CORAC

Band Plan (Updated)

Remember that HAM Radio is NOT private, so we will have to be extremely careful of what we talk about. However, since this is established to assist in an emergency situation, expediency is more important than privacy.

In the below listed band plan, three frequencies are identified. The first is primary (p) then the second is secondary (s) and the third is tertiary (t). If you dial up the primary frequency (p) and it is used by someone outside of CORAC, please monitor for two minutes to the secondary (s), wait and then switch to the tertiary (t). If any particular frequency you choose is not busy, start making your calls, making sure to identify yourself as CORAC.

The CORAC Net

The CORAC net is held each Sunday at 7:30 P.M. Eastern starting with JS8 Call at 10.130 then moving to 7.078 at 7:45. The SSB or voice portion of the net starts at 8 P.M. Eastern.

Seasonal Variations

Due to propagation, during the fall and winter seasons, (October 1 to through February 28) the net meets on 40 and 80 meters. During the Spring and Summer seasons (March 1 through September 30) the net uses the 20 – and 40-meter band. We use the frequencies as stated in the Emergency Band Plan below.

Emergency Band Plan

During a regional or national emergency please use the following:

- Try 40 meters first then go to 20 then 80 (at night)
- 40 meters (p) 7.284.10 (s) 7.265 (t) 7.178
- 20 meters (p) 14.312 (s) 14.257 (t) 14.228
- 80 meters (p) 3.982 (s) 3.962 (t) 3.762

DATA - Winlink

Use any frequency that can get through quickly for your message. Try doing a relay, through N5NJK at Liberty Center

JS8 Call

For JS8 call in emergencies use 30 and 40 meters: 10.138 and 7.088

Baofeng BF-H8HP

Note of Encouragement
In a crisis situation, you are not required to have a license to operate a HAM radio. However, it will matter that you know how to operate a HAM radio. I encourage all who read this to familiarize yourself with understanding how to operate a HAM radio. I also encourage you to follow up and study for the technician license which is the minimum license required fornon-crisis HAM radio operation.

The most common material to study is the American Radio Relay League (ARRL) Technician manual. There is also a web site called: www.hamexam.org where you can take a practice exam for the technician license. This web site also contains the entire pool of exam questions which will also help you to learn the technician requirements.

After you have studied and feel confident enough to take the license exam, you can find an exam location through the ARRL web site at: http://www.arrl.org/exam_sessions/search

Most locations run exam sessions on a regular basis.

Mandatory Equipment:
- Baofeng radio model BF-F8HP (do not order BF-F8) hand transceiver (HT) (~$62 on Amazon)

Optional Equipment (highly encouraged):
- Nagoya NA-771 Radio Antenna, SMA Female 15.6” Whip VHF/UHF (~$15 on Amazon)
- Hypario SMA-Male UT108 Dual Band 144/430MHz Antenna (~$20 on Amazon)

The Whip antenna is used to replace the standard antenna that comes with the HT and improves distance.

The Hypario antenna is magnetic mount and is intended to be used mounted on the top center of a car. This by far gets the best transmission quality for distance.

BASIC SETTINGS
Radio (HT) settings are changed using the “MENU” button. The HT is setup with default settings for simplex operation. Only the squelch setting needs to be changed when the HT is unpackaged from the box. Each setting can be accessed by first pressing the “MENU” button. There are 40 different MENU settings. Each setting also has a number associated with it that flashes in the upper right hand corner. There are two different ways to get to each setting.

Baofeng BF-H8HP *(continued)*

- Press “MENU” and then use the UP/DOWN arrows (white triangles) to scroll through the various settings.
- Press “MENU” and then immediately type a number between zero and 40
- NOTE: at anytime if you feel you have messed up, press “EXIT” to cancel and then you can try again.

Squelch (SQL)

- Press “MENU” and then press either the UP or DOWN arrows to get to SQL (setting zero)
- Press “MENU” a 2nd time to change the setting
- Press “1” to set the squelch setting to one (always use squelch setting of one)
- Press “MENU” again. You should hear an audible “confirmed”. The setting is now entered and will always be remembered.

How to setup up to use simplex operation (simple 2-way communication)

- Turn on the unit by turning the knob on top clock wise. You will hear a voice telling what mode you are on.
- Press (toggle) the orange “VFO/MR” button until you hear the voice say “frequency mode”.
- Use the blue A/B switch to toggle between the two frequency displays. Note where the little black triangle (caret) is on the display. This is the frequency that the unit will transmit and receive on.
- Enter the simplex frequency you want to talk on by typing the 6 digit number on the key pad. For example, to enter 146.850MHz, type: 1-4-6-8-5-0. If done correctly, you will see the frequency on the display next to the caret.
- Press the Push to Talk Button (PTT) to transmit. You will see the red LED light up when transmitting. The green light will light up when receiving a signal above the squelch level.

How to set up the Baofeng to use with a repeater

Find a repeater close by that you want to use. You can find a repeater near you by using someavailable internet sites. Here are some sites that you can use:

- http://www.artscipub.com/repeaters
- https://www.repeaterbook.com
- http://www.nerepeaters.com (North East US only)

To use a repeater station, you will have to enter 4 settings (frequency, offset, offset direction, CTCSS tone). These should all be listed on the above web sites for any particular repeater.

Baofeng BF-H8HP *(continued)*

- *Frequency:* Enter the repeater frequency as outlined in the Simplex operation above
- *Offset:* Press "MENU" and use the UP/DOWN arrows to scroll to "OFFSET," Press "MENU" again, Enter an offset number, (e.g. – to enter 600KHz, type 0-0-0-6-0-0), Press "MENU" again. You will hear "confirmed" if successful.
- *Offset Direction:* Press "MENU" and use the UP/DOWN arrows to scroll to "SFT-D," Press "MENU again, Use UP/DOWN arrows to change to either "OFF" (simplex), "-" (minus offset) or "+" (plus offset), Press "MENU" again and listen for "confirmed." NOTE: Offsets are typically listed as "+" or "-" next to the repeater frequencies in the repeater directories.
- *CTCSS Tone:* Press "MENU" and use the UP/DOWN arrows to scroll to "T-CTCS," Press "MENU" again, Enter an offset number by using the UP/DOWN arrows to scroll to the number listed for the repeater you want to use, Press "MENU" again and listen for "confirmed." NOTE: Repeater directories may list the CTCSS as "PL" or "Tone" or "CODE IN."

