

Arroyo Seco Neighborhood Council (ASNC)

COMMUNITY EMERGENCY RESPONSE TEAM COMMUNICATIONS MANUAL FOR FRS* AND HAM RADIOS

Prepared by the ASNC CERT Emergency
Communications Task Force

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Incorporating elements of the Los Angeles Fire Department's Auxiliary
Communications Service (ACS) Community Emergency Response Team
(CERT) Communication Plan v3.3 dated 12/21/10 (www.lafdacs.org)



For disaster communication in the ASNC area, tune to FRS Channel 2 (Alternate: Ch 12)
Ham Radio Operators should also tune to Battalion 2 simplex 145.585 MHz, PL 110.9

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INTRODUCTION

Cell phones and land lines will most likely not be available after a disaster. As a result, ASNC's Emergency Response Plan includes the use of battery-powered FRS radios as well as amateur radio to communicate between the ASNC Command Post and the surrounding community(ies).

A radio operator at the Command Post (meeting area at Via Marasol /Lomitas in Hermon) will be listening and recording all important communications and help requests on the following frequencies:

- **FRS Radio: Channel 2 (Alternate: Ch 12)**
- **Ham Radio: 145.585, PL 110.9 (Simplex)**

FRS/GMRS RADIO FEATURES AND HOW TO USE THEM

This manual will explain how to use the FRS radios that will be the backbone of our CERT communications during drills and any real disaster. You will encounter several unfamiliar abbreviations and technical terms in this manual. So we have marked them with an asterisk (*) and explained them in the back of this manual in the "Communications Glossary". When you see something like "FRS" written in this Manual and say to yourself "What the heck are they talking about?" have a look there. However this FRS thing needs to be explained so we know what we are talking about up front, so here goes:

1) What is an FRS radio?

A "FRS radio" is a small hand held two-way radio (it both transmits and receives) which is normally used by families and friends for ski trips, hiking, football games, amusement parks, talking from one car to another when caravanning, etc. in order to stay in touch. Pairs of these radios are sold in stores in bubble packs (see the illustration on the front of this Manual). FRS radios are often sold with GMRS capabilities and we will refer to them as FRS/GMRS radios. More details about this are in the "Changing and Setting Channels" part of this section, also in the "Radio Regulations" in the and "Buying a FRS Radio for CERT Activities" sections of this Manual.

2) Battery Packs and Batteries

Types

Most FRS radios come with “battery packs” which contain rechargeable batteries that can be used over and over again. They are usually charged up by using a tabletop charging stand which comes in the bubble pack. With most of these radios you can remove the battery pack and substitute regular alkaline batteries, either AA or AAA size; be sure to check which before you buy extras and always get alkaline, not heavy duty. Always remove batteries from a radio which will not be used again for more than 6 months. Batteries are marked with plus (+) and minus (-) ends. The plus end has a small bump and the minus end is flat. It is essential to look carefully to be sure that they go in the correct way as shown by the + and – in the battery receptacle.

Charging a rechargeable battery pack

Most radios just drop in to the table top charger with the radio’s battery pack inside. The radios need to slip all the way in to make contact with the charging terminals. If they don’t slip all the way in and turn on the “charging” light, you may have them in front-to-back. For some FRS radios you need to un-snap the latch and remove the battery cover (usually on the back). If the re-chargeable batteries are individual batteries, they need to be inserted into a battery charger for single batteries. Do not leave your radio in the charger for more than 8 hours. It will slightly damage the batteries if they are left in the charger for long periods.

Extending battery life

Always turn your radio completely off when not using it (don’t just turn down the volume). Limit transmissions to essential exchanges. Just in case your batteries go dead be sure to carry plenty of spare batteries with you. Remove batteries for extended radio storage (more than 6 months) to avoid leakage damage to your radio.

2) Volume (audio gain) control and On/Off switch.

There is usually a volume control knob which has a “detent” (a little bump-like feel) which tells you when it is on or off. If there is no volume knob, you have to go into your radio’s menu and find the volume adjustment (sometimes called audio gain). The volume should be a little on the loud side because it makes it easier to hear weak signals, but if turn it way up it may cause distortion of the sound.

