Technician License Course

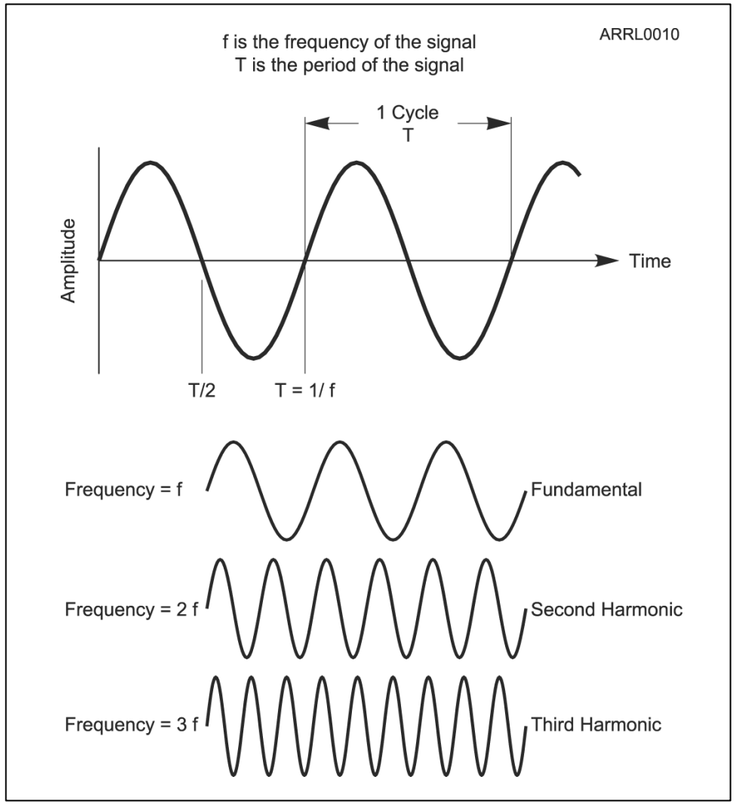
Chapter 2

Radio and Signals Fundamentals

Wave Vocabulary

Before we study radio, we need to learn some wave vocabulary.

- Amplitude
- Frequency **(Hertz, Hz)**
- Period (seconds, s)
- Fundamental
- Harmonics



Wave Vocabulary

- 1 cycle/sec = 1 Hz
- 1,500 Hz = 1.500 kHz (Kilo Hertz)
- 1,500,000 Hz = 1.500 MHz (Mega Hertz)
- 1,500,000,000 Hz = 1.500 GHz (Giga Hertz)

