnostic Aids

An intermittent condition may be caused by the following:

- Mis-routed harness
- Rubbed through wire insulation
- Broken wire inside the insulation
- A loose connector pin

Test Description

The numbers below refer to the step numbers on the diagnostic table.

1: Determines if the malfunction is present.

3: Tests for an open in the vehicle speed signal circuit between the instrument cluster and the navigation radio. A short would cause the instrument cluster to malfunction as well as the navigation system.

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DTC B0004

Step	Action	Yes	No
Schematic Reference: Navigation System Schematics			
1	Did you perform the Diagnostic System Check - Navigation System?	Go to **Step 2**	Go **Diagnostic System Check - Navigation System**
2	Verify the instrument cluster speedometer operation. Does the speedometer work on the instrument cluster?	Go to **Step 3**	Go to **Diagnostic Starting Point - Instrument Panel, Gages and Console** in Instrument Panel, Gages and Console
3	Test the vehicle speed signal circuit for an open between the instrument cluster and the navigation radio. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 6**	Go to **Step 4**
4	Inspect for poor connections at the harness connector of the navigation radio. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 6**	Go to **Step 5**
5	Replace the navigation radio. Refer to **Radio Replacement** in Entertainment. Did you complete the replacement?	Go to **Step 6**	-
6	1. Use the scan tool in order to clear the DTC. 2. Drive the vehicle at least 4 km (2.5 mi) with the GPS signal received. 3. Leave vehicle running and retrieve DTCs. Does the DTC reset?	Go to **Step 2**	System OK

DTC B2462

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

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- RAP UNLK

DTC B2462 does not set if DTC B1328 or B1327 is current.

Conditions for Setting the DTC

- The navigation radio test the GPS antenna every 0.3 second.
- The radio determines there is an open in the GPS antenna.
- DTC B2462 does not set if DTC B1328 or B1327 is current.

Action 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.

Diagnostic Aids

An intermittent condition may be caused by the following:

- Mis-routed harness
- Rubbed through wire insulation
- Broken wire inside the insulation

Test Description

The numbers below refer to the step numbers on the diagnostic table.

1: Determines if the malfunction is present.

3: Determines if the malfunction is due to an internal fault in the navigation radio or a GPS antenna failure.

DTC B2462

Step	Action	Value(s)	Yes	No
Schematic Reference: Navigation System Schematics				
	Did you perform **Diagnostic System Check - Navigation System** ?			Go to **Diagnostic**

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1		-	Go to **Step 2**	**System Check - Navigation System**
2	1. Turn OFF the ignition. 2. Disconnect the GPS coaxial cable connector. 3. Measure the voltage between the center conductor and the shield of the coaxial cable still attached to the navigation radio. Is the voltage within the specified range?	4.0-5.5 V	Go to **Step 5**	Go to **Step 3**
3	Test the GPS cable for an open or short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 7**	Go to **Step 4**
4	Inspect for poor connections at the harness connector of the GPS cable. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	-	Go to **Step 7**	Go to **Step 6**
5	Replace the GPS antenna. Refer to **Antenna Replacement - Global Positioning System (GPS)** . Did you complete the replacement?	-	Go to **Step 7**	-
6	Replace the navigation radio. Refer to **Radio Replacement** in Entertainment. Did you complete the replacement?	-	Go to **Step 7**	-
7	1. Use the scan tool in order to clear the DTC. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 2**	System OK

SYMPTOMS - NAVIGATION SYSTEMS

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

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

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functions.

Visual/Physical Inspection

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

Symptom List

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

No Global Positioning System (GPS) Reception

Navigation System - Vehicle Position Indicator Inoperative or Erratic

NO GLOBAL POSITIONING SYSTEM (GPS) RECEPTION

No Global Positioning System (GPS) Reception

Step	Action	Value(s)	Yes	No
Schematic Reference: Navigation System Schematics				
DEFINITION: When using the navigation system, the GPS icon does not appear on the navigation radio.				
1	Did you perform the **Diagnostic System Check - Navigation System** ?	-	Go to **Step 2**	Go to **Diagnostic System Check - Navigation System**
2	1. Move the vehicle to an open area outside of the building. 2. Turn ON the ignition. The Navigation screen appears on the navigation radio. 3. The display should show the current position of the vehicle. The GPS icon should appear green on the upper left corner of the screen, indicating that the navigation system has proper GPS reception. Does the system operate normally?	-	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems	Go to **Step 3**

