CERT Radio Communications 101 The Basics

Communications Support Series

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Overview

The purpose of this presentation is to reinforce the need for CERTeams to establish a CERT communications structure and plan for their teams, familiarize team members with two-way radio communications, review proper radio procedures and protocols, and encourage team members to get on the air.

What communications do we need?

- **Between CERT members in the field**
- **Between CERT members in the field and Incident Command**
- **Between CERT and the outside world:**
  - **Civil Defense**
  - **Other emergency and non-emergency stations.**

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Why worry about emergency communications?

- Our normal communications all rely on an extensive infrastructure that we seldom see or think about.
- Cell phones need the network of cell towers and their connection to landlines.

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Cell phones

- During the tsunamis, cell phone capacity was quickly overloaded, even without damage to the infrastructure.
- Authorities can restrict access to cell phone communication to provide for the use of the systems by their personnel.
- Cell phone systems are subject to damage by severe storms, earthquakes, and fire.

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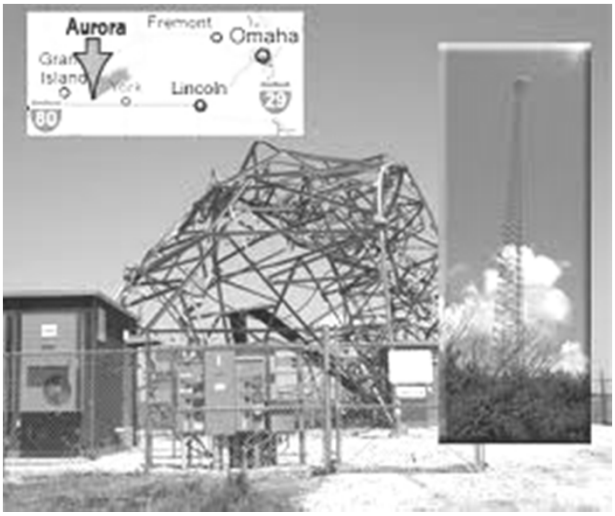
Before and after photos of a cellular telephone tower wrecked by a storm.



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Hurricane Iniki damage. Hawaii, September 1992.

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More damage to communication infrastructure by Hurricane Iniki.

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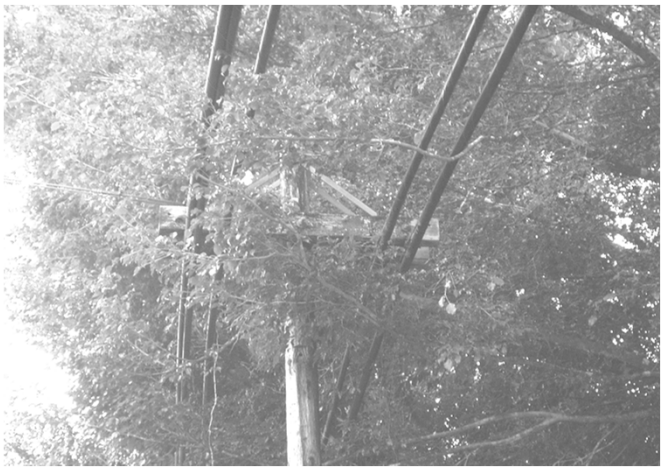
It doesn't take much of an emergency!



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What communication devices are available to us?

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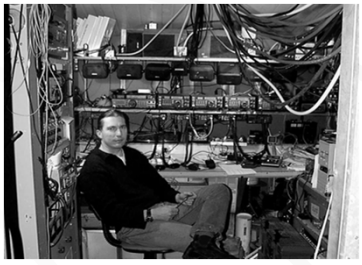
The more common ones

- **Telephone (land line)**
- **Cell phones**
- **Computers – email**
- **FRS, GMRS - "Walkie Talkie" – <u>self-supporting</u>**
- **Ham radio (<u>self-supporting</u>):**
  - **VHF/UHF Simplex - short range**
  - **VHF/UHF Repeaters - longer range**
  - **High Frequency (HF) - much longer range**

Amateur (Ham) Radio When all else fails

- Amateur emergency radios can be handheld, installed in your car or set up in your home.
- Amateur radio is capable of local and world-wide communications without infrastructure.
- Amateur radio can have many emergency power options.