- 1,500 kHz = 1.5 MHz
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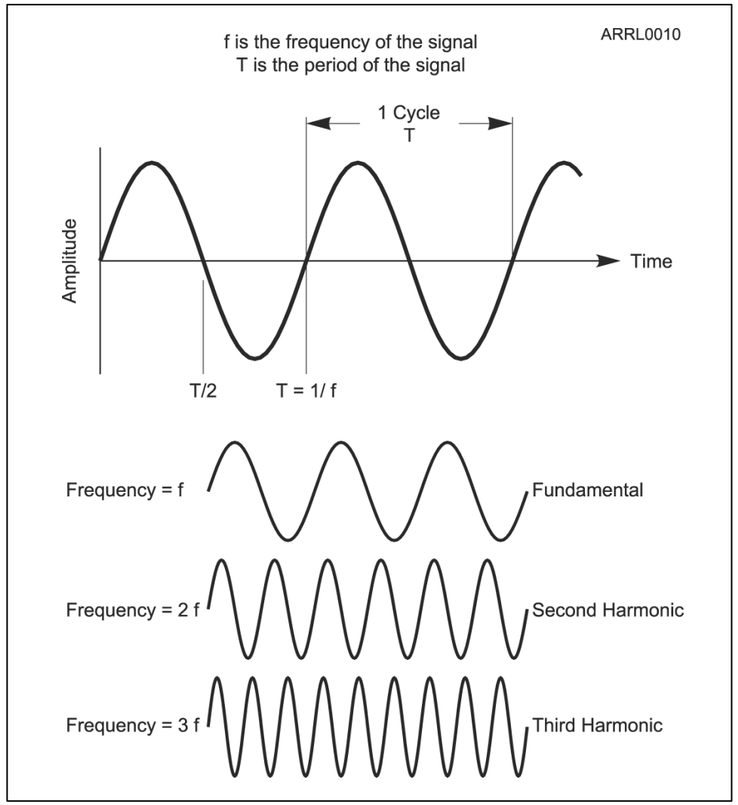
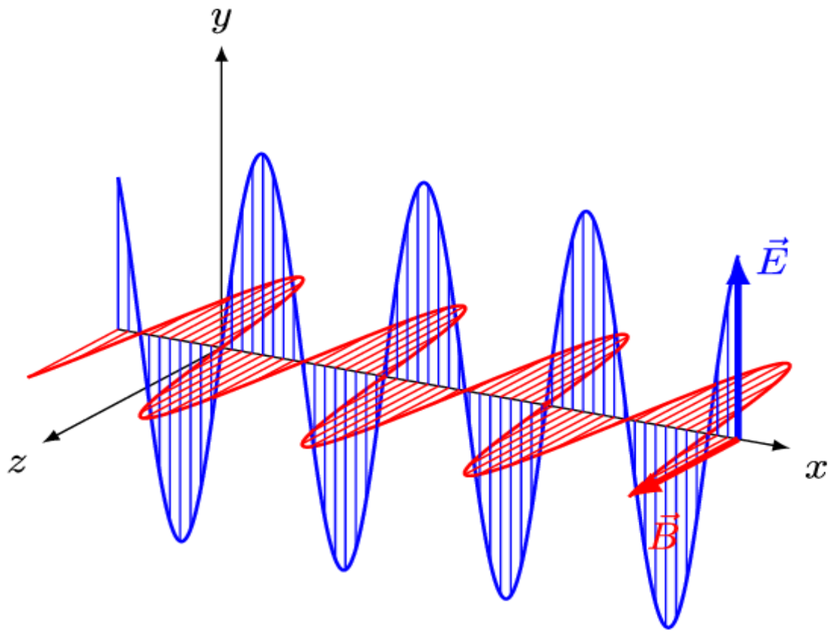


Electromagnetic Waves

- Electromagnetic waves are made up of electric and magnetic energy (fields).
- The electric and magnetic fields vary in the pattern of a sine wave.
- **Electromagnetic waves travel at the speed of light (300,000,000 m/s)**



Electromagnetic Waves

- Moving electrons in an antenna take the place of the moving magnet.
- A signal from a transmitter can make the electrons in an antenna move, transferring energy from the signal to electromagnetic waves.

