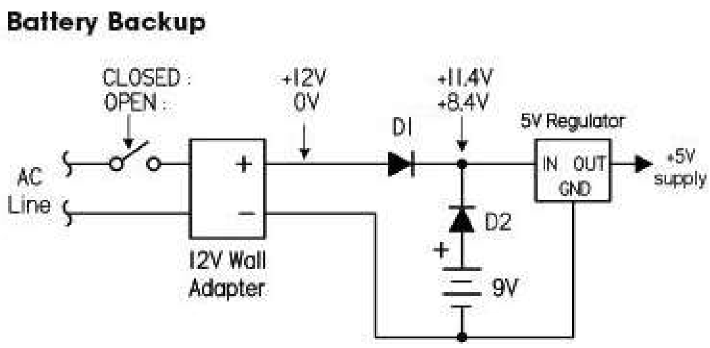
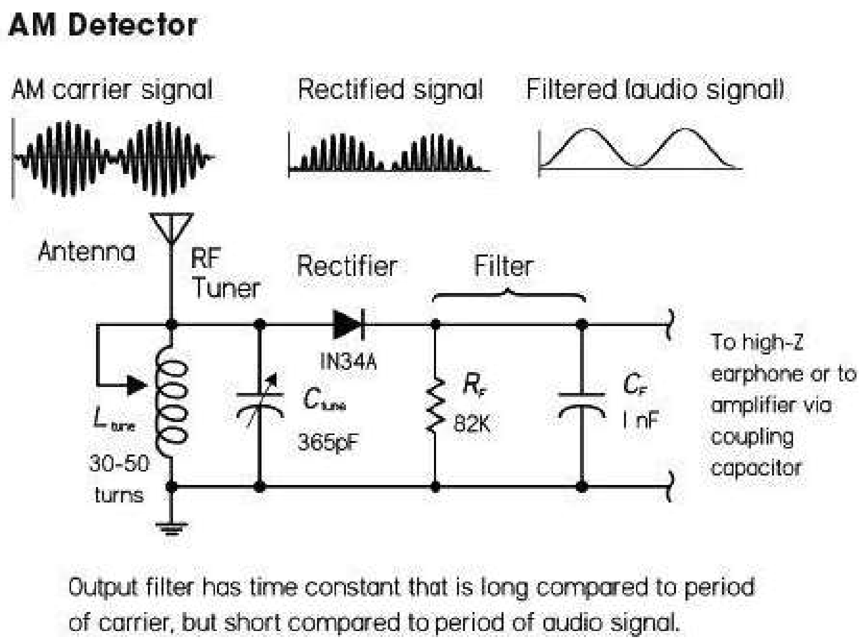


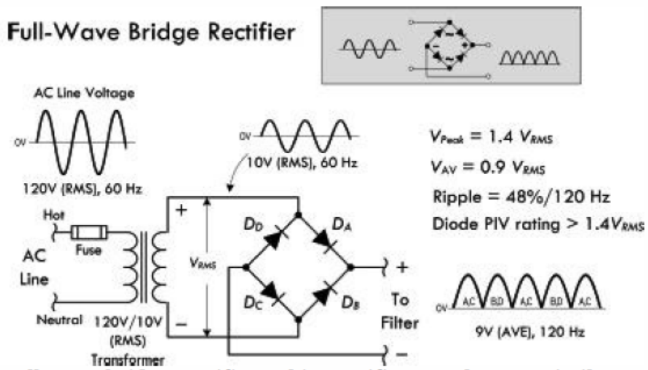
Devices are powered by a wall adapter with battery backup, typically diode-OR for the battery and wall-adapter connections, as shown in Fig. 4.24. Normally if the switch is closed, power is delivered to the load from the 12-V wall adapter through D_1; D_2 is reverse-biased (off), since its negative end is 2.4V more positive than its positive end. If power is interrupted (switch opened), D_1 stops conducting, and the battery kicks in, sending current through D_2 into the load; D_1 blocks current from flowing back into the wall adapter. There is a penalty for using diodes for battery backup, however, since the diode in series with the battery limits the minimum voltage at which the battery can supply power (around a 0.6-V drop for silicon p-n junction, 0.4 V for Schottky). Better battery-backup designs implement transistors or special ICs that contain an internal comparator which switches over battery power through a low-resistance transistor without the 0.6-V penalty. Check out MAXIM's website for some example ICs.

FIGURE 4.24



Diodes are often used in the detection of amplitude modulated (AM) signals, as demonstrated in the simple AM radio in Fig. 4.25. Within an AM radio signal, an RF carrier signal of constant high frequency (550 to 1700 kHz) has been amplitude modulated with an audio signal (10 to 20,000 Hz). The audio information is located in duplicate in both upper and lower sidebands, or the envelope of the AM signal. Here, an antenna and LC-tuning circuit act to "resonate" in on the specific carrier frequency of interest (transform radio signal into corresponding electrical signal). A signal diode (e.g., 1N34) is then used to rectify out the negative portion of the incoming signal so it can be manipulated by the next dc stages. The rectified signal is then stripped of its high-frequency carrier by passing through a low-pass filter. The output signal is the audio signal. This signal can be used to drive a simple crystal earpiece, a modern sensitive headphone, or a telephone receiver earpiece. (Low-impedance earphones or speakers will require additional amplification via a coupling capacitor of 1 µF or so.)

FIGURE 4.25



Full-wave bridge rectifier: **This rectifier produces a similar output as the last full-wave rectifier, but doesn't require a center-tap transformer. To understand how the device works, follow the current through the diode one-way gates. Note that there will be at least a 1.2-V drop from zero-to-peak input voltage to zero-to-peak output voltage (there are two 0.6-V drops across a pair of diodes during a half cycle). The average dc output voltage into a resistive load or choke-input filter is 0.9 ×** V_{rms} **of the transformer's secondary; with a capacitor filter and a light load, the maximum output voltage is 1.4 ×** V_{rms}**. The inverse voltage across each diode is 1.4** V_{rms}**; there the PIV of each diode is more than 1.4** V_{rms}**.**

See the following text for the pros and cons of the various rectifier configurations.

FIGURE 4.20