FIGURE 28–1 Audio systems use both electromagnetic radio waves and sound waves to reproduce sound inside the vehicle.

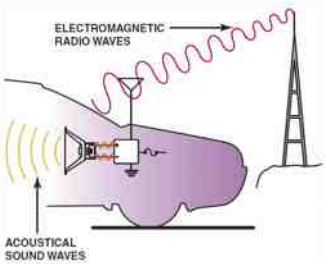

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FIGURE 28–2 The relationship among wavelength, frequency, and amplitude.

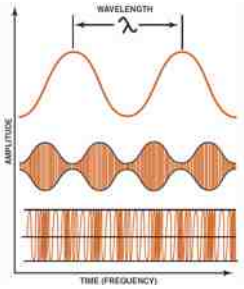

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FIGURE 28–3 The amplitude changes in AM broadcasting.

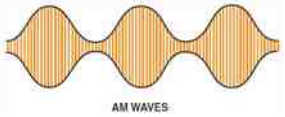

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FIGURE 28–4 The frequency changes in FM broadcasting and the amplitude remains constant.

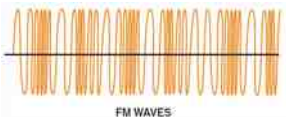

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FIGURE 28–5 Using upper and lower sidebands allows stereo to be broadcast. The receiver separates the signals to provide left and right channels.

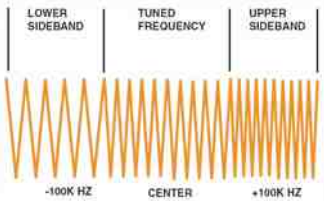

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FIGURE 28–6 The five types of antennas used on General Motors vehicles include the slot antenna, fixed mast antenna, rear window defogger grid antenna, a powered mast antenna, and an integrated antenna.

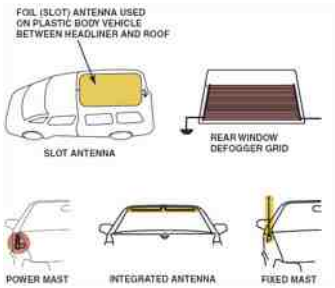

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FIGURE 28–7 The ground plane is actually one-half of the antenna.

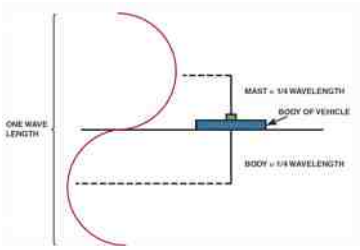

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FIGURE 28–8 If all ohmmeter readings are satisfactory, the antenna is good.

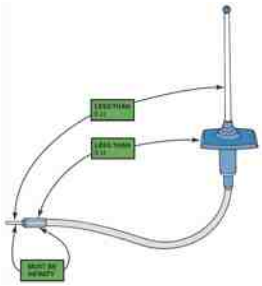

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FIGURE 28–9 Cutting a small hole in a fender cover helps to protect the vehicle when replacing or servicing an antenna.

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FIGURE 28–10 A typical power antenna assembly. Note the braided ground wire used to ensure that the antenna has a good ground plane.

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FIGURE 28–11 Between 6 and 7 volts is applied to each speaker terminal, and the audio amplifier then increases the voltage on one terminal and at the same time decreases the voltage on the other terminal causing the speaker cone to move. The moving cone then moves the air, causing sound.

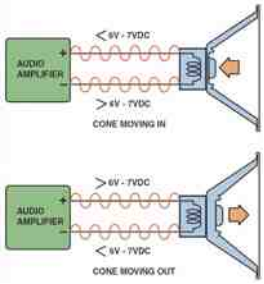

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FIGURE 28–12 A typical automotive speaker with two terminals. The polarity of the speakers can be identified by looking at the wiring diagram in the service manual or by using a 1.5 volt battery to check. When the battery positive is applied to the positive terminal of the speaker, the cone will move outward. When the battery leads are reversed, the speaker cone will move inward.