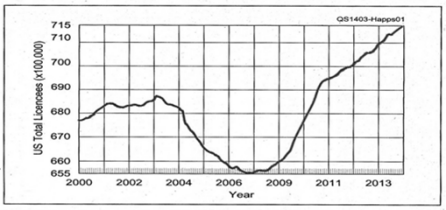
Amateur (Ham) Radio



Amateur Radio Licenses

- **Technician** – The beginner level license. Basically local line-of-sight and repeater communications. Useful for operation in emergency communications.
- **General** – The basic all-purpose license. All operator privileges on all bands with some exceptions. Includes long range (HF) bands.
- **Amateur Extra** – The "Elite" license. Privileges for all parts of all bands.

Amateur Radio Licensees on the Rise



Amateur Radio licensing data. [Joe Speroni, AHØA graphic]

U.S. - 774,543
State of Hawaii – 3,870 (1/421)
Hawaii County - 987 (1/192))
CERT – 74 (1/5)

Radio Comparisons

	Power Output	License	Range
FRS	**.5 w**	**No**	**2-3 blocks**
GMRS	**1 – 5 w**	*** No**	**“ “**
Ham Radio:			
• **Hand held**	**1 - 5 w**	**Yes**	**5 miles**
• **Mobile**	**30 - 75 w**	**Yes**	**25 miles**
• **Base station**	**100 – 1,500 w**	**Yes**	**Thousands of miles**

* Complete form; $90 fee; good for 5 yrs.

Simplex vs. Repeater Operations

- **Simplex**: Line of sight; receiving and transmitting on the same frequency.
- **Repeater**: A station, usually located on a hill or other high point that re-transmits the signals of other stations to give them greater range.
- If the electricity goes out most repeaters have backup, but their ability to maintain power to the repeater is limited, usually 10-12 hours.

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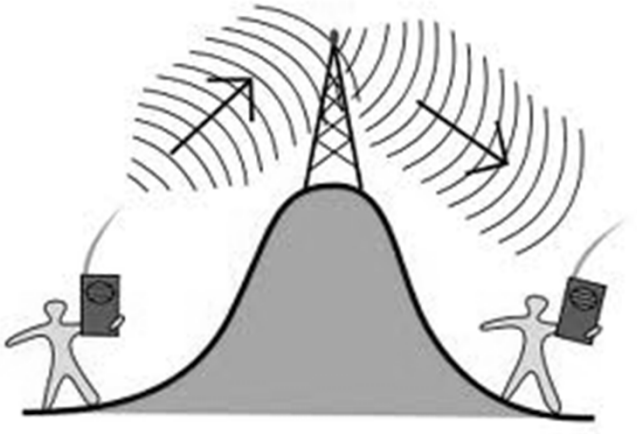
The repeater allows stations limited by terrain or distance to communicate with each other.



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Ham radio structures on Hawaii Island

- VHF/UHF repeaters
- High Frequency (HF)
- Two-way digital voice (future)
- Two-way digital text (data)

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What kind of two-way radios do you need?

- FRS, GMRS
- Handheld (Ham)
- Mobile (Ham)
- Base station (Ham)

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Ham Radio Operating Basics

- **VFO =** Allows free tuning of frequencies throughout the band you're operating in. Easy to get off frequency.
- **Memory =** Allows you to store (lock in) selected frequencies, tones, offsets and power.
- **VFO** and **Memory** are usually accessed through one **(V/M)** button.
- A frequency can be selected in the VFO mode by turning the dial or entering the frequency on the key pad.

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Ham Radio Operating Basics (Cont'd.)

- **Squelch** mutes the audio channel to suppress carrier noise (static) when signal is being received.
  - **By setting the squelch threshold above the noise level, the radio effectively silences it.**
  - **When your radio detects a signal above the squelch threshold the squelch circuit is deactivated and the signal is passed through. This is called "breaking squelch."**
  - **Having your squelch on significantly reduces power consumption.**

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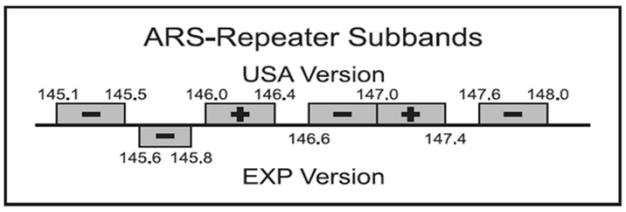
Repeater Operations – Repeater Shifts

- Repeaters use a **shift** (offset) to separate the transmission and receiving functions into 2 different frequencies. There is a separate frequency for transmitting (**input**) and one used for receiving (**output**)
- The **shift** is either + 600 kHz or - 600 kHz for the 2 meter (VHF) band; +5 MHz or -5 MHz for (UHF - 440 MHz).



