D5 CERT
GMRS Radio Training

-

- To be presented at Mayfair Community Center on 8/31
- Will be posted on sjncert.org
- Please send your comments & suggestions
- Corrected p.59 ZELLO time (v2)

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D10 Los Paseos CERT
August 31, 2023 v2

Check out sjncert.org website

(501c3 Non-Profit)

http://sjncert.org/

Radio topics are in "Communications"

Improvements to website have been made, …More coming!

GMRS Radio Training

- Agenda
  - Review of radio basics
  - We have MURS, why do we need GMRS?
  - GMRS Radio Training - How to use Radio
  - SJ CERT Radio Frequency Assignments & Repeaters
  - How to get your GMRS license

- During this training - feel free to ask questions

- This is not official CERT or FEMA training material
- Thank you to all who have reviewed this package & provided suggestions!

GMRS Radio Training

- Agenda
  - Review of radio basics

  - In the last training, we discussed using MURS radios at the neighborhood level (Multi Use Radio Service)
    - Can also use FRS radios (Family Radio Service)

ROVER1

Review - How to use a radio

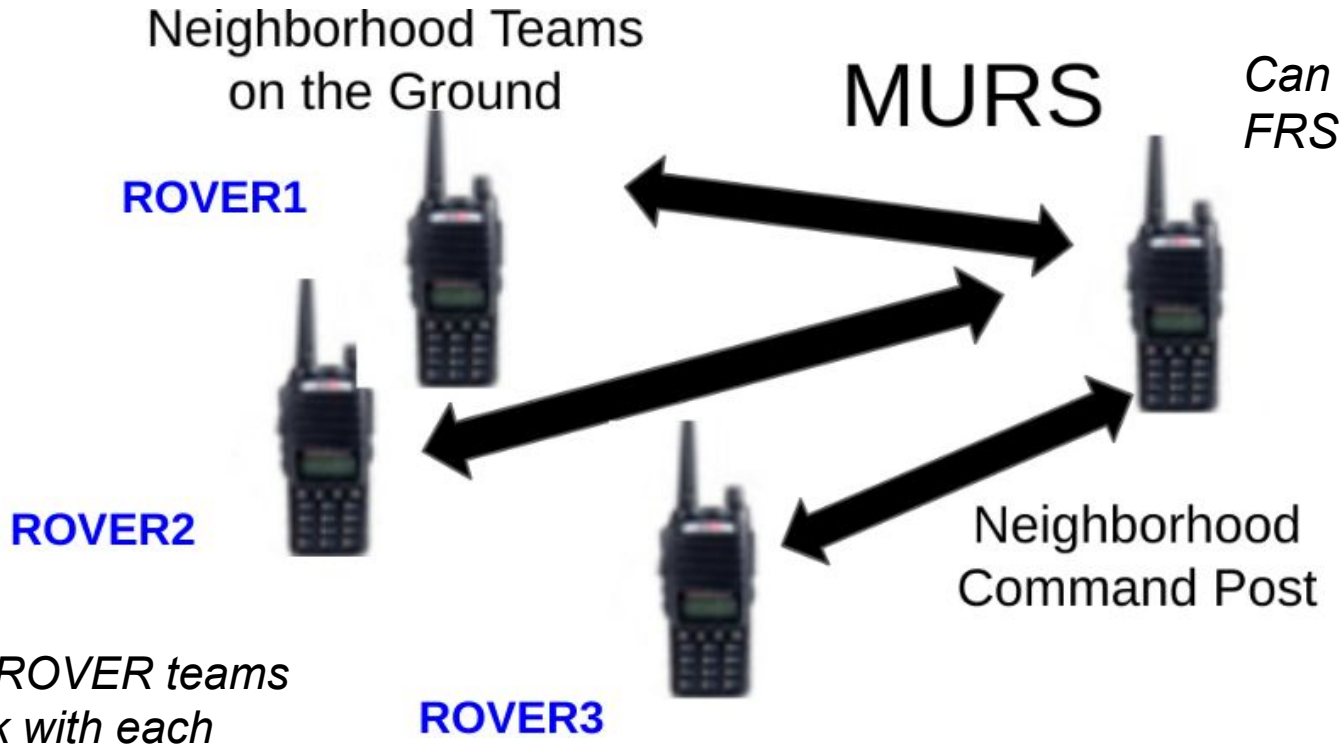
- Turn on
- Set channel
- Listen for information or status
- Talk
  - Press & hold PTT
  - Wait 2 seconds -> Speak slowly & clearly
  - Release PTT
- Listen for response

- All radios are pretty much the same, with minor differences
  - Controls
  - Features
  - Higher power
  - Different frequencies (bands) - MURS, FRS, GMRS
  - GMRS requires license

Neighborhood Use of Radios in an Emergency

- Example: CERT & Radio use during an *EARTHQUAKE*
  - Your CERT training kicks in
    - We should be prepared to be on our own for up to 72 hours
    - Make sure you & your family are safe
  - Next phase - Help our neighbors & the neighborhood
    - Set up CERT Command Post (CERTs & Neighborhood Leaders)
    - Organize Teams to assess situation in the neighborhood (Teams = CERTs + volunteers)
      - Check for injuries & building damage, do welfare checks
  - Radio is a tool for CERT
    - Use radios for communications between the Command Post & Teams on the ground

Neighborhood Use of Radios in an Emergency



All the ROVER teams can talk with each other

Radio Basics

Radios are a tool for CERT
How do radios work?

Radios Operate “Line of Sight”

- “Line of Sight”
  - Radio waves travel in a straight line from transmitting antenna to receiving antenna

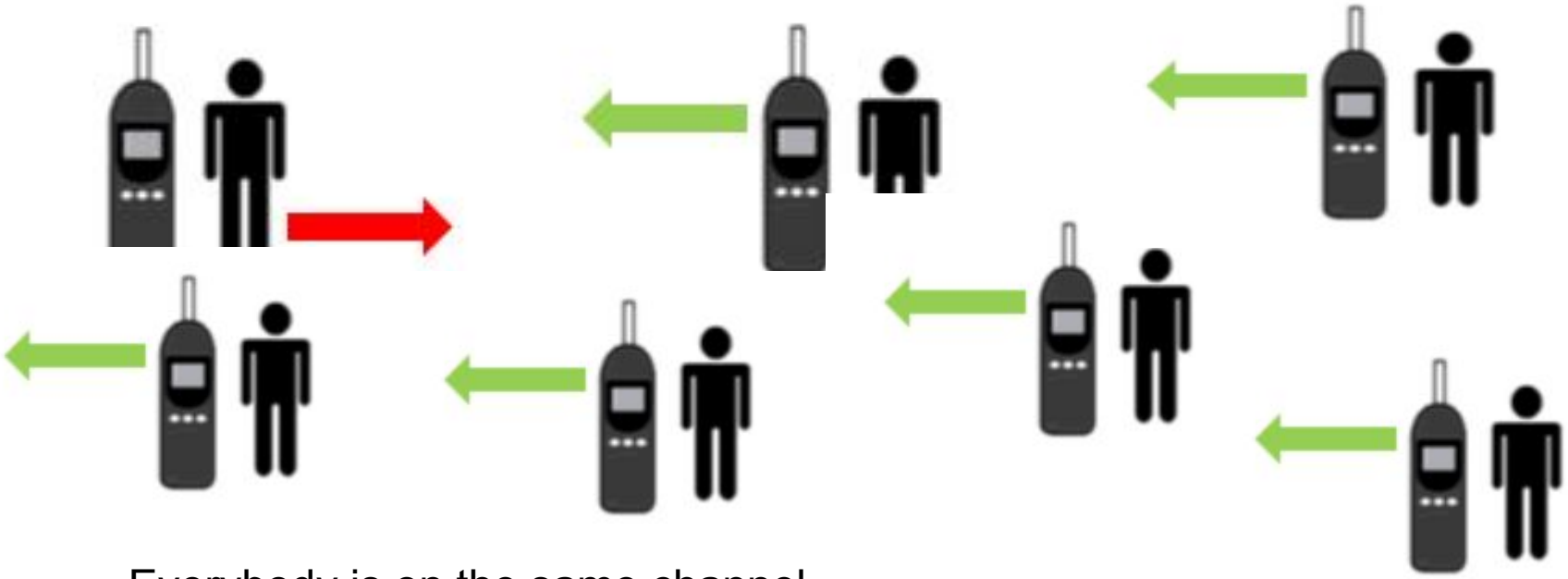
- Anything that blocks “Line of Sight” will affect how far you can talk (radio range) & how good it sounds (signal quality)

Simplex Radio Communications

- Simplex Mode
  - Radios are on the same channel
  - Talking and listening on the same channel
  - One radio talks and the other listens
  - Each radio takes turns talking

- Simplex can have more than 2 people

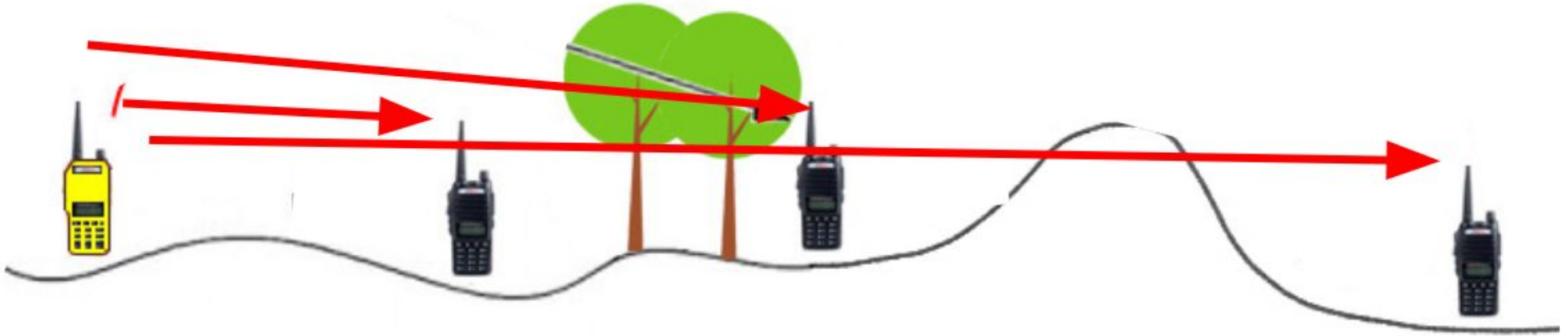
Simplex Mode
Neighborhood Command Post & Teams



- Everybody is on the same channel
  - Person farther away from transmitting radio will have less signal
  - Anything that blocks “Line of Sight” will affect signal range & quality

Limitations of Simplex

Anything that blocks line of sight -> limits radio range & signal quality



Good **Marginal** **Poor**

A **B** **C**

(genoak.org)

Relaying Messages when Not in Range

Command Post CP1 | Command Post CP2 | Command Post CP3

- CP2 can talk with CP1 and CP3
  - CP3 can talk with CP2, but not CP1

- How does CP3 communicate with the CP1?
  - Answer: Relay the message thru CP2
    - CP3 passes information to CP2
      - CP2 “relays” to CP1

(fema.gov)

GMRS Radio Training

- Agenda
  - We have MURS, why do we need GMRS?

Why we need GMRS radios?