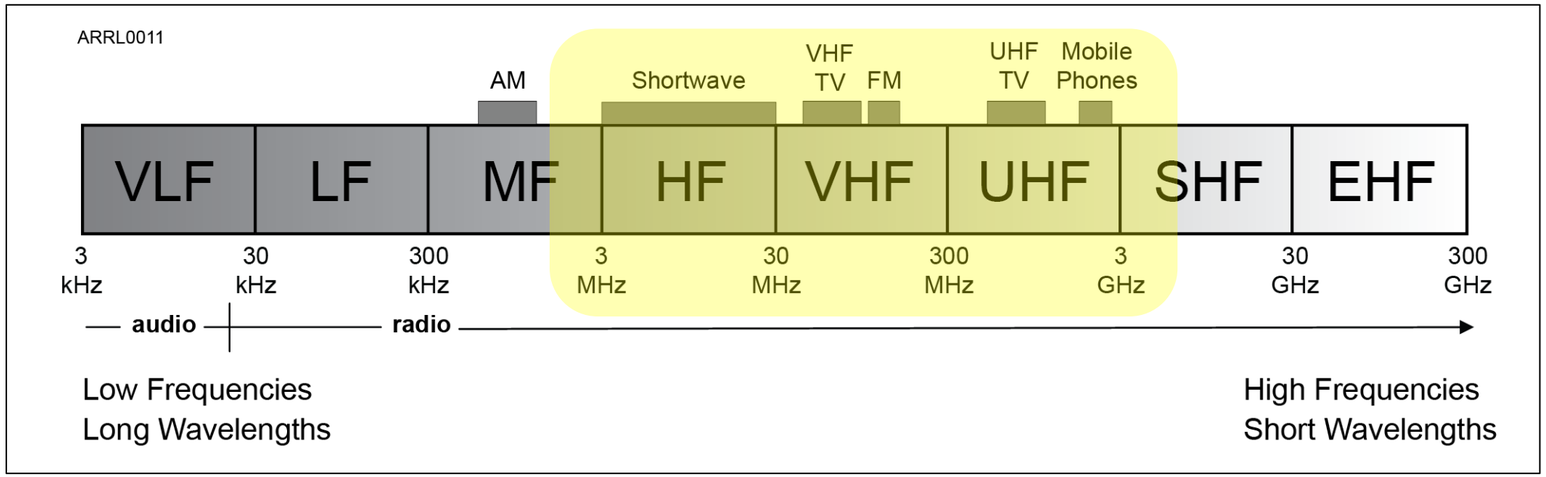
Electromagnetic Waves

- The same process works “backwards” too.
- Electromagnetic waves encountering an antenna make its electrons move in sync with the wave.
- Electromagnetic energy is transferred from the wave to the electrons.
- The moving electrons create a signal that can be detected by a receiver.

Electromagnetic Waves

- The electromagnetic spectrum is divided into ranges of frequencies in which electromagnetic waves behave similarly.
- Each range or segment has a different name.
- Waves with a certain range of frequencies which can be used for communication are called radio waves.

Radio Spectrum



- The part of the electromagnetic spectrum Composed of radio waves is called the *Radio Frequency* or RF spectrum

Radio Spectrum

- Parts of the spectrum allocated for a common purpose are called a *band*, such as the “AM Band” or “CB Band”.
- Signals in these bands are usually of the same for commercial purposes.
- Hams share the band across many signals of different types.

US Amateur Radio Bands

US AMATEUR POWER LIMITS — FCC 97.313 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

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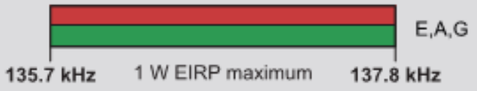

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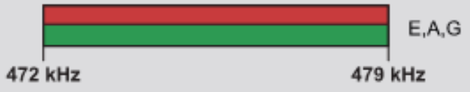

160 Meters (1.8 MHz)

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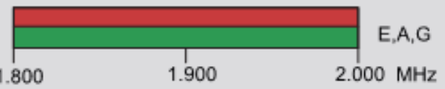
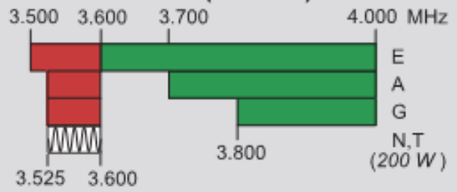


80 Meters (3.5 MHz)



60 Meters (5.3 MHz)

General, Advanced, and Amateur Extra licensees may operate on these five channels on a secondary basis with a maximum effective radiated power (ERP) of 100 W PEP relative to a half-wave dipole. Permitted operating modes include upper sideband voice (USB), CW, RTTY, PSK31 and other digital modes such as PACTOR III. Only one signal at a time is permitted on any channel.