3) Changing and Setting Channels in Memory

Setting a channel

The usual procedure involves pressing your radio’s MENU, MODE or SELECT button which causes a large number in its LCD display window to blink. Then press the up (+) or down (-) buttons and follow that channel number as seen in the window. On the most common radios (Motorola, Midland, Cobra, etc.) the channels 1-14 may be used by unlicensed operators as long as “low power”(0.5 watts or less) is used. Some “FRS radios” have only these channels and only allow low power.

If you obtain a GMRS license (see **RADIO REGULATIONS** below) you may use all channels 1-22 and “high power”(up to 5 watts) on channels 1-7 and 8-22 (see chart immediately below).

Most (but unfortunately not all) of the FRS and FRS/ GMRS radios (Motorola, Midland, Cobra, etc.) use the same channel numbers for the same frequencies as all the other such radios. What is important is the **frequency, not the channel**. The chart below shows what channel is set to what frequency from the popular Motorola Talkabout’s Instruction Manual. In this Arroyo Seco CERT Communications Manual we will be giving some channels for you to use for our CERT communications. We will always give you Motorola Talkabout channel, followed by the frequency in parentheses. We use the channel numbers for simplicity because most radios use this channel plan and it is easier to follow for most of us. However, each of you should find the chart for your radio and make sure it is the same as this one. If so you can follow the channel numbers we give. If it is not the same find the **frequency** after the Motorola Talkabout channel we give (in parentheses, with MHz after it), see what channel your radio uses for that frequency and use that channel.

Channel	Type	Frequency
1	FRS / GMRS	462.5625
2	FRS / GMRS	462.5875
3	FRS / GMRS	462.6125
4	FRS / GMRS	462.6375
5	FRS / GMRS	462.6625
6	FRS / GMRS	462.6875
7	FRS / GMRS	462.7125
8	FRS	467.5625
9	FRS	467.5875
10	FRS	467.6125
11	FRS	467.6375
12	FRS	467.6625
13	FRS	467.6875
14	FRS	467.7125
15	GMRS	462.5500
16	GMRS	462.5750
17	GMRS	462.6000
18	GMRS	462.6250
19	GMRS	462.6500
20	GMRS	462.6750
21	GMRS	462.7000
22	GMRS	462.7250

Locking (programming) channels into memory

Some, but not all, FRS and FRS/GMRS radios have a memory to lock in the channel and other settings so that accidentally pushing a button doesn't mess up your settings. When we are doing a drill, or if there is a real emergency, you should lock your radio on the channel number for our ASNC CERT emergency channel 12 (467.6625 MHz). Usually you need to adjust the radio to the desired channel, then using the menu (different on almost all sets so check your User's Guide /Owner's Manual), pick that channel number for the memory slot and then push your Mode or Select button. To lock it in see item #8 below.

4) Transmit (also called the Talk or Push-to-talk) Button

This is the large button (usually) on the side of a HT*. When the PTT button is held down the radio transmits and when released it receives. Sometimes the PTT button is used to capture what has been changed after using the Menu to alter your settings.

5) Setting the transmit power level

In all FRS radios the power is preset at ½ watt. If your radio is an FRS/GMRS it will usually have a high-low power switch for the GMRS channels. That choice is also commonly a "Hi-Lo" button on the front of the radio or it is one of the Menu/Mode/Select options. Radios vary quite a lot as to how they do this. You need to check this in your radio's User's Guide (instruction manual).

6) Setting Privacy Codes (Interference Eliminator Codes, CTCSS tones)

These are used to block in-coming transmissions which do not contain the exact tone (a frequency so low you can't hear it) which your radio is programmed to accept. This avoids being bothered by in-coming calls that are not intended for you. Setting privacy codes is accomplished on most radios by pushing your MENU, MODE or SELECT button and then scrolling by pushing the button one or more times. It is usually the second largest number on your screen and when you are in the right mode to change it, it blinks. Then push the UP (+) or DOWN (-) buttons to reach the number you want. Usually you then push the PTT* button to set that channel, but radios vary on how their menus work so check your User's Guide (instruction manual). It is not recommended that you use these in Emergency Communications because it leads to unknowingly interfering with others using the frequency.

7) "Squelch" and "Monitor" button

The "Squelch" button or knob The squelch is a circuit in the radio receiver which turns the sound off until it hears a moderately strong signal. If that squelch were not there, you would hear a constant and annoying hissing sound most of the time. Many FRS and FRS/GMRS radios have a built in preset squelch circuit which does not need adjusting. A few have a squelch knob which is adjusted by turning it slowly up to just barely past where the hissing sound ("static") goes away.

