Component Procedures: Radio/Stereo

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Parts and Labor (itype_189)

Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Remove & Replace	Antenna & Radio > Radio, R&R	B	0.9	0.7

Radio/Audio System Description and Operation (w/ Color Display) (Article 10919)

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

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

- Radio Circuit Operation
- Information Display and Controls
- Antenna System
- Radio Reception
- Digital Audio Broadcast (if equipped)
- Speaker Operation
- Audio Amplifier (if equipped)
- Theft Deterrent
- Auxiliary Input Jack
- USB Port (if equipped)
- Bluetooth® (UP9) (If equipped)
- Applications (if equipped)
- Navigation System Components and Features (if equipped)
- OnStar ® (If equipped)
- Steering Wheel Controls (if equipped)

Radio Circuit Operation

Radio Power

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

Radio Grounds

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

Radio Data Link Communication

The radio communicates with other modules via serial data.

Radio Outputs

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

Remote Enable Output

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

Information Display and Controls

The radio/HVAC controls is a separate component from the radio, combined into an assembly. The assembly contains the radio control knobs and buttons for all audio and HVAC functions and the information display. The assembly is supplied battery voltage and ground .

When the radio is on, a discrete 12 V signal is supplied on the remote enable circuit to the color display module. This signal is used to control the power state of the display, which is active when the signal is high and inactive when the signal is low. The info display module receives digital video data from the radio for on-screen display information through a dedicated video cable. The radio communicates with the info display

module over the touch screen serial data circuits for touch screen inputs and backlighting dimming level.
The radio uses a wake up circuit to control the power state of the controls. The radio controls communicate radio control inputs directly to the radio through the CAN Graphical Interface (CGI) data circuits. After receiving the message the radio will perform the requested function. Messages communicated between the radio and the radio/HVAC controls include the following:
- Button presses/knob rotations
- Commands for the state of indicators
- Radio control back-lighting
Communications between the HVAC controls and the HVAC control module are on a separate LIN circuit. The HVAC control module communicates status information to the radio via GMLAN for HVAC information display.

Antenna System

Multi-Band Antenna (If equipped)

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

Active Antenna (U77)

The active antenna system uses an integral antenna applied as an appliqué to the rear glass. The antenna module receives both AM and FM signals from the rear glass antenna . The antenna is part of the rear window and looks similar to the defogger grid. One antenna receives AM signals while the other antenna receives FM signals. Any damage to the antenna requires replacing the glass.
The radio antenna module is enabled when the radio is turned on. The radio provides battery voltage to the antenna module using the center conductor of the antenna coaxial cable. When a 12 V signal is seen by the module on the center conductor of the antenna coax, both AM and FM signals are amplified.

Spoiler Antenna (UB3)

The radio antenna is integral to the spoiler on the rear decklid. The antenna module on the underside of the spoiler receives both AM and FM signals from the antenna. The radio antenna module is enabled when the radio is turned on. The radio provides battery voltage to the antenna module using the remote enable circuit. When a 12 V signal is seen by the antenna module on the remote enable circuit, both AM and FM signals are amplified.

Radio Reception

AM/FM Radio Signal

The radio signal is sent from a broadcast station and is then received by an antenna. The strength of the signal received depends on the following:
- The power output (wattage) of the broadcasting station
- The location of the vehicle (or receiver) relative to the broadcast tower.
- Height of the broadcast antenna
- Height of the receiving antenna
- Obstacles between the tower and the receiver
- Atmospheric conditions
- What band (AM or FM) the station is broadcasting
- Type of antenna and the ground plane

Digital Radio Receiver (If equipped)

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

Radio Data System (RDS)

The RDS feature is available only on FM stations that broadcast RDS information. This system relies upon receiving specific information from these stations and only works when the information is available. While the radio is tuned to an FM-RDS station, the station name or call letters display. RDS data is carried in what is known as a "subcarrier". A subcarrier is a frequency that the FM broadcaster is authorized to use to send data that is not audible in the main audio program.
RDS functions will only work with FM broadcast stations that are broadcasting RDS data. Not all FM Broadcast stations broadcast RDS data or offer all of the RDS services.
The information displayed is dependent upon the information broadcast by the particular station. The information may vary greatly between stations. RDS functions may not work properly when reception is weak, reception is of poor quality, or RDS is not implemented properly by the FM Broadcaster. In some cases, a radio

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

Digital Audio Broadcast (If Equipped)

The Digital Radio Broadcast is emitted from terrestrial repeaters. A service fee may be required in order to receive the Digital Audio Broadcast service.
The Digital Audio Broadcast receiver is external to the Radio.