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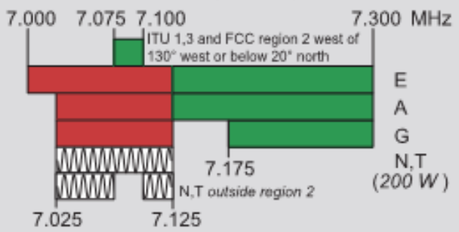

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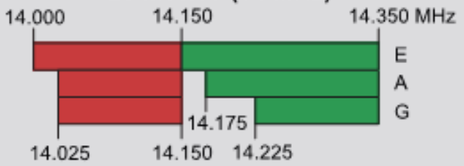
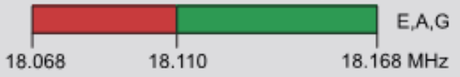
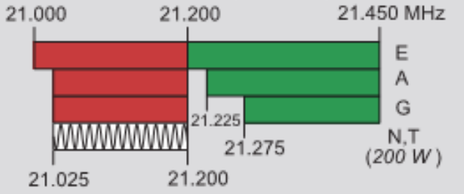


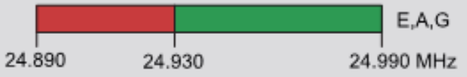
17 Meters (18 MHz)



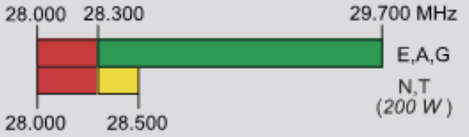
15 Meters (21 MHz)



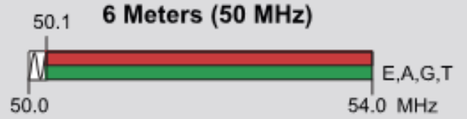
12 Meters (24 MHz)



10 Meters (28 MHz)

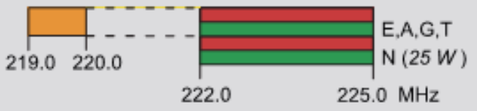


6 Meters (50 MHz)



2 Meters (144 MHz)

1.25 Meters (222 MHz)



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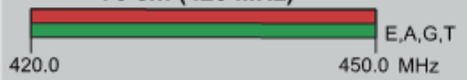
70 cm (420 MHz)*