- MURS radios are good for your local neighborhood
  - Communications between Command Post & Teams
  - Everyone can use MURS radios - license is not required
  - MURS radios are inexpensive
- MURS cannot transmit over long distances -> they are low power
- You will need higher power radios to reach outside of your neighborhood
  - GMRS = General Mobile Radio Service
  - Amateur Radio (aka “Ham”)
- Both require a license to operate, plus Ham requires a test
  - **In this presentation, we will focus on GMRS**
- Note: MURS & GMRS cannot talk with each other (different frequencies)

Why do GMRS radios have greater range?

- **GMRS radios are allowed to use higher power**
  - WIll have greater transmission range

Radio Type	Power	Range (Miles) *Handheld to Handheld
MURS Handheld	2 Watts max	0.5*
GMRS Handheld	5 Watts	2*
GMRS Mobile	20 to 50 Watt max	5+

- Radio range depends on surrounding terrain & structures, antenna, weather, etc.

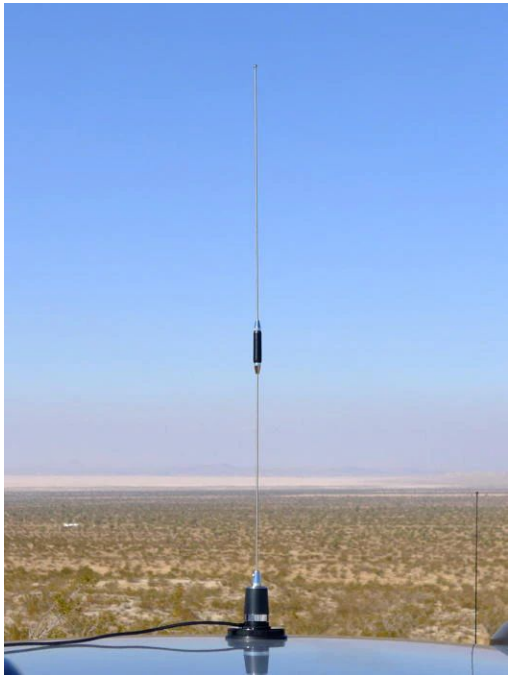
Handheld & Mobile Radio

Mobile Radio (requires battery/ power supply and antenna)

Handheld Radio (walkie talkie, HT = Handie Talkie = Handheld Transceiver, Handheld 2 way radio)

Mobile & Base Station Antennas

Mobile antenna with magnetic mount on top of a vehicle roof (not permanent)



Can move vehicle to a higher elevation to improve range

Base antenna on top of a roof

Antennas for Field Operations

Base antenna on extendable painter's pole

Handheld radios can be connected to a mobile or base station antenna

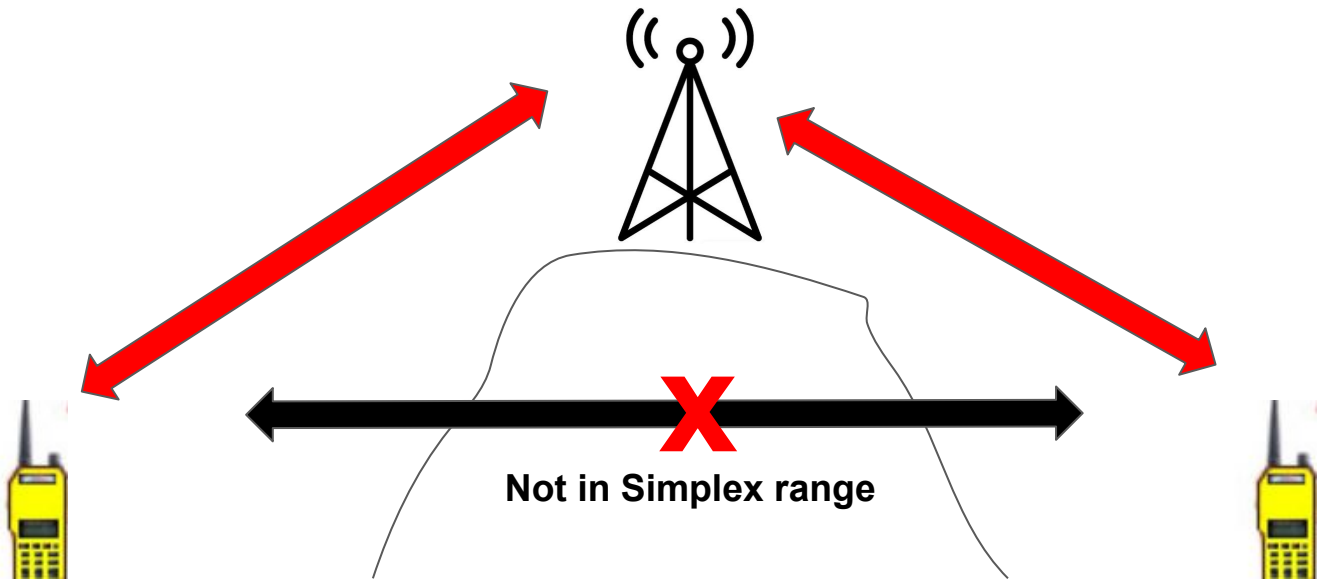
Using Repeaters to extend range

- A GMRS repeater is a radio system which can extend the range between radios
  - How do repeaters work?
    - Repeater receives the radio signal on one channel and
    - Repeater re-transmits the same radio signal on another channel
    - A repeater is
      - At a higher elevation
      - Has higher power (up to 50 watts)
  - This allows radios using the repeater to have a greater range

- **A GMRS handheld radio has a range ≅2 mile range (handheld to handheld)**
  - **A handheld using a GMRS repeater has a range of ≅10+ mile range**

- MURS & FRS radios do not have repeater capability

Radio Repeater



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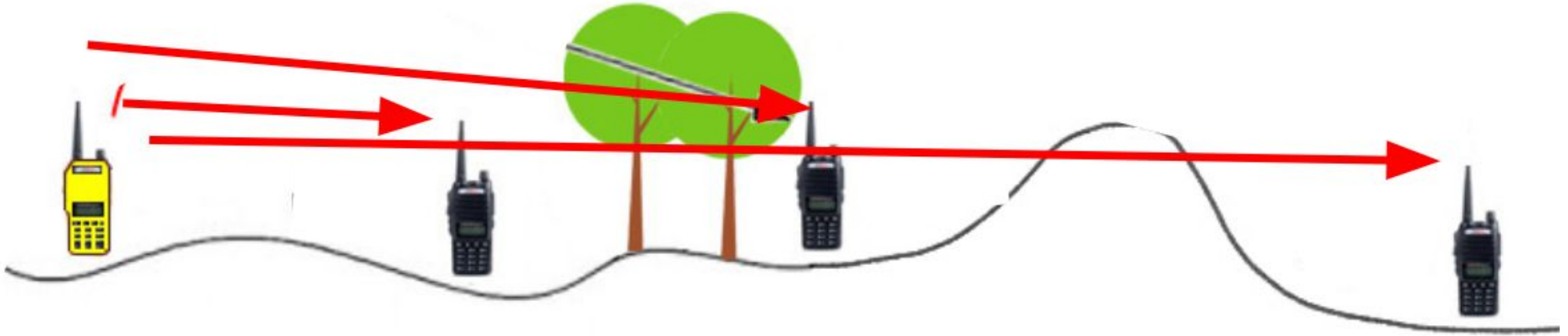

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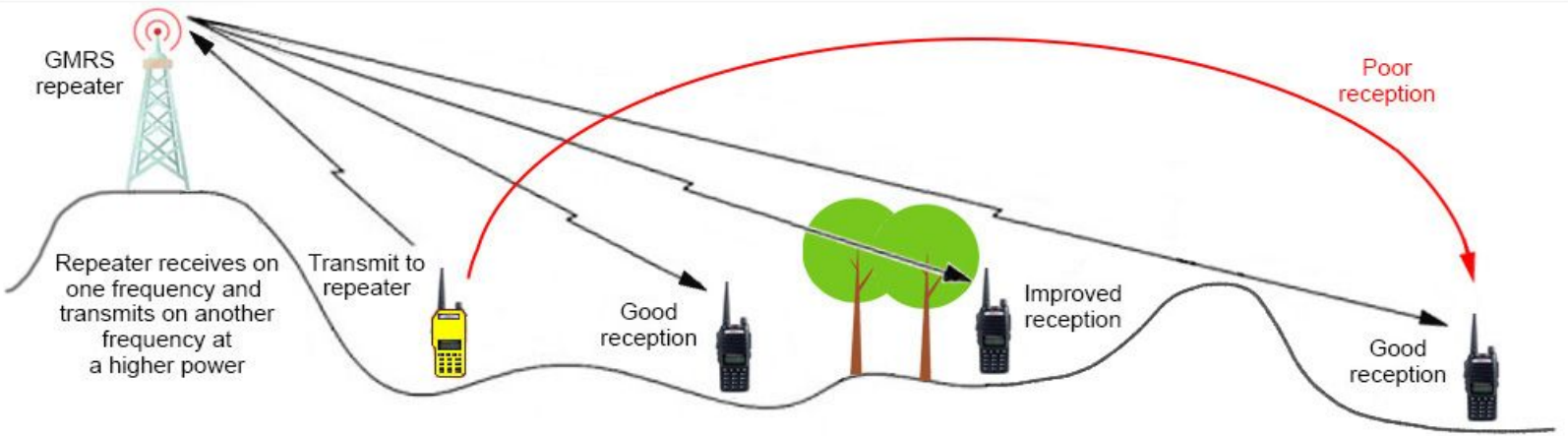
Radio Repeater



- A GMRS repeater increases radio range
  - Higher elevation -> better line of sight
  - Repeater has higher power

Recap: GMRS Radio have longer range

- Why do GMRS radios have longer range?
- Simplex Mode
  - GMRS radios have higher power
- GMRS can use repeaters
  - Repeaters are at higher elevation & higher power
    - Higher elevations means better line of sight

CERT radio communications within a District

RADIOS

GMRS MURS

GMRS & MURS cannot talk with each other

District Level Radio

Simplex Mode

Your Neighborhood

Neighborhood Teams on the Ground

MURS

Neighborhood Command Post (NCP)

Zone Command Post (ZCP)

District Command Post (DCP)

GMRS

Reporting up the Chain of Command

Chain of Command

- In a major disaster -> Traditional communications may be DOWN
- ***Use radios to report information up the Chain of Command***
  - To provide information on neighborhood condition & status
  - To request aid and support
- Having radios will not guarantee we will be able to reach the city level and get emergency services
  - But we need to be prepared

Neighborhood Readiness

- How are different neighborhoods doing?
  - Progress varies from neighborhood to neighborhood
    - CERT training
    - ICS (Incident Command System) training - *FEMA self study
    - Emergency supplies - community & individuals
    - Radio readiness
    - Organization within your district
      - Neighborhood Command Posts)
      - Neighborhood Zone Command Posts)
      - District Area Command Post(s))

    Reporting up the Chain of Command
  - Who can help with this?
    - Neighborhood Associations & Community Leaders
    - City Councilmember & other elected Officials

*FEMA (Federal Emergency Management Agency)
ICS 100 - introductory course
https://training.fema.gov/is/courseoverview.aspx?code=is-100.c&lang=en