Speaker Operation

Speakers turn electrical energy into mechanical energy to move air, using a permanent magnet and an electromagnet. The electromagnet is energized when the radio or amplifier (if equipped) delivers current to the voice coil on the speaker. The voice coil will form a north and south pole that will cause the voice coil and the speaker cone to move in relation to the permanent magnet. The current delivered to the speaker is rapidly changing alternating current (A/C). This causes the speaker cone to move in two directions producing sound.
The base (no amplifier) speaker system on the convertible also includes a self-amplified subwoofer . The subwoofer receives audio input from the rear audio signal circuits. The subwoofer assembly receives power and ground from the vehicle harness. The radio controls the power state of the subwoofer via the remote enable circuit.

Audio Amplifier (If Equipped)

Amplifier Interface

A fused battery voltage circuit provides the main amplifier power. A switched 12 V output from the radio is used to control the power - state of the amplifier. To respond quickly to audio input and control signals, the amplifier is ON in all vehicle power modes except OFF and CRANK Request. The internal amplifier bridges are fully powered and unmuted when the amplifier receives the switched 12 V input. This type of amplifier does not have serial data communication capability, and can not set DTCs.

Amplifier Operation

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

Theft Deterrent

The radio theft deterrent system is intended to disable or limit radio functionality if incorrect vehicle information is received by the radio. The radio disables functionality if the VIN information received by the radio does not match the VIN information that has been learned by the radio. The radio receives this information via serial data. A possible cause of incorrect VIN info could be the radio was originally installed in another vehicle.
The radio has the following theft operating modes as part of the theft deterrent system:
- Normal Mode: The radio has learned a correct VIN sequence and the VIN information received via serial data matches the learned VIN sequence. In this mode the radio has full functionality.
- No VIN Mode: The radio has not received or learned a correct VIN sequence. In this mode the radio has limited functionality.
- Theft Detected Mode: The radio has learned a correct VIN sequence and the VIN information received via serial data does NOT match the learned VIN sequence. In this mode the radio may be disabled or have limited functionality. The radio display will indicate that theft protection is active.

Auxiliary Audio Input Jack

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

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

USB Port (If Equipped)

The infotainment system may have a USB connector located in the center console. The USB connector may interface directly with the radio, or be connected to the infotainment system via a Multimedia Player Interface Module. The USB connector supports both USB standards 1.1 and 2.0.

USB Supported Devices:

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

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

Bluetooth ® (UP9) (If equipped)

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

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

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

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

- The device must be paired to the radio to use the available Bluetooth ® feature(s). The pairing process must only be performed once for each device, unless that device’s information is deleted.
- Up to five devices can be paired to the system, but only one can be connected at any given time.
- Streaming Audio allows playing music from the mobile device wirelessly. Music stored on the mobile device can be viewed and controlled from the display.
- To stream audio from a mobile device, the device must be unlocked, and any additional applications should be closed.

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

Applications (If equipped)

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

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

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

the vehicle controls.
- Using applications will use the device's data plan.
- The device must be unlocked, and any additional applications should be closed.
Refer to the owner's manual and supplements for information on mobile devices, control, and operation.

Navigation System Components and Features (if equipped)

The navigation system, if equipped, provides the following:
- Connection to the global positioning system (GPS) antenna, which provides the vehicle position information.
- Route guidance with verbal prompts to the operator.
- Map data for navigation and map route guidance, stored on the internal hard drive.
- Traffic and weather information for display on the navigation system map (with active subscription, where available).

Global Positioning System (GPS) Antenna

The global positioning system (GPS) antenna is part of the multi-band antenna located on the roof of the vehicle. The GPS antenna is used to collect the signals of the orbiting GPS satellites. Within the antenna is housed a low noise amplifier that allows for a more broad and precise reception of this data. The GPS antenna amplifier is powered through the coaxial cable.
The antenna is connected to the navigation radio through a signal splitter. The signal splitter is a component for dividing the navigation signal into two paths without any transmission loss. This allows the use of a single GPS antenna to provide a signal to both the navigation radio and the telematics communication interface module.

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, the vehicle speed signal. and serial data information to accurately display the current position of the vehicle.

