14.12

A waveform travels in space at a rate of approximately 300 million meters per second. The wavelength of a sine wave is the actual distance in space that is used by one sine wave as it travels. What is the wavelength of a 100-MHz sine wave? What is the wavelength of a 500-MHz sine wave? Antennas to send and receive electromagnetic waves are often sized to be one-half of the wavelength for the particular wave being used. Compare your previous calculations to the size of VHF and UHF television antennas. How large would a 1/2 wavelength antenna have to be to transmit a 60-Hz wave?

Wavelength = velocity / frequency = 300,000,000 / 100,000,000 = 3 meter

Wavelength = velocity / frequency = 300,000,000 / 500,000,000 = 0.6 meter

Length = 1/2 * velocity / frequency = 1/2 * 300,000,000 / 60,000,000 = 2.5 meter

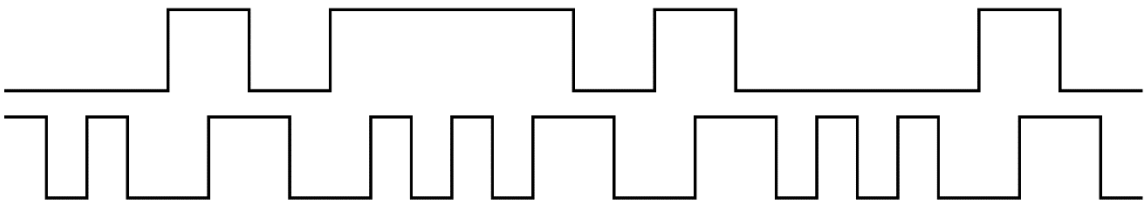
14.13

What is the carrier frequency of your favorite radio station? Is the station amplitude modulated or frequency modulated? How do you know? What is the bandwidth of this station? (Hint: what is the carrier frequency of the next nearest possible station on the dial?)

The radio station I love is FM 106.1 MHz, which is a news radio station in China. The bandwidth is 200 kHz.

14.17

Carefully draw a diagram that represents the binary sequence 00101110100010. Now, below your original diagram, draw the Manchester encoded representation of the same sequence.



(Drawing by Microsoft Paint)

14.19

What is the 4B/5B encoding for the binary sequence 1101000011001101?

1101 -- 11011

0000 -- 11110

1100 -- 11010

1101 -- 11011

1101000011001101 -- 11011111101101011011

14.20

a. What is the binary sequence represented by the 4B/5B encoded sequence 11110011111101111110?

11110 -- 0000

01111 -- 0111

11011 -- 1101

11110 -- 0000

11110011111101111110 -- 0000011111010000

b. What is the binary sequence represented by the 4B/5B encoded sequence 10101010101010101011?

10101 -- 0011

01010 -- 0100

10101 -- 0011

01011 -- 0101

10101010101010101011 -- 0011010000110101