



# Ham 101c: An Introduction to Amateur Radio and Emergency Communications

San Benito County ARES / ACS / RACES

Tuesday May 24, 2022

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# WELCOME



# San Benito County ARES/RACES Leadership

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ARES District Emergency Coordinator (DEC)  
Chief ACS/RACES Officer (CRO)  
San Benito Co. CERT Member  
ARRL Public Information Officer (PIO)  
Sea Otter Classic Volunteer Communications Leader  
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# San Benito County ARES/RACES Leadership

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## San Benito County Amateur Radio Assoc.

- Weekly Nets – Thursdays starting at 1930 hours
- Training classes
- Drills
- Public service events
  - Sea Otter Classic; Discovery Classic; etc...
- 501(c)(3) Non-Profit Organization



## San Benito County Amateur Radio Assoc.

- <https://sbcara.org/> (all links may be found here)
- <https://hamclubonline.com> search for N6SBC
- <https://sbcara.groups.io/>
- <https://facebook.com/sbcara>
- <https://twitter.com/sbcara>
- <https://instagram.com/n6sbc>

# Today's Agenda

- EmComm Organizations
- Radios and Accessories
- Voice Technology (VHF/UHF FM)
- Voice Operating Techniques
- Additional EmComm Modes
- Additional Training & Next Steps
- After Class Exercise: Get On The Air



# EmComm Organizations

National / State / Regional  
County

How to get connected

# ARES / RACES / ACS

- ARES: Amateur Radio Emergency Service
  - A division of ARRL Field Services
  - What we are day-to-day
- RACES: Radio Amateur Civil Emergency Service
  - Official unit under FEMA; defined by FCC Part 97.407
  - What we are when activated
- ACS: Auxiliary Communications Services
  - California RACES under State Office of Emergency Services
  - Includes RACES, MARS, and other radio comms groups
- Increasingly, organizations are joint ARES/RACES/ACS
  - Santa Clara County & San Benito County merges all three



# San Benito County ARES / ACS (Level II)

- Civilian Emergency Support
- ARRL: American Radio Relay League – National Association for Amateur Radio) Program
- Works w/ OES



# San Benito County RACES / ACS (Level I)

- Government Based Emergency Support
- Reports to OES





SAN BENITO COUNTY





# Do I have to be a paying voting member of SBCARA?

- No
- Members are flexible – only used for information.
- Voting Members get to vote on spending and approval of meeting items such as minutes.
- If you pay to vote, you get a say as to how that money is spent.
- Not required for ARES / ACS / RACES membership.

# DSW=Disaster Service Worker (San Benito Co.)

- ACS/RACES is registered as a DSW, ARES registered per event
  - Events require registration (contact DEC or ADEC)
  - Applies to training events as well as real incidents
  - Entitles you to State or County Worker's Comp if injured
- Process is simple
  - Take an oath and fill out a form (ARES per event & ACS/RACES permanent)
- Rules for DSW Coverage
  - You must be activated
  - You must be assigned, signed in and attend a safety briefing
  - You must be trained and supervised
  - You must act within the scope of your training and assignment

# ARES/RACES Activations (San Benito Co.)

## What Should I Do When the Shaking Stops?

- Check your family and your home
  - Without question, your family and home come first
  - You're no good to anyone if you're worried about folks at home
- Check-in/Monitor the local repeater network
  - Park Hill (Primary): 147.315 + 94.8 Hz
  - Call Mountain: 145.410 – 118.8 Hz (linked)
  - Bear Valley: 146.625 – 94.8 Hz (linked)
  - Hernandez Valley: 146.985 – 118.8 Hz (linked)
- Review your go-kit and make sure you're ready
- Listen for instructions
- When instructed, switch to a county tactical frequency
- Standby for assignment and activation
  - Make sure your family will be o.k. if you take an assignment

# Radios & Equipment

First Radio

Accessories

Antennas

Second Radio

Other Gear

# Tim's Radio Suggestions

- Handheld (a.k.a. handi-talkie or HT)
  - Basic entry point, least expensive radio option
- 2m/70cm dual-band HT may be needed for EmComm
  - Dual-receive is recommended
  - Look for 5 watts power output on (alkaline or rechargeable) batteries
- What do you need it for?
  - Ham Radio Only? FT-60 Excellent!
  - Part 90 (Public Safety – ACS/RACES) – Wouxun/Baofeng/Motorola
  - Cheap (Baofeng) or Rugged (Wouxun)?
- ARRL Article “Choosing a Ham Radio”
  - <http://www.arrl.org/buying-your-first-radio/>
  - Also included in *The Ham Radio License Manual* from ARRL



# Important HT Accessories

- Batteries
  - Spare rechargeable battery packs
    - Usually provides higher power
  - Need 3000 mAH for 12 hours in the field
  - Alkaline battery pack (fill with AA)
- Cigarette lighter cable
  - Allows charging batteries in car
- Higher gain HT Antenna
  - Extendable whip for stationary use
  - Flexible, higher-gain for daily use
- Antenna connectors & adapters
  - SMA, BNC, PL-259 (UHF), N
  - Be able to connect your HT to all other cable types



# Mobile/Field Antennas

- Stay in contact with net control while mobile
- VHF/UHF FM is usually vertically polarized
  - Omni-directional; Best for mobile use
- Check suitability for the mounting type
  - Mag mount won't work on fiberglass Red Cross vehicles San Benito Co. Command Van... and recently Ford F-150s soon other trucks too
    - In a pinch, use a cookie sheet and duct tape
  - Some antennas require a ground connection
    - Not suitable for magnetic or motorized mounts
- Roll-up J-pole antenna
  - Use string or tape to suspend from tree or pole
- Check connector type
  - Be able to adapt to your HT's connector



# Speaker/Mic or Headset



- Speaker-Mic
  - Combination speaker and microphone
    - Clip to your collar and keep your radio out of the cold/rain.
  - Not ideal for noisy or quiet environments
    - Some have an earphone jack for noisy environs
    - Radio chatter heard by surrounding people



- Headset
  - Headphone/boom-mic combination
  - Works well in noisy or quiet environments
    - Single ear allows listening to radio and others
    - Don't cover both ears while driving!
    - Very noisy environments may require dual ear
    - Radio chatter not heard by surrounding people
  - Also useful with mobile or base station



# Carrying Your Radio

- Your hands must be free so you can work
  - Writing, carrying equipment, holding clipboard, ...
- You'll need something to hold:
  - Radio
  - Accessories (batteries, charger, etc.)
  - Clipboard, flashlight, water bottle(s), sunscreen, etc
- Some example options:
  - Belt pouch
  - Backpack
  - Fanny pack
  - Messenger bag
  - Radio harness



# Second Radio for EmComm

- 2m/440 dual-band Mobile radio
  - Power
    - Typically 50 watts; more power to drive better antennas
  - Flexibility
    - Mobile in car direct wired to battery
    - Use as base station with power supply
    - Use as field emergency Net Control with sealed lead acid (gel-cell) batteries
  - Cross-band repeater option recommended
  - Data interface option recommended (for packet use)



# Standard Equipment for ARES/RACES

Santa Clara County ARES®/RACES Go Kit Checklists		Rev: 2009-Oct-17
<b>Legend:</b> X = Required (must have in kit at all times) R = Recommended (likely needed on most assignments) O = Optional (useful on some assignments)		
<b>2-Hour Carry Kit</b> Purpose: To be kept nearby at all times for immediate (within minutes) communication of damage reports during Resource Net Level 1 ops. Also used to remain in contact with Resource Net Level 2 while returning home to retrieve 12-hour Go-Kit.		
<b>Items:</b> X 2m/70cm dual-band radio <ul style="list-style-type: none"> <li>HT recommended (min. 5W on 12V/2.5W on batt)</li> <li>Mobile 25W optional (if vehicle will not be far away)</li> <li>Programmed with Resource Net frequencies</li> </ul> X Charged batteries for 2-3 hours operation X Mobile antenna (mag mount or existing mobile antenna) X Modified Mercalli (Mike-Mike) scale X Notepad / pens R Cigarette lighter adapter R Emergency county and city telephone contact list R Cell phone R Water (16 oz.)		
<b>12-Hour Go Kit</b> Purpose: For fully independent operation; unknown environment (heat, cold, wind, rain); unknown time (day, night, up to 12 hours). Return home to retrieve.		
<b>Equipment</b> <b>Portable Radio:</b> X 2m/70cm dual-band handie-talkie (HT) <ul style="list-style-type: none"> <li>minimum 5W on 12V/2.5W on batteries [Note 1]</li> <li>dual-receive recommended</li> </ul> X Radio user manual or cheat sheet X Earbud or headphones minimum; headset, earbud/mic, or speaker/mic/earbud, or similar recommended R Small backpack, vest, chest harness or other similar method for carrying HT while operating portable <b>Power Source:</b> X Charged batteries for 12 hours (min. 3000 mAh) [Note 2] X Power cord adapters – connect to various power sources: <ul style="list-style-type: none"> <li>Powerpoles</li> <li>Cigarette lighter socket</li> <li>Vehicle battery terminals</li> </ul> X Spare fuses R Powerpole splitter or fused distribution panel		
		R Extension cord, 3-wire, 3-6 ft., multi-outlet O Extension cord, 3-wire, 50-100 ft. O Power Inverter <b>Antennas:</b> R 2m/70cm high gain HT antenna X 2m/70cm dual-band magnetic mount antenna R 2m/70cm dual-band portable base antenna (e.g. roll-up J-pole or other) R Portable mast (elevates antenna min. 10 ft.) R Tripod or self-supporting base for mast R Window clip antenna mount X Coax adapters to connect HT to existing antennas: <ul style="list-style-type: none"> <li>BNC plug (male) &amp; BNC socket (female)</li> <li>UHF plug (PL-259) &amp; UHF socket (SO-239)</li> <li>N-type plug (male) and N-type socket (female)</li> </ul> <b>Other Communications Gear:</b> R Cell phone & charger and/or cigarette lighter adapt. O FRS/GMRS Radio O Satellite phone <b>Tools:</b> R Duct tape R Electrical tape R Nylon Tie-Wraps/wire ties R Utility knife R Small multi-tool or tool kit O Volt-Ohm meter O SWR/Power meter <b>Operating Position:</b> X Sign(s) for operating position R Lighting for operating position R Rope or Dacron cord (50') R Folding chair O Magnetic sign for car O Folding table O Pop-up Canopy O Tarp (8' by 8' or larger) O Folding cart O Safety strobes or flares O Caution/flagging tape (for marking cables, antennas, ...)
		<b>Documentation</b> <b>Identification:</b> X CA Driver's license or CA-issued ID card X Amateur Radio license X County DSW card X SCCo-issued ID badge; other city badges <b>Maps:</b> X Thomas Guide for Santa Clara County X Compass or GPS R Maps of antenna locations (if available)
Santa Clara County ARES®/RACES		Page 1 of 4

- 2 hr Carry Kit (required)
  - Nearby at all times
    - In car is o.k. if nearby
  - Immediate damage reports
  - City net check-ins
    - If cities activate
- 12 hr Go Kit (required)
  - Fully independent ops for 12 hrs
  - Return home to retrieve
- Extended Kit (optional)
- Recommended for everyone
- Talk to the other hams in your city ARES/RACES group for recommendations

# VHF/UHF FM Voice Technology

Bands and Frequencies

Simplex, Duplex and Repeaters

Making Sense of Repeater Listings

Setting up your Radio

# Some Important Terms

- VHF – Very High Frequency
  - 30 to 300 MHz
- UHF – Ultra High Frequency
  - 300 to 3000 MHz (3 GHz)
- FM – Frequency Modulation
  - The information in the signal is represented by variations in the frequency around a central carrier
  - The amount of variation is call the “deviation”

# Characteristics of VHF/UHF FM

- Short range
  - Point-to-point range typically < 5-7 miles (portable/mobile)
  - Influenced by line-of-sight; dependent on antenna height
- Frequency re-use
  - Short range allows for multiple conversations on the same frequency throughout the region
- Well suited for local emergency communications
  - Portable (handi-talkie or “HT” and mobile stations)
  - Clear voice quality (think of FM vs. AM broadcast)
  - Coverage can be extended by repeaters

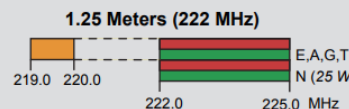
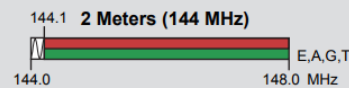
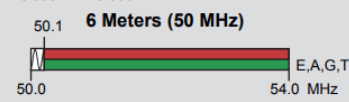
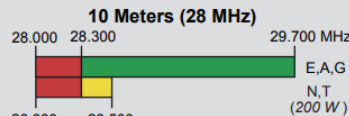
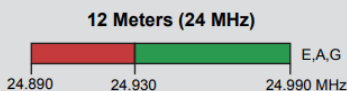
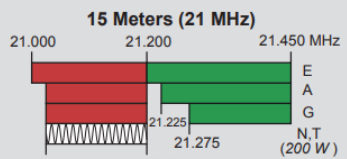
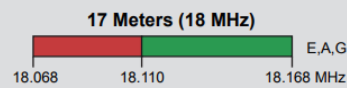
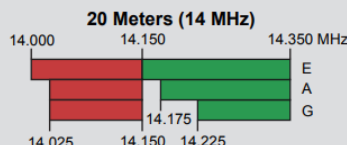
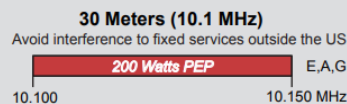
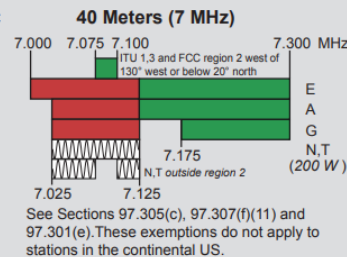
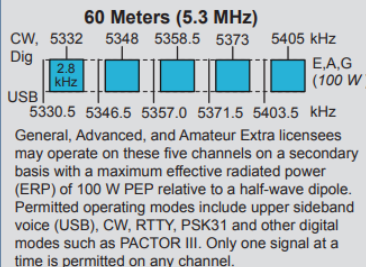
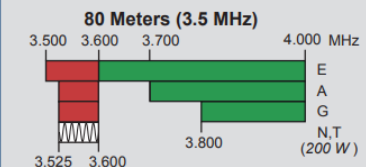
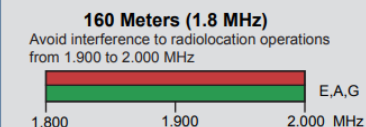
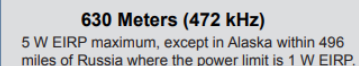
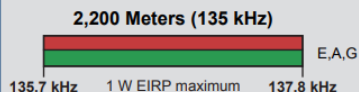
# VHF/UHF Amateur Bands – Current

## US Amateur Radio Bands

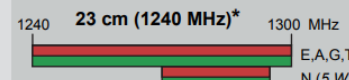
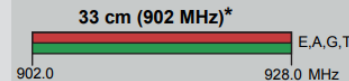
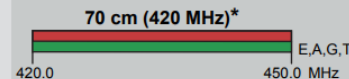
**US AMATEUR POWER LIMITS — FCC 97.313** An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.