Points of Interest

The map database provides point of interest information. Points of interests are locations that are frequently visited. Points of interest can be can be displayed on the map or set as a destination. The following are some of the available Points of interests:
- Gas Station
- Restaurant
- College
- Police Station

Traffic Information

XM NavTraffic™ is a subscription based service that enhances the navigation system with live traffic information. The service provides information on traffic conditions such as traffic speed, accidents, disabled vehicles, construction and road closings.
The integrated XM satellite radio receives the information. When Traffic Information is turned ON in the configuration menu, the available information will be displayed on the map screen.
The traffic information can vary based upon coverage in the area, and coverage is not available in all areas. No information will be displayed if coverage is not available, if there is no traffic information for the area, or if there is no subscription to receive the information.
A subscription fee is required in order to receive the XM NavTraffic™ service. No traffic data will be displayed without a current subscription.

Weather Information

XM NavWeather™ is a subscription based service that transmits weather information to the integrated XM satellite radio. Real time information such as current and future weather and road conditions, atmospheric conditions, and National Weather Service warnings is provided, as well as 3 day forecasts for some cities. Received information is available to be displayed on the Weather Info screen.
A subscription fee is required in order to receive the XM NavWeather™ service. No weather data will be displayed without a current subscription.

OnStar ® (If equipped)

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

Steering Wheel Controls (If equipped)

Some audio functions are available using the steering wheel controls. The steering wheel controls duplicate the function of the primary controls available on the radio.
For additional information on steering wheel controls, refer to Steering Wheel Controls Description and Operation Steering Wheel Controls Description and Operation .

Radio/Audio System Description and Operation (w/ Monochrome Display) (Article 10920)

The entertainment system on this vehicle may have several different configurations available to it. To determine the specific configuration of the vehicle, please see the Service Parts ID Label, and refer to RPO Code List .
Each item in the list below represents topics covered in detail below.
- Radio Circuit Operation
- Information Display and Controls
- Antenna System
- Radio Reception
- Digital Audio Broadcast (if equipped)
- Speaker Operation
- Audio Amplifier (if equipped)
- Theft Deterrent
- Auxiliary Input Jack
- USB Port (if equipped)
- OnStar ® (If equipped)
- Universal Handsfree Phone (if equipped)
- Steering Wheel Controls (if equipped)

Radio Circuit Operation

Radio Power

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

Radio Grounds

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

Radio Data Link Communication

The radio communicates with other modules via serial data.

Radio Outputs

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

Remote Enable Output

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

Information Display and Controls

Figure 1: Radio Communications Version C

The radio/HVAC controls is a separate component from the radio, combined into an assembly. The assembly contains the radio control knobs and buttons for all audio and HVAC functions and the information display. The assembly is supplied battery voltage and ground . The radio uses the wake up circuit to control the power state of the display. The radio controls communicate inputs internally to the display. Display backlighting dimming level, graphical data, and radio control inputs are communicated over the CGI serial data circuits between the display and the radio.
Messages communicated between the radio and the radio/HVAC controls include the following:
- Button presses/knob rotations
- Info display dimming
- Radio/HVAC controls back-lighting
- Graphics and text information

Communications between the HVAC controls and the HVAC control module are on a separate LIN circuit. The HVAC

control module communicates status information to the radio via GMLAN for HVAC information display.

Antenna System

Multi-Band Antenna (If equipped)

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

Active Antenna (U77)

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

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

Spoiler Antenna (UB3)

The radio antenna is integral to the spoiler on the rear decklid. The antenna module on the underside of the spoiler receives both AM and FM signals from the antenna. The radio antenna module is enabled when the radio is turned on. The radio provides battery voltage to the antenna module using the remote enable circuit. When a 12 V signal is seen by the antenna module on the remote enable circuit, both AM and FM signals are amplified.

Radio Reception

AM/FM Radio Signal

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

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

Digital Radio Receiver (If equipped)

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

Radio Data System (RDS)

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

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

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

With RDS, the radio can do the following:

- Display text information such as: station identification, type of programming, and general information (artist and song title, station messages, call in phone numbers, etc.).
- Seek to stations broadcasting the selected type of programming
- Receive announcements concerning local and national emergencies
- Receive alert warnings of local or national emergencies. When an alert announcement comes on the current radio station, ALERT! displays. You will hear the announcement, even if the volume is low or a CD is playing.

If a CD is playing, play stops during the announcement. Alert announcements cannot be turned off. ALERT! is not affected by tests of the emergency broadcast system. This feature is not supported by all RDS stations.

Digital Audio Broadcast (If Equipped)

The Digital Radio Broadcast is emitted from terrestrial repeaters. A service fee may be required in order to receive the Digital Audio Broadcast service.