The “Monitor” or “Moni” button

The squelch circuit may keep the sound (audio) turned off if only a weak signal is being received. So if you want to check to see if there is someone calling you with a weak signal or if you are receiving a weak signal that is cutting in and out, press the Monitor (Moni) button to temporarily turn off the squelch circuit. Also, if you do use a Privacy Code always check to see that a channel is not already in use by holding down the Moni button for a few seconds before you first transmission.

8) Locking the keypad settings

It is easy to accidentally push a button and mess up all your carefully made settings. To avoid that, most radios have a lock mode. Usually you have to push Menu/Mode/Select button, hold it down for several seconds and then a beep sounds plus a small padlock icon appears on your LCD screen. **Then you cannot change the settings unless it is unlocked.** To unlock it push and hold the Menu/Mode/Select button again until it beeps and the padlock icon goes away.

9) “Ring Alert” or “Call Key”

The Ring Alert or Call Key

The ring alert or call keys send out a ring tone (often several are available) to make the person receiving the tone notice that they are being called and reply. For some it is annoying and we usually turn them off for disaster work.

RADIO REGULATIONS

1) The Federal Communications Commission or “FCC”

The **Federal Communications Commission (FCC)** is an independent United States government agency, created, directed, and empowered by Congressional statute. It is charged with regulating all non-Federal Government use of the radio spectrum including radio and television broadcasting and all US telecommunications. Some understanding of the role of the FCC is important to CERT communicators because of its role in regulation, licensing, monitoring, and enforcement of radio laws and regulations. This section will explain the important rules governing the FRS and FRS/GMRS radios that you need to know.

2) The FRS, GMRS and the Amateur Radio Service

In this manual we will deal with three FCC created radio communications “Services” which are: the Family Radio Service or “FRS”, the General Mobile Radio Service or “GMRS” and the Amateur Radio Service (“ham radio service”). In summary:

An **FRS** radio is all you need for CERT activities. It requires no license and is allocated 14 UHF* channels. The radios with only FRS are small. They put out no more than ½ watt, and cost about ~\$15-30

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A FRS/GMRS radio requires a FCC “family” license which costs \$85; there is no examination. (www.fcc.gov). The radios are larger, can put out up to 5 watts on 15 GMRS UHF* channels, and cost about ~\$30-80. GMRS bubble pack radios that you buy in most stores also include the FRS channels. You do not need to buy a radio that includes GMRS power and channels for CERT use. However, if you can afford BOTH the license and the more expensive FRS/GMRS radio you should consider buying one because the extra power allows these radios to transmit over a somewhat greater distance. That will be helpful particularly if you use the radios for outdoor recreational activities (**hiking, skiing, fishing, boating, or car to car communications when caravanning**). **If you want such a radio you can use it in CERT exercises and during a disaster but without a GMRS license you cannot legally use the exclusive GMRS channels 15-22 (Motorola plan) or more than ½ watt power.**

To obtain information and purchase your GMRS operator’s license, you should access the FCC (Federal Communications Commission) online at www.FCC.gov or by phone at 1-888-CALL-FCC or 1-877-480-3201. Or you may e-mail the FCC for licensing help at: ulshelp@fcc.gov

Amateur Radio (“ham radio”) operation requires a FCC license which is obtained by taking an exam. It covers FCC rules, operating procedures and radio/electronics theory, but no longer has any Morse code requirement. Hams can use many different kinds of radio equipment and higher power which allows them to communicate around the world by radio. Hams have always been heavily involved in emergency communications. Arroyo Seco area hams were asked by the Arroyo Seco Neighborhood Council’s Public Safety Committee to help with CERT communications. We badly need more amateur radio operators (“hams”) for our CERT communications, so go to <http://www.hello-radio.org/> or ask any ham how to get your FCC license.

