Technician License Course

Chapter 4

Section 4.3 Feed Lines & SWR

Feed Line Vocabulary

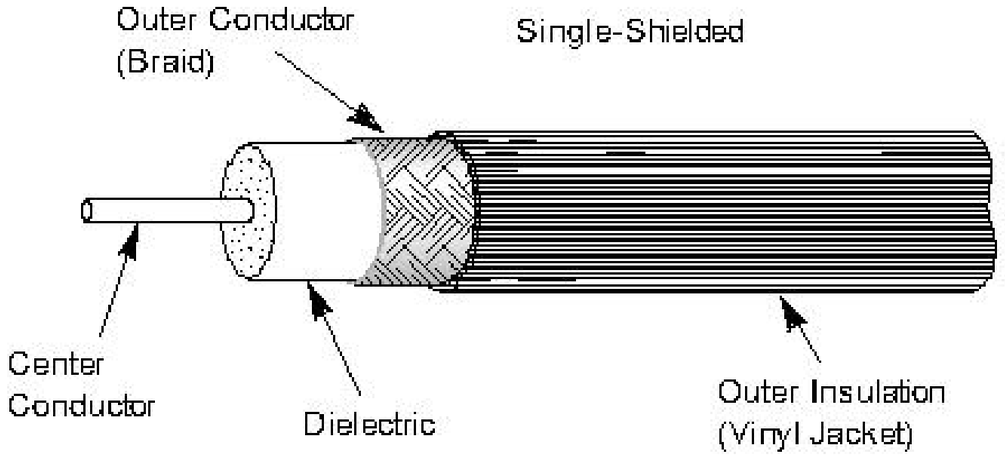
Feed Line Vocabulary

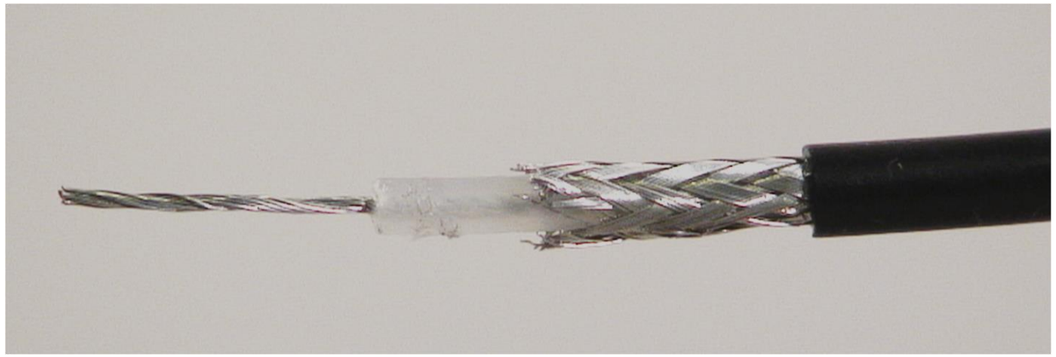
- Center conductor: Central wire
- Dielectric: Insulation surrounding center conductor
- Shield: Braid or foil surrounding dielectric
- Jacket: Protective outer plastic coating
- Forward (reflected) power: RF power traveling toward (away from) a load such as an antenna

Coaxial Cable

Coaxial Cable

- Most common feed line
- Easy to use
- Not affected by nearby materials
- Has higher loss than open-wire line at most frequencies
- Air-insulated “hard line” has lowest loss

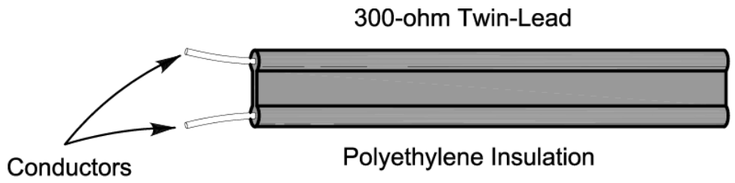


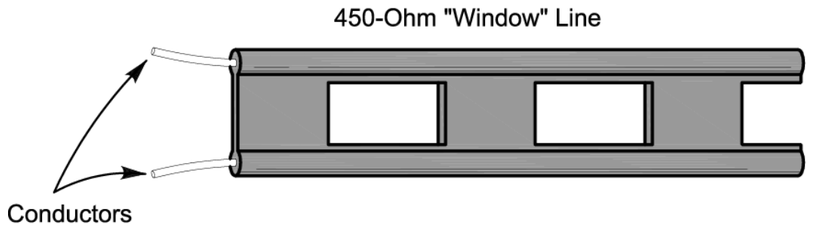


Open-Wire Line

Open-Wire Line

- Lighter and less expensive than coax
- Has lower loss than coax at most frequencies
- More difficult to use since it is affected by nearby materials
- Requires impedance matching equipment to use with most transceivers