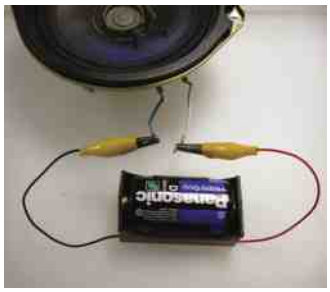

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FIGURE 28–13 (a) Two 4 ohm speakers connected in series result in total impedance of 8 ohms. (b) Two 4 ohm speakers connected in parallel result in total impedance of 2 ohms.

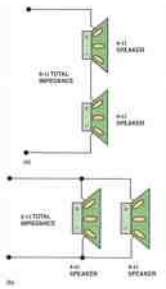

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FIGURE 28–14 Crossovers are used in audio systems to send high-frequency sounds to the small (tweeter) speakers and low-frequency sounds to larger (woofer) speakers.

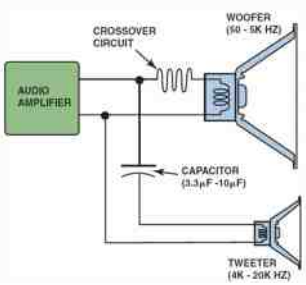

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FIGURE 28–15 Two capacitors connected in parallel provide the necessary current flow to power large subwoofer speakers.

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FIGURE 28–16 A powerline capacitor should be connected through the power wire to the amplifier as shown. When the amplifier requires more electrical power (watts) than the battery can supply, the capacitor will discharge into the amplifier and supply the necessary current for the fraction of a second it is needed by the amplifier. At other times when the capacitor is not needed, it draws current from the battery to keep it charged.

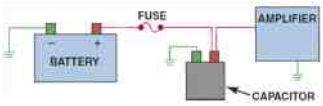

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FIGURE 28–17 Voice commands can be used to control many functions, including navigation systems, climate control, telephone, and radio.

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FIGURE 28–18 The voice command icon on the steering wheel of a Cadillac.

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FIGURE 28–19 Bluetooth earpiece that contains a microphone and speaker unit that is paired to a cellular phone. The telephone has to be within 33 ft (10 m) of the earpiece.

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FIGURE 28–20 SDARS uses satellites and repeater stations to broadcast radio.

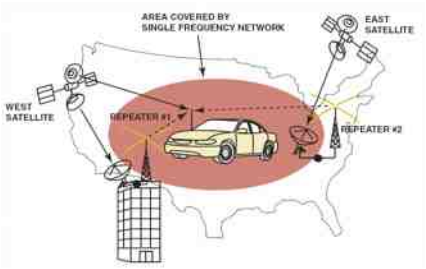

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FIGURE 28–21 An aftermarket XM radio antenna mounted on the rear deck lid. The deck lid acts as the ground plane for the antenna.

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FIGURE 28–22 A shark-fin-type factory antenna used for both XM and OnStar.

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FIGURE 28–23 A radio choke and/or a capacitor can be installed in the power feed lead to any radio, amplifier, or equalizer.

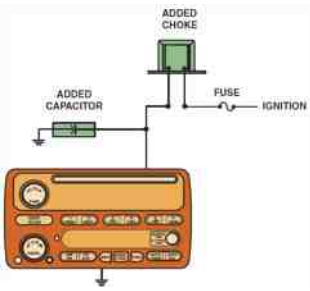

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FIGURE 28–24 Many automobile manufacturers install a coaxial capacitor, like this one, in the power feed wire to the blower motor to eliminate interference caused by the blower motor.

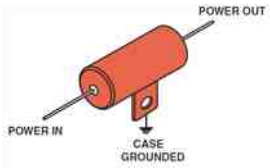

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FIGURE 28–25 A "sniffer" can be made from an old antenna lead-in cable by removing about 3 in. of the outer shielding from the end. Plug the lead-in cable into the antenna input of the radio and tune the radio to a weak station. Move the end of the antenna wire around the vehicle dash area. The sniffer is used to locate components that may not be properly shielded or grounded and can cause radio interference through the case (housing) of the radio itself.

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FIGURE 28–26 The tip of this antenna was struck by lightning.

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