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3	1. Leave the vehicle outside with the ignition ON or set to ACC for 30 minutes. 2. Examine the navigation display for the GPS icon, indicating that the vehicle has GPS reception. Does the system have GPS reception?	-	Go to **Step 9**	Go to **Step 4**
4	Inspect the front window and front door glass for metallic tinting or any other alterations or obstructions. Is the front window glass OK?	-	Go to **Step 6**	Go to **Step 5**
5	Remove the front window or front door glass tinting or other alterations. Did you complete the repair?	-	Go to **Step 9**	-
6	Test the GPS antenna line for resistance between the center conductor and the outer shield. Does the resistance measure near the specified value?	200ohm	Go to **Step 8**	Go to **Step 7**
7	Replace the GPS antenna. Refer to **Antenna Replacement - Global Positioning System (GPS)** . Did you complete the replacement?	-	Go to **Step 9**	Go to **Step 7**
8	Replace the navigation radio. Refer to **Radio Replacement** in Entertainment. Did you complete the replacement?	-	Go to **Step 9**	-
9	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to **Step 3**

NAVIGATION SYSTEM - VEHICLE POSITION INDICATOR INOPERATIVE OR ERRATIC

Navigation System - Vehicle Position Indicator Inoperative or Erratic

Step	Action	Yes	No
Schematic Reference: Navigation System Schematics			
DEFINITION: When using the navigation system, the vehicle position indicator does not operate or is erratic.			
1	Did you perform the Diagnostic System Check - Navigation System?	Go to **Step 2**	Go to **Diagnostic System Check - Navigation System**
2	1. Start the vehicle and press the NAV button to switch to the navigation screen. 2. Drive the vehicle for longer than 15 seconds with the speed above 15 mph. 3. Monitor the vehicle position indicator.	Go to **Testing for Intermittent Conditions and Poor**	

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	Does the vehicle position indicator operate normally?	**Connections** in Wiring Systems	Go to **Step 3**
3	Test the Vehicle Speed Signal circuit for an open. Did you find and correct the condition?	Go to **Step 6**	Go to **Step 4**
4	Inspect for poor connections at the harness connector of the navigation radio. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** in Wiring Systems. Did you find and correct the condition?	Go to **Step 6**	Go to **Step 5**
5	Replace the navigation radio. Refer to **Radio Replacement** in Entertainment. Did you complete the replacement?	Go to **Step 6**	-
6	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 2**

REPAIR INSTRUCTIONS

ANTENNA REPLACEMENT - GLOBAL POSITIONING SYSTEM (GPS)

Removal Procedure

1. Remove the I/P top pad. Refer to **Trim Panel Replacement - Instrument Panel (I/P) Upper** in Instrument Panel, Gages and Console.
2. Remove the radio. Refer to **Radio Replacement** in Entertainment.
3. Remove the GPS antenna screw (1).

IMPORTANT: Observe the routing of the GPS antenna cable to ensure the GPS antenna cable is routed properly during installation.

4. Remove the GPS cable from the I/P structure.
5. Remove the GPS antenna (2) from the vehicle.

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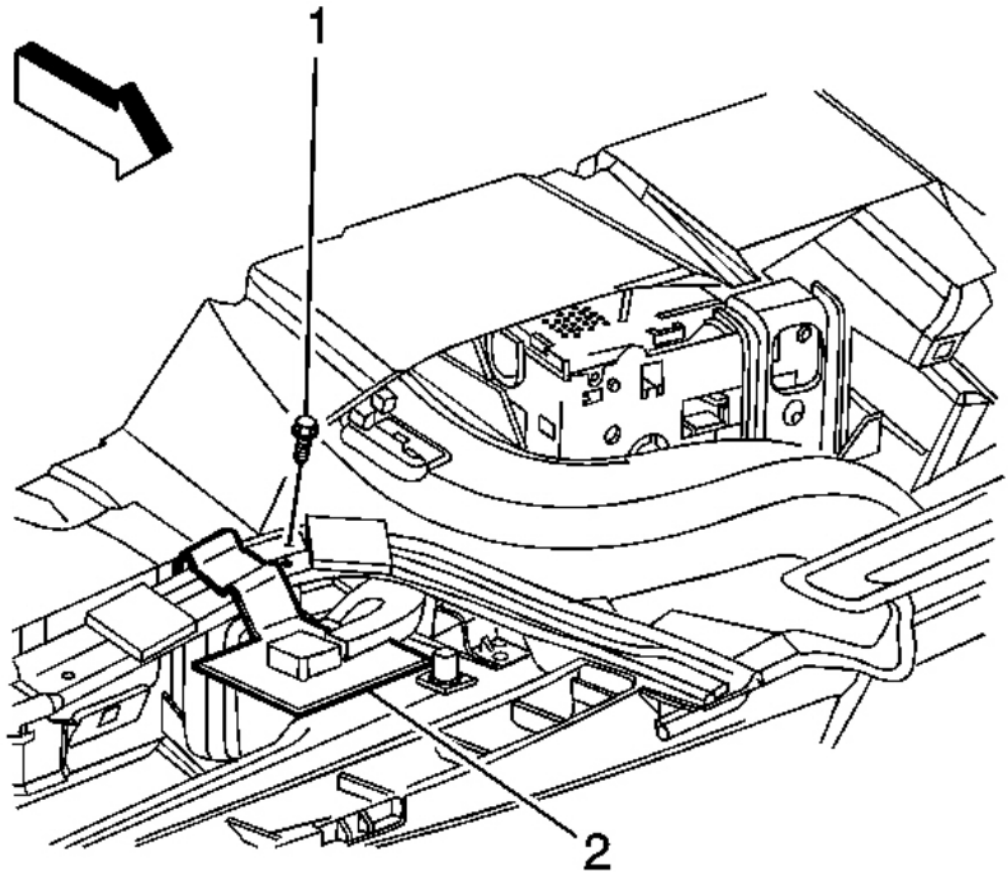