Amateurs wishing to operate on either 2,200 or 630 meters must first register with the Utilities Technology Council online at <https://utc.org/plc-database-amateur-notification-process/>. You need only register once for each band.



\*Geographical and power restrictions may apply to all bands above 420 MHz. See The ARRL Operating Manual for information about your area.



All licensees except Novices are authorized all modes on the following frequencies:

2300-2310 MHz	10.0-10.5 GHz ‡	122.25-123.0 GHz
2390-2450 MHz	24.0-24.25 GHz	134-141 GHz
3300-3500 MHz	47.0-47.2 GHz	241-250 GHz
5650-5925 MHz	76.0-81.0 GHz	All above 275 GHz

‡ No pulse emissions

### KEY

**Note:** CW operation is permitted throughout all amateur bands.

**MCW** is authorized above 50.1 MHz, except for 144.0-144.1 and 219-220 MHz. Test transmissions are authorized above 51 MHz, except for 219-220 MHz.

- █ = RTTY and data
- █ = phone and image
- █ = CW only
- █ = SSB phone
- █ = USB phone, CW, RTTY, and data
- █ = Fixed digital message forwarding systems only

- E** = Amateur Extra
- A** = Advanced
- G** = General
- T** = Technician
- N** = Novice

See **ARRLWeb** at [www.arrl.org](http://www.arrl.org) for detailed band plans.

### ARRL We're At Your Service

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email: [newham@arrl.org](mailto:newham@arrl.org)

Exams: 860-594-0300 email: [vec@arrl.org](mailto:vec@arrl.org)

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# VHF/UHF Amateur Bands

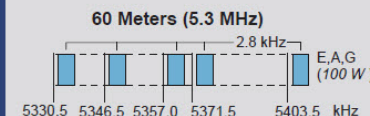
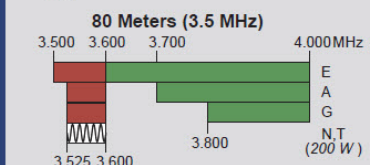
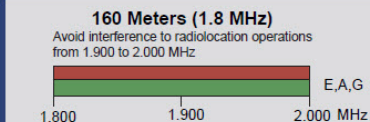
## US Amateur Radio Bands

### US AMATEUR POWER LIMITS

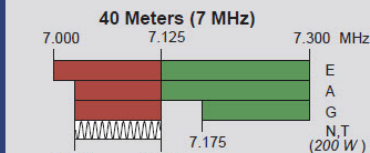
FCC 97.313 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

Effective Date  
March 5, 2012

Published by:  
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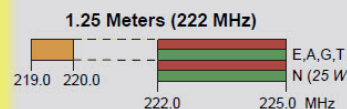
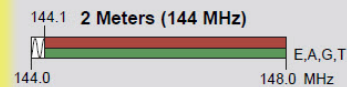
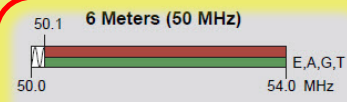
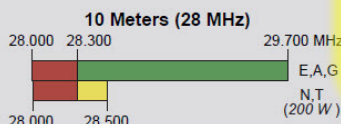
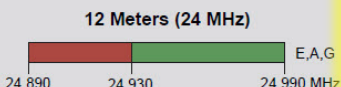
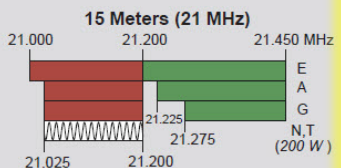
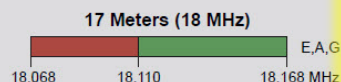
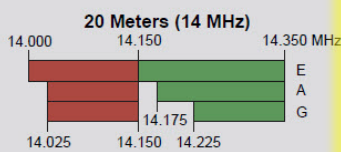
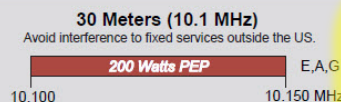


General, Advanced, and Amateur Extra licensees may operate on these five channels on a secondary basis with a maximum effective radiated output of 100 W PEP. Permitted operating modes include upper sideband voice (USB), CW, RTTY, PSK31 and other digital modes such as PACTOR III as defined by the FCC Report and Order of November 18, 2011. USB is limited to 2.8 kHz centered on 5332, 5348, 5358.5, 5373 and 5405 kHz. CW and digital emissions must be centered 1.5 kHz above the channel frequencies indicated above. Only one signal at a time is permitted on any channel.

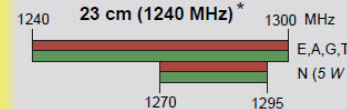
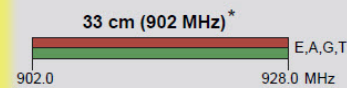
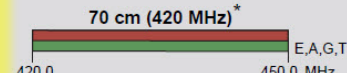


Phone and Image modes are permitted between 7.075 and 7.100 MHz for FCC licensed stations in ITU Regions 1 and 3 and by FCC licensed stations in ITU Region 2 West of 130 degrees West longitude or South of 20 degrees North latitude. See Sections 97.305(c) and 97.307(f)(11).

Novice and Technician licensees outside ITU Region 2 may use CW only between 7.025 and 7.075 MHz and between 7.100 and 7.125 MHz. 7.200 to 7.300 MHz is not available outside ITU Region 2. See Section 97.301(e). These exemptions do not apply to stations in the continental US.



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E = Amateur Extra  
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T = Technician  
N = Novice

See [ARRLWeb](http://www.arrl.org) at [www.arrl.org](http://www.arrl.org) for detailed band plans.

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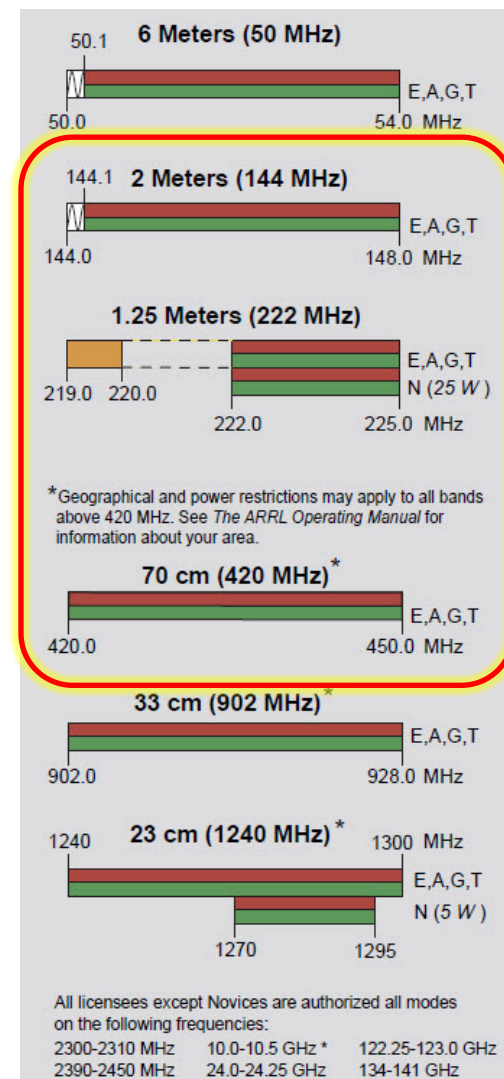
<http://www.arrrl.org>

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# Primary VHF/UHF Bands for EmComm

- 2 meter band (commonly called “2 meters”)
  - 144-148 MHz (VHF)
- 70 cm band (commonly called “440”)
  - 420-450 MHz (UHF)
- Also, 1.25 meter band (“220” or “222”)
  - 222-225 MHz (VHF)
  - In SCCo ARES/RACES, used for packet comms
- Where do the names come from?
  - $300 / \text{Frequency (MHz)} = \text{Wavelength (m)}$
  - Example:  $300 / 148 \text{ MHz} \approx 2 \rightarrow 2\text{m band}$



# Frequency Confusion

- Which do I use?
  - 147.000 MHz
  - 147.0105573 MHz
  - 147.315 MHz
  - 147.322 MHz
  - 148.500 MHz

# Amazon Prices

amazon smile Prime


Cell Phones & Accessories ▾

Supporting: San Benito County Amateur Radio Emergency Service ▾

Departments ▾ Prime ▾ Fresh ▾ Video ▾ Music ▾

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<b>\$59.99</b> & <b>FREE Shipping</b> + \$0.00 estimated tax	<b>New</b>

# Selecting a Frequency

- Questions:
  - How do we pick a frequency to use?
  - How will people know where to find us?
  - How do we avoid interfering with other users?
  - How do we avoid interfering with other modes?
    - Including ones that we can't even hear on our FM radio!
- Answers:
  - Band plans
    - Allocate blocks of frequencies to particular modes
  - Frequency Lists
    - Identify specific frequencies for specific purposes