3) Operating Practices and Regulations: what you should know

- No intentional interference with another radio station is allowed. The channels used by FRS and GMRS are all shared on a “party line” basis. That means whoever is there first can use that frequency (another term for channel) until they are done; then you can use it. It is important to listen before transmitting on the channel you are about to use. If that channel has a “privacy code” set on your radio you must push the Monitor (Moni) button before listening for others using the same channel so that you don’t interrupt ongoing communications. Also, don’t hog a channel just because you got there first.
- Emergency communications always have precedence so that if there is a non-emergent conversation on a channel and you need to deal with a life or property threatening situation, the channel should be given up to you. Most FRS and

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- GMRS users don't understand that. If you encounter resistance explain the rule and the nature of your emergency traffic and most users will release the channel.
- It is not true the FCC rules allow the use of GMRS frequencies and power by unlicensed operator during a disaster or emergency situation even if there is risk to life or property.
 - Broadcasting is making one-way transmissions of music, news, etc. Except for very few exceptions, broadcasting is authorized only for the stations on our AM/FM/satellite radios and TV stations. Do not use FRS/GMRS radios for broadcasting. You always must be talking to another station.
 - No obscenity or swearing is allowed. Do not talk to people who break these rules. Ignoring them makes them stop.
 - GMRS allows business use, FRS and Amateur do not.

PROPER USE OF YOUR RADIO IN CERT ACTIVITIES

1) Holding your HT*

- The radio should be about 2- 3 inches from your mouth and not right up against your mouth. Every radio is different and you should test your own to see what distance is best by having another person listen to you from a few hundred feet and reporting back what sounds best.
- Your radio should be turned 30-45 degrees from your face so “gusts” of air from your mouth slide by. This increases the intelligibility of your transmissions.
- Keep your antenna pointing almost straight up. Radios work better if the transmitting and receiving antennas are parallel to each other. Keep your antenna from touching anything, especially metal. It robs power from the signal.
- Do not put your antenna right up against your body, particularly your head. Keep it 3+ inches away. There are concerns that there may be negative health effects from doing that and it saps power from your signal. Do not use when close to a pacemaker.

2) Speech

- Speak in a normal voice.
- Too close or too loud causes distortion while too soft or too far away makes it hard to hear the weak sound.
- Use plain English (avoid “10 codes” and radio jargon).
- Speak slowly, enunciate clearly, especially if there is difficulty getting through.
- Use phonetics if necessary to be understood (use first names like Andrew, Barbara, Charlie, for A, B and C, etc.).
- Avoid areas with a lot of background noise (near a busy road, near a generator).

3) Operating practices:

- Before transmitting make sure that the frequency (channel) you want to use is clear by listening for a few seconds BEFORE using it.
- Each new series of transmission should start by stating who you are calling followed by “this is” or “from” followed by your tactical call sign (e.g. “Command Communications, this is “Search Team Alpha”)
- Then “Do you copy?”
- The response should be “”Search Team Alpha, this is Command Communications, Roger, go ahead. “Roger” means “received” *Roger* does not mean or imply “I will comply”. If that is what you mean say “wilco” (for “will comply”).
- The response need always not begin by repeating who you are calling and who you are unless radio conditions are difficult and identification required for purposes of making sure each station knows with whom they are communicating.

- If copying (understanding) the transmissions is difficult spell out words by using a phonetic alphabet as mentioned above.
- When you are talking on the same channel at the same time as another person it is called “**doubling**”. Sometimes it is because the person you are speaking to thinks that it is their turn to transmit and, not only doesn’t know you are also transmitting, but thinks you are hearing what they are saying. To let the person know it is now their turn to talk say “over” or “go ahead” at the end of each transmission.
- In communications involving more than two stations always indicate who should transmit next by saying “go ahead Communications Center” or “over to you Search Team Alpha”.
- When concluding a series of transmissions say “out” or “clear”

4) Radio jargon

There are some commonly used words while talking on any kind of two-way radio. Some are so well known by the public (and most make good sense) that we will use them in our CERT work. However, we should **avoid using the 10-codes** (like 10-4) because many people do not know them. The radio terms we will use are:

- “**Over**” which means “I am done with my transmission, you go ahead and start talking now”. Sometimes one substitutes “go ahead” “go” or “take it” for “over” for variety.
- “**I copy**” or “**I read you**” means “I heard you and I understood all of it”. If you missed part say so.
- “**Roger**” means “Yes, I agree”
- “**Stand-by**” means “please wait and do not transmit until I tell you to”. The reply should be “standing by”.