33 cm (902 MHz)*

23 cm (1240 MHz)*

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2300-2310 MHz	10.0-10.5 GHz ‡	122.25-123.0 GHz
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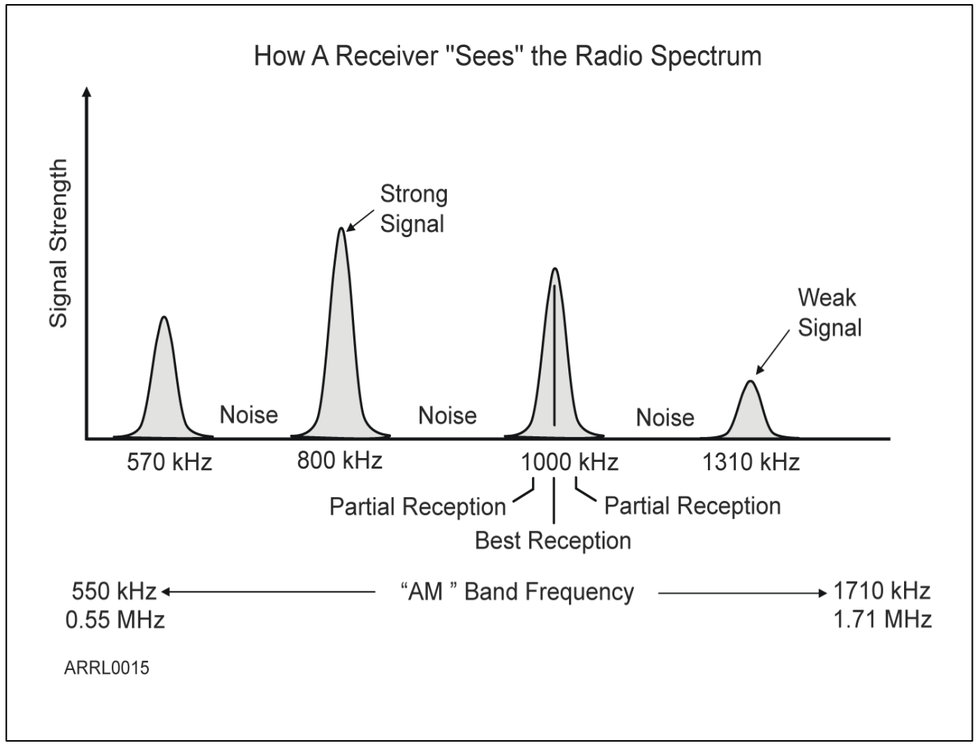
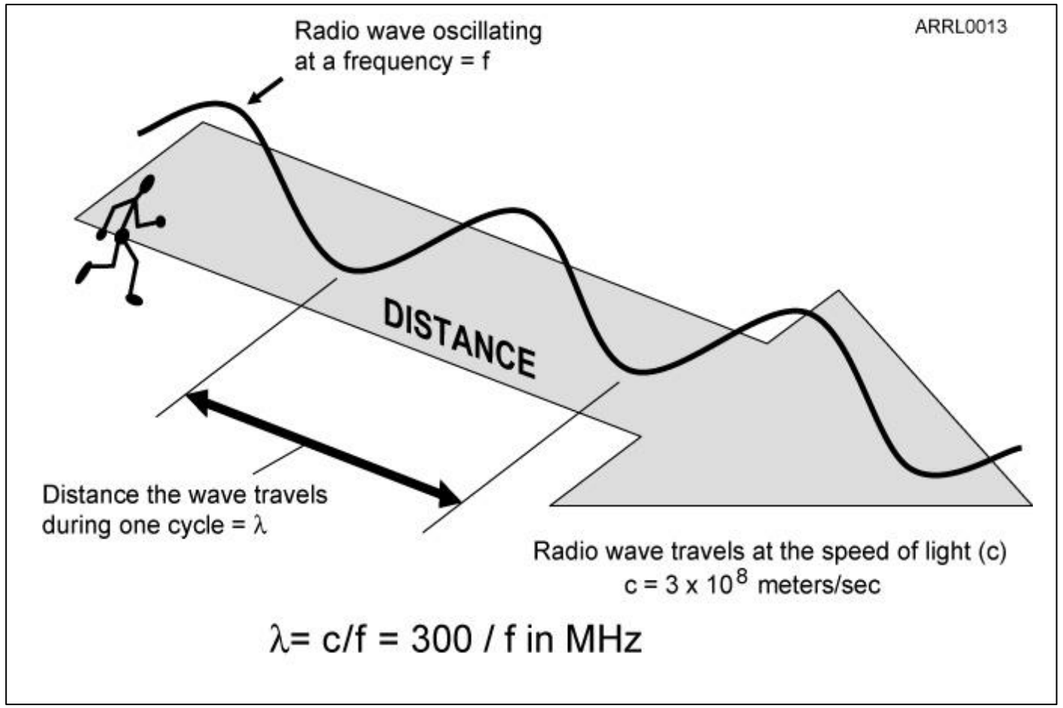
Radio Signals

- A radio wave carrying information is a *radio signal*.
- Each signal occupies a range of frequencies.
- Receivers “tune in” a signal by listening at the signals frequency.