RADIOS

GMRS MURS

GMRS & MURS cannot talk with each other

District Level Radio

Simplex Mode ->
NCP unable to reach ZCP

District Command Post (DCP)

Zone Command Post (ZCP)

Your Neighborhood

Neighborhood Teams on the Ground

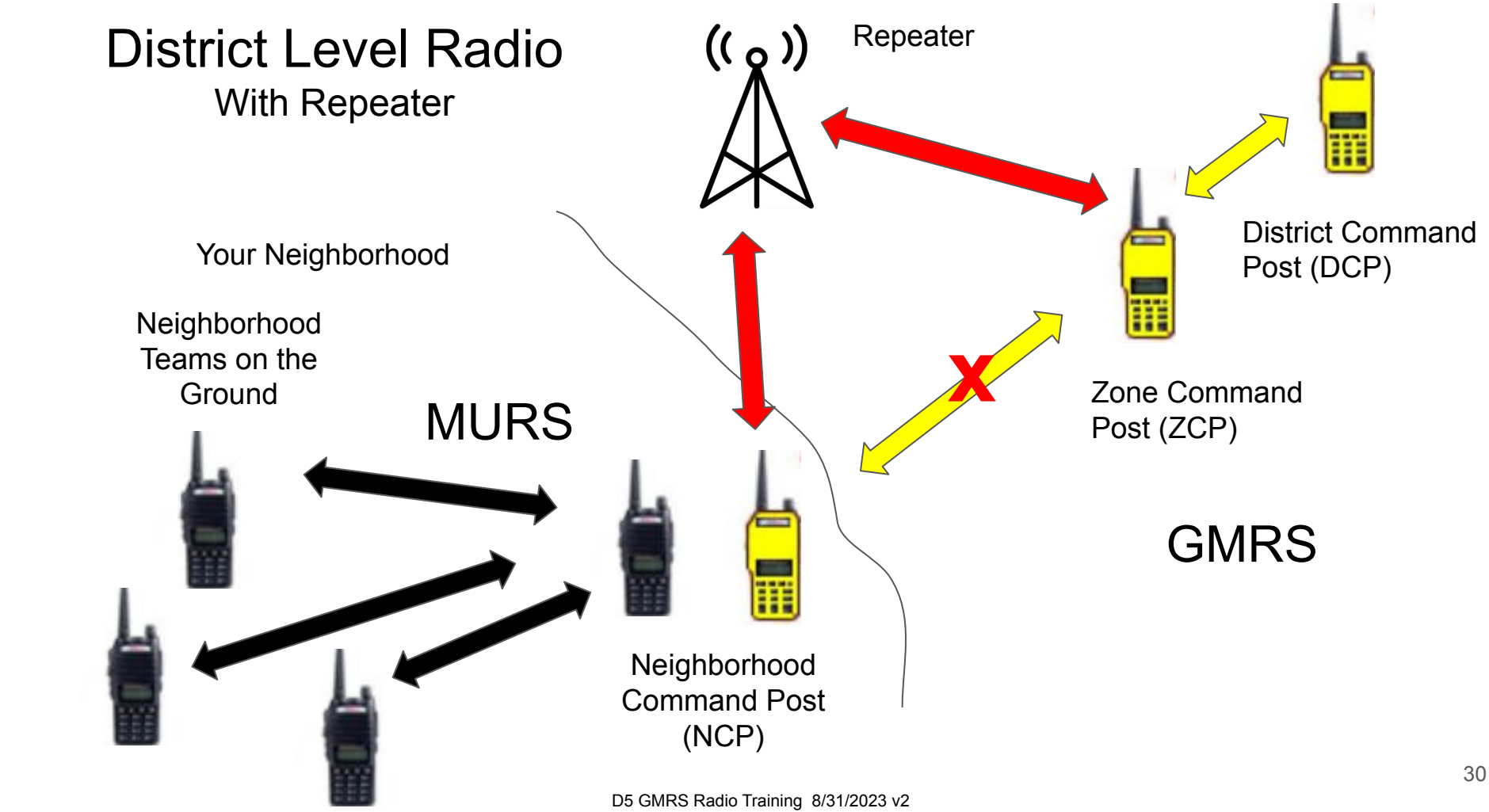
MURS

Neighborhood Command Post (NCP)

GMRS

Reporting up the Chain of Command

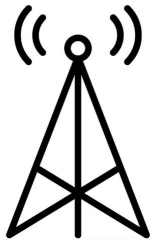
District Level Radio
With Repeater



District Level Radio

With Repeater ->

Repeaters are great, but…



Repeater

District Command Post (DCP)

Your Neighborhood

Neighborhood Teams on the Ground

MURS

Neighborhood Command Post (NCP)

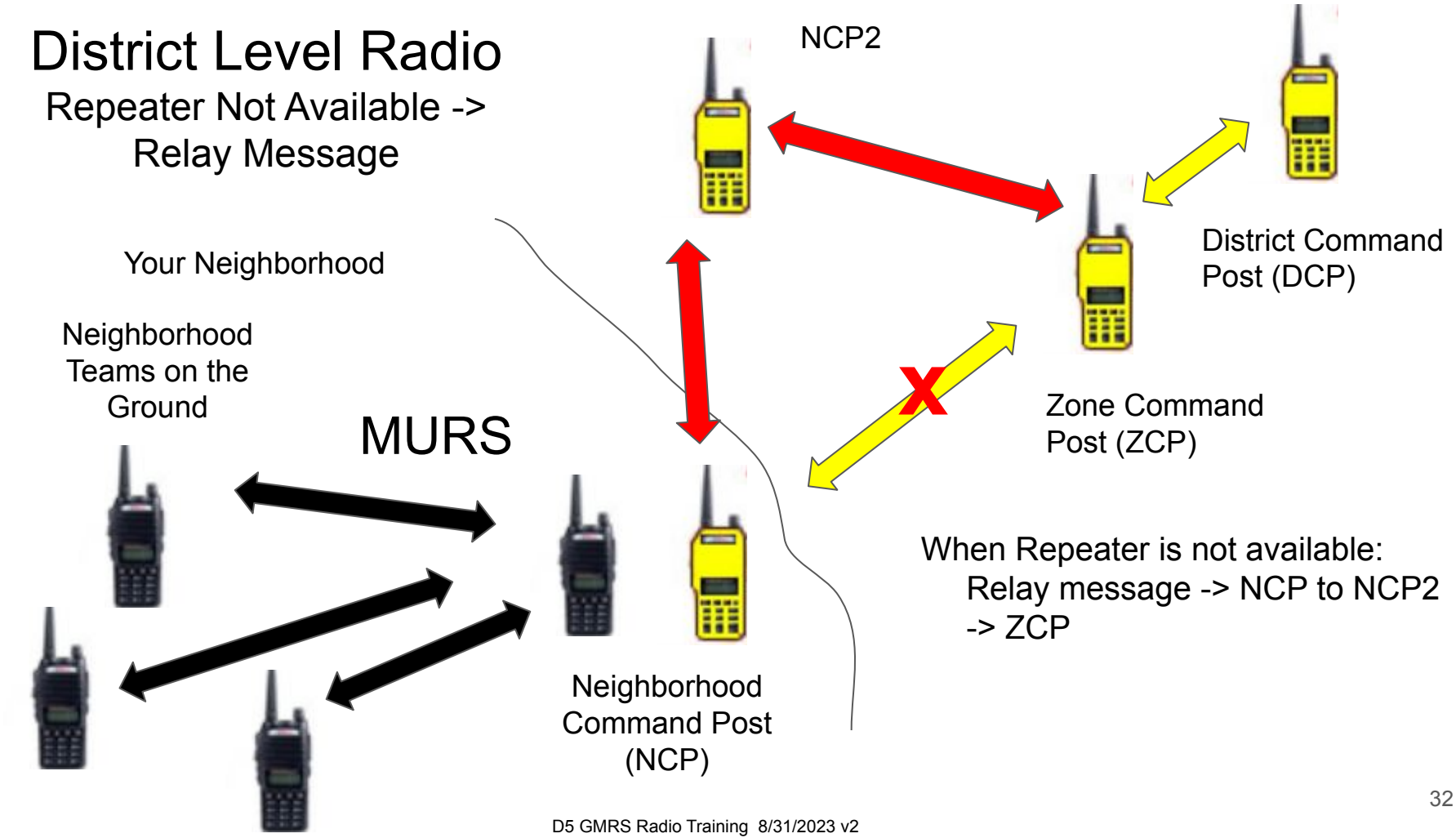
Zone Command Post (ZCP)

Repeaters can extend radio range! During an Emergency, repeaters will be a limited resource -> Use simplex whenever possible in an Emergency!

During a disaster, a repeater may go offline! Typically located on a hillside & wildfire may damage

District Level Radio

Repeater Not Available -> Relay Message



When Repeater is not available:
Relay message -> NCP to NCP2 -> ZCP

GMRS Radio Training

- Agenda
  - GMRS Radio Training - How to use Radio

Radio Training - How to use GMRS Radio

- This material builds upon the knowledge you have learned from the MURS Radio Training

- Purpose of this section
  - Train you (Neighborhood Leaders) on use of GMRS radio
    - Using Wouxun KG-905G as an example
      - Wouxun = pronounced Ou Xun (sounds like “ocean”)
    - 905G is the big brother of the very popular KG-805G
      - Basic principles covered here apply to most radios
  - Provide you with knowledge to train your neighbors & team members
  - Principles discussed here will apply to other radio models & types

- GMRS = General Mobile Radio Service
  - A license is needed to operate a GMRS radio
    - Cost $35/10 yrs (good for your entire family)
    - Instructions are in the back section (my un-official instructions)

GMRS License - Covers you & your family

- GMRS license needed to operate a GMRS radio
- License cost is $35 and good for 10 years
  - You get license from Federal Communications Commission (FCC)
  - No test is required for license
- You and your entire family can use the license
    - Any individual who holds an individual license may allow his or her immediate family members to operate his or her GMRS station or stations. Immediate family members are the licensee's

      spouse, children, grandchildren, stepchildren, parents, grandparents, stepparents, brothers, sisters, aunts, uncles, nieces, nephews, and in-laws.