# FM Voice Operating Modes

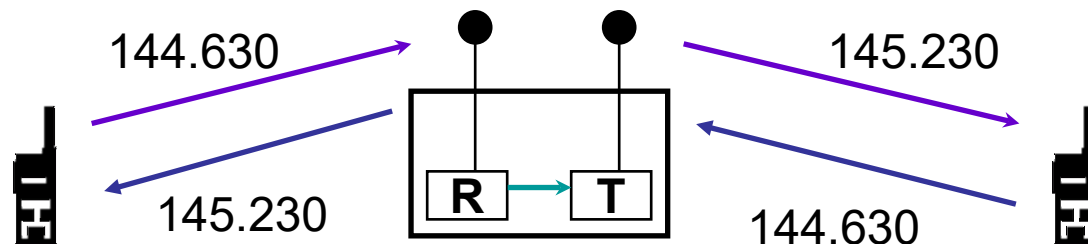
## SIMPLEX

Single frequency - one station at a time



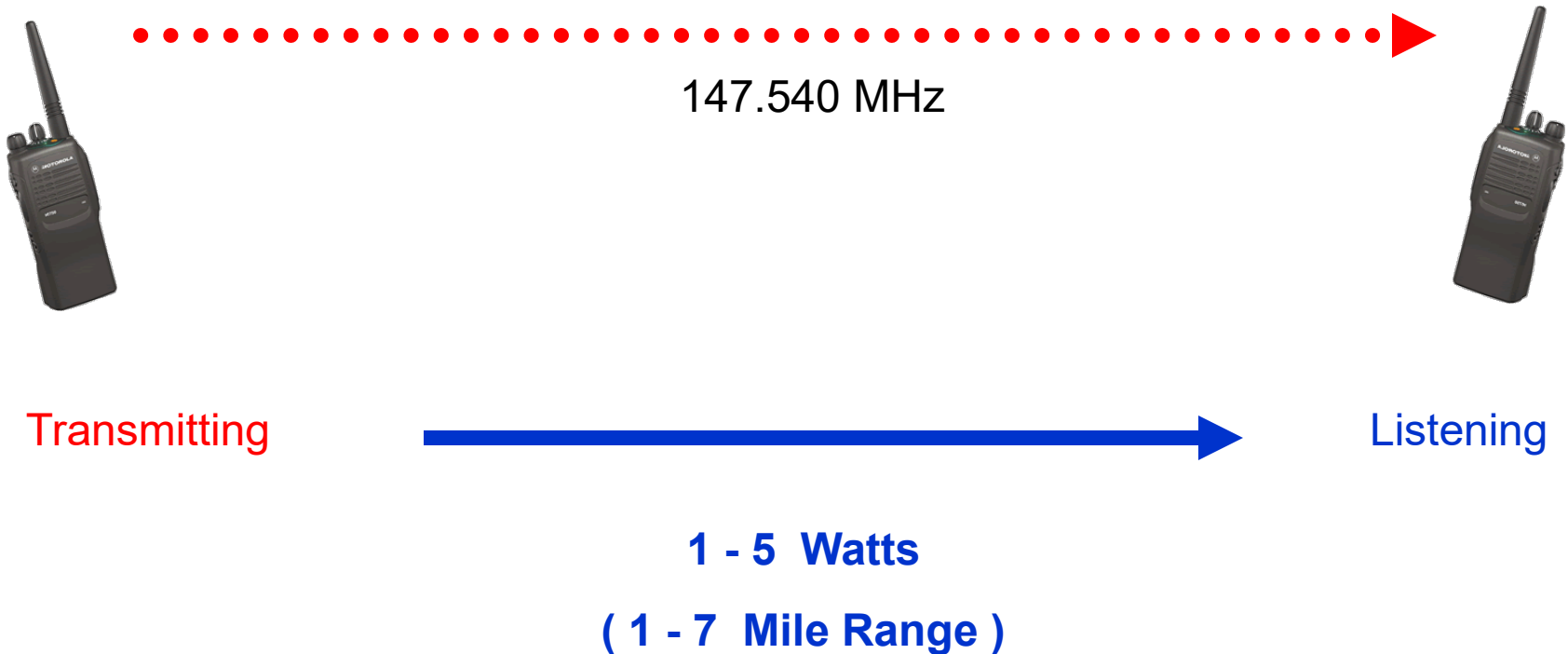
## DUPLEX

Two frequencies - one station at a time

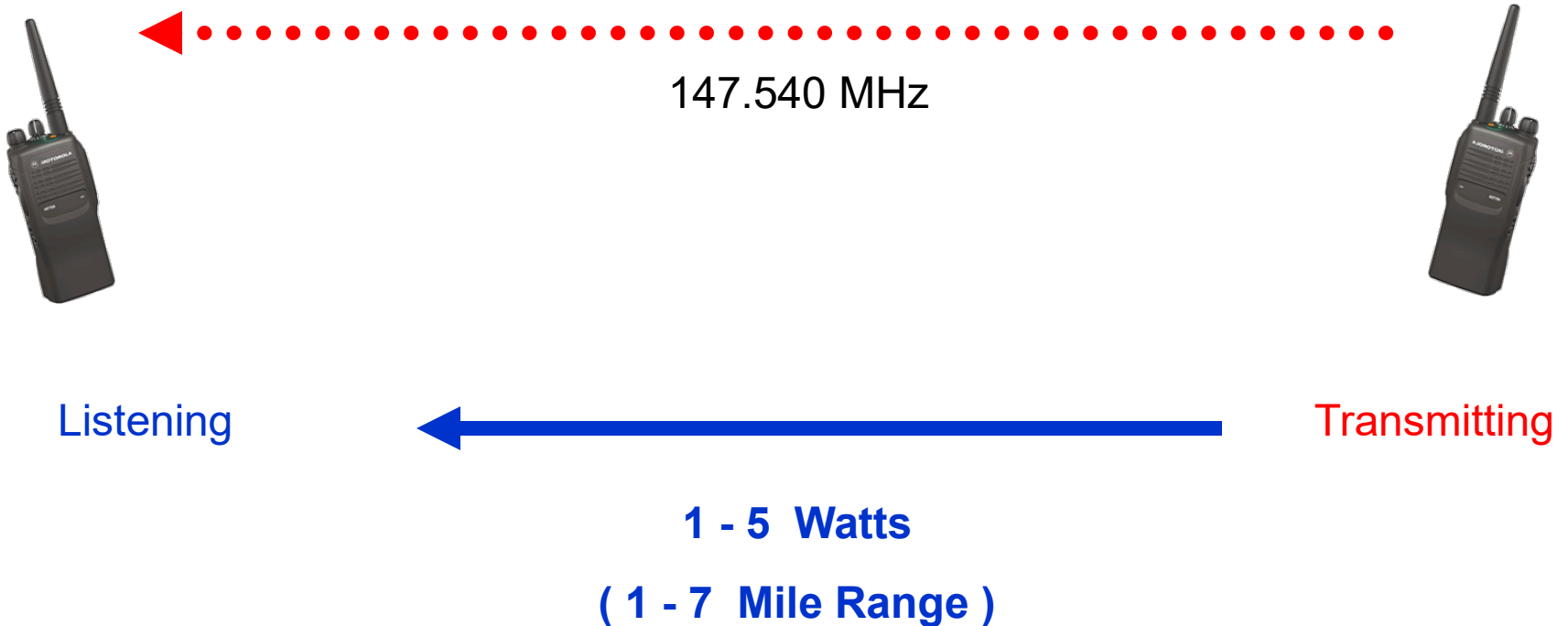


**REPEATER**

# How Simplex Communication Works...

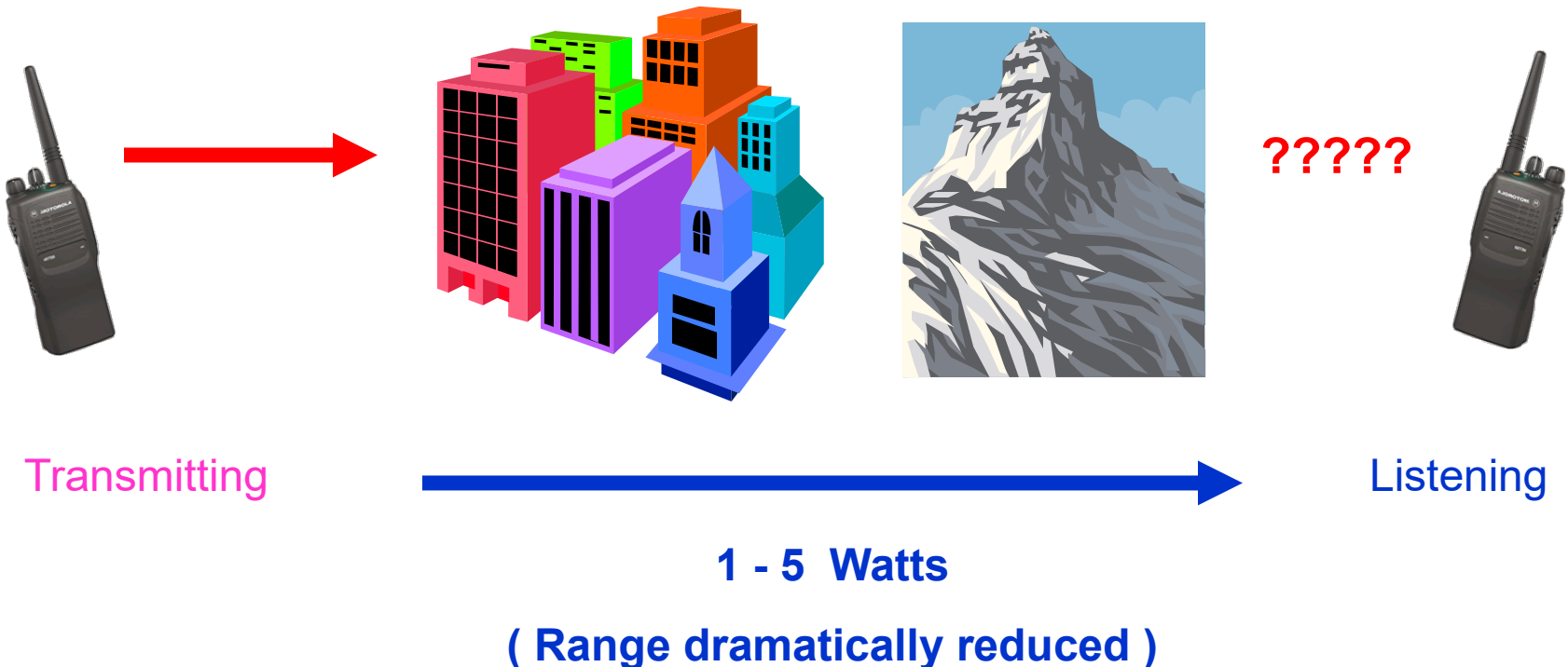


# How Simplex Communication Works...



# VHF & UHF are Influenced by Line of Sight

Buildings, hills, mountains can block or degrade transmission

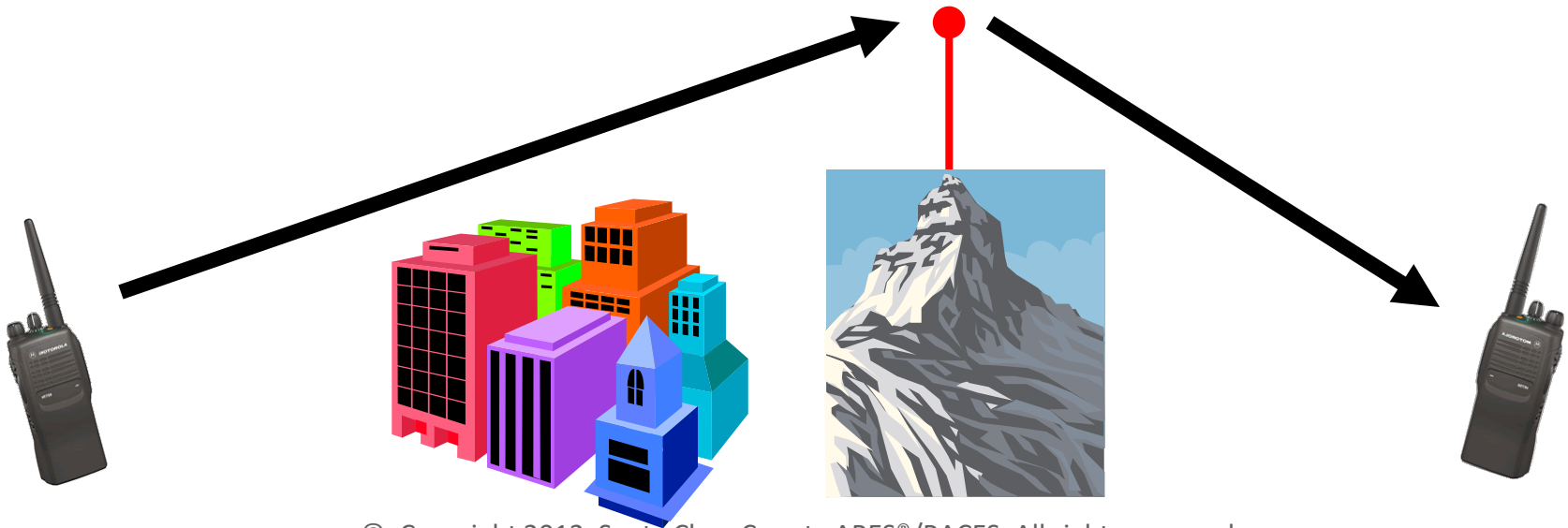


So, how can we overcome these limitations?



# Repeaters

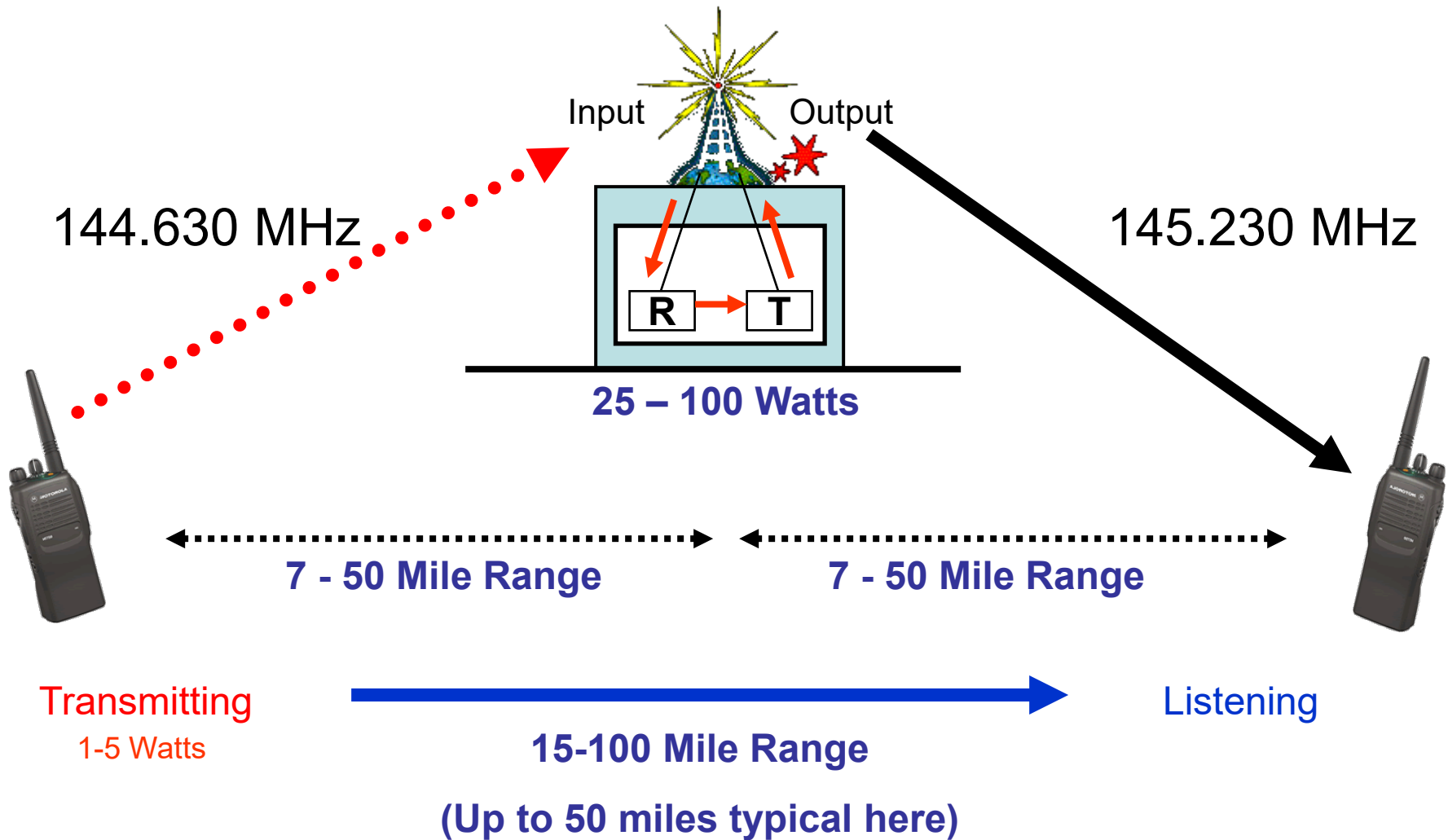
- Usually placed on towers on top of buildings, hills, or mountains
  - Extends line of site over top of many types of obstacles
  - Extends range between end points
    - Much better antenna located up (very) high; more power



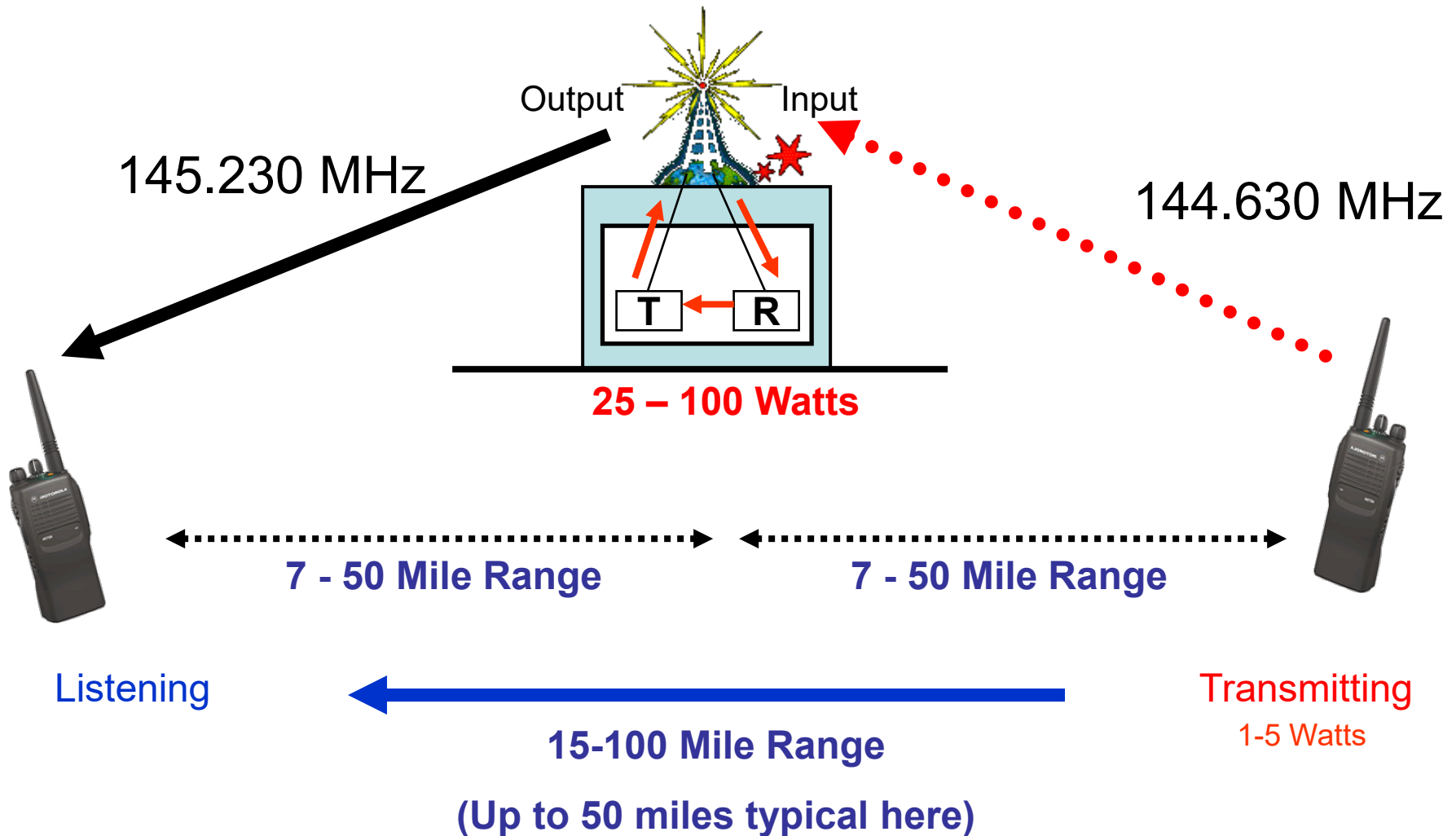
# What is a Repeater?