How to setup up and use an IRLP (Internet Radio Linking Project) capable repeater

A local IRLP capable repeater will allow you to send your transmitted signal across the internet to another long distance IRLP capable repeater and then reconstitute the signal over the airwaves which can then be received by another radio. This will allow you to communicate with virtually anyone in the country (or world) as long as they are within range of an IRLP capable repeater.

During a national crisis, it is unlikely that the internet will be disabled by the government. The reason is the government actually needs the internet for vital national security functions to operate during a crisis. What this means is the government may shut down cell towers (rendering cell phones inoperable) or target specific web sites rendering them inoperable (like Skype), but the internet in general will be functional. IRLP communications does not depend on a web site to be operational, but only requires that the internet be functional. This means that during a crisis, IRLP capabilities will most likely be available to communicate.

Although it may sound complex, using IRLP is rather quite simple. Each IRLP capable repeater will have a code (just like a phone number) associated with it. This code can be found in most repeater directories.

- Locate a local IRLP capable repeater node close to you and setup to access the repeater as shown above (frequency, offset, offset direction, CTCSS tone).
- Locate a long distance IRLP capable repeater node close to the location of the person you want to contact and note the IRLP code for that particular long distance repeater. The person who you want to talk with will have to setup their radio for the long distance repeater close to them (frequency, offset, offset direction, CTCSS tone). NOTE: You only need to setup for the local repeater.

Baofeng BF-H8HP *(continued)*

- Press push to talk (PTT) and hold it. While simultaneously holding PTT, enter the IRLP code of the long distance node on the HT key pad. It will sound just like the touch tones on a phone. NOTE: Only one IRLP code needs to be entered to make a successful connection.
- If you are successful, the local repeater node will let you know.
- At this point, you can have a normal radio conversation with the person located near the long distance repeater. The node will stay locked in so you do not have to enter the code every time you PTT.
- To exist the IRLP when done talking, simultaneously press PTT and enter the code “73” on the key pad.

NOTES

- For a list of IRLP capable repeaters see: http://www.irlp.net (click on “Active node status”, click “Up-to-date node list in pdf format” and then select the IRLP report that you want to search for a IRLP capable repeater node.
- There is a method for multiple users to connect using IRLP code for what is called a “reflector”. This will be discussed in a later update.

CORAC

BaoFeng BF-F8HP Radio

BASIC SETUP & OPERATION

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   b. Press “MENU” and then immediately type a number between zero and 40
   c. NOTE: at anytime if you feel you have messed up, press “EXIT” to cancel and then you can try again.
2. Squelch (SQL)
   a. Press “MENU” and then press either the UP or DOWN arrows to get to SQL (setting zero)
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2. To use a repeater station, you will have to enter 4 settings (frequency, offset, offset direction, CTCSS tone). These should all be listed on the above web sites for any particular repeater.
   a. Frequency: Enter the repeater frequency as outlined in the Simplex operation above
   b. Offset:
      • Press “MENU” and use the UP/DOWN arrows to scroll to “OFFSET”
      • Press “MENU” again
      • Enter an offset number. Example: to enter 600KHz, type 0-0-0-6-0-0
      • Press “MENU” again. You will hear “confirmed” if successful.

c. Offset Direction:
- Press “MENU” and use the UP/DOWN arrows to scroll to “SFT-D”
- Press “MENU again
- Use UP/DOWN arrows to change to either “OFF” (simplex), “-“ (minus offset) or “+” (plus offset)
- Press “MENU” again and listen for “confirmed”
- NOTE: Offsets are typically listed as “+” or “-“ next to the repeater frequencies in the repeater directories.

d. CTCSS tone:
- Press “MENU” and use the UP/DOWN arrows to scroll to “T-CTCS”
- Press “MENU” again
- Enter an offset number by using the UP/DOWN arrows to scroll to the number listed for the repeater you want to use.
- Press “MENU” again and listen for “confirmed”
- NOTE: Repeater directories may list the CTCSS as “PL” or “Tone” or “CODE IN”

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3. Press push to talk (PTT) and hold it. While simultaneously holding PTT, enter the IRLP code of the long distance node on the HT key pad. It will sound just like the touch tones on a phone. NOTE: Only one IRLP code needs to be entered to make a successful connection.
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6. To exist the IRLP when done talking, simultaneously press PTT and enter the code “73” on the key pad.

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Basic Communications

BACKGROUND

Ham radio gives us a means to communicate with each other over the air. The question, though, is now that you have that brand new handheld radio, there are a lot of functions that you have no idea what it means! To compound this, you know that if you don't set up these unknown functions, your shiny new radio will be useless! The radio came with an operating manual, but, again, it is useless unless you know what those functions are. That is what this document will try to do, give you anunderstanding of the basic functions of your radio so that you can use the manual to configure it correctly. I will do my best to avoid giving specific instructions (such as push this key, then turn that knob) because people have different radios and I want everyone to be able to use this. That is why your instruction manual will be important, as it gives the specific steps to configure a specific function. Let's get started!

A radio operates by using electricity to "excite" an antenna to "vibrate" (which is undetectable by sight or touch) at a specific frequency. It also uses an antenna (usually the same one) to detect those "vibrations" in the air at a specific frequency in order to hear what has been sent by the transmitting entity. For transmitting, you enter a specific frequency in your radio. When you transmit a signal, the radio causes electricity to be sent to the antenna, causing it to "vibrate" at the chosen frequency. On the receive side, the antenna is detecting all radio wave signals. By entering the frequency in the radio, the electronics inside are "listening" for a specific frequency and ignoring all others. It is like hearing your child crying in a crowded mall, you know it is your child and you focus in on that to the exclusion of all other noises.