Fig. 2: Removing GPS Antenna & Screw
Courtesy of GENERAL MOTORS CORP.

Installation Procedure

1. Install the GPS antenna (2) to the I/P bracket.
2. Route the GPS antenna cable to the radio opening, as noted in the removal procedure.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the screw (1).

Tighten: Tighten the screw (1) to 2 N.m (18 lb in).

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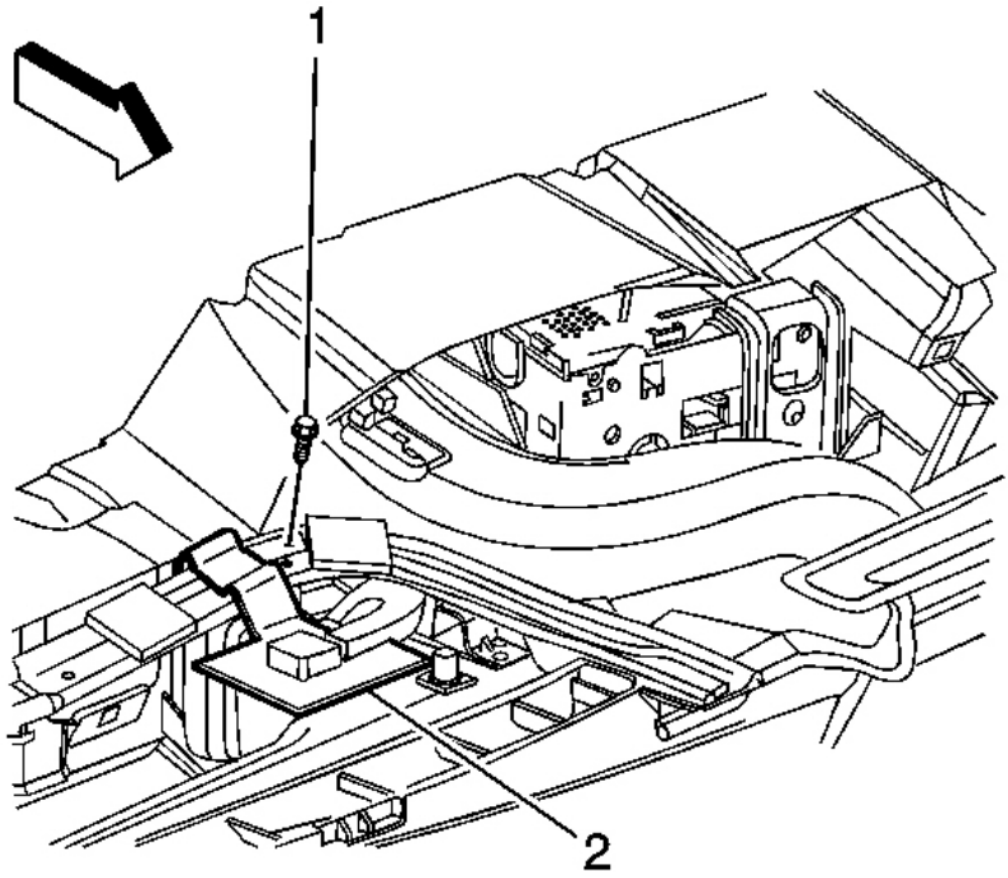

Fig. 3: Installing GPS Antenna & Screw
Courtesy of GENERAL MOTORS CORP.

4. Install the radio. Refer to **Radio Replacement** in Entertainment.
5. Install the I/P top pad. Refer to **Trim Panel Replacement - Instrument Panel (I/P) Upper** in Instrument Panel, Gages and Console.

DESCRIPTION AND OPERATION

NAVIGATION SYSTEM DESCRIPTION AND OPERATION

Navigation Display Head

Navigation Display Head	
Controls	**Function**

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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

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

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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.

Point of Interest (POI)

Points of interests (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.

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