GMRS - Technical

- Some technical things about GMRS
  - There are 30 GMRS channels (≅462-467 MHz)
    - 22 simplex channels
    - 8 repeater channels
  - Transmitter power up to 50 watts
    - Handheld radios - 5 watts (0.5 watt on some channels)
    - Mobile radios - 20-50 watts (not allowed to use the above 0.5 watt channels)
  - GMRS handheld radios have removable antennas
    - Connecting to a vehicle mobile antenna or base station antenna will increase its range
  - FCC requires GMRS radios to be “part 95E” certified

- For details, see GMRS Technical & Legal in the back section
- Links for the 905G & 805G user manual are in the back section (radios come with the manual)

Highly Rated GMRS Radios

	Wouxun KG-805G	Wouxun KG-905G
	Most Popular	
Cost	$100	$120
Power (spec)	5 Watts	5 Watts
Channel Memory	128 (more than enough)	256
Battery Capacity	1700 mAH	2600 mAH
USB-C Charging	No	Yes*
Water Protection	IP55** (Good)	IP66** (Better)
Size		A little bigger

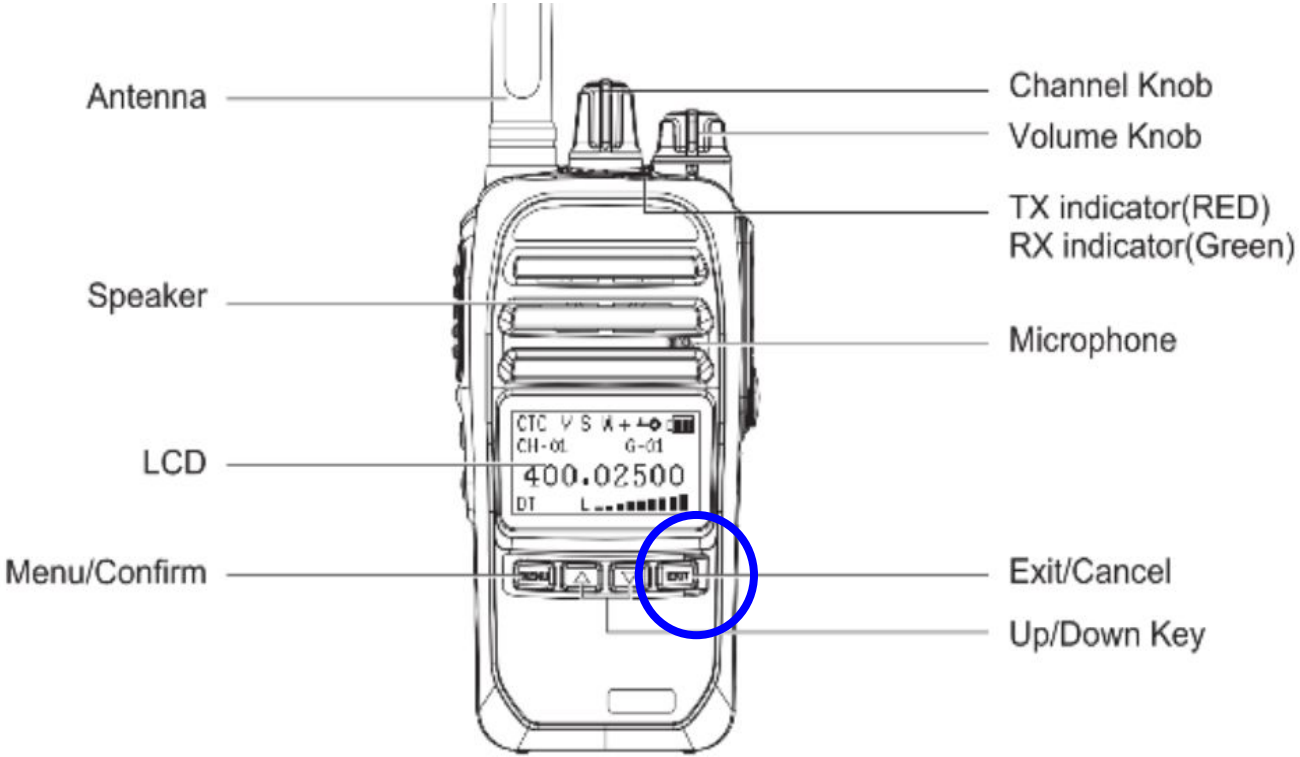
- *Not advertised, radio we received has USB-C charging
- **Not submersible
- Antenna upgrade: Nagoya NA-771G (with SMA-F connector) $20

How to use a radio (Picture is MURS RT21V)

- Turn on
- Set channel
- Listen for information or status
- Talk
  - Press & hold PTT
  - Wait 2 seconds -> Speak slowly & clearly
  - Release PTT
- Listen for response

- Using a GMRS radio is basically the same
  - License required
  - **You need to periodically announce your FCC Call Sign (assigned to you with your license)**

Wouxun KG-905G



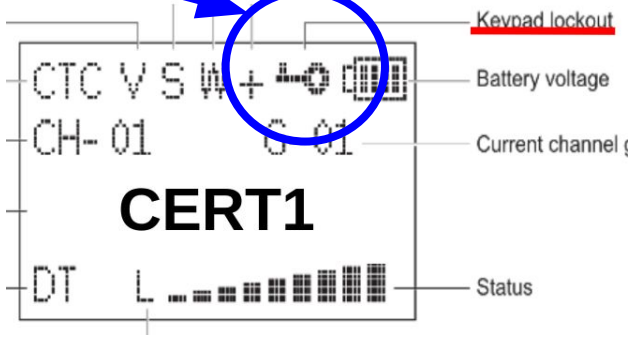
Wouxun KG-905G has Auto Lock

- This radio has been programmed to include:
  - SJ CERT channels
  - Auto Lock the Channel Knob & Front Panel controls (after 30 seconds)

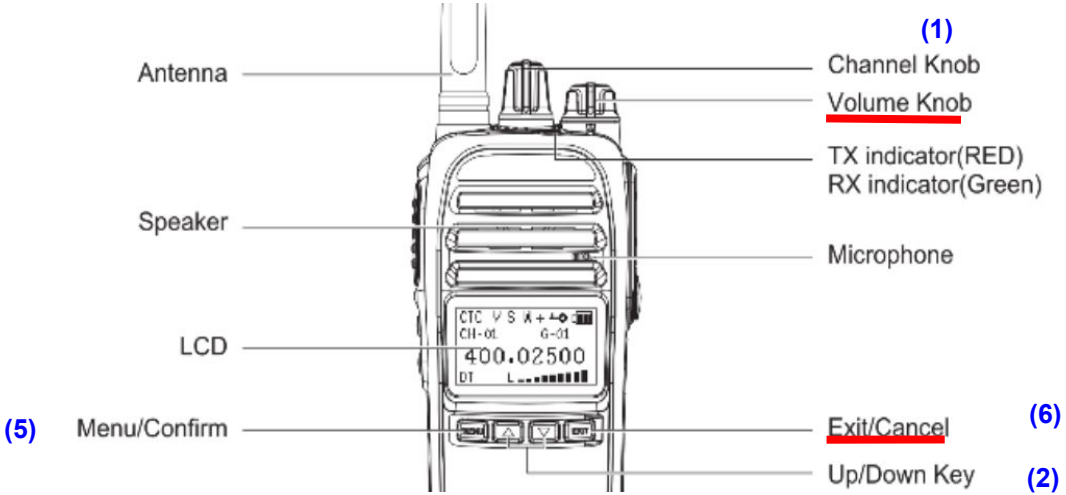
- This is to prevent accidentally
  - Changing the channel
  - Entering the “Menu” mode (to change internal settings)
  - Display will show **KEY** symbol when locked

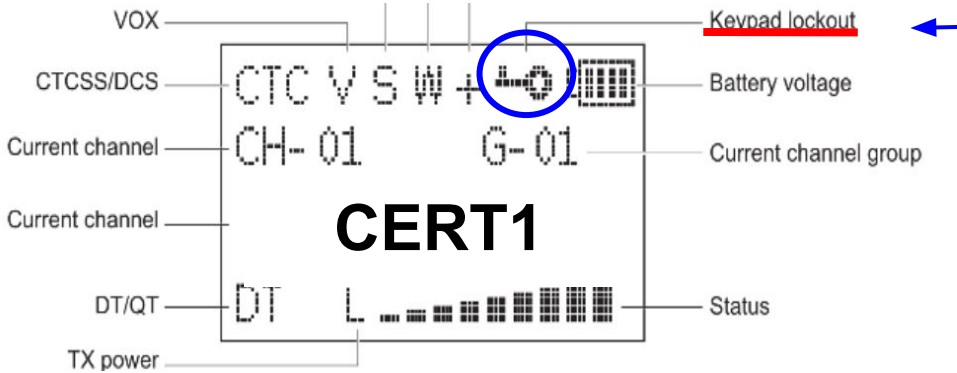
- **To Lock and Unlock**
  - **Press/Hold EXIT**

- You can customize or disable the Auto Lock
  - Not recommended to disable



KG-905G Cheat Sheet





Volume Knob - **On/Off** & Volume

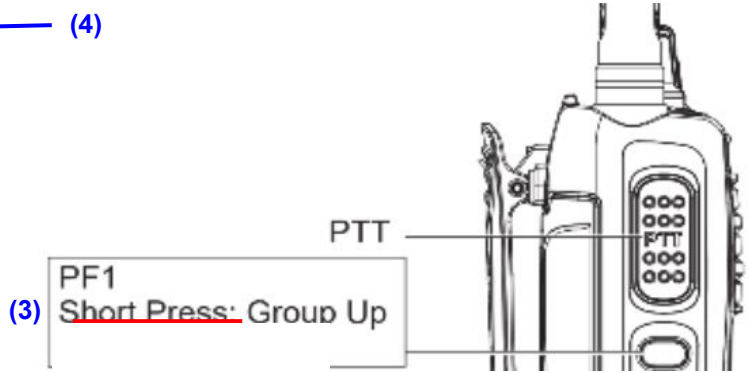
Lock/Unlock Keypad - Press/Hold **(6)** "**Exit**"
-> Display will show "key" if Locked **(4)**
Radio will auto-Lock Keypad after 30 sec.

Change Channel - **(1)** Channel Knob or
(2) Up//Down Key, also **(3)** PF1 (short press) on left side for Group Up

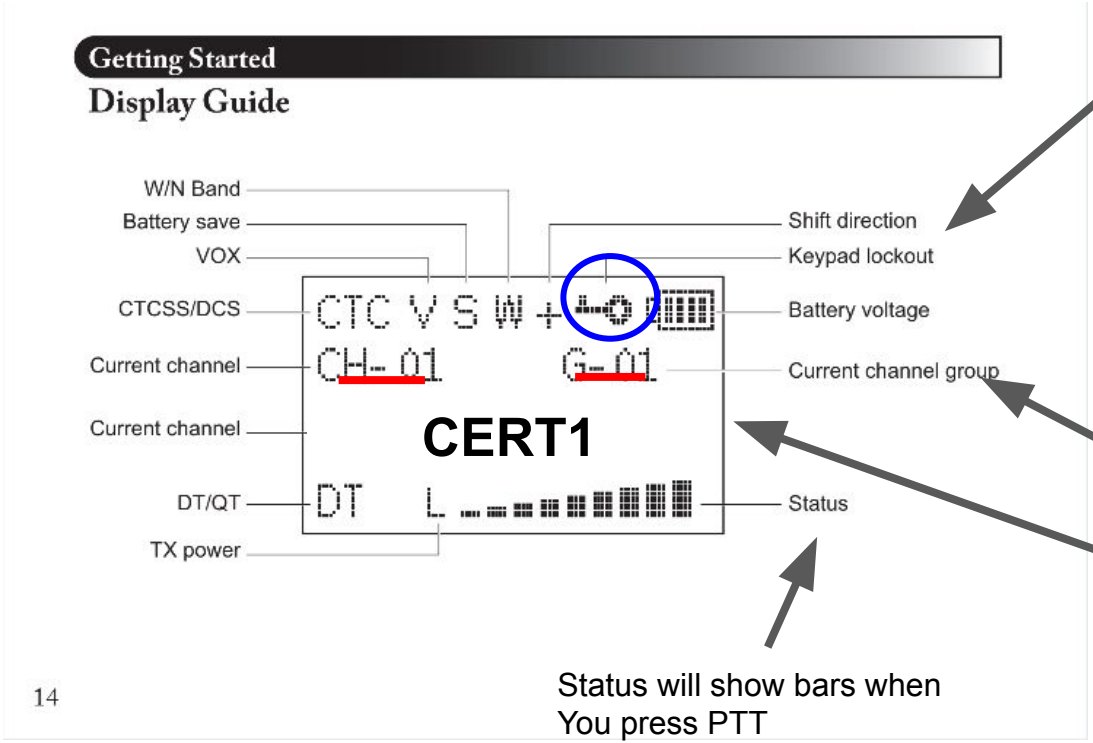
This display will show Current Channel = Channel Name (example: CERT1)