The Digital Audio Broadcast receiver is external to the Radio.

Speaker Operation

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

The base (no amplifier) speaker system on the convertible also includes a self-amplified subwoofer . The subwoofer receives audio input from the rear audio signal circuits. The subwoofer assembly receives power and ground from the vehicle harness. The radio controls the power state of the subwoofer via the remote enable circuit.

Audio Amplifier (If Equipped)

Amplifier Interface

A fused battery voltage circuit provides the main amplifier power. A switched 12 V output from the radio is used to control the power - state of the amplifier. To respond quickly to audio input and control signals, the amplifier is ON in all vehicle power modes except OFF and CRANK Request. The internal amplifier bridges are fully powered and unmuted when the amplifier receives the switched 12 V input. This type of amplifier does not have serial data communication capability, and can not set DTCs.

Amplifier Operation

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

Theft Deterrent

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

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

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

Auxiliary Audio Input Jack

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

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

- Playback of an audio device that is connected to the 3.5mm jack can only be controlled using the controls on the device.
- The volume control on the device may need to be adjusted to ensure sufficient playback volume through the infotainment system.

USB Port (If Equipped)

The infotainment system may have a USB connector located in the center console. The USB connector may interface directly with the radio, or be connected to the infotainment system via a Multimedia Player Interface Module. The USB connector supports both USB standards 1.1 and 2.0.

USB Supported Devices:

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

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

OnStar ® (If equipped)

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

For additional OnStar information, refer to OnStar Description and Operation OnStar Description and Operation .

Universal Handsfree Phone (If Equipped)

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

Steering Wheel Controls (If equipped)

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

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

Radio Replacement (Article 10997)

Callout Component Name

Preliminary Procedure Remove the radio control assembly. Refer to Radio Control Assembly Replacement .

Preliminary Procedure

Remove the radio control assembly. Refer to Radio Control Assembly Replacement .

1 Radio Screw (Qty: 4) Caution: Refer to Fastener Caution . Tighten 2.5 Nm (22 lb in)

2.5 Nm (22 lb in)

2 Radio Procedure Disconnect the electrical connections. Refer to Control Module References for programming and setup information.

Procedure

- Disconnect the electrical connections.
- Refer to Control Module References for programming and setup information.

Radio Control Assembly Replacement (Article 10990)

Callout Component Name

Preliminary Procedure Slide the front floor console rearward to allow the radio control to slip over the lip. Refer to Front Floor Console Replacement .

Preliminary Procedure

Slide the front floor console rearward to allow the radio control to slip over the lip. Refer to Front Floor Console Replacement .

1 Radio Control Assembly Bolt/Screw (Qty: 2) Caution: Refer to Fastener Caution . Tighten 2.5 Nm (22 lb in)

2.5 Nm (22 lb in)

2 Radio Control Assembly Procedure Use a flat-bladed plastic trim tool in order to release the retainer clips securing the radio control assembly to the instrument panel. Disconnect the electrical connections. When replacing the radio control assembly, transfer components as necessary . Refer to Control Module References for programming and setup information.

Procedure

- Use a flat-bladed plastic trim tool in order to release the retainer clips securing the radio control assembly to the instrument panel.
- Disconnect the electrical connections.
- When replacing the radio control assembly, transfer components as necessary .
- Refer to Control Module References for programming and setup information.

Audio Player and USB Receptacle Replacement (Article 10977)

Callout Component Name
Preliminary Procedure Open the front floor console armrest. Remove the front floor console rear cover. Refer to Front Floor Console Rear Cover Replacement
Preliminary Procedure
- Open the front floor console armrest.
- Remove the front floor console rear cover. Refer to Front Floor Console Rear Cover Replacement
1 Audio Disc Player and USB Receptacle Procedure Depress the tabs to remove the receptacle. Disconnect the electrical connector.
Procedure
- Depress the tabs to remove the receptacle.
- Disconnect the electrical connector.

