Radio Communication Basics

FRS / GMRS Fundamentals

Simplex, Repeaters, Radio Types, and Best Practices

How do radios work?

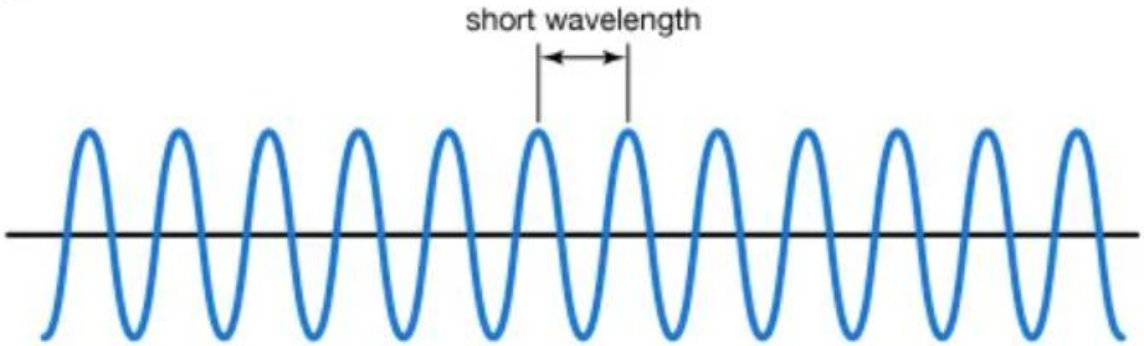
- Generate radio waves from a transmitter that can be received by another radio
- Voice → Radio Wave → Voice

What is a radio wave?

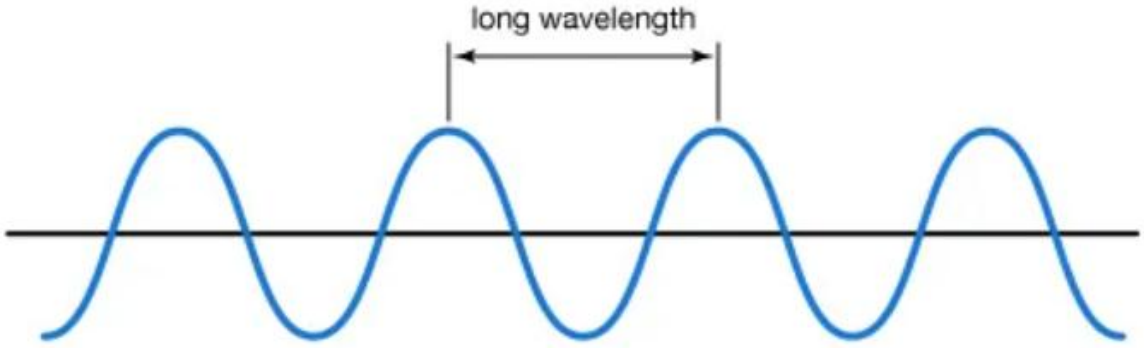
Frequency

Frequency

High frequency



Low frequency



Basic Radio Operation

- Simplex = radio-to-radio direct communication
- Both radios transmit and receive on the same frequency
- One-At-a-time – Cannot transmit at the same time. One person transmitting on a frequency at a time.
- No Internet or infrastructure required
- Range depends on terrain, buildings, antenna height, and power

Understanding Squelch

- Squelch suppresses background radio noise when no signal is present
- Too low = constant static/noise
- Too high = weak signals may not be heard
- Most radios allow manual squelch adjustment
- Proper squelch settings improve usability
- (visual)

Tone Squelch (CTCSS / DCS) aka PL

- Tone squelch filters unwanted transmissions
- CTCSS - Continuous Tone-Coded Squelch System
- DCS - Digital Coded Squelch
- Your radio only opens audio for matching tones/codes
- Important: tones do NOT provide privacy or encryption

What Are FRS and GMRS?

- FRS - Family Radio Service (license-free in the U.S.)
- GMRS - General Mobile Radio Service (FCC license required in the U.S.) $35 for 10 year. Covers all the immediate family. No test
- Used for families, camping, off-roading, events, emergency communication, and community coordination
- Both operate in frequencies between 462–467 MHz
- FRS radios typically have fixed antennas and lower power (2W)

Frequencies vs Channels

- Provides a simple way to coordinate communications.
- “Meet on channel 16” vs “Meet on 462.525Mhz”
- FRS/GMRS have established channels 1 thru 22.

