

UNIT 17

ALTERNATING CURRENT FUNDAMENTALS

17.1 Introduction

The major advantage of alternating current is that it can be transformed into different voltages to transmit power long distances. In this unit you will learn:

- ▶ how alternating current is produced
- ▶ the relationship of voltage and current waveforms

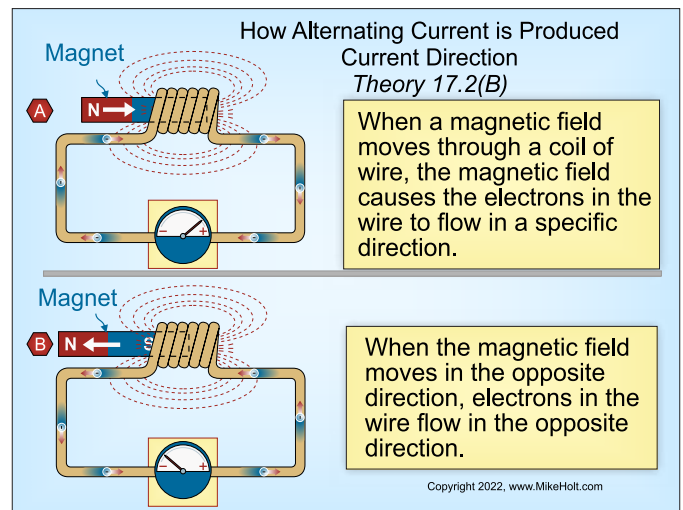
17.2 How Alternating Current is Produced

(A) Magnetism. In 1831, Michael Faraday discovered that electricity could be produced from a source other than a battery. He knew that electricity could be used to produce an electromagnet and wondered if a magnet could be used to generate electricity. Faraday discovered that when he moved a magnet inside a coil of wire, he was able to measure a pulse of electric current with a measuring instrument called a “galvanometer.” When he pulled the magnet out of the coil of wire, he measured another electrical pulse of current.

(B) Current Direction. Faraday discovered that a magnet that pushes into or pulls out of a coil of wire causes the current in the wire to move in a specific direction relative to the movement of the magnetic field of the magnet. When a magnetic field moves through a coil of wire, the lines of force of the magnetic field cause the electrons in the wire to flow in a specific direction and when the magnetic field moves in the opposite direction, electrons in the wire flow in the opposite direction.

▶Figure 17-1

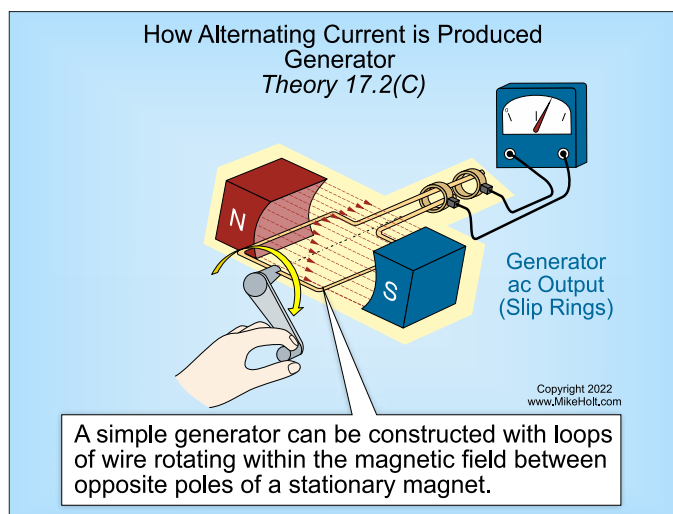
(C) Alternating-Current Generator. Generators can be used to produce alternating-current flow. To do so, a magnetic field must have motion relative to a coil of wire. A simple ac generator can be constructed with loops of wire rotating within the magnetic field between opposite poles of a stationary magnet. ▶Figure 17-2



▶Figure 17-1

Author's Comment:

- ▶ According to the Drift Theory, electrons wiggle back and forth no more than one inch per $\frac{1}{2}$ cycle in 60 Hz alternating-current circuits.



►Figure 17-2