Characteristic Impedance

Characteristic Impedance

- The impedance presented to a wave traveling through a feed line
- Given in ohms (Ω), symbolized as Z_0
- Depends on how the feed line is constructed and what materials are used
  - Coax: 50 and 75 Ω
  - OWL: 300, 450, and 600 Ω

Standing Wave Ratio (SWR)

Standing Wave Ratio (SWR)

- If the antenna feed point and feed line impedances are not identical, some RF power is reflected back toward the transmitter.
  - Called a *mismatch*
  - Forward and reflected waves create a pattern of *standing waves* of voltage and current in the line
  - SWR is the ratio of standing wave max to min
- Measured with an *SWR meter* or *SWR bridge*

Nothing Is Perfect

Nothing Is Perfect

- SWR equals the ratio of feed point (or *load*) and feed line impedance, whichever is greater than 1 (SWR always greater than 1:1).
- What is an acceptable SWR?
  - 1:1 SWR is perfect – no power reflected
  - Up to 2:1 SWR is normal
  - Modern radios lower transmitter output power for protection when SWR is above 2:1

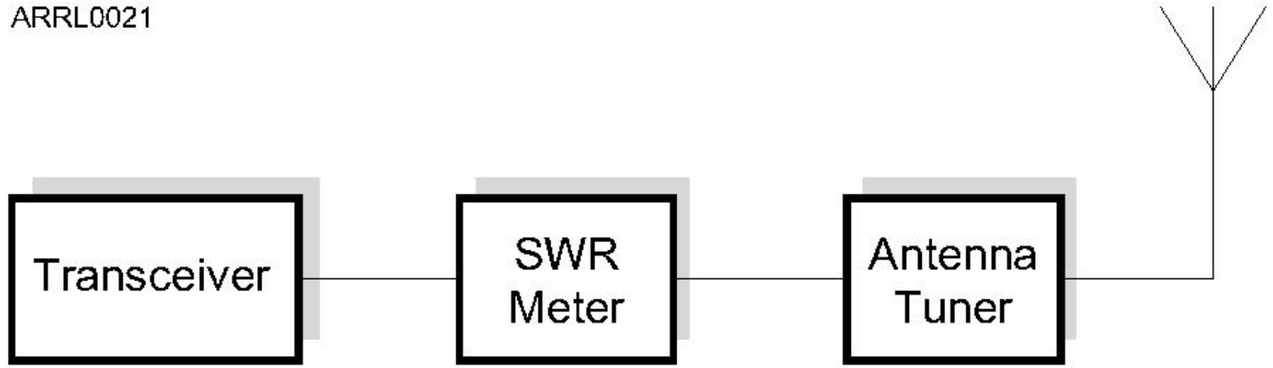
Nothing Is Perfect

- SWR above 3:1 is considered high in most cases.
- Erratic SWR readings may indicate a **faulty feed line, faulty feed line connectors, or a faulty antenna**.
- High SWR can be corrected by
  - Tuning or adjusting the antenna
  - With impedance matching equipment at the transmitter
    - Called an *antenna tuner* or *transmatch*
    - Does not change SWR in the feed line

Adjusting SWR

Adjusting SWR

- An SWR meter is inserted in the feed line and indicates the mismatch at that point.



Dummy Loads

Dummy Loads

- A dummy load is a resistor and a heat sink
  - Used to replace an antenna or other piece of equipment during testing.
- Dummy loads dissipate signals in the feed line as heat
  - Allows transmitter testing without sending a signal over the air
  - Helpful in troubleshooting an antenna system

Any Questions?