- A repeater:
  1. Receives and demodulates an RF signal
  2. Regenerates the audio information
  3. Modulates the audio on a new RF carrier and retransmits
- Repeaters use duplex communications
  - Receive on one frequency (called the “input”)
  - Transmit on a different frequency (called the “output”)
  - Difference between output and input is “offset”
- Your radio must be capable of duplex
  - Critically important feature for emergency communications use
  - Most recent (10 years) amateur radios have duplex capability

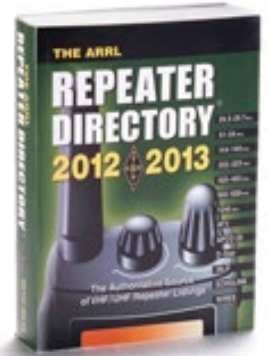
# How a Repeater System Works



# How a Repeater System Works



# Understanding Repeater Listings



- Typical repeater directory entry looks like:

– N6NFI 145.230 MHz – 100.0

CALL SIGN  
of repeater

Repeater OUTPUT  
frequency (you receive  
on this frequency)

OFFSET

- "-" standard negative offset,  
input lower than output
- "+" standard positive offset,  
input higher than output
- Amount of offset shown if  
non-standard

TONE  
(frequency of tone  
required to access)

# Repeater Output Example

- Repeater listing:

– N6NFI 145.230 MHz – 100.0

CALL SIGN  
of repeater

Repeater OUTPUT  
frequency (you receive  
on this frequency)

OFFSET

- "-" standard negative offset,  
input lower than output
- "+" standard positive offset,  
input higher than output
- Amount of offset shown if  
non-standard

TONE  
(frequency of tone  
required to access)

Tune radio to the repeater OUTPUT to hear the repeater

# Repeater Offset Example

- Repeater listing:

– N6NFI 145.230 MHz – 100.0

CALL SIGN  
of repeater

Repeater OUTPUT  
frequency (you receive  
on this frequency)

OFFSET

- “-” standard negative offset,  
input lower than output
- “+” standard positive offset,  
input higher than output
- Amount of offset shown if  
non-standard

TONE  
(frequency of tone  
required to access)

## Example:

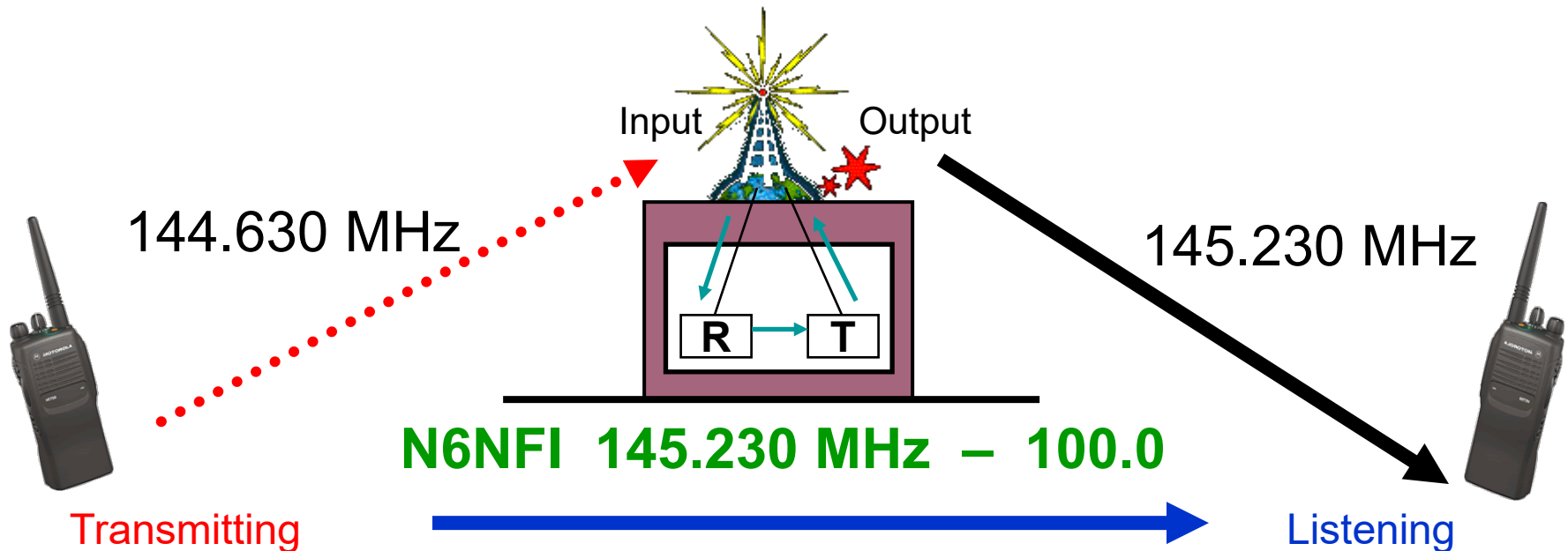
- This repeater uses a negative (or “minus”) offset
- Input frequency is a lower frequency than output frequency
- Offset amount is standard (otherwise, it would be shown)

# Repeater Offset

- Difference between repeater output and input is the “offset”
- 2m repeaters
  - may have positive or negative offsets – check band plans
  - standard offset amount is 0.6 MHz (600 kHz)
- 70cm/440 repeaters
  - generally have positive offsets
  - standard offset amount is 5 MHz
- Most repeaters use standard offset amounts
  - Typically, just configure the offset direction (+/-);
  - Radio applies standard offset amount
  - Some radios even pick the correct offset direction automatically
    - Take care – band plans differ across the country



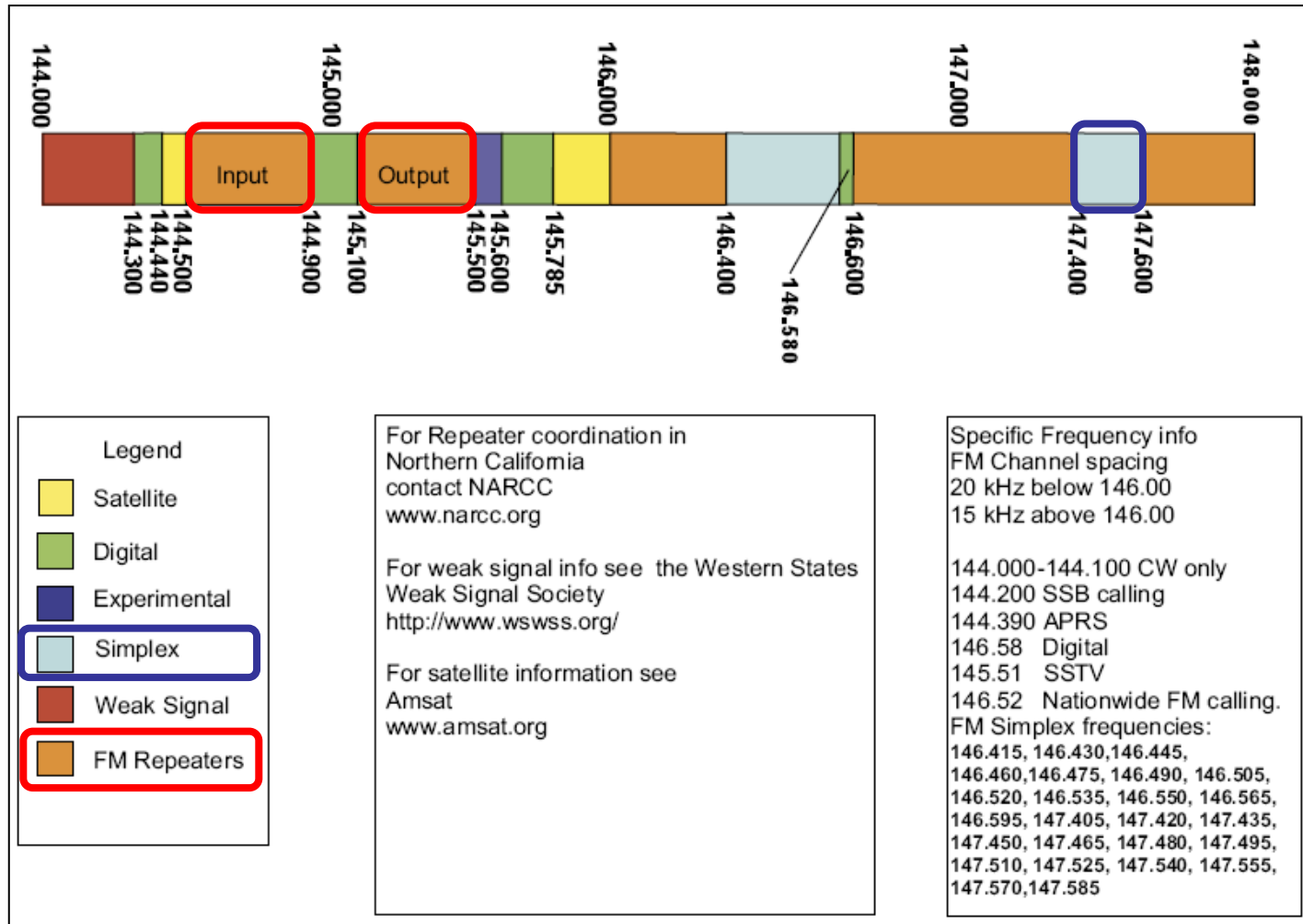
# Repeater Offset Example



## How it Works:

- You tune radio to repeater output frequency of 145.230 MHz & set minus offset
- Your radio calculates input frequency = 144.630 MHz
  - $145.230 \text{ MHz (output)} - 0.600 \text{ MHz (2m standard offset)} = 144.630 \text{ MHz (input)}$
- When you press PTT, your radio automatically switches to 144.630 MHz
- When you release PTT, your radio automatically switches back to 145.230 MHz

# 2m Band Plan (Northern California)



<http://www.narcc.org> – Northern Amateur Relay Council of California

# Repeater Tone Example

- Repeater Listing:

– N6NFI 145.230 MHz – 100.0

CALL SIGN  
of repeater

Repeater OUTPUT  
frequency (you receive  
on this frequency)

OFFSET

- "-" standard negative offset,  
input lower than output
- "+" standard positive offset,  
input higher than output
- Amount of offset shown if  
non-standard

TONE  
(frequency of tone  
required to access)

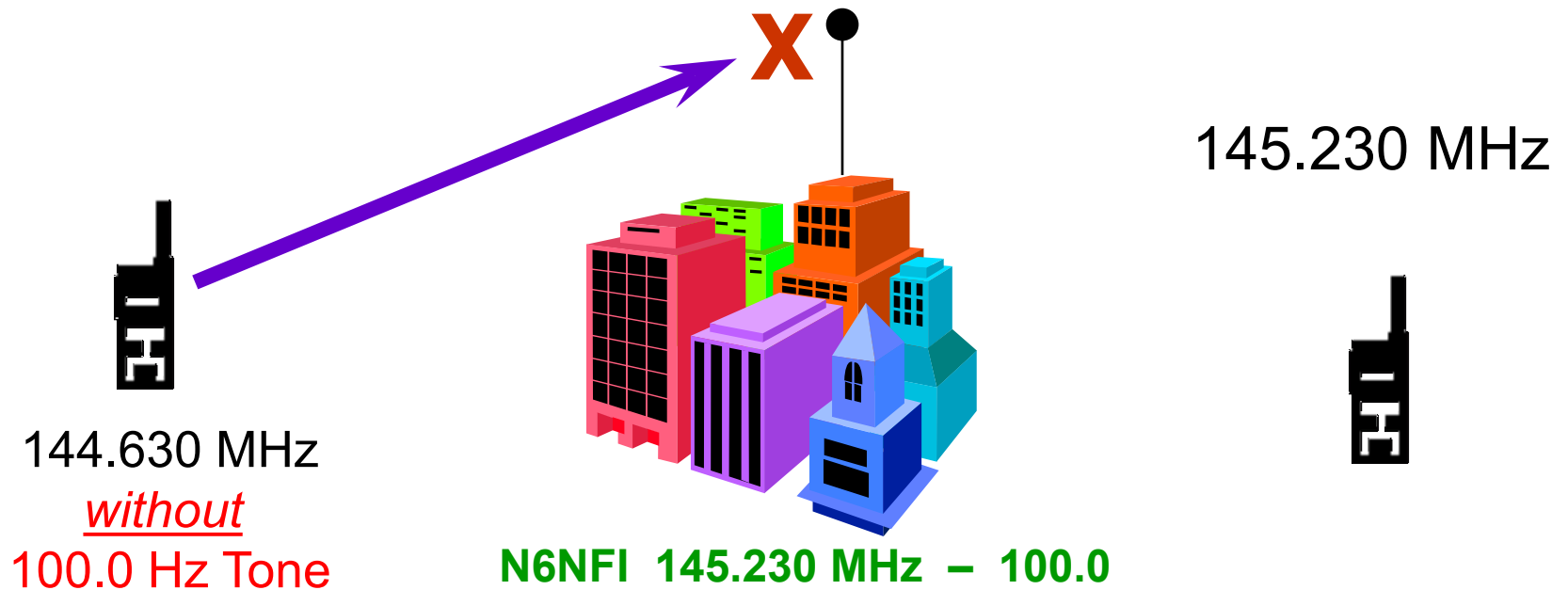
Example:

- This repeater requires a 100 Hz tone to accompany the transmission

# Transmitting CTCSS Tones

- “PL” or “PL Tone” or “CTCSS” or “Tone Encode”
  - “PL” = “Private Line” (old Motorola term, still commonly used)
  - “CTCSS” = Continuous Tone-Coded Squelch System
- A sub-audible tone sent by your radio along with your voice transmission
  - About 40 discrete values ranging from 67.0 to 250.3Hz
  - Functions like a “key” to unlock the receiver to accept the signal
- Repeaters
  - Most repeaters require that you send the proper tone
  - If you don’t send the tone, the repeater will not repeat your transmission
- Setting up to transmit CTCSS tone involves two steps:
  - Enable tone
    - Kenwood = “Tone” or “T”; Yaesu & Icom = “Tone”
  - Set tone frequency
  - Common error is forgetting to set tone, or setting tone to wrong frequency