GMRS Rules

- The start of a transmission, must ID (say you callsign)
- Every 15 minutes during a conversation you, must ID
- On your last transmission, must ID

Typical Conversation

- Misty: This is WSGA497 Misty, Steven are you there?
- Steve: This is WSDZ724 Steve, what's up?
- Misty: Are you still in town?
- Steve: Yup, still in town.
- Misty: I need you to pick up a large bottle of Smirnoff
- Steve: Ok
- Misty: See you when you get home, WSGA497 CLEAR
- Steve: Ok, see you then, WSDZ724 CLEAR

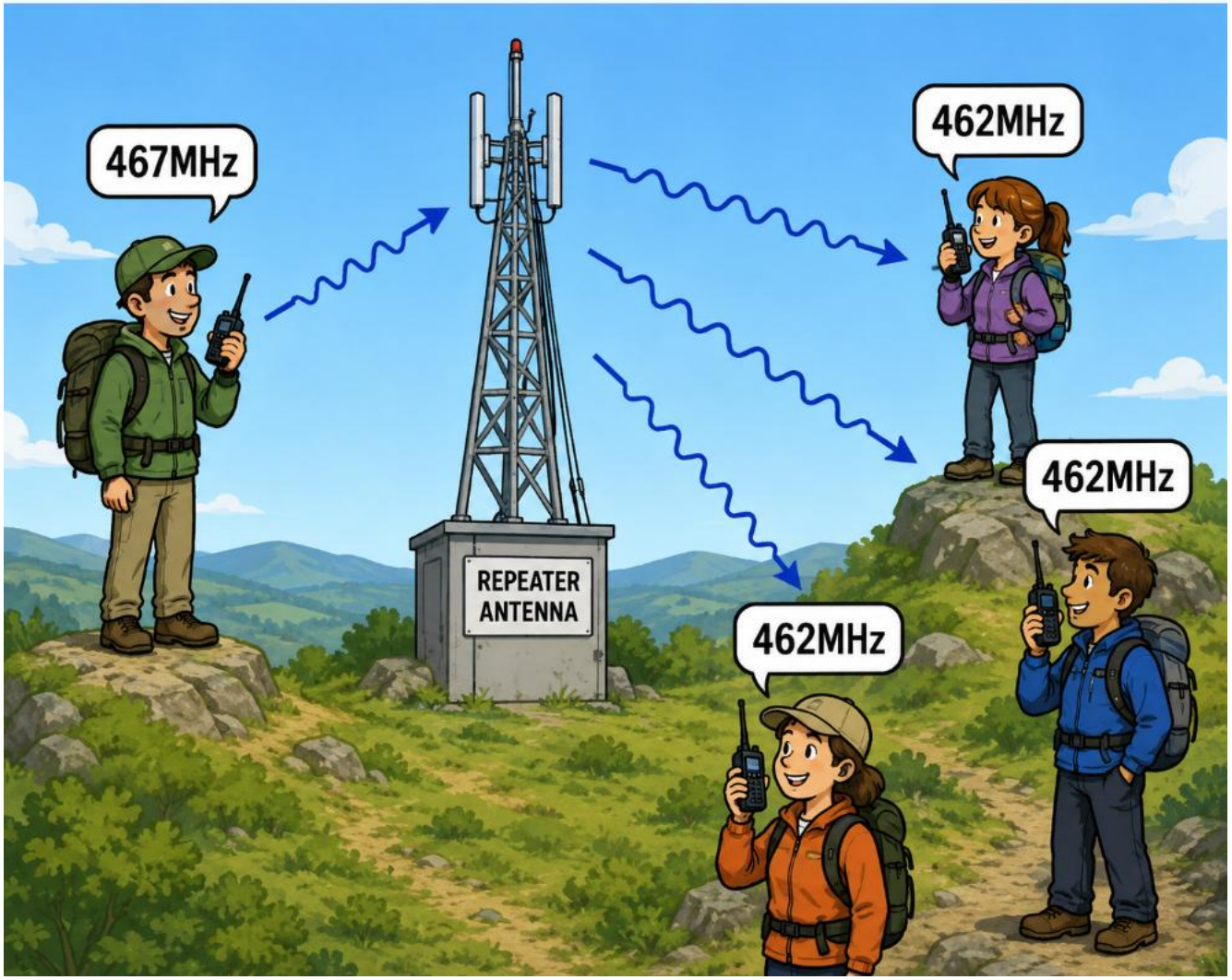
Repeaters

- Repeaters receive a signal and retransmit it
- Greatly extends communication range
- Usually installed on towers, hills, or tall buildings
- GMRS can use repeaters; FRS **cannot**
- Users transmit on one frequency and receive on another