5) Coordinating speech with the PTT (push-to-talk) or “Talk”button

One of the commonest errors in two-way radio is clipping off the first or last word of a transmission because of incorrect use of the PTT button. It is essential to learn to consciously wait two seconds before you begin talking after pushing the PTT button. Similarly, at the end of your transmission always remember to stop talking and then wait two seconds before letting up on the PTT button

HOW TO GET THE MOST OUT OF YOUR FRS RADIO

1) Line-of sight

In order to make these radios work efficiently you must pay attention to this section. We believe that it may be the most important in this manual. Radio transmissions using UHF* frequencies travel by what is called “line-of-sight”. That means that if you can see the person you want to talk to your radio will probably work. However, if something is in the way the signal will drop off or disappear. **Things like hills, buildings, metal objects, dense foliage, and the curvature of the earth are**

common things that block UHF radio waves. Therefore the “ranges” given on the packages of FRS/GMRS radios in stores are misleading. These ranges are determined by using two stations both on elevated points with nothing in between. First of all, if you do not have a GMRS radio license and need to use the lower power FRS radio, you should not expect to get what is advertised because it is for the GMRS power level. **Also, the most important factor in getting a good transmission is to avoid the obstructing objects just mentioned by moving around. Often that means getting out from behind a structure, climbing a small hill or moving out of a very leafy area to get a clearer “path” to the person you are trying to talk to.** If you are having trouble communicating both stations should try different locations and ask for “readability” reports (1= not heard, 2=heard with difficulty, 3=little difficulty understanding, 4=heard no difficulty, 5=perfectly understandable)...then go back to where you got your best report.

2) Relaying

When one station is too far away to reach another station that you want to talk to, it is possible to pass information by using a relay station. We expect to use this method in ASNC CERT disaster communications. What is done is that a third station, somewhere in the middle that can talk to and hear both of the first two stations, receives messages and passes them back and forth. Often this relay station will be located at a high point (hill or building) which can be seen by others at lower levels.

3) Pausing between transmissions

It is a good idea to pause for 2-3 seconds between all transmissions, particularly during a disaster or disaster drill. This allows time for another station with emergent traffic* to make that known. If you need to use an already occupied radio channel to exchange a message which relates to preventing injury, death or property damage say quickly between transmissions: “your tactical call with emergency traffic.” This means that you need the channel immediately to pass time sensitive information.. Also, waiting before starting to talk allows you to hear if you are “doubling” with someone (see 3 above) and allows someone to join in to conversation if they need to.

6) Disaster Drills

During disaster drills you should state “this is a drill” every 5-10 minutes. Remember that anyone with a FRS/GMRS radio or scanner can hear what you are saying. If the CERT group is practicing in an exercise with a “mock” disaster scenario, someone listening in might become frightened and even go to the police, or a radio or TV station to report a “disaster”. Frequently saying “this is a drill” can avoid this kind of panic.

7) Passing messages and tactical call signs

Passing information between radio stations, also called **message (or traffic) handling**, is the main function of radio communications during an emergency. To help know who is talking to whom each functional disaster unit will be assigned a

“tactical call sign”. “ASNC Rescue One” and “ASNC Emergency Control” would be “tactical call signs” because they are descriptive. For radios using GMRS and Amateur Radio, their FCC call signs need to be given also at the end of any series of transmissions or every ten minutes.

8) Avoid unnecessary conversation

During a CERT drill or disaster response talking on the radio about anything that is not absolutely necessary to support that activity must be avoided. Chating, discussing anything personal or telling a joke are examples of forbidden radio activity. Keep reports shot and to the point!

COMMUNICATIONS GLOSSARY:

Previously unexplained technical terms are marked with an asterisk (*) and can be understood by looking them up further along in the glossary.

AMATEUR RADIO: a FCC licensed radio service which requires passing an examination on electronics, radio-communications, regulations and operating practices. Morse code proficiency is no longer required. Amateur radio operators are commonly referred to as “hams”. Hams have always been very involved in providing communications as a public service, particularly during disasters.

ANTENNA: a piece of equipment which radiates and collects radio transmissions. For our purposes it is that thumb shaped projection sticking out of the top of a hand held two-way radio*.

BATTERY PACK: Several small rechargeable batteries packaged together and use to power small radios instead of individual rechargeable ones.