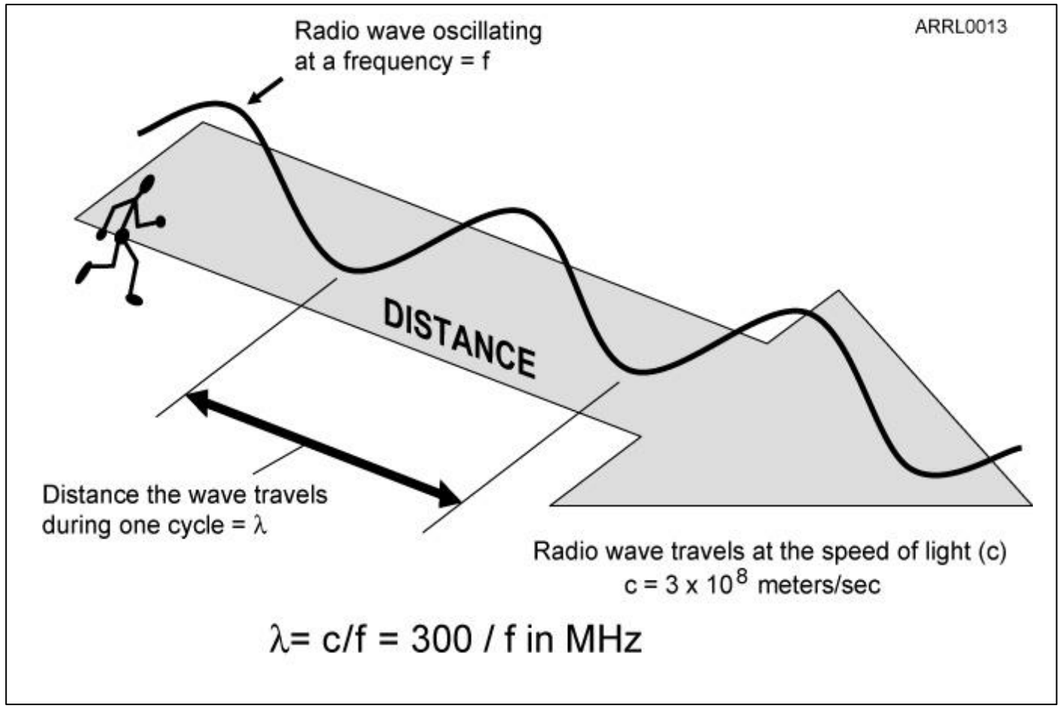
Wavelength

- *Wavelength* is the distance a radio wave travels during one cycle of the wave's electric and magnetic fields.
- λ (lambda) is the symbol for wavelength.



Wavelength

- **Waves travel at the speed of light, c**.
- Hams can refer to bands by frequency (50MHz) or **wavelength (6 meters)**.
- **Wavelength gets shorter as frequency increases**
- **λ (meters) = 300 / f (MHz)**



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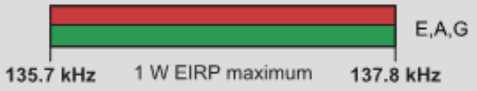

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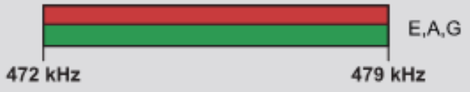

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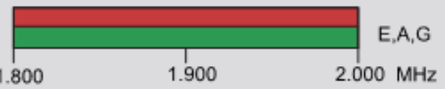

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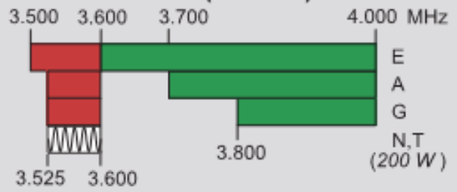

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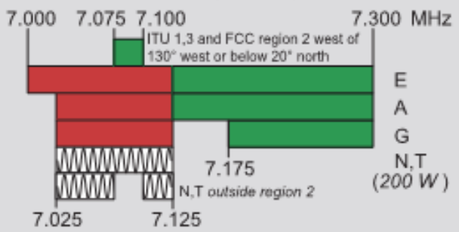

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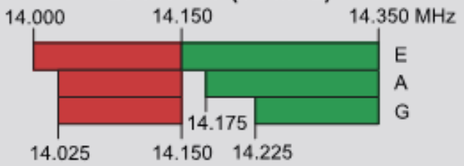

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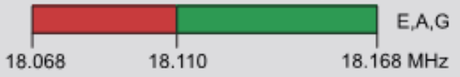

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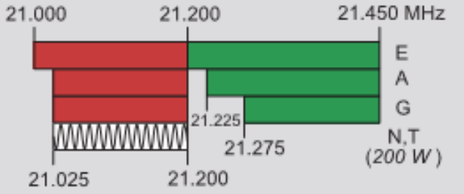