Basic Function

Every radio has several things in common. Below is a list, with a basic description of each.
Antenna: This is important to both transmitting and receiving a signal.
Power button/dial: Turns the radio on and off.
Push To Talk (PTT) button: This causes the radio to transmit a signal.
Squelch Dial: Allows for the suppression of the output on the radio if the signal level drops below a certain level (otherwise the radio would broadcast "white noise" constantly). You will want to turn this dial just far enough to stop the "white noise". If you are getting intermittent "white noise", turn it just a little further until that stops, but no further. Turning it too far will prevent any signal from getting through.
Number Keypad: Allows for the direct entry of a frequency to either transmit or receive on. This keypad also provides additional access to multiple functions built into the radio.

Basic Communications *(continued)*

Basic Capabilities

There are several ways to communicate with your radio, but the majority of people will be using themto communicate verbally, which usually uses Frequency Modulation (FM) in the Very High Frequency/Ultra High Frequency (VHF/UHF) range, while with High Frequency (HF) communications, Single Side Band (SSB) is used for voice communications. There is simplex operations, which allows users to dial in a specific frequency and communicate directly on that frequency. It is called simplex because only one user can communicate at a time, since every user is using the same frequency. Next, there are repeater communications which are, essentially, simplex, but the repeater uses two frequencies, one to receive on and the other to re-transmit what it has just received. Repeaters have a listed frequency, which is the one they receive on, and use an "offset" frequency to retransmit on. In the US, the offset for Very High Frequency (VHF) and Ultra High Frequency (UHF) is usually plus or minus 600 kHz from the given frequency. For example, if a repeater uses a frequency of 144.650 Mhz, then the positive (or plus) offset frequency would be 145.250 Mhz and the negative (or minus) offset would be 144.050 Mhz. Please note that in the UHF range, the offset is usually +/- 5 Mhz, making a frequency of 445.000 Mhz as 440.000 Mhz on the negative and 450.000 Mhz on a positive offset.

The good thing about most radios today is that they have a function for Automatic Repeater Shifts. If you make sure that this function is turned on, then it will automatically configure your radio for this offset shift. The problem, however, is that although most repeaters in the US use a standard shift, not all do, so you may have to configure the offset shift manually. This is one of the areas that you will have to consult your specific radio manual to determine how to configure the radio for the appropriate shift.

To find a repeater close to you, log into www.repeaterbook.com and click on "North American Repeaters" under "Main Menu". Next, click on your state. You will several lists, but the most important will probably be "Repeaters by nearest city/town:." Find your city (or a city close by), and click on the city name. This will give you a list of the frequencies for that repeater. Below is the list for the Poway, California repeater, which is close to my home:

Frequency	Tone	Location	County	Call	Use	
145.1800-	107.2	Poway, Woodson Mountain	San Diego	K6KTA	OPEN	
147.1950+	110.9	Poway	San Diego	K6JCC	CLOSED	
147.3000+	103.5	Poway	San Diego	N6PWY	OPEN	
448.5200-	DMR	Poway, Mt Woodson	San Diego	KI6KQU	CLOSED	
449.7800-	141.3	Poway, Woodson Mtn	San Diego	KI6BJN	OPEN	

Basic Communications *(continued)*

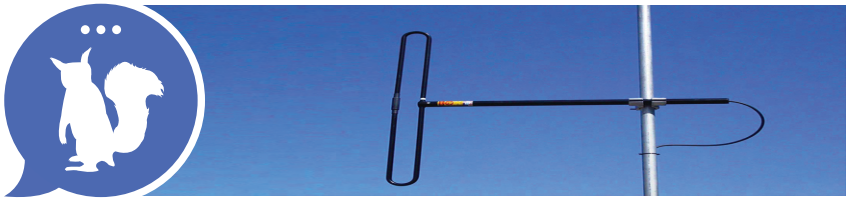
Let's break this down. First is the given frequency, followed by either a "+" or a "-" sign. This is the frequency that the repeater receives on, and the "+" or "-" tells you what the offset is, either positive or negative. For the 14X Mhz frequencies, that offset will be either plus or minus 600 kHz. For the 44X Mhz frequencies, the offset will be either plus or minus 5 Mhz. Next is the Tone (which I will describe next) that the repeater uses to activate. Next is the location, or where the repeater is located. The next block is the county that the repeater is in. The Call is the callsign of the control operator of the repeater. The Use tells you if the repeater is currently Open or Closed (open meaning it is open for anyone to use, closed meaning it is restricted to specific users, such as a ham club). The final box, with the antenna, tells you if the repeater is on-air (green), off-air (red), testing (yellow) or unknown status (white). This will give you everything you need to know to configure your radio for that specific repeater.

Now, to address the Tone. Many repeaters require a user to use a "tone" in order to access the repeater. The reason for this is simple. There are numerous radio transmissions at any given place at any given time, especially in more crowded areas. Without this tone function, every time a signal keyed up on or near the repeater frequency, even if the signal is for something other than repeater use, the repeater would activate. Since only one party can communicate on a repeater at a time, if every signal near this frequency activated the repeater, almost no one would ever be able to use the repeater as it would constantly be activated, preventing people from using it. This tone is used to let the repeater know that the signal it is receiving is from a person that wants to use the repeater. These tones are called either Continuous Tone-Coded Squelch System (CTCSS) or Digital-Coded Squelch (DCS). The tone is usually given in Hertz (Hz) and is sub-audible. In the example above, one of the tones is listed as DMR. This stands for Digital Mobile Radio and is a set tone for some digital radios. When setting up your radio for a repeater, look up CTCSS or DCS in your manual and configure your radio for the specific tone (for example, the Poway, Woodson Mountain repeater on 145.180 uses a CTCSS tone of 107.2 Hz).