If you accidentally press **(5)** "Menu" (display will show internal settings -> Press "Exit"

PTT - Big button on left side



Wouxun KG-905G LCD Display



Keypad Lockout: (**Key symbol**)

- When locked, you cannot change channel with Channel Knob & Up/Down Key (Also disables "Menu")
- Press/Hold Exit" to lock keypad
- Press/Hold "Exit" to unlock keypad

After changing channel, best to Lock Keypad (to avoid accidentally changing Channel & pressing "Menu")

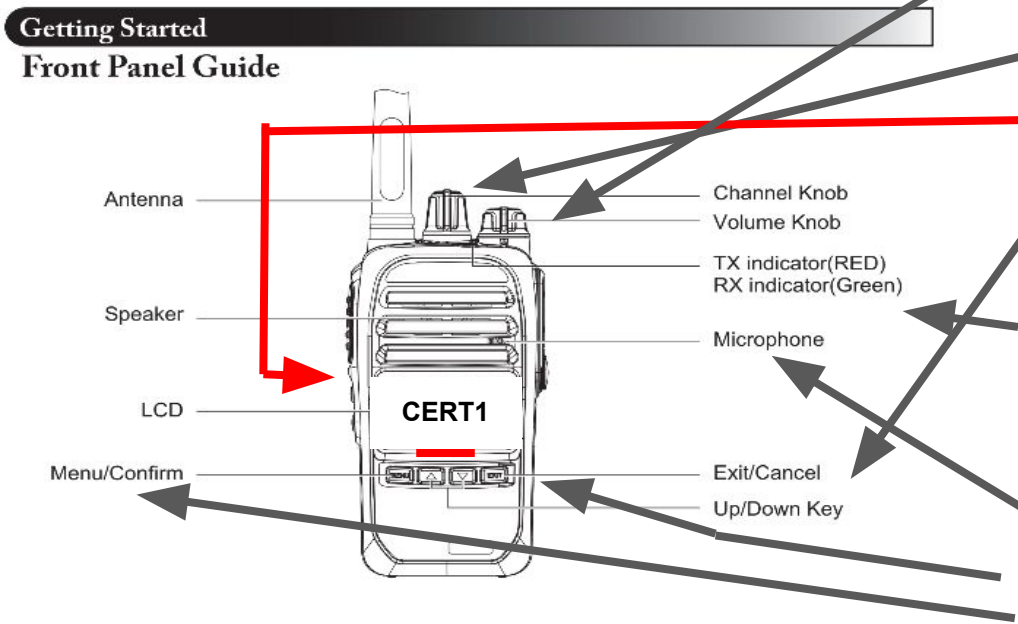
Current Channel & Group - Indicates channel **CH (Channel) & G (Group)**

Current Channel - Radio is programmed to show channel "NAME"
Examples: CERT1, CERT2, BANDIT, D5-19, TAC18

Status will show bars when You press PTT

wouxun.com

Wouxun KG-905G Front Panel



Volume Knob - **On/Off** & Volume (short knob)

How to change channel:

- Channel Knob (tall knob)
- **Up/Down Key**
- PF1 (Short Press) Channel **Group Up** (on Left Side of Radio)

If unable to change -> keypad is locked
Lock/Unlock - Press/Hold "Exit" (see display) -> Lock after changing channel

Indicator Light

- Transmit (Tx) = **RED** (display "status" will also show bars)
- Receive (Rx) = **GREEN**

Microphone - Note microphone opening

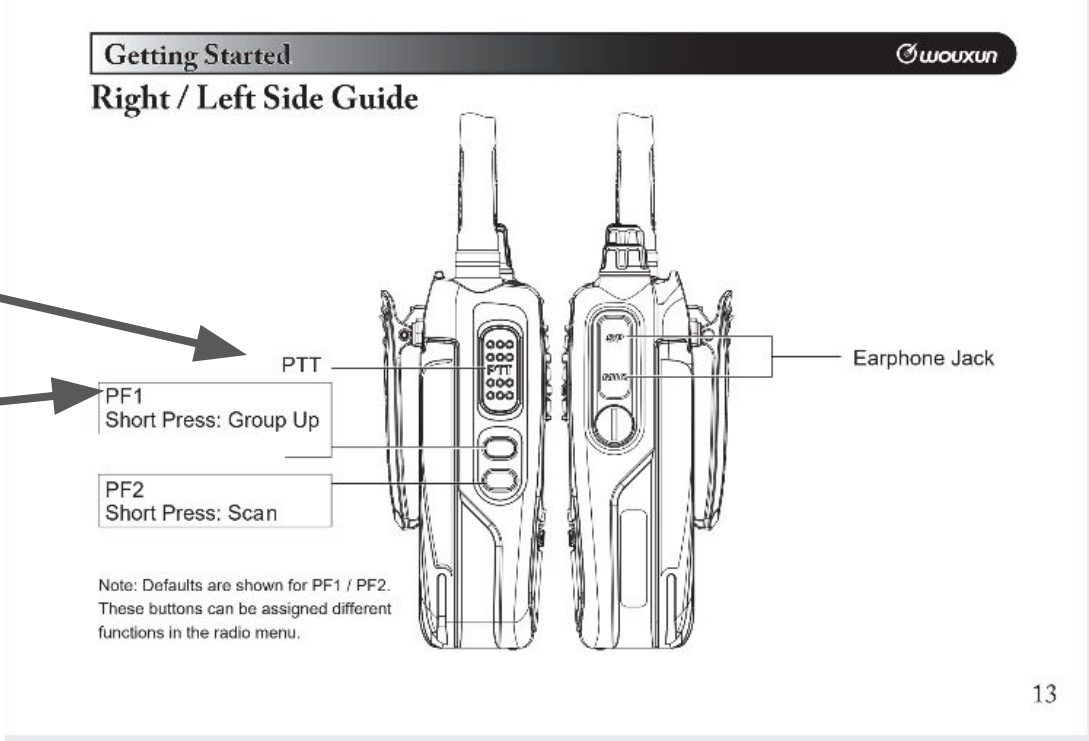
Lock/Unlock - Press/Hold "Exit" (see display)
Do not press "Menu" unless you want to change Internal radio settings
If you accidentally press "Menu" -> press "Exit"

Wouxun KG-905G Right/Left Side

LEFT SIDE
PTT (Push to Talk)

PF1 (Short Press)
Channel Group Up

Note: This radio does not have a "Monitor or "Moni" function button



wouxun.com

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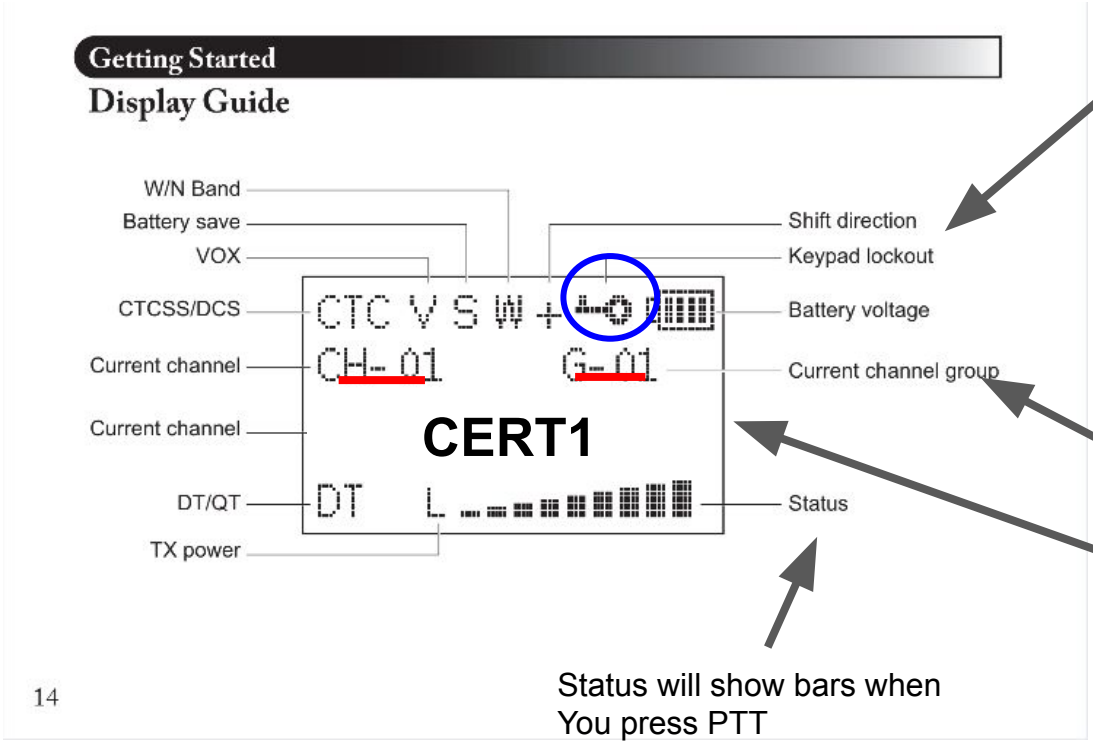

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Examples: CERT1, CERT2, BANDIT, D5-19, TAC18

Status will show bars when You press PTT

wouxun.com

Your FCC GMRS Call Sign

- You will be assigned a **FCC GMRS Call SIgn** with your license
  - Call Sign format: 4 Letters & 3 Numbers -> **A B C D 1 2 3**
  - You should memorize your Call Sign

- FCC requirement:
  - Announce your Call Sign at the end of your transmission and
  - Every 15 minutes (if transmissions longer than 15 minutes)

- **Assign Tactical Call Signs for CERT & emergencies events**
  - A Tactical Call Sign is a descriptive & functional identification
    - Example: Command Post, Rover1, Shelter3, etc.
    - You still need to use your FCC Call Sign

.

Best Practice: Announcing your Call Sign

- “Best Practice” is to clearly identify who is speaking at the beginning
  - Also follow FCC rule for announcing at the end

- For **CERT & emergency events**: Use Tactical Call Sign & your FCC Call Sign
  - At beginning of transmission -> use Tactical (**Rover1**)
  - At end of transmission -> use both Tactical & FCC GMRS (**Rover1, ABCD123**)
  - Every 15 minutes -> both Tactical & GMRS

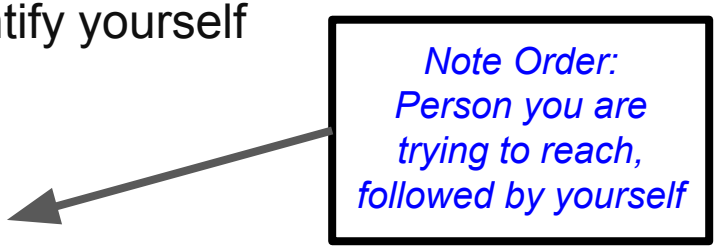
- If your are using MURS or FRS -> Also assign Tactical Call Signs and announce at beginning & end of transmission

Best Practice: Announcing your Call Sign (cont.)

