Speaker Project

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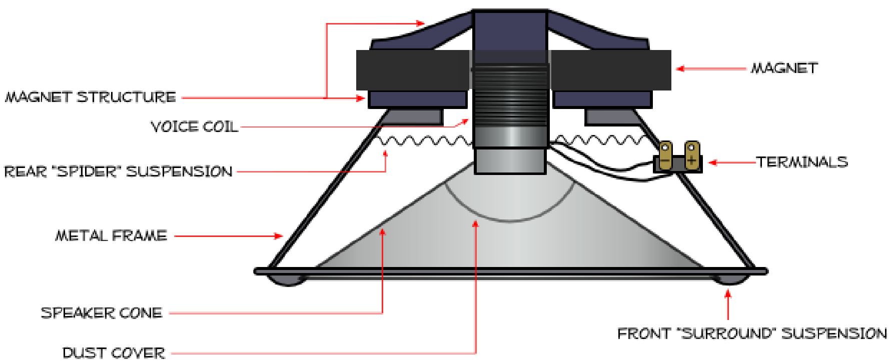
How do speakers work?



Speakers apply the simple principle of electromagnets to convert electrical signals into sound energy which we hear. The five main components of the speaker consist of a permanent magnet, a voice coil, a spider, a cone, and the frame. The permanent magnet has a standing magnetic field of its own, and it is fixed in position (stationary), whereas the voice coil is able to move up and down (mobile), and exerts a magnetic field only when current is passed through it. The voice coil is attached to the spider, a structure that supports and keeps the voice coil and the cone in place, but flexible enough to allow the coil to move up and down. The cone, also known as the diaphragm, is the main moving mass that is attached to the spider, and moves up and down along with the spider to push air that surrounds the speaker and produce sound. The frame of the speaker holds all the parts together in place, and it is the framework around which the speaker is built. When the alternating electrical signals (current) from a device travel through the audio amplifier, copper wire and eventually reach the voice coil (coiled conductor; a solenoid) inside the speaker, it turns the voice coil into an electromagnet, thus allowing it to produce alternating magnetic field. This can be explained using Oersted's principle, which states that a charge moving through a conductor creates a magnetic field around the conductor. With this alternating polarity between North and South poles, the voice coil is attracted and repelled to the permanent magnet at the bottom of the speaker. This alternating movement of the voice coil moves the spider up and down, and causes the cone (which is attached to the spider) to move with it. This movement of the cone changes (increases and decreases) the air pressure around the speaker, and creates sound waves with frequencies that are between 20 HZ to 20 KHZ, which the human ear can hear as sound. The bigger the cone, the louder the sound gets, as there is more surface area for the cone to push air.