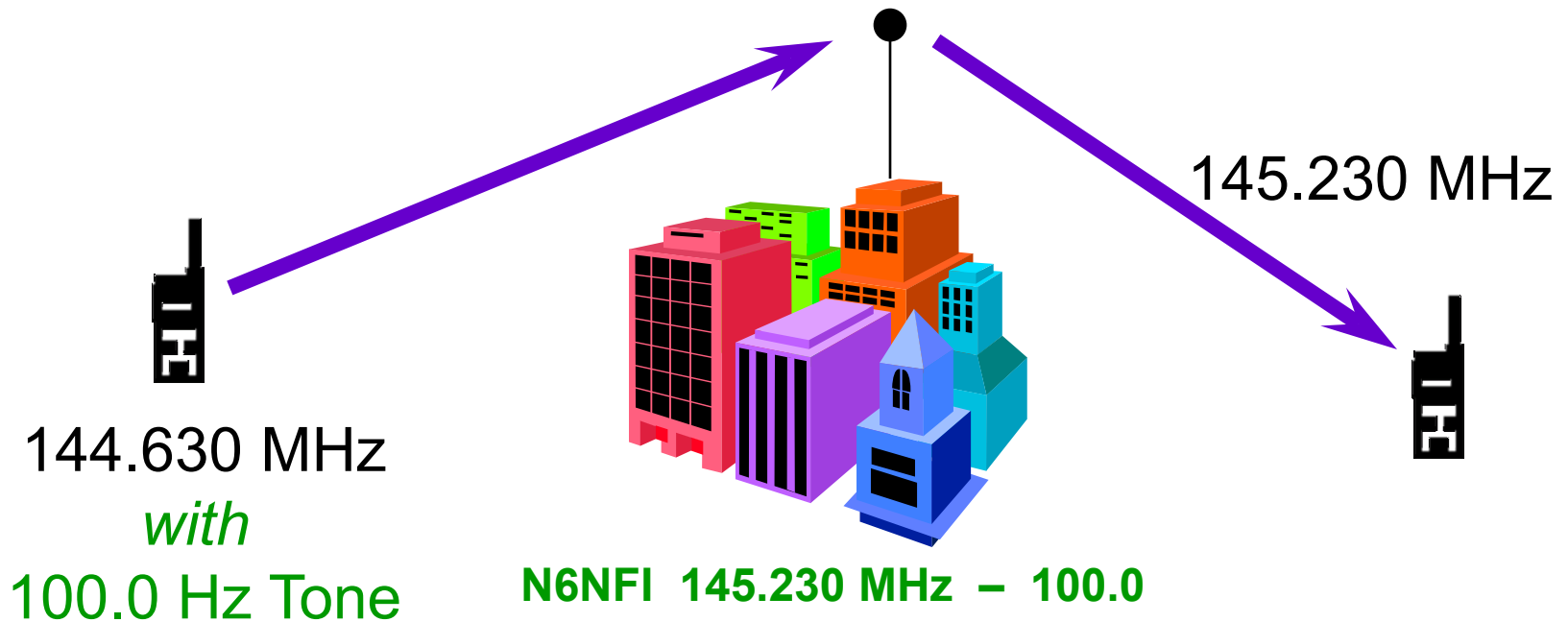
# Repeater Tone Example



Example:

- Repeater requires 100 Hz tone
- No tone (or wrong tone) is sent
- Repeater does NOT repeat the transmission

# Repeater Tone Example



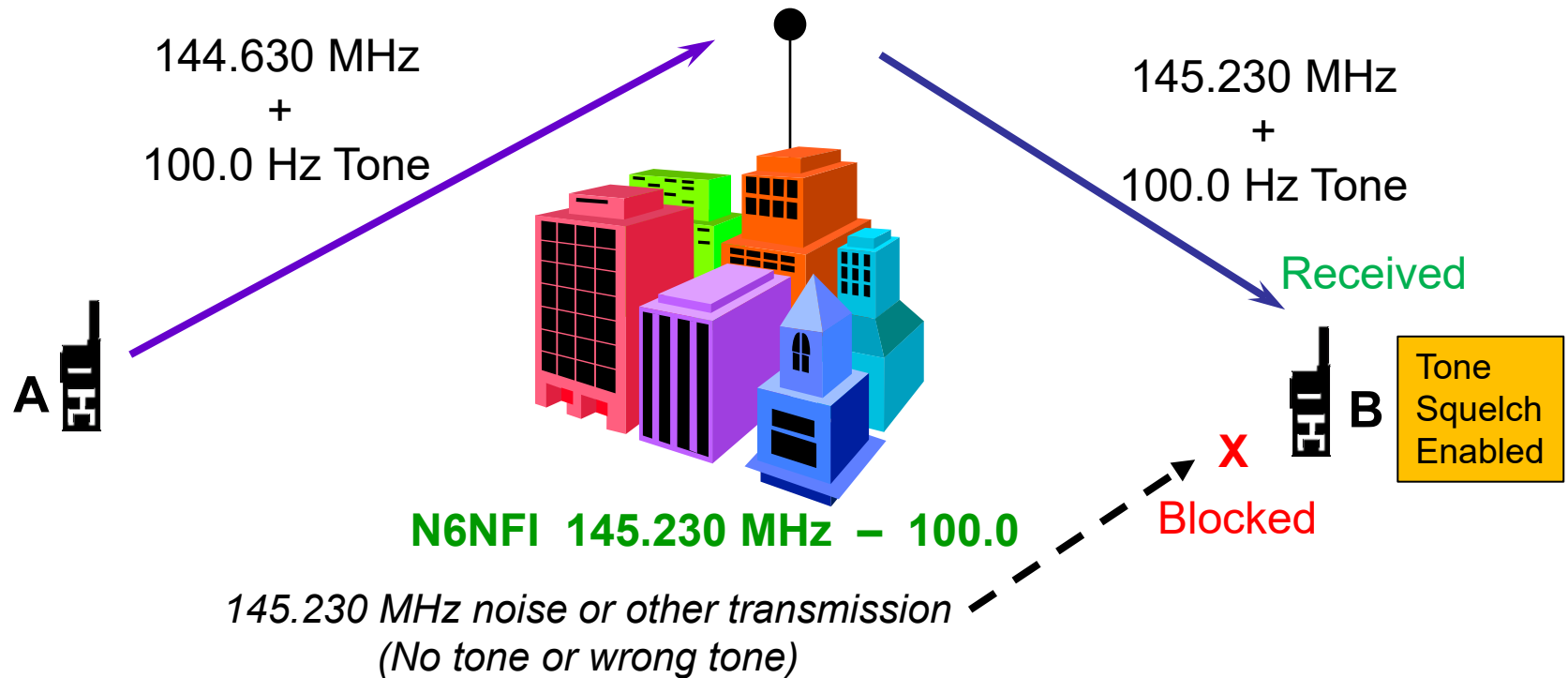
## Example:

- Repeater requires 100 Hz tone; 100 Hz tone is sent
- Repeater receives and retransmits signal

# Tone Squelch / CTCSS Decode

- Just like a repeater requires a tone when receiving ...
- You can configure your radio to require a tone when receiving
  - This is called “tone squelch” or “CTCSS decode”
  - Allows you to ignore transmissions not accompanied by the tone
  - Keeps local noise from exceeding squelch level
  - Display: Kenwood = “CTCSS” or “CT”; Yaesu & Icom = “TSQL”
- **BUT** ... using tone squelch will prevent reception if the other end is not sending tone!
  - Simplex
    - Most simplex users do NOT send tone
  - Repeaters
    - Some repeaters also send a tone when they transmit
    - But many repeaters do NOT send a tone – check your settings

# Tone Squelch Example



## Example:

- A sends tone with its transmission
- Repeater hears tone and repeats transmission; also sends tone
- B has tone squelch configured; receives repeater transmission with tone
- B does not receive noise or other signals without tone



# Tone Squelch / CTCSS Decode (cont.)

- Tone squelch is mentioned here for completeness and so you don't confuse it with regular repeater input tone
- Recognizing a problem
  - If: S-meter deflects but no sound is heard; volume is up; squelch is down
  - Then: tone squelch is ON but other end is not sending tone
  - Check Display for: Kenwood = "CTCSS" or "CT"; Yaesu & Icom = "TSQL"
  - Therefore: turn off tone squelch
- Recommendation:
  - Don't use this feature until you are familiar with your radio and the local repeater capabilities

# Putting it All Together

Simplex (No Repeater):

**Example Simplex Frequency:  
147.540 MHz**

- Set the frequency
- Disable offset (set to blank)
- Disable tone (usually)
- (Optional) Store setup in memory
  - Highly recommended

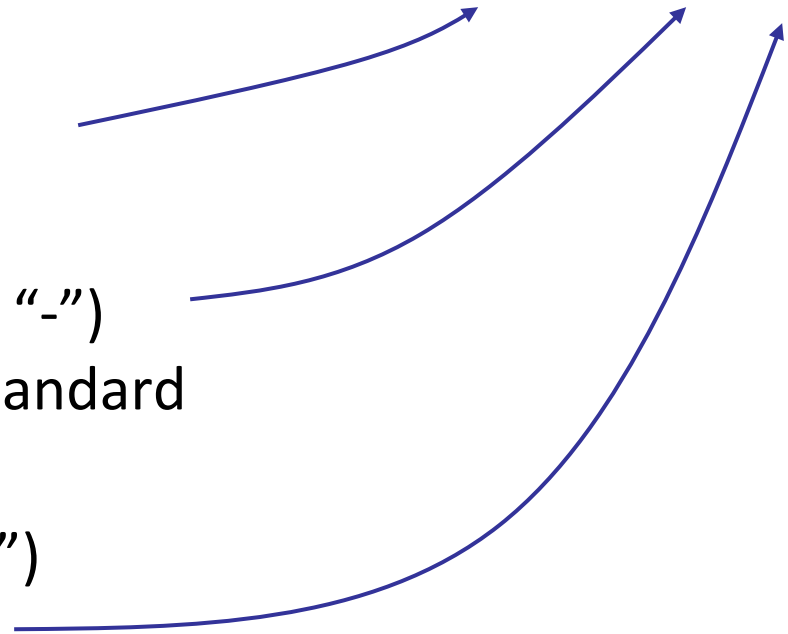
Seek additional help from fellow hams, local club members, or your ARES/RACES Emergency Coordinator or Assistant ECs

# Putting it All Together

## Duplex (Repeater):

- Set the output frequency
- Offset
  - Set offset direction (“+” or “-”)
  - Offset amount is usually standard
- Tone
  - Enable Tone (“T” or “Tone”)
  - Set the tone frequency
- (Optional) Store setup in memory
  - Highly Recommended

**Example Repeater Listing:**  
**N6NFI 145.230 MHz – 100.0**



Seek additional help from fellow hams, local club members, or your ARES/RACES Emergency Coordinator or Assistant ECs

# Apps

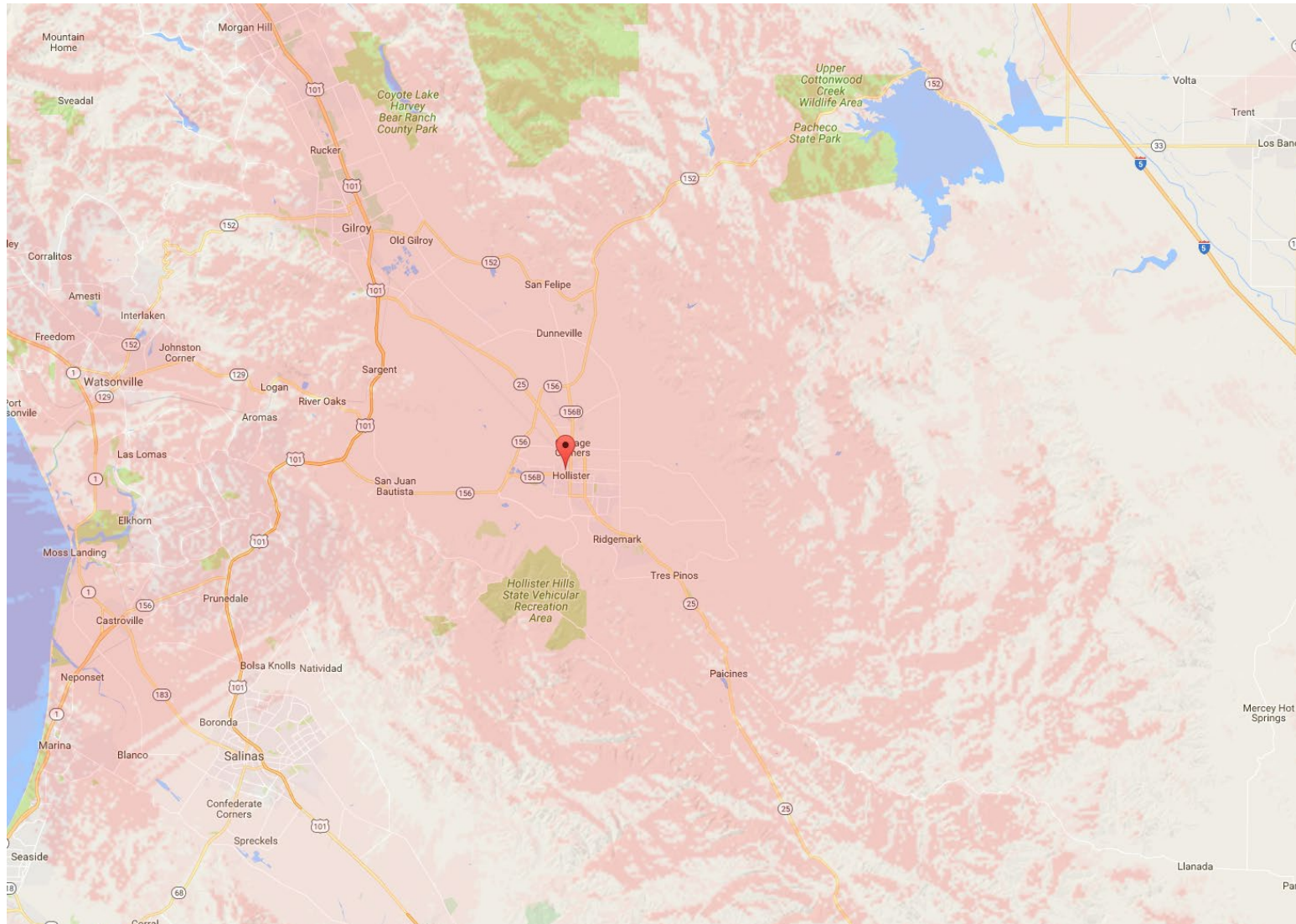
- RFinder – (Radio Frequency Finder) - <http://www.rfinder.net> (iOS, Android, Web) – Cost \$9.95/yr
- Repeaterbook - <https://www.repeaterbook.com/> (iOS, Android, Web) – Free / Donation

# San Benito Co. ARES/ACS/RACES

1. **PKHILL** N6SBC – **Downtown 147.315+ 94.8**
2. CALLMT N6SBC – Call Mtn./Panoche 146.410- 118.8
3. BEARVL N6SBC – South/Pinnacles 146.625- 94.8
4. HERNDZ N6SBC – LagunaMtn / ClrCrk 146.985 - 118.8
5. SBTAC1 – 147.495 156.7
6. SBTAC2 – 146.565 156.7
7. SBTAC3 – 446.500 156.7

