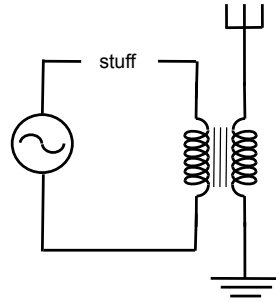


RADIOS

Sending Station:

- 1.) The sending station's circuit is shown to the right.
- 2.) Each AM station is given a specific high-frequency signal with which to work. (Example: KFWB's signal frequency is 980,000 Hz.)
- 3.) Current running up onto and down off of the antenna produces an alternating magnetic field; the presence of charge on the antenna produces an alternating electric field.
- 4.) If the frequency of the signal is above 500,000 hertz, the signal will flip off the antenna and move outward at 186,000 miles per second (that is, at the speed of light) as an electromagnetic wave.

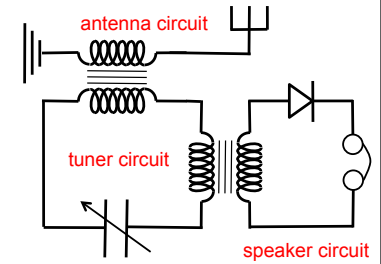


1.

5.) A transformer transfers the selected signal into the speaker circuit.

6.) A speaker is comprised of a fixed magnet and a coil attached to a cone. As the signal/current pass through its coil, the magnetic field generated by the current interacts with the fixed magnet and motivates the cone to move away from or toward the magnet, depending upon what the current is doing. In doing so, the cone flexes producing sound waves.

7.) If we put AC through a speaker coil at a frequency of 980,000 Hz, the speaker, being too inert, will just sit there. To get the speaker to respond to the signal, we have to make it into DC. This is done using a diode (see circuit). (More will be said about this after we talk about *amplitude modulation*.)



3.

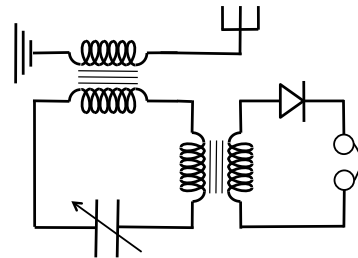
RECEIVING CIRCUIT:

- 1.) The receiving circuit is shown to the right.
- 2.) Electromagnetic waves from all of the radio stations in the area motivate charge to move on the receiving station's antenna.
- 3.) A transformer transfers the signals from the antenna into the tuning circuit.
- 4.) Problem: There needs to be a way to tune out undesired stations. The tuning circuit accommodates this need. Being comprised of inductors and a capacitor, it has a resonant frequency of

$$v = \frac{1}{2\pi} \sqrt{\frac{1}{LC}}$$

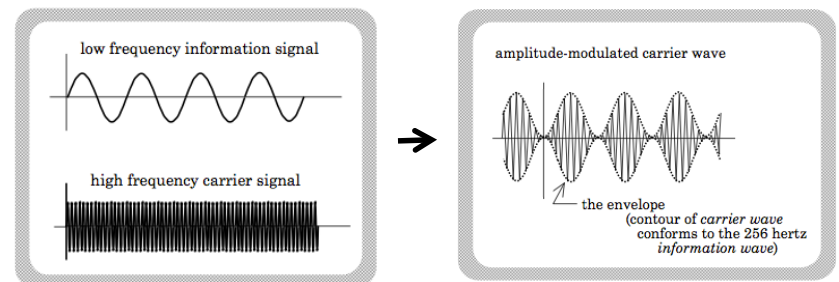
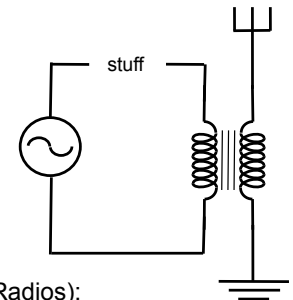
Using the variable capacitor, we can tune the natural frequency of the circuit to the frequency of the station we want. That signal will proliferate and all others will simply dampen out and go away.

2.



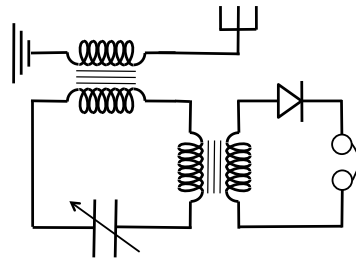
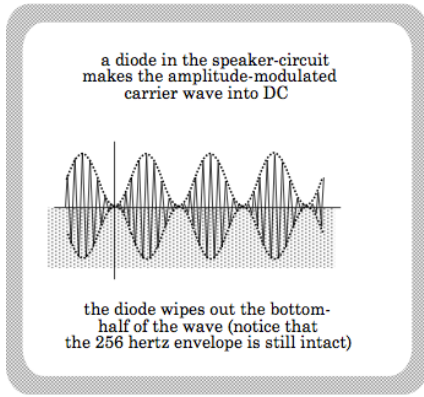
AMPLITUDE MODULATION:

- 1.) The "stuff" in the sending circuit takes the high frequency "carrier wave" and puts the "information wave" onto it.
- 2.) The way this is accomplished is to modulate the amplitude of the carrier wave so that it looks like the information wave.
- 3.) That is (taking from Fletch's text/chapter on Radios):



4.

4.) The diode in the speaker circuit makes the AC into DC.

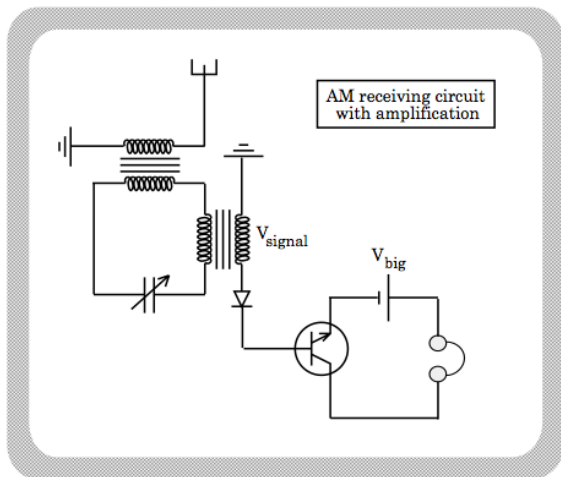


5.) The general trend of current is what motivates the speaker to flex in and out, which is to say that the speaker cone's motion is governed by the envelope of the amplitude modulated wave, where the envelope is the same as the information wave.

5.

AMPLIFIED CIRCUIT:

1.) To amplify the signal, all we need is a transistor as shown in the sketch.



6.