Now that your radio is set on the correct frequency, with the correct offset and the correct tone, you should be able to communicate on your local repeater! The most important thing is to listen for a short time to make sure no one else is using the repeater before you transmit. If the repeater is clear, you should be able to use it.

There are, of course, many more functions on your radio, but the above are the basics you will need in order to conduct the majority of your communications using repeaters. I sincerely hope this helps people to better understand their radios and how they function!

**** Please note that this document applies more directly to VHF/UHF communications as opposed to HF communications****

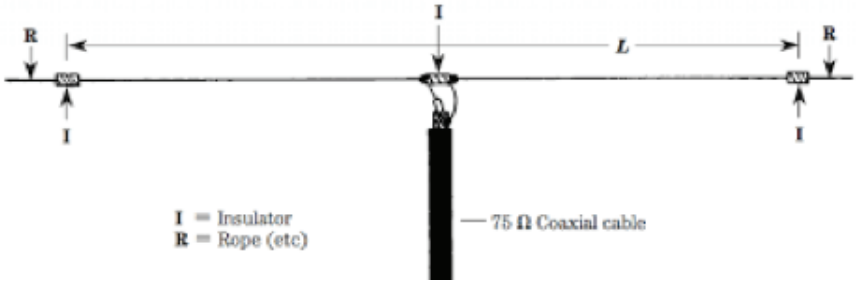


Basic Dipole Antenna

What is the best antenna any Ham Radio operator could put up quickly and one which works very well?

The answer is, of course, the tried-and-true Dipole or, as some will call it, the Doublet. This antenna is by far and away the most popular and the most utilized in sheer numbers throughout the world. For New Hams, the term dipole (two poles) is an antenna that has two arms of equal length of wire for each arm, fed in the middle with a feedline of either coax or twin lead or window line.

A dipole can be any length depending on the band of choice. If the dipole antenna is fed with coax, it should be cut specifically for one band. If the antenna is fed with twin lead (300 ohm) or window line (400 ohm), it can be pretty much any length.



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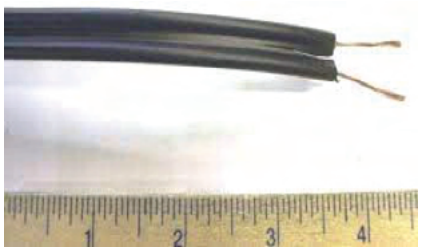
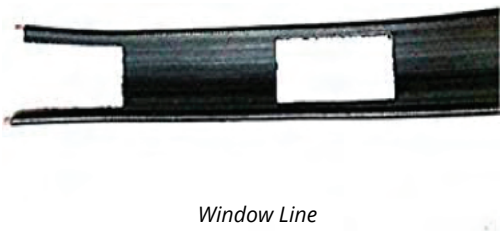


Twin Lead



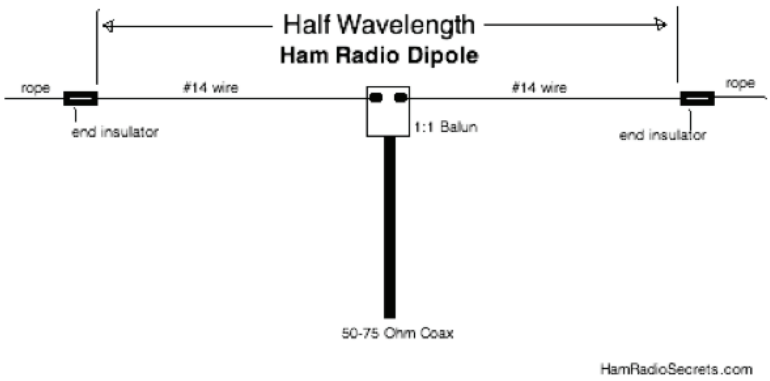
Window Line

The term twin lead and window line refer to a feedline for the antenna consisting of two wire sides also called balanced line.

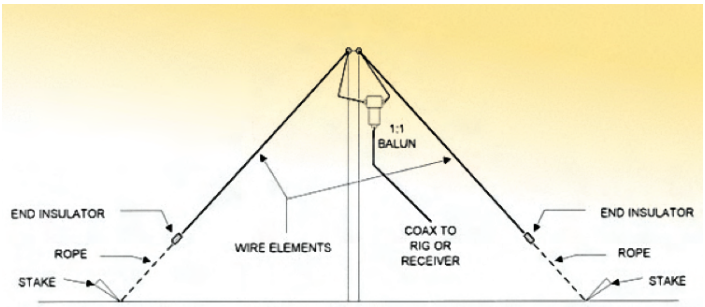
Basic Dipole Antenna *(continued)*

I always encourage ham radio operators to go for the Dipole fed with the twin lead or window line because either of those feedlines presents the operator very little loss in signal strength no matter what the Standing Wave Ratio (SWR) happens to be. The SWR, is the number of standing waves or feedback on one's antenna line, which may prove to be a problem with coaxial cable.

Here are two basic drawings of the two most popular dipole configurations, one called a flat-top and the other an inverted or 46.510 upside-down "V" antenna. First the flat top. As it states, it is a horizontal dipole antenna.



And, the inverted "V" (picture courtesy of Basu, VA2USB, June 9, 2020), a popular dipole variant:



Considerations for building either the horizontal flat top or inverted V antenna: Both of these antennas can be purchased through many different ham radio commercial product distributers.

For those who wish to try to build and antenna, here is a list of basic items needed:

1. Wire which will be measured equal distances for both sides of the antenna. At the bottom of this article, I will list the basic lengths of wire needed for different band considerations.
2. Insulators: these are non-conducting materials needed for each wire end and one in the middle of the antenna (called the center insulator) to connect the two wires to the feedlines.

Basic Dipole Antenna *(continued)*

3. A Balun or choke. The balun stands for balanced to unbalanced when connecting a twin lead or window line feedline to the short run of coaxial cable to the radio. A choke is used between a coaxial feedline and the antenna to prevent/reduce common mode or stray current. The balun can also be considered a form of a choke to keep stray current from attenuating on the feedline.
4. Antenna Tuner: For multi-band antennas, which are not resonant on the frequency of choice, a tuner will be needed to match your new antenna to the 50 ohms needed by your radio.