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Repeater Operations – Repeater Shifts
(Cont'd.)

- Most modern radios will set the appropriate shift automatically when you activate the repeater function and enter the frequency.
- Your radio will display a (+) or (-) indicating that the shift is activated.
- Example: The Kulani Repeater has a – 600 kHz shift. In other words you *receive* (output) the signal on **146.760** MHz and *transmit* (input) on **146.160** MHz.
- The shift should be turned off for simplex. Your display should not indicate a (+) or (-).

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Repeater Operations – PL Tones

- **PL** or **CTCSS** is a sub-audible tone which when used, will selectively pass transmissions that have the same tone.
- Many repeaters require this audio tone (**PL**) to activate the repeater.
- This tone system is called CTCSS or Continuous Tone Coded Squelch System.

CTCSS TONE FREQUENCY (Hz)					
67.0	69.3	71.9	74.4	77.0	79.7
82.5	85.4	88.5	91.5	94.8	97.4
100.0	103.5	107.2	110.9	114.8	118.8
123.0	127.3	131.8	136.5	141.3	146.2
151.4	156.7	162.2	167.9	173.8	179.9
186.2	192.8	203.5	210.7	218.1	225.7
233.6	241.8	250.3	–	–	–

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Repeater Operations – PL Tones (Cont'd.)

- The appropriate tone frequency must be entered into your radio before you can transmit through a repeater that has a **PL** tone.
- Your radio will display a symbol ("TSQ" for Yaesu; " ♪" for Icom; "CT" for Baofeng) to indicate that the tone is activated.
- The Kulani repeater (**146.760**) does not have a PL tone.
- The Haleakala repeater (**146.940**) has a PL tone of **110.9.**

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Memory Function

- Your radio allows you to store selected frequencies in various numbered channels for instant recall when needed.
- It's important to use this feature in an emergency.
- General steps for setting up a frequency in memory:
  1. Select the VFO mode on your radio
  2. Select the desired frequency you wish to store in memory
  3. Be sure the proper shift (+) or (-) is indicated
  4. Set-up the PL tone, if required
  5. Select the channel number you want to use
  6. Save the setting in that memory channel

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Getting On The Air

- **Everyone is nervous the first time!**
- **It's easier than you think!**
- **And, you can even have your mother talk to your ham friends!**

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Getting On The Air

- Think of it like using your cell phone with a few added rules:

Cell phone		**Ham Radio**
Paul's Phone	1) Ring, ring, ring	"WH6FM, KH7DQ"
Paul	2) "Hello"	"WH6FM " or "this is WH6FM"
Doug	3) "How are you doing Paul?"	"How are you doing Paul?"
Paul	4) "Fine, what's up?"	"Fine, what's up?"
Doug	5) "Will you be joining the CERT Net tomorrow night?"	"Will you be joining the CERT Net tomorrow night?"

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Getting On The Air

Cell phone		**Ham Radio**
Paul	6) "Yea, I plan to participate"	"Yea, I plan to participate"
Doug	7) "OK, talk to you tomorrow night, bye"	"Roger, talk to you tomorrow night, KH7DQ"

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Getting On The Air

- If you are afraid of making a mistake or embarrassing yourself, **don't' be!** **Nobody cares** if you make a mistake!
- On your first transmission into a net you can **simply check** in by saying: "KH7DQ, in and out"
- **Use a script** for your transmissions until you're comfortable.

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Getting On The Air - Begin by listening

Net	Time	Frequency	PL Tone
Morning Net (Mon, Wed, Fri)	**8:00 a.m.**	**146.760**	**None**
ARES Net (Saturdays)	**7:00 p.m.**	**147.120**	**100.0**
Lava Net (Fridays)	**8:00 p.m.**	**147.120**	**100.0**
PERC Net (Wednesdays)	**7:00 p.m.**	**146.520**	**(simplex)**
After signal checks and short comments the Net moves to -		**147.120**	**100.0**

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Getting On The Air

- Be sure to **speak slowly** and **talk across the mike** at approximately 3" away from your mouth so everyone can understand what you are saying.