- For a general use: Use your FCC Call Sign
  - At beginning of transmission -> use FCC GMRS Call Sign (**ABCD123**)
  - At end of transmission -> use GMRS (**ABCD123**)
  - Every 15 minutes -> use GMRS (ABCD123)

Examples of Radio Exchanges

- Identify who you are trying to reach and identify yourself
- Acknowledge that you heard transmission
- Repeat back critical information
- Use NATO phonetic alphabet



Rover1	Command Post, (this is) Rover1.
Command Post	Rover1, go ahead.
Rover1	Bernal Shelter needs water bottles and blankets.
Command Post	Roger, Rover1. Shelter needs water and blankets.
Rover1	Clear, Rover1, ABCD123.

Command Post	All stations, (this is) Paseos Net Control, for health and welfare check. Please respond with your status. Rover1, status
Rover1	Rover1 location is 1234 Sea Court. I spell SIERRA ECHO ALPHA Court. Continuing damage assessment.
Command Post	Copy, Rover1.
…	…

Examples of Radio Exchanges

Rover1	Rover1 with emergency traffic.
Command Post	This is Paseos Net Control, go ahead.
Rover1	We have a downed power line at Avenida Rotella and Via Del Oro.
Command Post	Break. Any station in vicinity of Fire Station 28, advise Duty Officer of downed power line. Report back when completed.
Rover2	Rover2 with update.
Command Post	Paseos Net Control, go ahead.
Rover2	I am at Fire Station 28, informing Duty Officer about downed power line.
Command Post	Roger, Rover2.
…	…

- Identify who you are trying to reach and identify yourself
- Acknowledge that you heard transmission
- Repeat back critical information
- Use NATO phonetic alphabet

Relaying Messages (2)

Command Post CP1 | Command Post CP2 | Command Post CP3

- Knowing who the message is for and from is important for relaying messages

(fema.gov)

Radio Programming

- Your KG-905G radio has been programmed & ready to go
  - We have included local SJ CERT channels
  - Programmed to Auto Lock (Press/Hold “Exit” to Lock/Unlock)

- GMRS radios typically “may” require re-programming to update repeaters & channels
  - Near-term: sjncert.org can help
  - Long-term: You should have 2+ people local in your district to do programming (we can help train)
    - Scenario: We distribute an update file & your local team can re-program the radios (this will minimize radio downtime)

- More details on Radio Programming in the back section

GMRS Radio Training

- Agenda
  - SJ CERT Radio Frequency Assignments & Repeaters

KG-905G Channel Assignments

STANDARD GMRS CHANNELS (No PL Tones)						SJ CERT GMRS CHANNELS (With PL Tones)								
CH	G	NAME	CH	G	NAME	CH	G	NAME	CH	G	NAME	CH	G	NAME
1	01	GMRS01	1	03	GMRS15	1	05	D1-15	1	06	TAC15	1	07	CERT1
2	01	GMRS02	2	03	GMRS16	2	05	D2-16	2	06	TAC16	2	07	CERT2
3	01	GMRS03	3	03	GMRS17	3	05	D3-17	3	06	TAC17	3	07	CERT3
4	01	GMRS04	4	03	GMRS18	4	05	D4-18	4	06	TAC18	4	07	BANDIT
5	01	GMRS05	5	03	GMRS19	5	05	D5-19	5	06	TAC19	5	07	ZELLO
6	01	GMRS06	6	03	GMRS20	6	05	D6-20	6	06	TAC20			
7	01	GMRS07	7	03	GMRS21	7	05	D7-21	7	06	TAC21			
1	02	GMRS08	8	03	GMRS22	8	05	D8-22	8	06	TAC22			
2	02	GMRS09	1	04	RPT15	9	05	D9-15	10	06	CALL			
3	02	GMRS10	2	04	RPT16	10	05	D10-16	11	06	SJ OEM			
4	02	GMRS11	3	04	RPT17				13	06	W6UU			
5	02	GMRS12	4	04	RPT18				14	06	WA2IBM			
6	02	GMRS13	5	04	RPT19									
7	02	GMRS14	6	04	RPT20									
			7	04	RPT21									
			8	04	RPT22									

For channel details, see San Jose CERT Radio Frequency Assignments (sjncert.org) http://sjncert.org/?page_id=799

The last 2 digits in the NAME refers to a frequency

On your radio display

CH = Channel No. (CH-xx)

G = Channel Group (G-xx)

NAME = Channel Name

Note: Your Wouxun KG-905G is programmed with these channels

G = 01-03 - Standard GMRS Simplex channels (no tones)

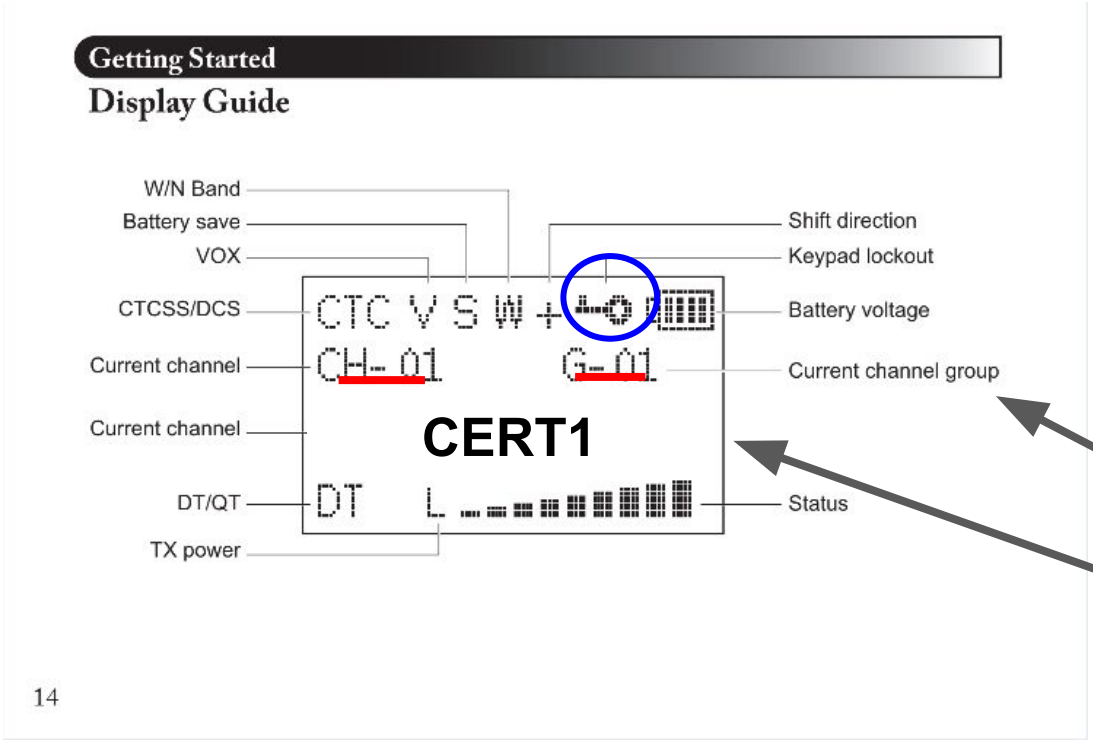
G = 04 -Standard GMRS Repeater channels (no tones)

G = 05 - SJ DISTRICT Simplex (w/tones)

G = 06 - SJ TACTICAL, Simplex (w/tones); (CALL & SJ OEM are tbd), Listen only Ham W6UU (SJRACES) & WA2IBM

G = 07 - SJ CERT repeaters

Wouxun KG-905G LCD Display



Channel Identification

Current Channel & Group - Indicates channel **CH (Channel) & G (Group)**

Current Channel - Radio is programmed to show channel “NAME”
Examples: CERT1, CERT2, BANDIT, D5-19, TAC18

wouxun.com

SJ CERT Simplex Channels - Which to use?

- **DISTRICT Channels** (G05)
  - For use within your District
    - Examples:
      - District 5 use District channel D5-19
      - District 10 use District channel D10-16

- **TACTICAL Channels** (G06)
  - For between Districts or backup/secondary for your District
    - Example:
      - Use channel TAC18 for backup (or other TAC channels)

- **The last 2 digit in the Channel NAME refers to a frequency**
  - **Avoid using channels with same last 2 digits in the same area**
  - Example: Do not use D1-**15** and TAC**15**
    - OK to use D1-**15** and any TAC channel other than TAC**15**

    - **Why? Channels with the same frequency nearby can interfere**

Details on Channels

- # KG-905G Channel Assignments

STANDARD GMRS CHANNELS						SJ CERT GMRS CHANNELS						
CH	G	NAME	CH	G	NAME	CH	G	NAME	CH	G	NAME	CH
1	01	GMRS01	1	03	GMRS15	1	05	D1-15	1	06	TAC15	1
2	01	GMRS02	2	03	GMRS16	2	05	D2-16	2	06	TAC16	2
3	01	GMRS03	3	03	GMRS17	3	05	D3-17	3	06	TAC17	3

- In the Channel NAME -> last 2 digits refer to a frequency
  - In the same area, avoid using channels with the same 2 digit suffix to avoid interference
  - Example:
    - Do not use D1-**15** and TAC**15**
      - OK to use D1-**15** and any TAC channel other than TAC**15**

Standard GMRS Channels

- Use Standard GMRS Channels with radios which have not been programmed with SJ CERT channels
  - Radios usually come this way from the factory
  - The Standard Channels do not have PL Tones
- Standard Channels should allow you to talk with radios which do not have the SJ CERT channels

- **PL tone = “Privacy Line” Tone** (Tone or CTCSS or DCS)
  - If your channel is set with a PL Tone -> your radio can only hear other radios using the same tone
    - **Your conversation is NOT private**
    - **Other radios without a PL Tone can hear you**
  - **Do not say anything personal or confidential on your radio!**

Weekly CERT GMRS Radio Check-ins (corrected 083123)

http://sjncert.org/?page_id=799

Repeater	Date/Time	Location	Notes	Comments
CERT2*	Tue. / 6:50 PM	Willow Glen	Backup	*Set up by J. Nourse ** Private repeaters, Owners allow CERT use Bandit = SJ CERT SmokeyBandit
CERT1*	Tue. / 7:00 PM	Mt. Pleasant	Backup	
CERT BANDIT**	Tue. / 7:15 PM	Alum Rock	Primary	
ZELLO**	Sat. / 2:50 PM	Santa Cruz Mtn	Primary	
SJ OEM (CERT3)	Not online yet; eta early 2024?	Senter/Phelan (1)	Primary	SJ OEM bldg under construction (1)

These first 4 repeaters are set up by private individuals using their own funds.
Thank you John (CERT1/2), Ken (Bandit) and Marcos (Zello)!