My Recommendation for either the Flat Top or Inverted V antenna:
The antennas I build are always multi-band or all band antennas. That is, I make the antenna as long as I can, then feed it with twin lead or window line. I have three multi-band antennas one a flat top and two inverted V antennas.

How long should you build your antenna:
This depends on the amount of space you might have to
put up a good wire antenna. If you would like to get most of the bands, say 80 meters or 3.6 MHZ and up, you would need an antenna approximately 134 feet long for optimal operation. Not to worry though as you can operate 80 meters with as little as 100 feet and still get by.

Common lengths for whatever bands you may want to squeeze in:
- 80 meters and up: (3.6 MHZ)- 100 to 134 feet for the total antenna length. Split this number in half for each antenna leg.
- 40 meters and up: (7.150 MHZ)-66 feet total length or 33 feet for each leg.
- 20 meters and up: (14.200 MHZ)- 34 feet total or 17 feet for each leg

Feedline:
As stated previously, one can use twin lead (300 Ohm) or window line (400 Ohm) of whatever length is needed to get to the radio.

Last things:
When constructing the dipole antenna, the wires will generally be soldered, one wire to one side of the feedline and the other wire to the other wire of the feedline. The feedline will then be run to t he radio room area or just outside the radio room and the twin lead or window line will then be attached to one side of what is called a 1:1 current balun. From the other side of the balun, a short run of coaxial cable is used to go to the radio connection. It is my hope that this short article will give some insight into building or purchasing a dipole antenna which will fit into your area and meet your ham radio needs. If anyone has any questions on either building or purchasing a good antenna, please feel free to e-mail me at russ.duteau@windstream.net.
Thanks, 73 and God bless to everyone.

Russ K4WQS.

Build & Test HAM Radio

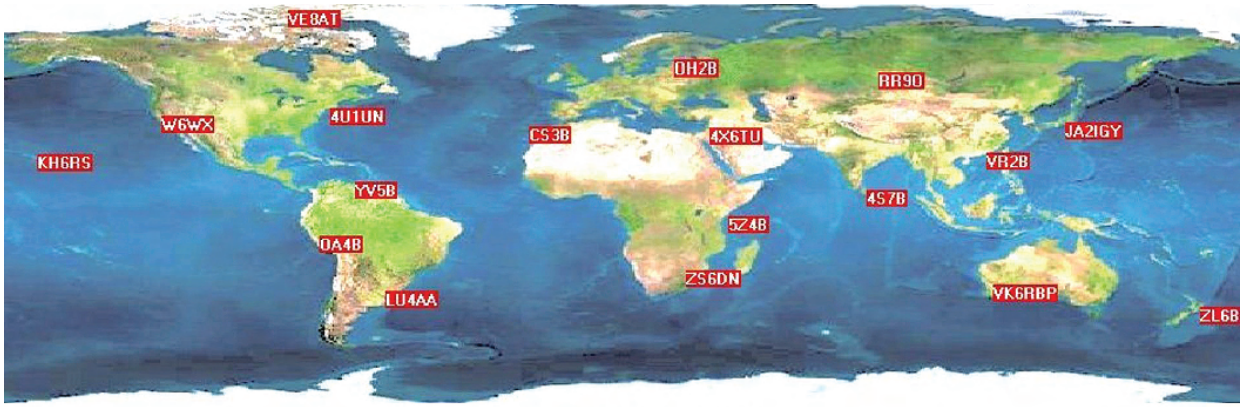
Introduction
The purpose of this document is to demonstrate some of the sources of regular broadcast frequencies in order to assess your radio and antenna performance. Other aspects feature methods to test your transmission efficacy. A search of the web will find other stations for these purposes, but this will introduce the concepts.

Receive/Listen
There are a number of radio sites that regular transmit near frequency ranges of interest to the amateur radio operator. These stations are either beacons that routinely transmit known-strength signals or transmit time signals.

Beacons
Ham radio beacons are allowed to operate in order to better understand propagation. These stations typically operate 24/7 and transmit signals of known strength.

The International Beacon Project transmits on five bands:
http://www.ncdxf.org/beacon/index.html

Stations transmit on each of the five bands on a 10 second transmission schedule and then are silent until they come up again on the schedule.



NCDXF/IARU International Beacon Project

Build & Test HAM Radio *(continued)*

Frequency	Beacon	Location
14.100	RR9O	Siberia
18.110	JA2IGY	Japan
21.150	VK6RBP	Australia
24.930	ZL6B	New Zealand
28.200	KH6RS	Hawaii

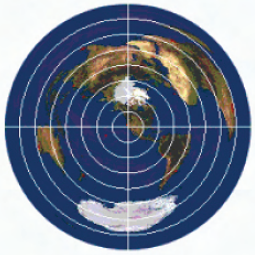
Clock compensation:

- -46 +

18:52:15 UTC

What direction is the beacon?

How far away is the beacon?



Beacon	Frequency
4U1UN	silent
VE8AT [2]	silent
W6WX	silent
KH6RS	28.200
ZL6B	24.930
VK6RBP	21.150
JA2IGY	18.110
RR9O	14.100
VR2B	silent
4S7B [4]	silent
ZS6DN	silent
5Z4B [7]	silent
4X6TU	silent
OH2B	silent
CS3B	silent
LU4AA	silent
OA4B	silent
YV5B	silent

If you are able to be on the webpage while listening to the station, you will be able to hear which beacon transmitted. Stations are all over the world and initial transmit station ID and a tone at 100W and then the tone at 10W, 1W, and 100mW.

Time Signals

A number of countries, including the US, provide time signals. These signals include various digital and voice transmissions. This websitecovers time transmitters from 2.5 to 20 MHz: **https://www.smeter.net/stations/hf-time-frequency.php**

There are a large number of rows in this table, but just the beginning is given to show part of the site and encourage you to go there and try the various frequencies at different times to see how successfully and reliably you can receive the signals.