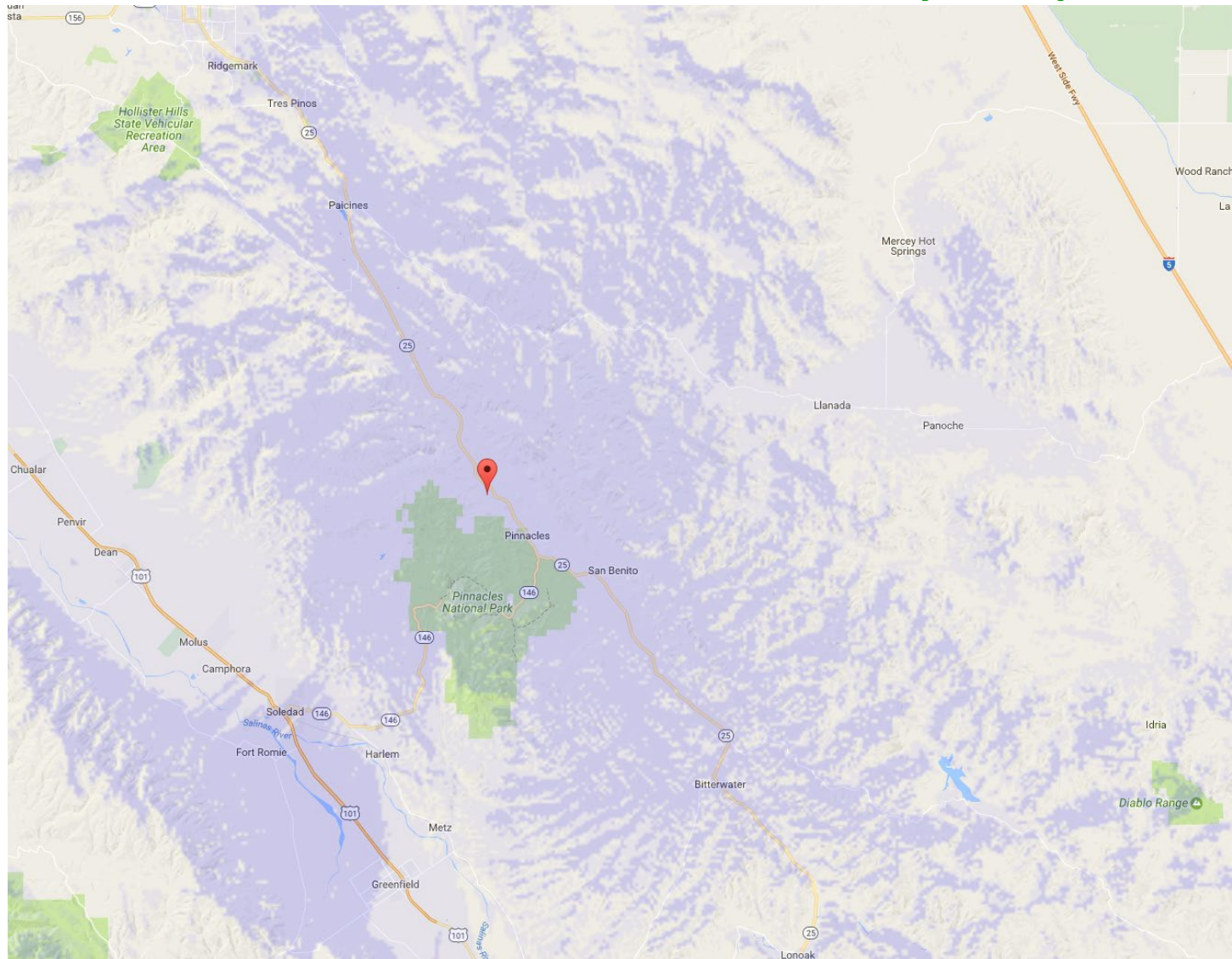
<https://sbcara.org/freq/>

# Park Hill Ham Repeater

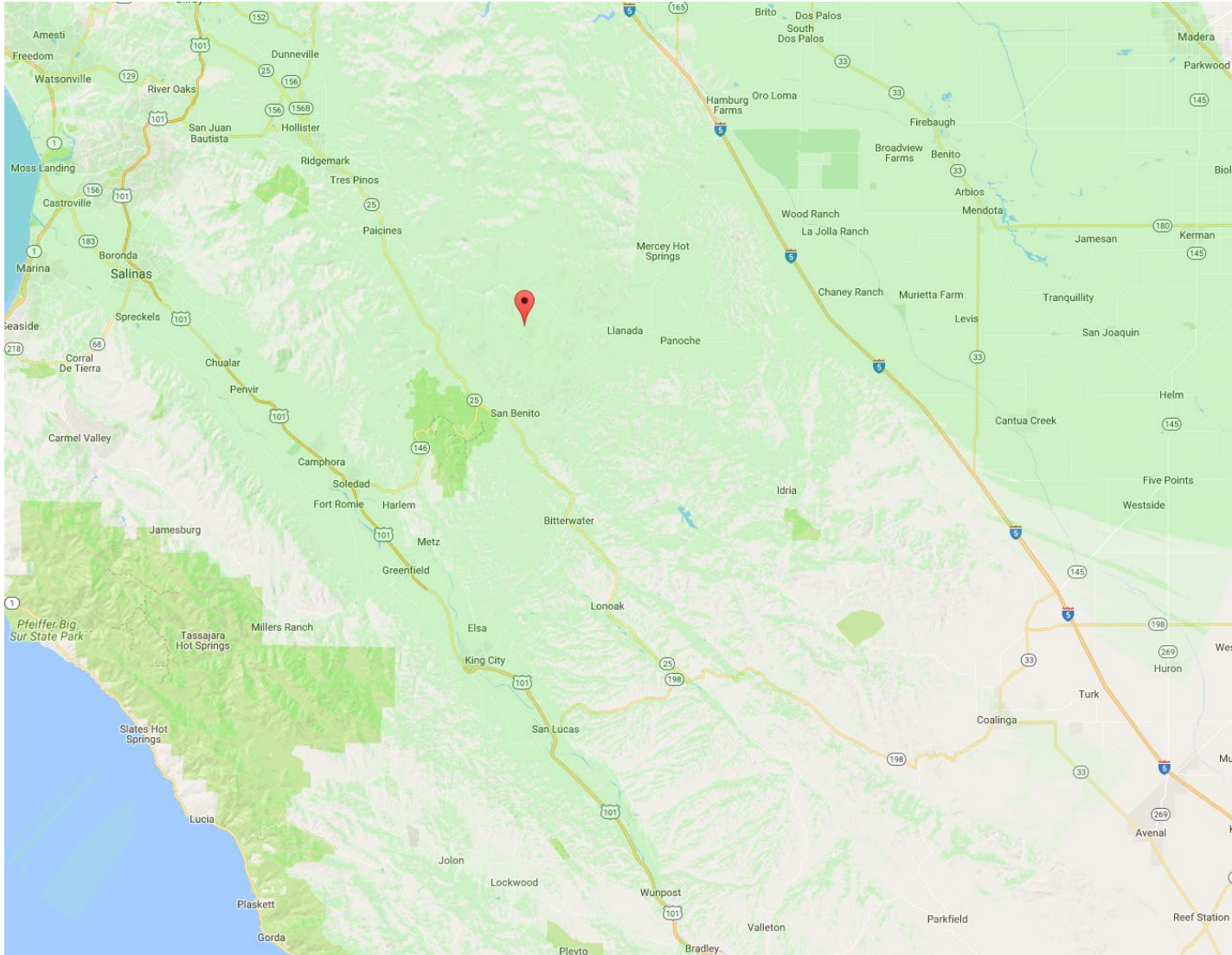




# So. Co. / Pinnacles / Bear Valley Repeater

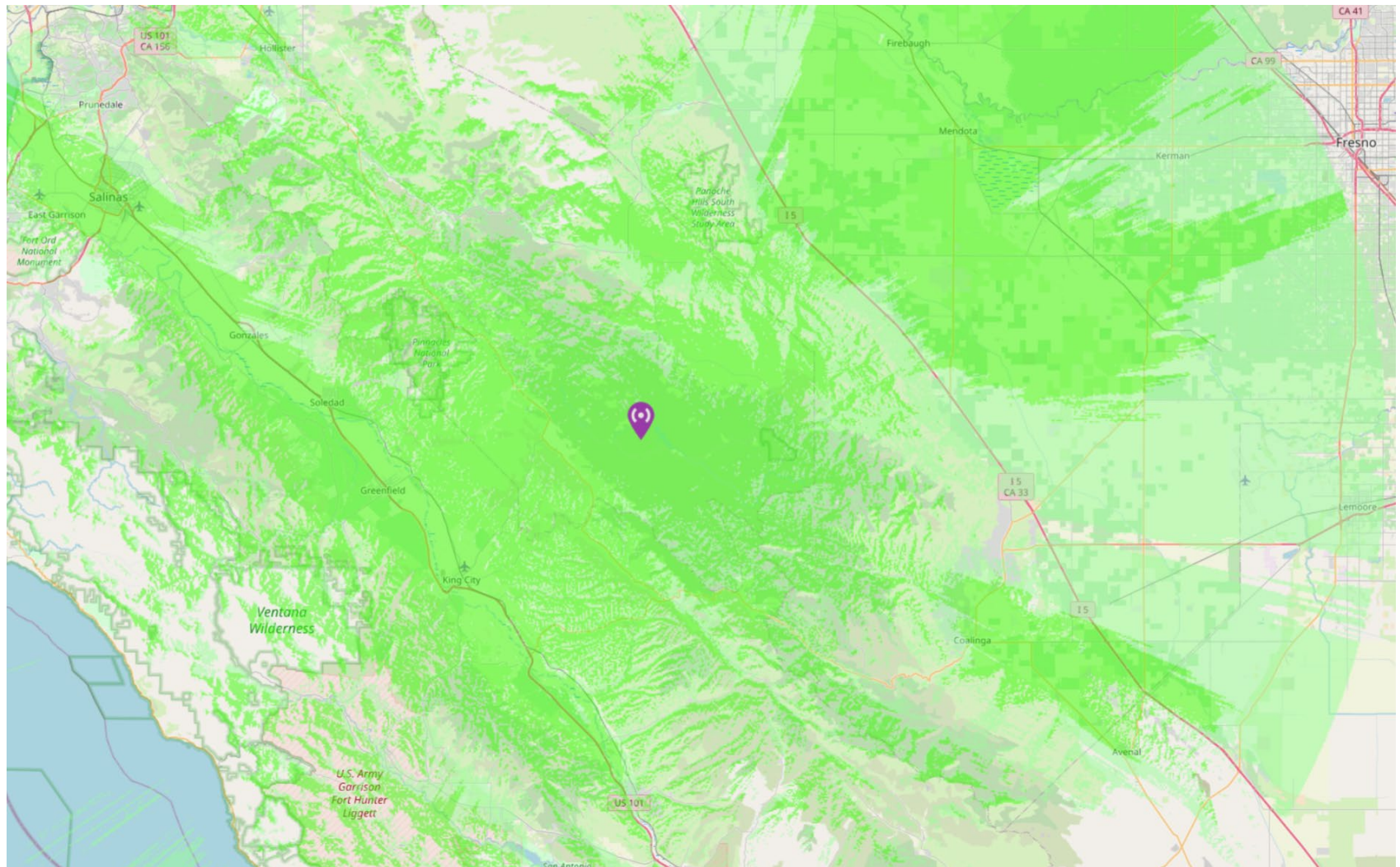


# Call Mountain / Panoche Ham Repeater



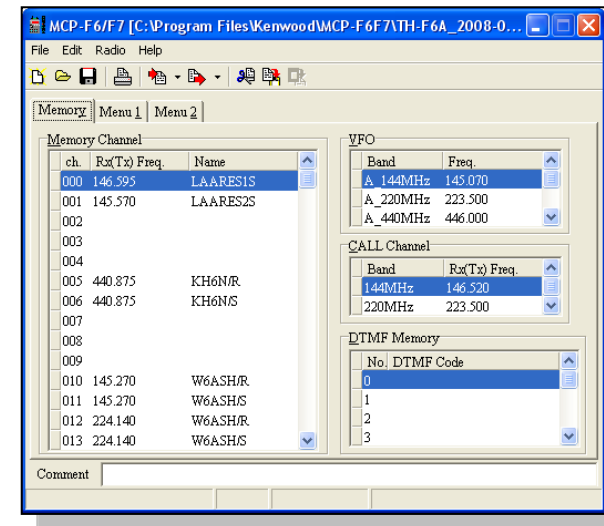


# Hernandez Valley Ham Repeater



# Programming Your Radio Memory

- Know how to program your radio with the keypad
  - Simplex and duplex (offsets)
  - Tones / PL / CTCSS
  - Keep radio manual or “cheat sheet” in your Go-Kit
    - “Nifty Accessories” (<http://www.niftyaccessories.com>)
    - SPECS website (<http://www.specsnet.org/CSindex.htm>)
- Programming software is nice
  - Easier to program many frequencies
  - Helps when maintaining multiple radios
  - But ... you won't have it with you in the field!
  - Not available for all radios – check before you buy
- Store all commonly used frequencies
  - Program into the radio's memory
  - Keep a copy of the frequency list in your Go-Kit
    - County List: <http://www.scc-ares-races.org/operations.html>
    - City List: consult your city ARES/RACES website



# Voice Operating Techniques

Communication Fundamentals

Directed Net Basics

Directed Net Exercises

Net Control Examples

# A Radio is Not a Telephone!



BECAUSE:




- When YOU talk, you can't hear
  - The receiver is cut-off while the transmitter is operating
- When YOU talk, no one else can talk
  - If you talk too long, you may prevent emergency traffic
  - Many repeaters have timers that help to enforce this
- If EVERYONE talks, NOBODY understands
  - A “double” occurs and all you hear is garbled noise
- SO...

# Listen First!



- Simplex or repeater:
  - Leave a pause before keying up to allow others to break in
  - Check your volume (up) and squelch (down)
- Simplex
  - You may not be able to hear someone who can hear you (they've got a better antenna)
  - Always ask, "Is this frequency in use?"
  - Usually, someone who can hear you both will tell you
- Repeaters
  - What you're really listening to is the repeater itself
  - So, if you can hear anyone (or repeater itself), then you can hear everyone
  - Listen for a brief period to make sure others are not pausing during a conversation
  - Wait for the courtesy tone

# Courtesy Tone

- Audible tone from repeater after each transmission
- Indicates when it is OK to transmit
  - After other person has dropped carrier
  - Plus slight pause for others to break in
- Eliminates need for saying “over” or “go ahead”
- Sent by many (not all) repeaters
  - N6NFI/R courtesy tone 
  - W6ASH/R courtesy tone 
  - N6SBC/R or AA6BT/R courtesy tone 
- Wait until you hear the courtesy tone before you transmit



# When Do You Speak?



- For EmComm, speak ONLY if you have to
- Wait for the courtesy tone and/or leave a gap
  - If truly urgent, use “break” or “priority” or “emergency” as appropriate
- Key the PTT and pause slightly
  - Avoids clipping your first syllable; wait longer with linked repeaters
- Speak Accurately, Briefly, Clearly
  - Keep it short and accurate
  - Use plain English; no 10-codes or Q-signals or abbreviations
  - Stick to the facts; don’t speculate; don’t assume
  - Remember that others are listening
    - General public, news media, ...
    - Avoid personal info, sensationalism
    - Be professional at all times
- Release PTT as soon as you finish speaking; don’t create “dead air”
- In a Directed Net, be sure to follow Net Control’s instructions

# Standard ITU Phonetics

A - alfa (AL-fa)	N - november (no-VEM-ber)
B - bravo (BRAH-voh)	O - oscar (OSS-cah)
C - charlie (CHAR-lee)	P - papa (pah-PAH)
D - delta (DELL-tah)	Q - quebec (keh-BECK)
E - echo (ECK-oh)	R - romeo (ROW-me-oh)
F - foxtrot (FOKS-trot)	S - sierra (see-AIR-rah)
G - golf (GOLF)	T - tango (TANG-go)
H - hotel (hoh-TELL)	U - uniform (YOU-ni-form)
I - india (IN-dee-ah)	V - victor (VIK-tah)
J - juliet (JU-lee-ETT)	W - whiskey (WISS-key)
K - kilo (KEY-loh)	X - x-ray (ECKS-RAY)
L - lima (LEE-mah)	Y - yankee (YANG-key)
M - mike (MIKE)	Z - zulu (ZOO-loo)