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General Radio Protocols

- When **calling a particular station** say that station's call sign followed by your own:

  e.a. "WH6FM, KH7DQ" or "WH6FM this is KH7DQ"

- If you want to **enter an existing conversation**, when there is a pause, give you call sign:

  e.a. "KH7DQ"

- If you want to **invite someone to talk with you**, give your call sign and say "listening" or "monitoring".:

  e.a. "KH7DQ listening" or "KH7DQ monitoring"

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General Radio Protocols

- In a transmission transaction **you do not have to repeat (or remember) the other person's call sign**. You're only required to say you own call sign **every 10 minutes** and **at the end of your transmission *transaction***.
- When transmitting through repeaters, hold your PTT switch down for one or two seconds before speaking to allow the repeaters to link up.
- When transmitting you can pause and release your PTT switch to see if you are doubling with someone. If you are, stop transmitting and allow the other station to complete their call.

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Net Operations - Controlled Nets

- A controlled net is a way to formalize a group of radio operators on a single frequency. If you are part of the net (i.e., checked in and acknowledged as a participating station) **all transmissions must go through the net control station (NCS) operator – "net control."**
- During the time the net is operating **you should not communicate directly with another participating station** without the permission of net control.
- **Do not begin transmitting if you have not checked into the net.** This is rude and disruptive to the net control operator and other stations on the net.

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Net Operations – Controlled Nets

- One of the Net Control Operator's job is to always have an accurate list of stations (inventory of assets) on the net. It is important to ensure that if you have checked into the net, that you remain in a position to always be called upon to assist if needed.
- If you wish to leave (be excused from) the net, particularly an emergency net, you should request permission to do so. This is so that the net control operator can keep track of who is on the net and who isn't.

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Tactical Nets

- Tactical nets are primarily used for public service events. Tactical call signs can be used such as "Aid Station 1" during the net.
- Stations use their full call sign when first checking into the net. Tactical call signs can be used thereafter providing that full call signs are given at the end of the communications **transaction**.

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Tactical Nets

- **Check in example**:

  Net Control "WH6FM Station 1, this is KH7DQ Net Control, how do you copy, over"

  Aid Station 1 "WH6FM Station 1, copy you loud and clear, over"

- **Regular traffic example after check in:**

  Aid Station 1 "Net control, this is Station 1, over"

  Net Control "Station 1, Net Control, over"

  Aid Station 1 "Request medical van be sent to my location, over"

  Net Control "Roger, medical van has been dispatched to your location with eta of 2 minutes, over"

  Aid Station 1 "Roger Net Control, thank you, Station 1, WH6FM"

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Emergency Nets

- Emergency Nets are established during periods when a disaster like a flood, hurricane, landside, earthquake or other event may, or has, stricken an area.
- When your team is called upon in an emergency you should already have standard operating instructions including primary radio frequencies that you have access to.
- Hams participate as a community service and to help save lives.

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Emergency Nets

- The rules usually include**:**
  1. Report to Net Control as soon as you can.
  2. Ask Net Control permission before you use the frequency.
  3 Use the frequency for emergency traffic, not chit-chat.
  4. Answer promptly when called by Net Control.
  5. Use tactical call signs if appropriate.
  6. Follow the protocol established by Net Control.
  7. Always request permission from Net Control to leave the net, even for a short time.

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New CERT Net

- Weekly Net will be established soon.
- Participation of at least one operator from each team.
- **Purpose:**
  1) Test radio equipment
  2) Practice radio protocols
  3) CERT announcements
  4) Get people comfortable using their radios

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Establish a Radio Comms Unit for Your CERTeam

- Appoint a Comms Officer.
- Identify the comms requirements (intra and external) that are specific to your group.
- Identify team members who have an amateur radio license and their radio equipment capabilities.
- Select a simplex frequency for local use by your team.
- Develop and implement a written Comms Plan.

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Get "Radio Active"!!

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73’ & Mahalo

Doug & Paul

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