Build & Test HAM Radio *(continued)*

HF Time & Frequency Standard Stations

The stations below are widely used to check current radio propagation conditions.

The primary functions of WWV and WWVH are to transmit official standard time on highly accurate reference frequencies traceable to the U.S. national standard. Other stations listed below serve similar functions in other countries.

In addition to those primary functions, these stations serve another important function in providing means to quickly check radio propagation conditions from multiple locations on a variety of widely spaced frequencies. That function is especially important to radio amateurs, shortwave listeners, and others interested in radio propagation. These stations serve that function better than most other shortwave stations, because they transmit constantly from known locations with known power levels using known antenna systems.

- Terrain map showing the 358-mile direct-path from WWV
- Terrain map showing the 3070-mile direct-path from WWVH

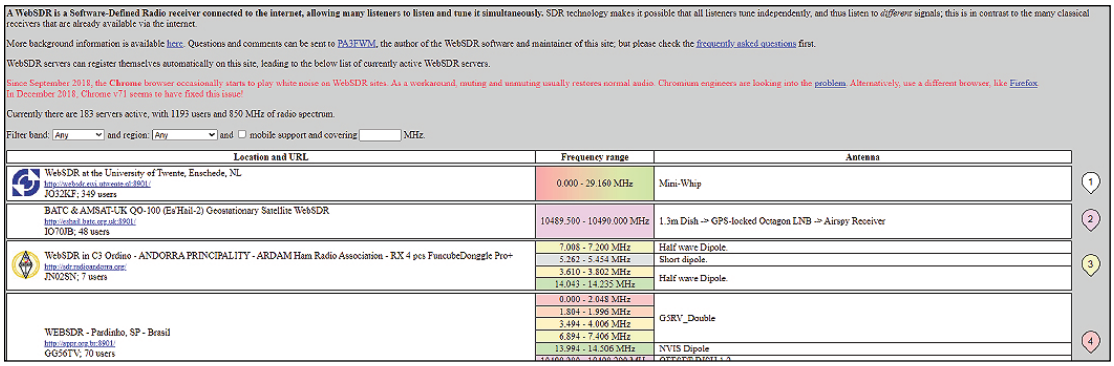
Time & Frequency Standard Stations

Freq.	Call	Power	Distance	Description
2500 kHz	WWV WWVH	2.5 KW 5 KW	358 Miles 3070 Miles	WWV Broadcasts National Institute of Standards and Technology (NIST) time and frequency signals from a location near Fort Collins, Colorado. WWV uses a male voice. WWVH Broadcasts National Institute of Standards and Technology (NIST) time and frequency signals from a site near Kekaha at Kokole Point on the Island of Kauai, Hawaii. WWVH uses a female voice. For both stations the transmission mode is DSB AM. Steady tone modulation is 50%. BCD time code modulation is 50%. Second pulses and minute and hour marker modulation 100%. Voice modulation is 50%. The antenna polarization is vertical. WWV and WWVH share 2500 kHz with BPM, Shaanxi Astronomical Observatory, Chinese Academy of Sciences, P.O. Box 18 - Lintong, Shaanxi, China. (See Double Time Markers)

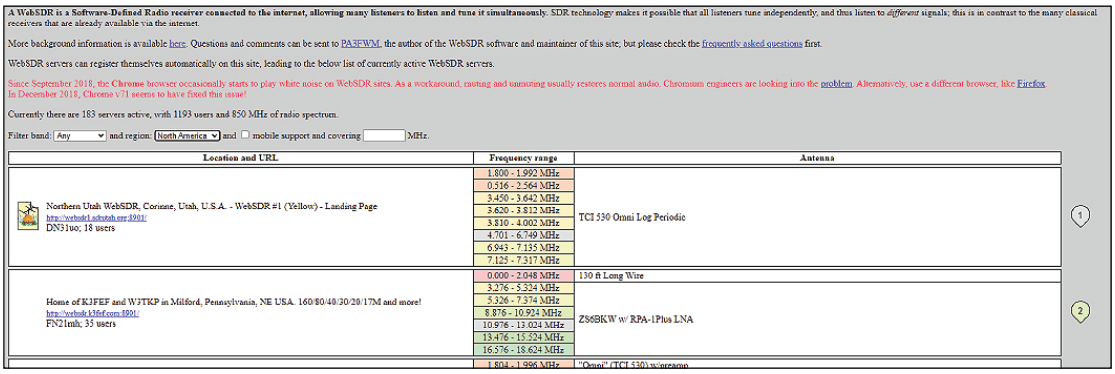
Build & Test HAM Radio *(continued)*

Web Software Defined Radio

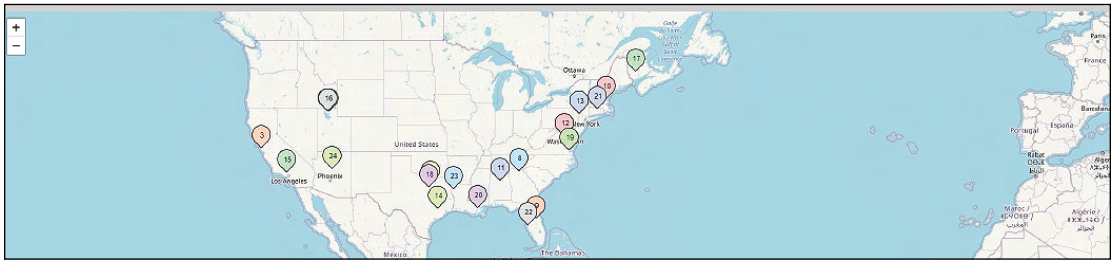
Web SDR is a relatively new entrant into the world of radio. Using these features, you can listen through someone else's radio and antenna system that they've made available via a website interface. It is a listening-only facility, but it's interesting to see what's on the air in other locations. A gateway to the available Web SDR equipment is on: **http://websdr.org** From that site, you can limit your area of interest and specific frequencies by using the filter boxes on the top.