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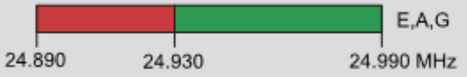

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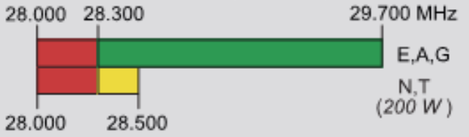

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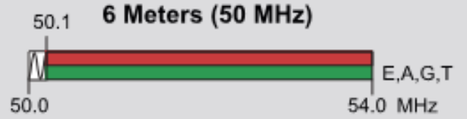

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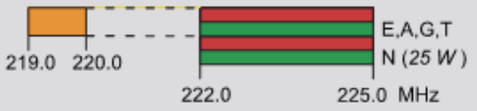

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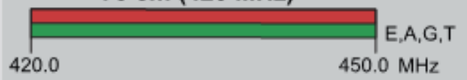

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Basic Radio

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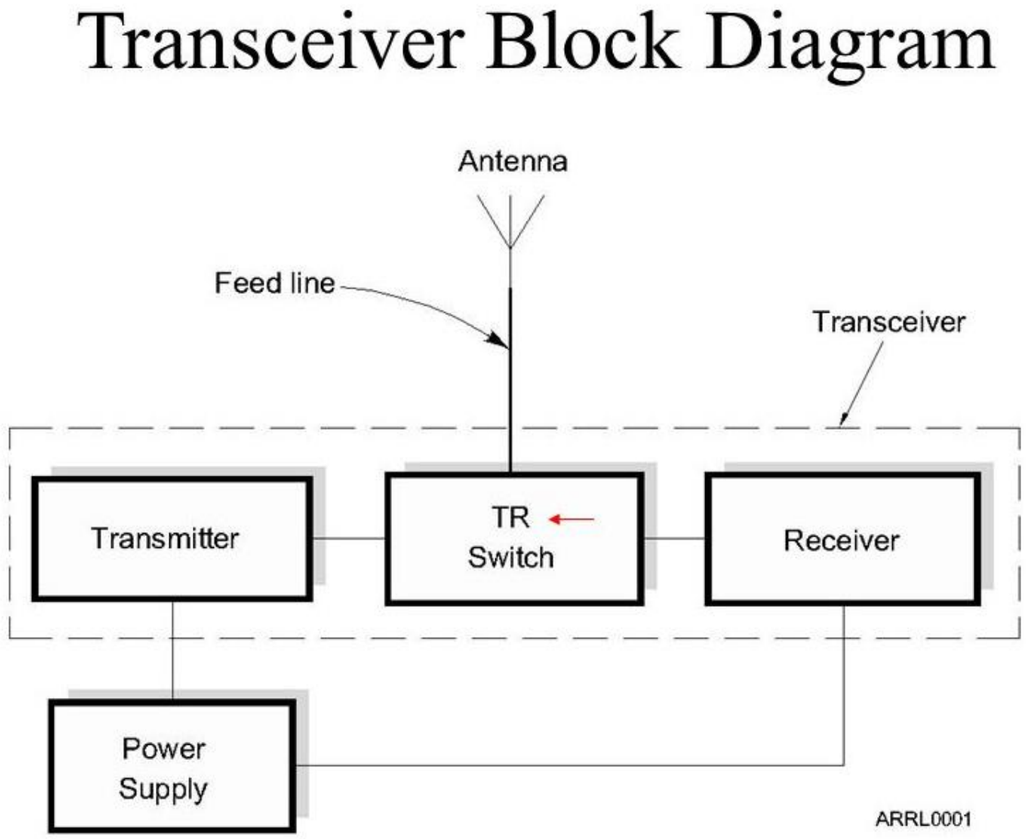
- Receiver (RCVR)
- Transmit Receive Switch (TR)
- Transceiver (XCVR)
- Antenna
- Feedline
- Power Supply



End of Chapter 2

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