Above sjncert.org link shows frequency details & Weekly CERT & Ham Check-In Nets

San Jose CERT Repeater Check-In

- How to check-in to a weekly CERT GMRS Repeater Net
  - Instructions for the beginner
    - On the net date & time, turn your radio on and set to the repeater channel
    - Monitor the net from the beginning (turn on your radio early)
      - The Net Control Operator will announce specific instructions for check-in
      - Before you attempt to check-in, listen to other participants to learn how they check-in
    - When invited to check-in:
      - Press & hold your radio PTT and wait about 2 seconds
      - Speak slowly & clearly
      - Announce your Call Sign (phonetically) and your first name
      - Announce your city & neighborhood
      - Indicate if you have “traffic” or “no traffic”
    - Don’t be shy, it takes some practices!
    - After you check-in, the Net Control Operator will acknowledge your check-in
      - If you are not acknowledged -> repeat your check-in

What kind of Radio to reach a Repeater?

- Many neighborhoods in SJ will be able to reach at least one of the repeaters with a handheld radio
  - Connecting a handheld to a mobile or base station antenna will increase range

- Some areas will need a mobile radio and base station antenna

- Test in your neighborhood to know the capability of your equipment
  - **Do this before an EMERGENCY**
  - What is your range & coverage?
    - Handheld & mobile radios
    - Simplex & Repeater
  - Which repeaters are you able to reach?
    - Repeaters may be damaged in a disaster - You should have access to more than 1 repeater

Why Participate in Repeater Check-Ins

- Prepare for emergencies -> *This is what CERT is about*
- Practice your radio skills
- Know which repeaters you can reach
- Make sure your radio & gear is working
- Learn new things
- Make connections & friendships in the CERT & radio EMCOMM community

Recap & Conclusion

- You have been introduced to the basics of GMRS radio
- Get your GMRS license
- You may not be proficient now -> you will if you PRACTICE, PRACTICE & PRACTICE
- Go out and train your team & neighbors
- Conduct radio range testing to know how far your radios will work
- Know what GMRS repeaters you can reach
- Practice -> Use the radios in your neighborhood & community events
- Schedule radio exercises -> keep practicing
- Thanks! Contact me if you have questions/comments: rmacwhy@gmail.com

Check out sjncert.org website

(501c3 Non-Profit)

http://sjncert.org/

Radio topics are in "Communications"

Improvements to website have been made, …More coming!

GMRS Radio Training

- Agenda
  - How to get your GMRS license

How to Apply for a GMRS License

Wyman Pang
rmacwhy@gmail.com
AJ6HU WRNV894
D10 Los Paseos CERT
August 3, 2023 v2

How to apply for a GMRS license

- GMRS license cost is $35 and good for 10 years
  - No test is required to get a GMRS license
- You and your entire family can use the license
    - Any individual who holds an individual license may allow his or her immediate family members to operate his or her GMRS station or stations. Immediate family members are the licensee's spouse, children, grandchildren, stepchildren, parents, grandparents, stepparents, brothers, sisters, aunts, uncles, nieces, nephews, and in-laws.
- Here is a good youtube video on how to apply

  Look for this youtube -> Applying for your GMRS license in 5 easy steps! LOL
  Video by MedinaCountyTexasGMRS https://www.youtube.com/watch?v=meBYQ2WT46k
- Warning about the above video -> FCC made changes to the license website after this video was made
  - Some of the links & website addresses are no longer correct
    - This package contains the correct links
  - This is still probably the best youtube on the subject

Tips for getting a GMRS license

- FCC website is NOT user friendly! (not like shopping on Amazon)
  - Sometime the FCC website goes down (try again later)
- Use only the official FCC website (it will say fcc.gov)
- You will need to provide personal information, including your SSN
- Age requirement to get a GMRS license: 18 years or older
  - The license is good for you & your family
    - Your family members under 18 can use a GMRS radio
- There are 5 steps to get a GMRS license
- How long will applying for a GMRS license take?
  - About 30-45 minutes
    - Including 15 minutes to wait for the Username confirmation email

Tips for getting a GMRS license

- Watch the youtube video first (about 15 minutes) **https://youtu.be/meBYQ2WT46k**
  - Do not start applying for the license yet!
  - Watching the video will let you know what to expect in when you start the application process (such as: how much info you need to provide)
  - The video is good, but some of the FCC links (in the video & on youtube) have changed (or can be confusing) -> the correct links are shown in this package
- When you are ready to apply for a GMRS license:
  - Print out this package and have it next to you when applying
  - I suggest you use on 2 computers -> pausing on each step
    - 1. Watch the video again on one computer (or tablet, etc.) -> pause at each setup (this is optional but highly recommended)
    - 2. Apply on a laptop or desktop (there is a lot of info to enter & a keyboard will make it easier), pause step by step
      - On this computer, have this document open -> you will use it to click on the FCC links

Navigating within FCC Applications

- When you are in the FCC applications
  - Where you have logged in with your Username or FRN
    - DO NOT USE browser **forward arrow** and **back arrow** (on the top)
      - ***DO NOT USE:***
        - **<- ->**
    - USE the **buttons** within the FCC application (near the bottom)
      - ***USE:***
        - **SUBMIT** and **GO BACK** buttons
        - **CONTINUE** button

Steps 1 & 2

- If clicking link does not open webpage -> copy & paste into browser
- 1. Register Username
  - https://apps.fcc.gov/cores/userLogin.do
    - Look for -> Need a Username?
      - Register your email address & set your password
      - After you complete this step, you will get a confirmation email usually in about 15 min.
      - Look in your email account (if you don't see it, check your spam or other folders)
      - Click on the link in your email to confirm
- 2. Get FRN (FCC Registration Number)
  - https://apps.fcc.gov/cores/userLogin.do
    - Look for -> Username Login
      - Login with Username & Password
      - Look for -> Register new FRN
      - You will need to provide your SSN
      - After you complete filling in info -> it will assign you a FRN
      - Write it down or take a picture of it -> you will need your FRN for the next step

Steps 3 & 4 (v2)

- If clicking link does not open webpage -> copy & paste into browser
- 3. Apply for GMRS license
  - https://wireless2.fcc.gov/UlsEntry/licManager/login.jsp
    - Look for -> Login & box for FRN
      - Login with FRN & password (same password as Username)
      - Look for -> Apply for new license
      - Select Service -> ZA - General Mobile Radio (GMRS) <- at the bottom of the list.
      - You may be directed to pay the $35 GMRS license fee in this step
- 4. Pay license fee (Not required if you paid in Step 3)
  - https://apps.fcc.gov/cores/userLogin.do
    - Look for -> Username Login
      - Login with Username & Password
      - Look for -> Bills & Fees
      - GMRS license fee is $35
- This completes the application process
  - Step 5 is to check on your application status (do in 2+ business days)

Step 5

- If clicking on link does not open webpage -> copy & paste into the browser
- 5. Check for license status under your FRN
  - https://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp
    - Do this 2+ business days after you applied & paid your $35
    - Look for -> License Search
      - Select -> By FRN
      - Enter -> Your FRN (no password required)
      - If you see a Call Sign for Radio Service ZA (GMRS) -> you have been issued a GMRS license - Congrats!
        - Click on -> your Call Sign
        - Click on -> Reference Copy (near top)
          - This will download your GMRS Radio Station Authorization with your Call Sign
          - Keep it in a safe place
          - You can now start using a GMRS radio!
- A test is not required to get a GMRS license
  - People say: *Applying for the license is the test!*
  - …If you get the license, you passed!

Backup Material

GMRS - Technical & Legal

- Some technical things about GMRS
  - There are 30 GMRS channels (≅462-467 MHz)
    - 22 simplex channels
    - 8 repeater channels
  - Transmitter power up to 50 watts
    - Handheld radios - 5 watts (0.5 watt on some channels)
    - Mobile radios - 20-50 watts (not allowed to use the above 0.5 watt channels)
  - Most GMRS handheld radios have removable antennas
    - Connecting to a vehicle or base station antenna will improve its range
  - FCC requires GMRS radios to be “part 95E” certified

- FRS (Family Radio System) shares the 22 GMRS non-repeater channels
  - FRS does not required a license to use
  - Handheld radios only, limited to 0.5 or 2 watts
  - Do not have removable antennas (most have short/stubby antennas)
  - Not repeater capable

GMRS - Technical & Legal (cont.)

- For specific rules & regulations concerning use of GMRS radios
  - https://www.fcc.gov/wireless/bureau-divisions/mobility-division/general-mobile-radio-service-gmrs
  - https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-95/subpart-E
  - Suggestion: You should read at least once
-

How to get Maximum Radio Range

- Use the radio outdoors
- Keep the antenna vertical
- Do not use stubby/short antennas -> they provide less range than longer antennas
- Connect your handheld radio to a better and/or higher antenna
  - A mobile antenna on your vehicle (magnetic mounted antenna)
  - A base station antenna & mounting it high
- GMRS radios operate in “line of sight” propagation
  - Radio waves travel in straight line from transmitting antenna to receiving antenna
  - Changing your position & orientation may improve radio performance
    - Higher elevation
    - Clear view (no obstruction)
  - Caution: Be careful & safe when you move around for better reception/transmission
    - Be aware of your surroundings when you are moving to optimize your signal
    - Don’t fall or walk into something

Battery Charging

- Charging with cradle
  - Plug AC adapter to charging cradle & plug adapter to 120vac
  - Turn off radio before inserting radio into charging cradle
  - Note indicator on cradle (Red = Charge & Green - Full)
  - When battery completes charging, *don’t leave radio on charger for extended period

- Can also charge by plugging USB-C cable directly to battery (on radio back) -> cable not included with radio
  - USB-C charging does not require cradle
  - Can charge from car with USB
  - Indicator on battery will show Status (Red / Green)
  - Disconnect cable after charging*

- Warning: Exposed battery contacts on back of radio
  - Don’t put radio in pocket, purse, backpack, etc. with coins & other conductive items

Radio Programming

- Your KG-905G radio has been programmed & ready to go
  - We have included local SJ CERT repeaters & channels
  - Programmed to auto-Lock Keypad (Press/Hold “Exit” to unlock)

- GMRS radios typically “may” require re-programming to update repeaters & channels
  - Near-term: sjncert.org can help
  - Long-term: You should have 2+ people local in your district to do programming
    - Scenario: We distribute an update file & your local team can re-program the radios (this will minimize radio downtime)

- We do not recommend a untrained beginner to change the programming
  - Skill to program updates is not difficult (more on next page)
    - …Just need to be detail oriented & careful
    - A willing Ham or GMRS radio operator in your district is a good candidate to help (they usually know how to program radios)

Radio Programming cont.