Here, I've limited the equipment to North America and allowed for any bands:

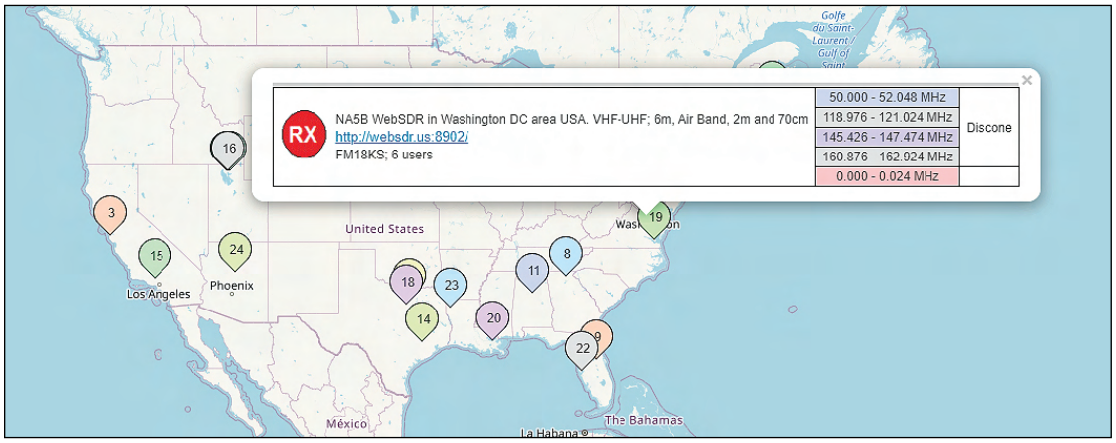


For ease of use, there's a map of the resulting stations at the bottom of the page:

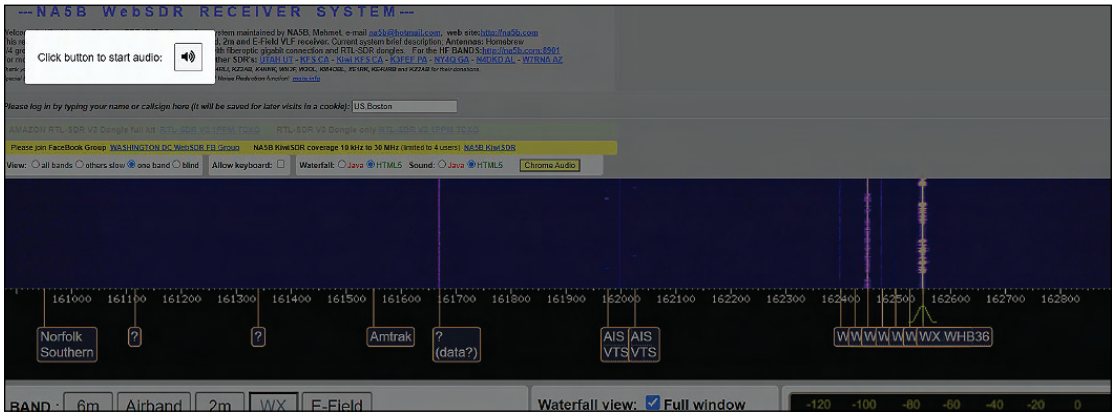


Build & Test HAM Radio *(continued)*

You can zoom in on the map, as I've already done, and then you can click on a site to see the details and get a link to go to the site:



Oftentimes, you may need to initially click a button to get the stream started, but they're not always so easily found as in this site:

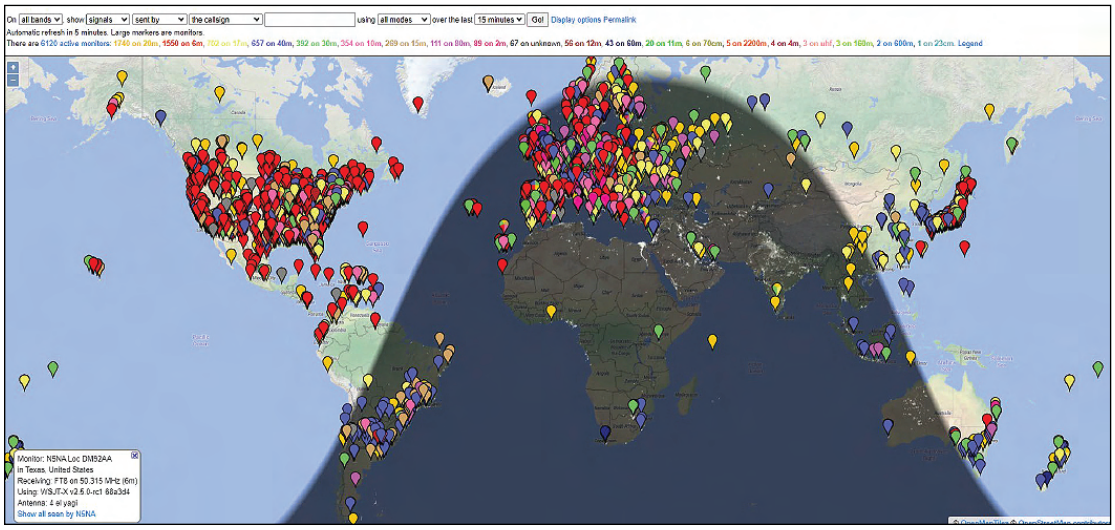


Then, you can enter a frequency of interest or, for testing, the one on which you're going to transmit. Make sure to set the appropriate mode and other parameters. You may want to use headphones on the computer if you're going to transmit so you can more easily distinguish your test transmission from the sounds picked up on the radio and also avoid feedback.