Repeater Inputs and Outputs

- Repeater output - what you listen to
- Repeater input - what your radio transmits on
- GMRS repeaters typically use a +5 MHz offset

Repeater Inputs and Outputs



Repeater Inputs and Outputs

- What is a challenge a repeater could face?
- Many repeaters require a CTCSS or DCS tone to access
- Incorrect tone or offset prevents repeater access

Local Repeaters

- Winchester 1 (located 7 miles south of LH)
  - Coverage from Berkley Springs to Front Royal
- Blue Mountain Repeater
  - Coverage from North of Martinsburg to south of Culpeper

Equipment Review: Handheld Radios

- Portable and battery powered – GMRS pair as cheap as $30
- Good for hiking, events, and family communication
- Limited antenna size and output power (usually 5W)
- Common examples include Midland, Motorola, Wouxun, and Baofeng GMRS models
- Easy for beginners to use
- Covers most of Lake Holiday

Equipment Review: Mobile/Base Radios

- Range from $150 - $450
- High power available (GMRS 50W)
- Many antenna options
- Can be used for both home and cars.

Services

- Internet
- Streaming Services
- Cell Phones
- Cable TV
- AM/FM Radio
- Satellite TV
- Land Lines (not internet based)
- Over the Air TV
- Weather Radios

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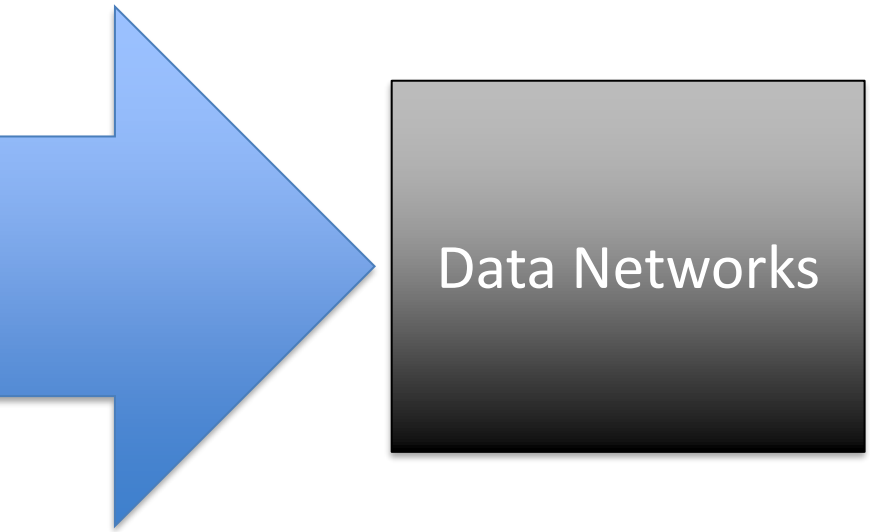

Infrastructure Challenges

- Prolonged Power outages
- GPS Satellites
- CMEs – Coronal Mass Ejections from Sun
  - 1859 Carrington Event
  - July 2012: 9-day miss.
    - Power Grid Collapse
    - Internet Loss
    - Cell Phone Loss
    - GPS Loss
    - Satellite Destruction
    - 4-10 year recovery
- Hackers

Why Radio Communication Skills Matter

- Useful during power outages and emergencies
- Reliable when cellular networks fail or become overloaded
- Supports outdoor recreation and travel coordination - Boating
- Improves community preparedness and situational awareness
- Builds confidence in emergency communication

Lake Holiday Radio Net

- Every Thursday 8:00pm on Channel 16
- LHRN.K8SRR.COM
- Make sure equipment is working
- Gain confidence in communication
- Connect with the community
- Monitor – Bulletins like weather alerts, air quality alerts, or any other community impacting events are announced.

Amateur (Ham) Radio

- ARES – Amateur Radio Emergency Service
  - Covers Frederick County & Winchester
  - Have relationships with served agencies (county)
  - Trained communicators move messages in and out of an affected area
- SkyWarn
  - Trained weather spotters provide weather updates via Ham Radio
  - Weather info is also provided to the NWS

Questions

http://LHRN.K8SRR.COM