- What you need to program KG-905G
  - Hardware
    - Windows* computer (laptop is best because it's more portable)
    - Programming cable ($10-20)
  - Software
    - Wouxun KG-905G programming software (available from buytwowayradios.com) -> Official Wouxun software specific for KG-905G* (available for no charge)
    - This radio is not supported by CHIRP software
  - Training - We can help train

- Caution
  - If you want to learn programming on your own
    - Always copy your existing radio configuration before you attempt to make any changes (so you can go back to the previous working condition)
    - Changing radio settings can put your radio in a:
      - Non-compatible configuration (not be able to talk with your other radios)
      - In-operable mode (i.e. "bricked") -> "usually" can be recovered if you re-load the previous working configuration
    - The internet has instructions & videos

Basic Radio Terms

Term	Meaning
Affirmative	Yes
Negative	No
Radio check	How is my signal?
Do you copy?	Can you hear me?
Loud and clear	Your signal is good
Copy	Message Understood
Roger	Message Understood
Say again	Repeat your message again
Come again	Repeat your message again
Go ahead	I am ready to receive your message
Break	Interrupting transmission with urgent matter
Stand-by	Your message received, but I am unable to reply right away
Over	My message is over, waiting for your reply
Out	End of my transmission
Clear	End of my transmission

Avoid use of "coded" terms
Examples:
- *10-4 (Roger)*
- *QTH (What is your location?)*

NATO Phonetic Alphabet (Spelling Alphabet)

A	**Alpha**	**H**	**Hotel**	**O**	**Oscar**	**V**	**Victor**
B	**Bravo**	**I**	**India**	**P**	**Papa**	**W**	**Whiskey**
C	**Charlie**	**J**	**Juliet**	**Q**	**Quebec**	**X**	**X-ray**
D	**Delta**	**K**	**Kilo**	**R**	**Romeo**	**Y**	**Yankee**
E	**Echo**	**L**	**Lima**	**S**	**Sierra**	**Z**	**Zulu**
F	**Foxtrot**	**M**	**Mike**	**T**	**Tango**		
G	**Golf**	**N**	**November**	**U**	**Uniform**		

The NATO Phonetic Alphabet is used to spell words over the radio for clarity.
For example, the letters “B” (bee) and “P” (pee) can sound similar, especially if there is radio static. Using the phonetic alphabet you can say “Bravo” for “B” or “Papa” for “P” to avoid confusion.

Use the phonetic alphabet to spell out words clearly.
Example: You want to report there is an injured person at 123 “Park” Street -> spell “Park” as “Papa - Alpha - Romeo - Kilo” to avoid misunderstanding.

Budget GMRS Radios

	Baofeng UV-9G	Retevis RB27
Cost	$45	$25*
Power (spec)	5 Watts	<5 Watts
Channel Memory	128?	128?
Battery Capacity	1500 mAH	1500 mAH
USB-C Charging	No	Yes
Water Protection	IP67**	Not water rated

- For antenna upgrade: UV-9G uses antenna with SMA-F, RB27 uses antenna with SMA-M
- *$50 for 2 radios
- **Not submersible

Radio Comparison

When shopping, pick radios specific for the service (GMRS should be FCC part 95E certified)	**MURS** **Multi Use Radio Service** **For use within your Neighborhood**	**FRS** **Family Radio Service** **For use within your neighborhood**	**GMRS** **General Mobile Radio Service** **To get outside of your Neighborhood**
License	Not required	Not required	$35/10 yrs Include family members
Channels	5 Simplex	22 Simplex Share with GMRS	22 Simplex 8 Repeater
Frequency (MHz)	151-154	462-467	462-467
Power	Handheld - 2W max	Handheld - 2W max (15 channels)	Handheld - 5W Mobile - 50W max
Removable Antenna	Get radio with removable antenna	No	Yes (most have removable antenna)
Cost (starting prices for budget radios)	Handheld $25 Antenna upgrade $5 Mobile/Base antenna $100+	Handheld $15	Handheld $50 Antenna upgrade $20 Mobile $120 Mobile/Base antenna $100+
***Range, HT to HT (miles), depends on terrain/structures, antenna, weather, …**	0.50+ w/antenna upgrade w/base antenna 0.75+	0.25+ w/2W channels (because of short antenna)	Handheld 2+ Handheld w/repeater 10+ Mobile 5+
Repeater Capable	No	No	Yes

*Do range testing in your neighborhood to know your coverage

Budget MURS Radio

	Retevis RT21V	Retevis RB27V	Retevis RB17V
Cost (8/30/23) amazon	$50/2 = $25 Sandy $50/6 = $8?	$56/4 = $14	$90/4 = $22.50
Battery (maH)	1100	1500	4400
USB-C Charging	No	Yes	Yes
Removable Antenna	Yes Need SMA-F Antenna	Yes Need SMA-M Antenna	Yes Need SMA-M Antenna
MURS Antenna Upgrade & Cost (8//30/23) retevis.com, free ship for over $50	Reevis HA01 SMA-F telescopic $30/10 = $3	Retevis HA01 SMA-M telescopic $23 /10 = $2.30	Retevis HA01 SMA-M telescopic $23/10 = $2.30
Antenna Cost (8/30/23) amazon	HA01? SMA-F $20/5 = $4		

MURS: 2W max, 5 simplex channels (5 memories), license free

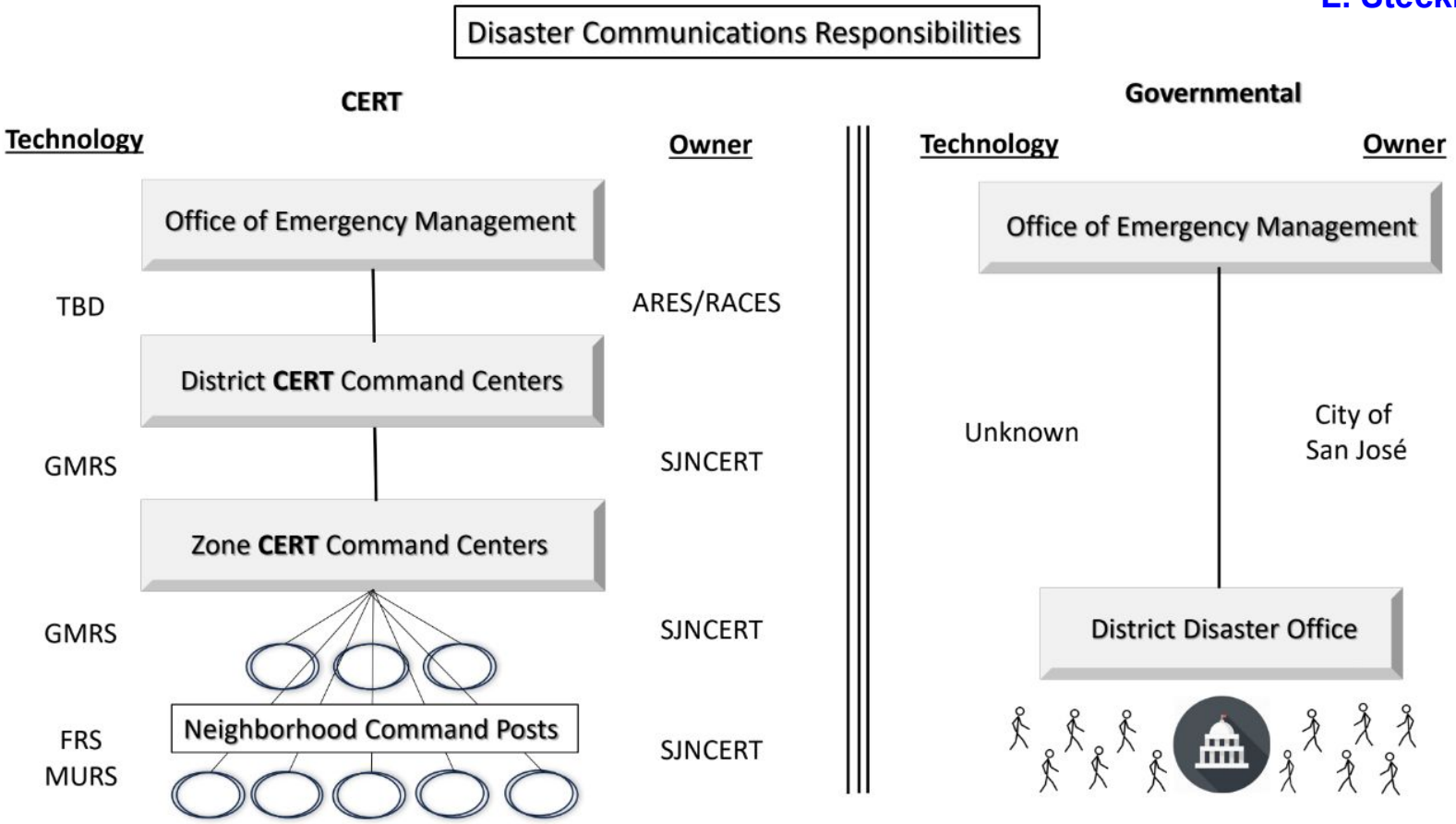
Alternate MURS antenna upgrade (retevis.com): HA06 in SMA-M or -F ($60/10 = $6)

*Do range testing in your neighborhood to know your coverage

MURS, FRS & GMRS Comparison

- GMRS is superior
  - Higher power & repeater capable -> provides greater range
  - However, license & higher radio cost -
    - May prevent widespread adoption in your neighborhood
  - If your neighborhood goes with GMRS only, will you have enough people with radios?
- MURS & FRS are license free and lower radio cost
  - MURS can use mobile/base antenna which can increase range
    - MURS not compatible with GMRS (different frequencies)
  - FRS have non-removable antennas
    - Come with short stubby antennas which has less range
    - Share the 22 simplex GMRS channels (15 are 2W, 7 are 0.5W)
  - If you use MURS or FRS, larger neighborhoods may need GMRS to supplement coverage

L. Steckmest


Disaster Communications Responsibilities
CERT
Technology
Owner
Office of Emergency Management
TBD
ARES/RACES
District CERT Command Centers
GMRS
SJNCERT
Zone CERT Command Centers
GMRS
SJNCERT
Neighborhood Command Posts
FRS
MURS
SJNCERT
Governmental
Technology
Owner
Office of Emergency Management
Unknown
City of
San José
District Disaster Office

Radios in EMCOMM

- What radios to be used and where?
  - “Pedestrian” personnel (people not sitting down)
    - Use handheld radios
  - Fixed locations (Command Post, Shelter, Aid Station, etc.)
    - Use mobile radios with external antennas (mobile/base antenna)
    - Ok to use handheld radios with external antenna

- In an emergency -> Repeaters will be a limited resource
    - Can be overloaded with traffic
    - Repeaters can also be damaged & go offline

- Use simplex wherever possible & lowest radio power that works
  - Relay messages
  - “Pedestrian” can use repeaters when needed
  - Fixed locations radios -> use simplex only (mobile have higher power)
    - If using a Handheld at a fixed location, keep within 1 mile of another fixed location (plan ahead the location of your command posts)
    - Handhelds at fixed location may need to use repeaters

During an Emergency - What Radios Where?

Location	Radio	Antenna	Simplex or Repeater?
Local Neighborhood Teams	Handheld MURS or FRS, Can also use Handheld GMRS	MURS: telescopic GMRS: antenna upgrade	Simplex Repeater if necessary
Neighborhood Level Leaders & Pedestrian Personnel (not a Fixed Location)	Handheld GMRS	Handheld antenna upgrade	Simplex Repeater if necessary
Fixed Locations (Command Post, Shelter, Aid Station, etc.)	Mobile GMRS radio (require battery for field use); Can use Handheld with external antenna	Use mobile/base antenna	Simplex only, Relay messages in simplex

- Ahead of an emergency -> Test radios at the Fixed Locations (command posts, etc.) to check radio range & coverage
- Use lowest radio power that works