- If there is a chance of misunderstanding, spell it out with “I spell”:
  - “go to Kay Street” → “go to Kay, I spell kilo alfa yankee, Street”



# Pronouncing Numerals

0 - zero (ZEE-row)

1 - one (WUN)

2 - two (TOOO)

3 - three (THUH-ree)

4 - four (FOH-wer)

5 - five (FY-ive)

6 - six (Sicks)

7 - seven (SEV-vin)

8 - eight (Ate)

9 - nine (NINE-er)

- Multi-digit numbers are spoken as a string of single digits:
  - 600 = “six zero zero”
- Often preceded by the word “figures”
  - “Please copy 109” → “Please copy figures one zero niner”
  - “Requesting 16 blankets” → “Requesting figures one six blankets”

# Directed Net Basics

Participating in a Directed Net

Calling Net Control

Acknowledging a Call

Ending a Call

Calling Another Station

Phonetics and Numbers

# What is a “Directed Net”



- One station (“net control”) controls/manages the communication flow
  - Others respond to Net Control when called
  - Others must call “Net Control” to get permission before calling anyone else
- Generally used with more than four people
- A net control operator can:
  - Coordinate communications for best efficiency
  - Prioritize use of the net for the most urgent traffic
  - Record a log of net activity

# Participating in a Directed Net

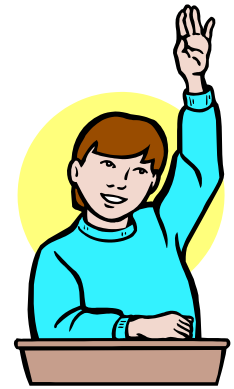
- Route all communications through “Net Control”
  - Get permission before contacting anyone else
- When called, answer PROMPTLY
  - Monitor the radio continuously
  - Answer immediately if called
    - The entire net is waiting on you to answer!
  - End your message with your call sign
    - Tells Net Control that you have nothing more to add
    - Assures that you comply with FCC ID requirements
- Check-in and Check-out
  - Don’t leave the net without checking out!
  - Otherwise, “Net Control” wastes time
    - They may send someone to find you; see if you’re o.k.
    - You’ve now become part of the problem!

# Calling Net Control



- If the Net has been quiet for a while, you might say:
  - “Net Control, this is <your ID>” checking in
  - “Net Control, this is <your ID> with one priority message”
- To convey a message or info, indicate what it is so Net Control can prioritize:
  - “<your ID> with one announcement”
  - “<your ID> with one emergency message”
- On an very active net, usually just say your ID:
  - “<your call sign>”
- Wait for Net Control to answer
  - Don’t call repeatedly; NC probably heard you and is busy
  - Net Control will decide when you can speak
  - NC: “<your ID>, go ahead”
- Then you can speak... keep it brief

# Acknowledging a Call



- When Net Control calls you ...
- Pause briefly before pressing PTT
  - Wait for the courtesy tone or slightly longer
  - Gives others a chance to break in
- Then respond right away
  - Don't keep the net waiting
- Say, "This is <your ID>, go ahead"

# Ending a Call



- The person who initiated the call ends it
- End a call:
  - Say “... this is <your call sign>.”
  - We don’t use “73” - keep it short
  - Maintains compliance with FCC Part 97 to ID at end of last transmission

# Calling Another Station Directly

- We don't (usually) use "CQ" in FM EmComms
- Say "<their ID>, this is <your ID>":
- Wait until they acknowledge you
  - "this is <their ID>, go ahead", or
  - "<your ID>, this is <their ID>, go ahead"
- Then you can speak... keep it brief
- Remember to ID at the end of the call
- In a directed net:
  - You must ask Net Control to "go direct" with another station
  - If possible, Net Control will give you permission to "go direct"
  - When finished, turn it back to Net Control
  - "this is <your ID>, back to Net Control"



# Check-In



- Check-in is how you make yourself known to Net Control
- Net Control directs the process; follow their instructions
  - NC: “Will all stations in Sunnyvale, please check in now?”
  - NC: “Will all stations with call sign suffixes beginning with A-L please check in now”
- Speak slowly, enunciate clearly, make use of phonetics
  - The entire net slows down if NC needs to ask for a “fill” or repeat
  - Gives Net Control time to write it down

# Relays



- Sometimes, a station cannot be heard by net control
  - Very weak station (poor antenna, bad location, low power)
  - Net Control may not be in an ideal location or have an ideal antenna (emergency situation, temporary NC)
- All participants need to actively monitor check-ins and acknowledgements to see if Net Control misses anyone
- If you hear a station that Net Control misses, you should relay the info to Net Control

# Tactical Call Signs or “Unit IDs”


- Identifies a location or function instead of an individual
  - Examples: “Checkpoint 3”, “Rover 1”, “John’s Shadow”, “Net Control”
- Allows Net Control to manage resources without regard to who is staffing any particular location or function
  - Simple, plain English
  - Tactical call stays the same throughout the incident or event
  - Use your tactical call consistently
  - Contact Net Control or others by their tactical call
  - Listen for your tactical call and respond promptly when called

**IMPORTANT:** Does not eliminate FCC requirement to ID with your FCC call sign at least every 10 minutes and at the end of your last transmission.


- It may be longer than 10 minutes before Net Control gets back to you again
- So, finish your transmission with your FCC call sign

# Net Control Examples

# Net Control Example

- Milpitas Quake – Oct 2007 (3m45s) 
  - AA6BT repeater; weekly SVECS net at time of quake
  - Listen for the following:
    - Check-ins; Net control calls on KE6AGJ, Larry Carr, DEC
    - Larry makes announcement [clipped]; back to NC
    - Net control solicits questions
    - Questioner talks to NC, not directly to Larry
    - NC asks Larry to answer question
    - Larry answers question [clipped]; earthquake occurs [static]
    - Larry assumes net control function, announces intentions
    - Some initial vague reports; WA6UBE w/ “double”
    - Larry begins directing traffic; net settles down
  - What aspects of your training did you hear?
  - Comments? Observations?

# Net Control Example

- Loma Prieta Quake – 1989 (2m40s) 
  - W6ASH repeater 10 minutes after quake
  - Listen for the following:
    - Net Control request someone turn off timer
    - Repeater control operator answers; will do it shortly
    - Net Control directs multiple callers, in order
    - Net Control hand-off to new net control operator, N6FW
    - Repeater control operator turns off timer
    - Net Control resumes collecting damage reports
  - What aspects of your training did you hear?
  - Comments? Observations?

# Additional EmComm Modes

Winlink / Packet

APRS

Digital: DMR, D-Star, Fusion, etc

AREDN

HF (various modes)

# Winlink: Email

- Send and receive email via radio

Winlink Express 1.5.37.0 - W6TST

W6TST Settings Message Attachments Move To: Saved Items Delete Open Session: Telnet Winlink Logs Help

No active session.

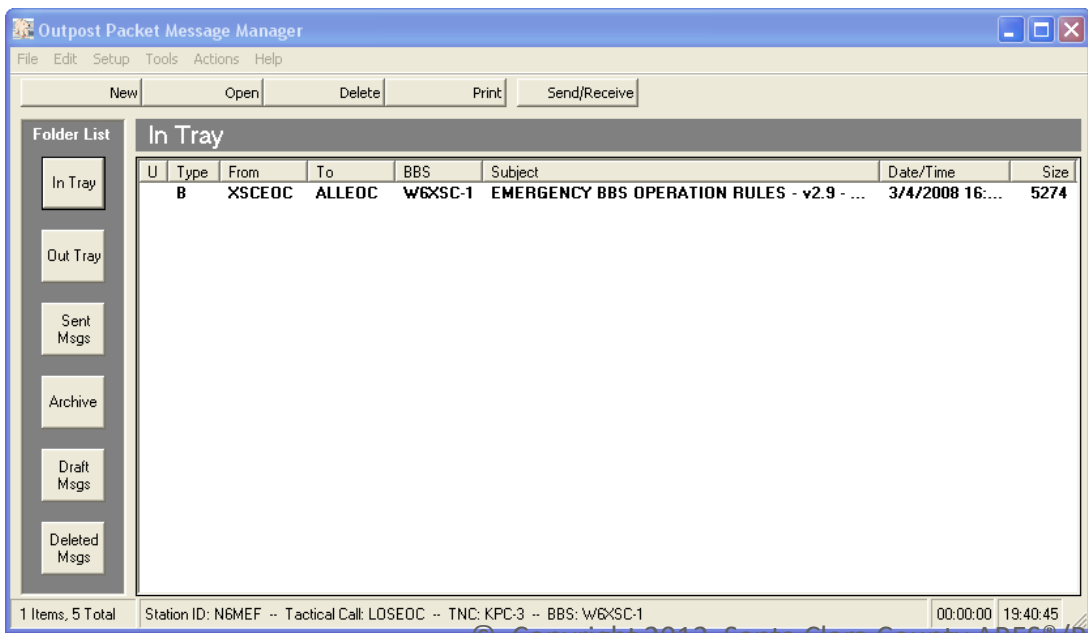
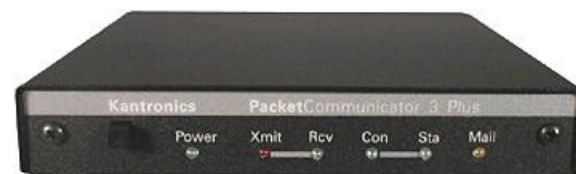
	Date/Time	Message ID	Size	Source	Sender	Recipient	Subject
	2021/05/1...	M3UU6LB...	25...	AJ6KN	AJ6KN	KE6AFE...	Re:213-test 1-Re:Hello, test message 1 - 2021-05-07 08:54
	2021/05/10 1...	5P4RV3CN45...	1364	W2AFE	W2AFE	K6SDR...	California Coastal Winlink Net for May 2021
	2021/05/09 1...	L94FVL7YBOY7	2305	KF6NPG	KF6NPG	AA6CS...	NorCAL Winlink Check in Reminder
	2021/05/0...	S29ZHOP...	412	ARC...	ARCPACI...	W6TST	ACK: Express Check In [Exercise]-W6TST-Hollister, CA
	2021/05/08 1...	OQVHBD8PL...	930	SMTP	SMTP:john.rui...	W6TST	Re: [EXTERNAL] Demo/Test Message from Helen Cosentino-Massimino
	2021/05/0...	E7YWW6...	43...	KF6...	NCALWLI...	AA6CS...	NorCAL Winlink Weekly Report
	2021/05/0...	3FERA8Y...	21...	KE6...	KE6AFE	KE6AFE...	213-test 1-Re:Hello, test message 1 - 2021-05-07 08:54
	2021/05/0...	2EQLO3G...	454	N6R...	N6RJX	KE6AFE...	Re:Hello, test message 1
	2021/05/0...	HH86ID9...	558	KE6...	KE6AFE	N6RJX...	Re:Hello, test message 1
	2021/05/0...	8TR5WZ9...	23...	KF6...	NCALWLI...	AA6CS...	NorCAL Winlink Net Weekly Check in Reminder
	2021/04/3...	01TL4CQ...	46...	NB6S	NB6S	AA6CS...	NORCAL_WINLINKnet Weekly report
	2021/04/2...	1R5Z6Z77...	780	W2A...	W2AFE	K6SDR...	FW: May 8th: National Red Cross Winlink Exercise, and International Red Cross/C
	2021/04/2...	DZ3DP5C...	29...	NB6S	NB6S	AA6CS...	//WL2K NORCAL_WINLINKnet Reminder [PLEASE READ]
	2021/04/2...	YSOS4ZK...	43...	NB6S	NB6S	AA6CS...	NORCAL_WINLINKnet Weekly report
	2021/04/2...	ZCA32ZT...	27...	W2A...	W2AFE	K6SDR...	California Coastal Winlink Net report for 19 April 2021
	2021/04/1...	ZJQH4CR...	928	NB6S	NB6S	AA6CS...	Happy Amateur Radio Day
	2021/04/1...	3QGI6KB...	29...	NB6S	NCALWLI...	AA6CS...	//WL2K NORCAL_WINLINKnet Reminder [PLEASE READ]
	2021/04/1...	7PLXTWU...	41...	KF6...	KF6OBI	AA6CS...	NORCAL_WINLINKnet Weekly report
	2021/04/1...	EL3V22D...	377	KF6...	NCALWLI...	W6TST	Thank you for checking in to the NORCAL_WINLINKnet
	2021/04/1...	DUYMCX...	19...	SYS...	SERVICE	W6TST	INQUIRY: WL2K NEARBY

Message ID: OD66PP0107OR  
Date: 2019/12/02 16:40



# Winlink / Packet

- Send and receive data via radio
  - Similar to TCP/IP packets over Ethernet
- Like using an e-mail program
- Text messages, official forms, complex spelling (drug names, addresses), cut-and-paste from other apps



**EOC MESSAGE FORM**  
 PACFORMS adaptation of SCCa ICS Form 213 (Ver. 2.1.3)  
 By Phil Henderson, KF6ZSO  
 (This form works with OutpostOpDirect for Automatic ASCII text save)  
 For Instructions using this form [Click Here](#)

2.) When Receiving Msg: Senders's msg. #  3.) When Sending Msg: Receiving msg. #

RED Areas Required

1a.) Date: (MM/DD/YY)  12/30/2008

1b.) Time: (24 hour clock)  1946  
 0001 to 2400  
 2:00 PM - (2+12)=1400 Hrs.

4.) Situation Severity (Select One)  
☐ EMERGENCY (e.g., Life Threat)  
☐ URGENT (e.g., Property Threat)  
☐ OTHER (All Others)

5.) Msg. Handling Order (Select One)  
☐ IMMEDIATE (As Soon as Possible)  
☐ PRIORITY (Less Than One Hour)  
☐ ROUTINE (More Than One Hour)

6.) Message Request You to: TAKE ACTION (Check one)  
☐ Yes ☐ No  
 REPLY (Check one)  
☐ Yes, by  ☐ No  
 FOR YOUR INFO. (No action required)

7.) ICS Position: (required)

8.) ICS Position: (required)

9a.) Location: (required)

9b.) Location: (required)

To: (required) Name: (optional)  Telephone #: (optional)

From: (required) Name: (optional)  Telephone #: (optional)

10.) SUBJECT:

11.) REFERENCE (e.g., Number of earlier msg.):

12.) Message (what, when, where needed; how long; contact name and phone number) KEEP MSG BRIEF

13.) Action Taken: (For use by Originator / Recipient) -> USE SEPARATE MESSAGE FORM IF SENDING REPLY!