Radio and Telephone Control Switch Replacement (Article 10985)

Callout Component Name
Preliminary Procedure Remove the steering wheel spoke cover. Refer to Steering Wheel Spoke Cover Replacement .
Preliminary Procedure
Remove the steering wheel spoke cover. Refer to Steering Wheel Spoke Cover Replacement .
1 Radio and Telephone Control Switch Fastener (Qty: 2) Caution: Refer to Fastener Caution .
2 Radio and Telephone Control Switch

All Technical Service Bulletins (itype_100)

Tsbs
- Information on Inappropriate Warranty Claims Submitted for Damaged Radios and Instrument Panel Clusters (IPCs) (08-08-44-015H, 2016/12/19)
- Information on Multi-Media Infotainment Tester (MIT) Incompatibility Issues (17-NA-386, 2017/12/04)
- Blank Radio Displays Due to Bad NAV USB Update (PIT6122, 2024/01/31)
- Incoming Bluetooth Calls Cannot Be heard Through Vehicle Audio System - (Dec 5, 2016) (PIC6233, 2016/12/05)
- Missing Channels or No Audio On Certain XM Radio Channels (PIC5959C, 2017/02/20)
- Diagnostic Tips: XM Audio Traffic And Travel Link Availability And Operation (PIT5353C, 2018/11/20)
- Cannot Delete Paired Phone, Phone Missing From List, HVAC Button Lock Up On Display (Volt Only), HVAC Fan Speed Freezing On Display(Camaro Only), Navigation Address Entry Concerns (Encore only), XM Background Graphics Default, Radio Freezes And/Or Resets (PIC6158B, 2016/02/15)
- OnStar Will Not Power Up (PIC5491K, 2017/12/18)
- Apple Phone Will Not Always Auto Connect Through Bluetooth To The Radio (PIC6120A, 2016/03/21)
- Loss of Radio Audio Shortly After an OnStar In-Vehicle Voice Message Is Heard (20-NA-026, 2020/07/22)
- XM Band Not Receiving All Channels (Preview Mode) (PIC5088F, 2016/04/21)
- Performance Of XM Radio System With Sunroof Fully Open (PIC3074F, 2019/02/04)
- Audio System - Noise When Using Portable Playback Unit (06-08-44-015C, 2012/03/30)

Customer Interest Bulletins (itype_109)

Tsbs
- Audio System - Noise When Using Portable Playback Unit (06-08-44-015C, 2012/03/30)

Software Update Bulletins (itype_434)

Tsbs
- Cannot Delete Paired Phone, Phone Missing From List, HVAC Button Lock Up On Display (Volt Only), HVAC Fan Speed Freezing On Display(Camaro Only), Navigation Address Entry Concerns (Encore only), XM Background Graphics Default, Radio Freezes And/Or Resets (PIC6158B, 2016/02/15)

Erratic Operation (itype_132)

Tsbs

- Cannot Delete Paired Phone, Phone Missing From List, HVAC Button Lock Up On Display (Volt Only), HVAC Fan Speed Freezing On Display(Camaro Only), Navigation Address Entry Concerns (Encore only), XM Background Graphics Default, Radio Freezes And/Or Resets (PIC6158B, 2016/02/15)
- Apple Phone Will Not Always Auto Connect Through Bluetooth To The Radio (PIC6120A, 2016/03/21)
- Performance Of XM Radio System With Sunroof Fully Open (PIC3074F, 2019/02/04)

Inoperative (itype_148)

Tsbs

- OnStar Will Not Power Up (PIC5491K, 2017/12/18)
- Missing Channels or No Audio On Certain XM Radio Channels (PIC5959C, 2017/02/20)

Noise (itype_156)

Tsbs

- Audio System - Noise When Using Portable Playback Unit (06-08-44-015C, 2012/03/30)

Out of specification (itype_158)

Tsbs

- XM Band Not Receiving All Channels (Preview Mode) (PIC5088F, 2016/04/21)

Poor performance (itype_162)

Tsbs

- Apple Phone Will Not Always Auto Connect Through Bluetooth To The Radio (PIC6120A, 2016/03/21)
- Loss of Radio Audio Shortly After an OnStar In-Vehicle Voice Message Is Heard (20-NA-026, 2020/07/22)
- XM Band Not Receiving All Channels (Preview Mode) (PIC5088F, 2016/04/21)
- Performance Of XM Radio System With Sunroof Fully Open (PIC3074F, 2019/02/04)

Miscellaneous Information (itype_111)

Tsbs

- Diagnostic Tips: XM Audio Traffic And Travel Link Availability And Operation (PIT5353C, 2018/11/20)

Tools and Equipment (itype_113)

Tsbs

- Information on Multi-Media Infotainment Tester (MIT) Incompatibility Issues (17-NA-386, 2017/12/04)

Warranty Information (itype_119)

Tsbs

- Information on Inappropriate Warranty Claims Submitted for Damaged Radios and Instrument Panel Clusters (IPCs) (08-08-44-015H, 2016/12/19)