CALL SIGN: A series of letters and numbers assigned to identify a specific radio station. These are usually assigned by the FCC* to most radio services such as the General Mobile Radio Service (example WABC1234) or the Amateur Radio Service (KA6ABC). In emergency communications “tactical” call signs are sometimes also used which are not assigned by the FCC (example” SLNC Depot One”)

CHANNEL: A numbered designation given to a radio frequency rather than using the actual cycles per second. For example, the frequency 462.5625 MHz has been assigned to the GMRS* as Channel 8. It is usually the large number in your FRS/GMRS* radio’s LCD*display.

CTCSS (continuous tone-coded sub-audible squelch) or call “tones”, “quiet codes”, “privacy channels”, etc.). When you have this feature turned on, your transmitter sends

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out a tone that is so low in frequency that your ear can't hear it. It goes right along with your regular transmission, so that ONLY if you have your radio set to that same tone's number will you be able to hear the transmission. It is usually a small number in your radio's LCD* display. A zero means that CTCSS is turned off.

DOUBLING: occurs when two stations transmit at the same time, which means that they cannot hear each other.

EMERGENCY TRAFFIC: A message which relates to preventing injury, death or property damage. If you need to use a radio channel to exchange this kind of information say quickly between transmissions “your tactical call with emergency traffic.”

FCC (Federal Communications Commission): The federal government's agency in charge of communications.

FREQUENCY: The FRS* and GMRS* channels are designations for “frequencies” assigned by the FCC. “Frequencies” are (in technical terms) the number of cycles per second of the transmitted radio wave.

FRS (Family Radio Service): An unlicensed Radio Service authorized for personal communications by the FCC to operate using small two-way* hand held radios which transmit with ½ watt or less in UHF* bands.

“FRS/GMRS*radio”: The term used for any two-way* hand held radio that has both FRS and GMRS* channels in the same radio.

GMRS (General Mobile Radio Service): A licensed personal Radio Service authorized by the FCC to operate using two-way* hand held (up to) 5 watt* radios which share some UHF* channels with the FRS and some others which are exclusive to the GMRS. See item #2 under Radio Regulations (above).

HT (“handi-talky”): a small hand held two-way radio*. “HT” comes from the earlier name of “handi-talky”. They are similar to but smaller than the old “walki-talkys”.

LCD (liquid crystal display): A small display screen on your FRS/GMRS radio with a grey background and black numbers.

Modulation: The term used for the superimposing of voice on the radio waves used by FRS/GMRS radios. “**Overmodulation**” occurs when speech is too loud and the signal becomes distorted and difficult to understand. “**Undermodulation**” is due to speaking too softly or too far away from the microphone so that the received sound is too weak to be understood.

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Push-to-talk (PTT): The button on the side of a HT. When held in, the radio transmits and when released, it receives.

Squelch: A feature which prevents the hissing sound normally made by a radio which is not receiving a radio signal. The squelch level must be adjusted slowly up until it just turns off the annoying hissing, but not much higher or weak transmitted signals that you may want to hear can not “break” through and be heard.

TEN-CODES: Ten codes are not to be used. These are codes that start with the number ten and then a second number like (10-4 for “understood”, what’s your 10-20? for “location”). In the past they were used in police and fire work but are actively being phased out because their meaning was often unclear. That is even more of a problem in CERT work, so it is best to use plain English.

TRANSCEIVER: a radio capable of transmitting and receiving contained in the same case. FRS/GMRS HTs are all transceivers.

TRAFFIC: is a message or messages containing information that needs to be passed on to either another station for delivery to someone at that station or relayed on by radio or other means to a further destination (not automobile congestion).

TWO-WAY RADIOS: radios which transmit and receive to another similar radio allowing the talk to and hear the other. FRS/GMRS HTs are two-way radios.

UHF (ultra high frequency): a portion of radio frequencies used by FRS/GMRS radios. They will not bounce off the ionosphere (“skip” like CB,s can) or penetrate mountains or large man-made structures. They normally can only travel by line-of-sight or very slightly beyond.

VOLT: A measurement of electrical “push” or “force”. Batteries are rated in volts and most alkaline batteries (AA and AAA) are 1.5 volts.

WATTS: a measure of electrical power. The higher the watts your FRS/GMRS radio gives off, the further it can transmit, but wattage is not nearly as important as having a line-of-sight path.

NOTES:

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