CC: ☐ Management ☐ Operations ☐ Planning ☐ Logistics ☐ Finance

14.) Operator use Only  
 How Received ☐ or ☐ Sent ☐ (Check One this line and one below)  
☐ Telephone ☐ Dispatch Center ☐ FAX ☐ Courier  
☐ EOC Radio ☐ Other

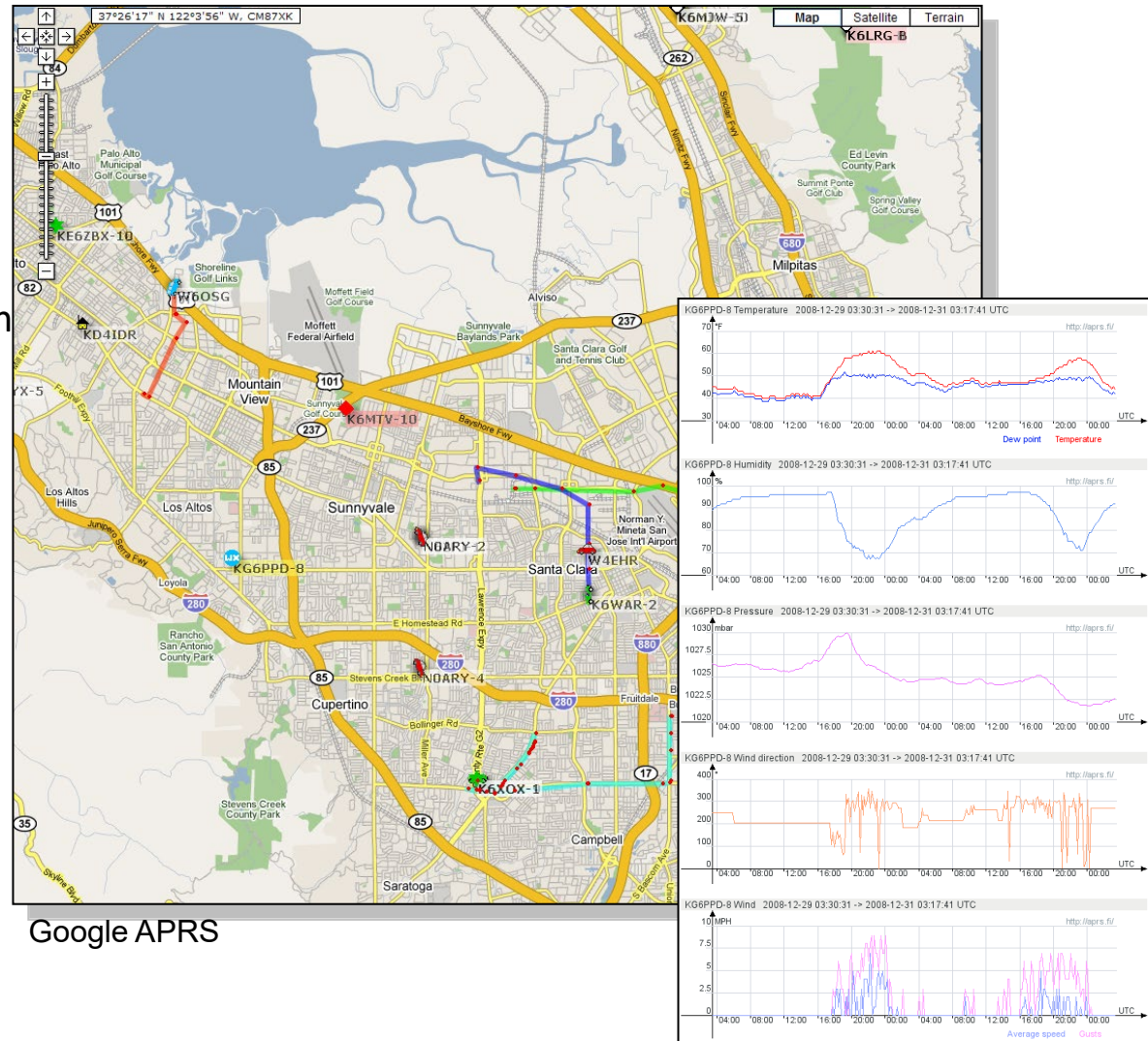
Operator Call Sign:

Operator Name:

Date:  12/30/2008 Time:  1946

# Automatic Packet Reporting System

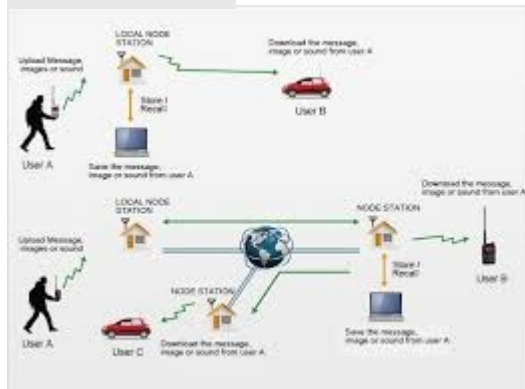
- <http://www.aprs.org>
- Special packet network
- Position
  - Connect to GPS
  - Beacon location information as you travel
- Weather
  - share your weather station info
- Short messages



Google APRS

# Digital: DMR, D-Star, Fusion, etc....

- Transmit both analog and digital signals
  - Send voice or data including telemetry (APRS)
  - Multiple standards – check with local contacts as to what is best for your area.
- Not currently used for emergency operations, but may be in the future.





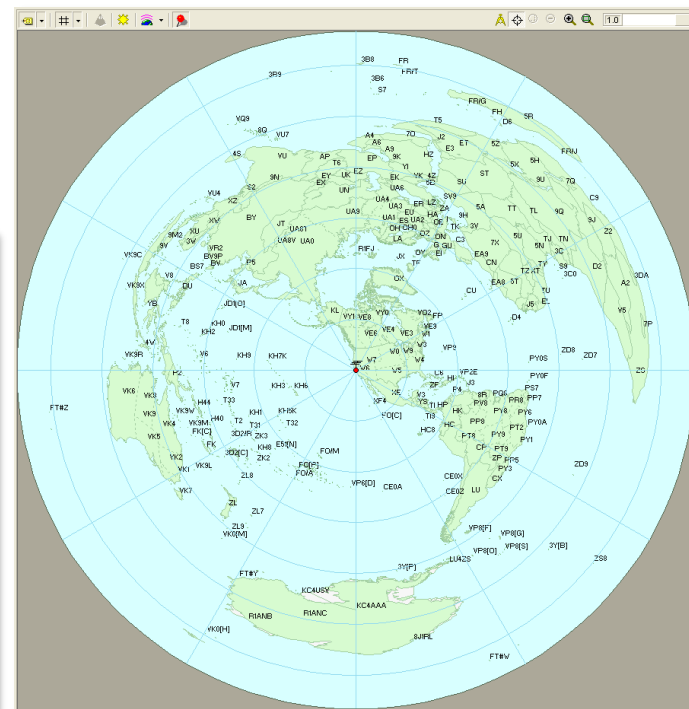
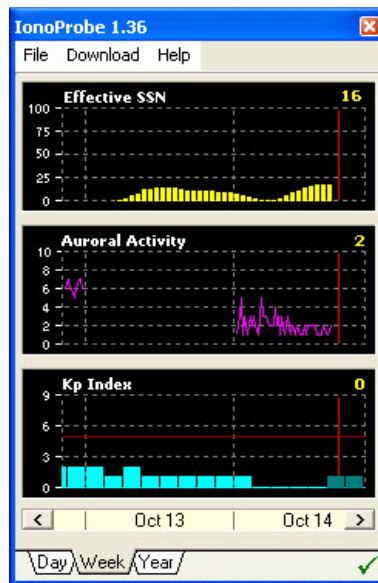
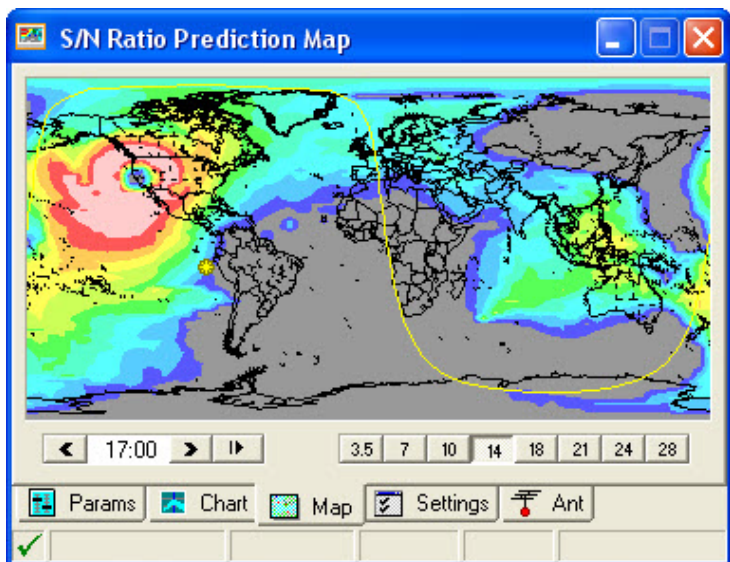
# AREDN: Amateur Radio Emergency Data Network

- Internet service over amateur radio frequencies for backup connectivity during emergencies.



# HF (High Frequency = 3 – 30 MHz)

- 10m and lower bands
- Regional, national, international communications
- SSB, CW, data modes ...
- Local voice net: Tuesdays, 2030 hrs
  - Currently on 3.878 MHz (75m LSB)



# Next Steps

What to do when you walk out the door today ...

Local Amateur Radio Clubs

EmComm Training

Action Items

# Local Amateur Radio Clubs

- San Benito County Amateur Radio Association
  - Meetings: 1st Tuesday of the month at 7:00 p.m.
  - Net: Thursday 7:30pm on N6SBC (147.315 – 100 Hz)
  - <http://www.sbcara.org/>
- Garlic Valley Amateur Radio Association (GVARC)
  - Meetings: Last Saturday morning of the month
  - Net: Tuesday 7:30pm on W6GGF (147.825 – 100 Hz)
  - <http://www.gvarc.net/>
- Morgan Hill Amateur Radio Society (MHARS)
  - Net: Wednesday 9:00 pm on K7DAA (442.975 + 100 Hz)
  - <http://www.mhars.org/>



# Nearby Amateur Radio Clubs

- Palo Alto Amateur Radio Association (PAARA)
  - Meetings: 1st Friday of the month at 7:30 p.m.
  - Net: Monday 8:30pm on N6NFI/R (145.230 – 100 Hz)
  - <http://www.paara.org/>



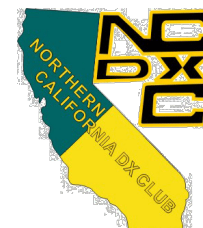
- Foothill Amateur Radio Society (FARS)
  - Meetings: 4th Friday of the month at 7:00 p.m.
  - Net: Thursday 8:30pm on N6NFI/R (145.230 – 100 Hz)
  - <http://www.fars.k6ya.org/>

*Foothills Amateur Radio Society*

- Northern California Contest Club (NCCC)
  - Meetings: 2<sup>nd</sup> Monday of the Month
  - <http://www.nccc.cc/>



- Northern California DX Club (NCDXC)
  - Net: Thursday 8pm W6TI/R (147.360 + 110.9 Hz)
  - <http://www.ncdxc.org/>





# EmComm Training



- SCC ARES/RACES Training
  - Monthly training classes – 1<sup>st</sup> Sat. of month
  - Quarterly drills
  - City and county public service events
  - <http://www.scc-ares-races.org/training.html>
- ARRL Training and Books
  - License Manual, Antenna Book, other great books
  - Amateur Radio Emergency Comms Courses, ...
  - <http://www.arrl.org/catalog>
- FEMA NIMS/ICS Training
  - ICS 100, ICS 200, ICS 700, ...
  - <http://www.training.fema.gov/IS/NIMS.asp>
- Red Cross Training
  - Introduction to Disaster Services, Shelter Ops, ...
  - <http://www.siliconvalley-redcross.org>

Recommended next class:  
**“Fundamentals of  
Emergency Communications”**



# Action Items



- Get the right radio and accessories
  - Talk to your city EC/AECs for more recommendations
- Join your city ARES/RACES group
  - Weekly nets, monthly training, quarterly drills, operating activities
  - <http://www.scc-ares-races.org/activities>
- Learn your radio(s) inside and out
  - Simplex, duplex, offset, tone, memory, reset, etc
- Build your go-kit
  - <http://www.scc-ares-races.org/operations.html>
- Join other clubs and participate
  - Getting on the air is the best way to improve your skills
- Ask lots and lots of questions
  - Amateur Radio operators are friendly and helpful
- **Above all, GET ON THE AIR and HAVE FUN!**

# Exercise: Get On The Air ASAP



- Objective: Contact “Net Control” and check in on the next weekly net
  - N6SBC (147.315 + 94.8 Hz)
- Script
  - Report your first name and end with your call sign
    - “This is <your ID>, <your first name> from <your city>”
  - Listen for Net Control to acknowledge
    - “Net Control acknowledges <your ID> <your name>.”
  - If any corrections are needed, remember to end your conversation with your ID
- We have a net every Thursday (except Thanksgiving or major holiday) at 1930 hours (7:30 PM) – Please check in weekly.

# Exercise: Get On The Air ASAP



- If you are out of the area:
  - Go to <https://sbcara.groups.io/g/net-irlp> list and join the mailing list, or email [w6tst@arrrl.net](mailto:w6tst@arrrl.net)
  - Tune in on Echolink to 336037 or via a IRLP repeater (may have to get permission and codes) to node 9257 and join a Thursday night net on the 2<sup>nd</sup> and 4<sup>th</sup> Thursdays of the month.

# Exercise: Get On The Air ASAP



- If you are out of the area and have a General Class license or higher with HF gear:
  - Go to <https://sbcara.groups.io/g/net-hf> list and join the mailing list , or email [w6tst@arrrl.net](mailto:w6tst@arrrl.net)
  - Tune in on Echolink to 336037 or via a IRLP repeater (may have to get permission and codes) to node 9257 and join a Thursday night net on the 2<sup>nd</sup> and 4<sup>th</sup> Thursdays of the month.

# Exercise: Participate in a Drill




- Participate in Drills
  - Some are simple check in like the weekly net...
  - Some you may inject made up status... Net control may ask for status and you can say (for example):
    - All is fine
    - Our house had a water leak, but we were able to shut off water to the leak and all is fine for now.
    - We lost electrical power and are now on back up power.
  - Stay away from dramatic exaggerations / clowning around and jokes. Remember that the airwaves are open for others to listen in and they often do.

# Educate, Train & Gain Experience



- <https://sbcara.org/ares/>
- Check out the ARES Task Book for an training and education plan.

<b>ARES® STANDARDIZED TRAINING PLAN</b>	
	
<b>ARES® EMERGENCY COMMUNICATOR INDIVIDUAL TASK BOOK</b>	
<b>Task Book Assigned To:</b>	
Name: _____	Call: _____
ARES® Group: _____	
Phone Number: _____	Email: _____
<b>Task Book Initiated By:</b>	
ARES® Leader's Name: _____	Call: _____
Title: _____ ARES Group: _____	
Phone Number: _____	Email: _____
<b>Initiated:</b>	
Location: _____	Date: _____

Ver. 2.1.1

# Thank You!

Questions, comments, suggestions?



Exercise is Next





## San Benito County Amateur Radio Assoc.

- <http://sbcara.org/> (all links may be found here)
- <http://sbcara.groups.io/>
- <http://facebook.com/sbcara>
- <http://twitter.com/sbcara>
- <http://instagram.com/n6sbc>
- <http://sbcara.org/ares> These slides (link below table)