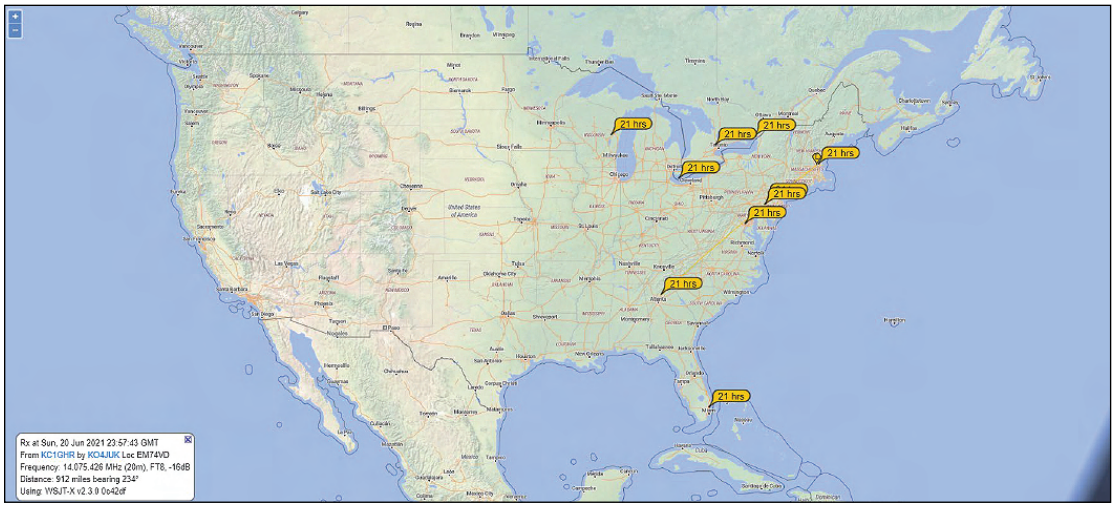
Digital Modes

When you're transmitting using digital modes such as FT8, PSK31, etc., there are a number of monitors that constantly capture and report data to the internet. There are a number of great resources to see these results. The first one, PSKReporter, is graphical and provides a great mapping feature here: **https://pskreporter.info/pskmap.html**

Build & Test HAM Radio *(continued)*



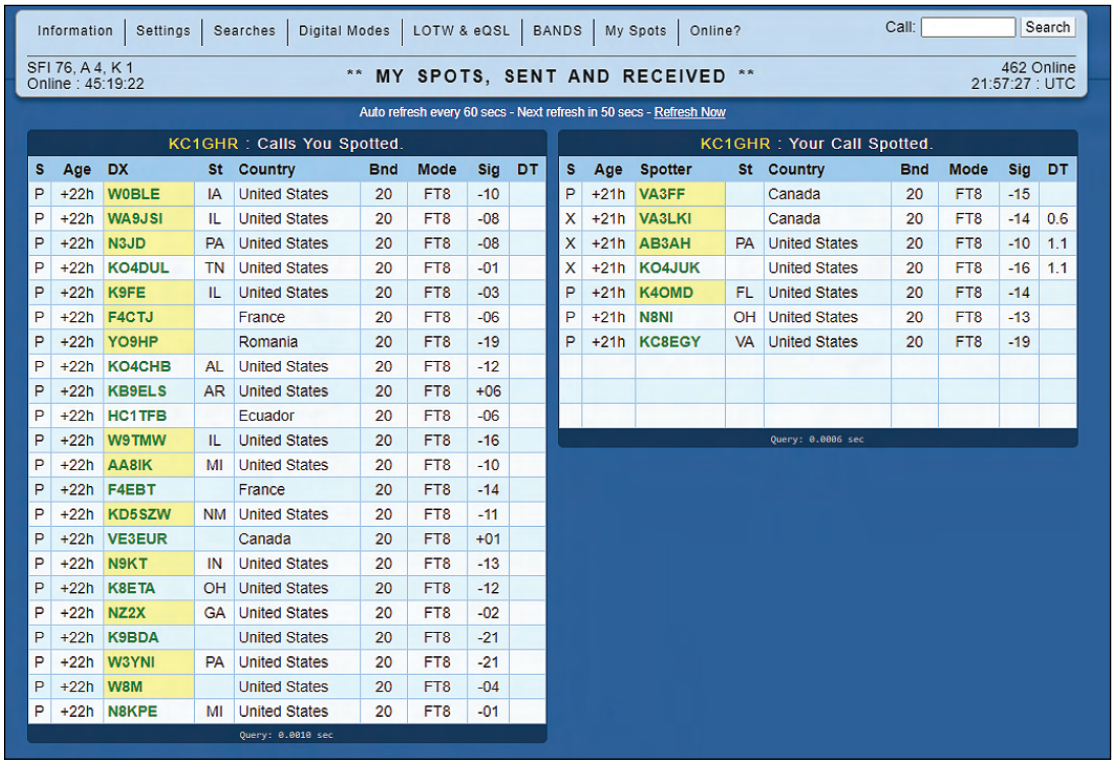
You can then do a search for your callsign to determine where you were able to reach with that particular radio and antenna arrangement:



Another great tracking website is Hamspots:
https://hamspots.net/

Some features, like your spots, require a free account to login.

Build & Test HAM Radio *(continued)*



Information | Settings | Searches | Digital Modes | LOTW & eQSL | BANDS | My Spots | Online? Call: Search

SFI 76, A 4, K 1
Online : 45:19:22

** MY SPOTS, SENT AND RECEIVED **

462 Online
21:57:27 : UTC

Auto refresh every 60 secs - Next refresh in 50 secs - Refresh Now

KC1GHR : Calls You Spotted.

S	Age	DX	St	Country	Bnd	Mode	Sig	DT
P	+22h	W0BLE	IA	United States	20	FT8	-10	
P	+22h	WA9JSI	IL	United States	20	FT8	-08	
P	+22h	N3JD	PA	United States	20	FT8	-08	
P	+22h	KO4DUL	TN	United States	20	FT8	-01	
P	+22h	K9FE	IL	United States	20	FT8	-03	
P	+22h	F4CTJ		France	20	FT8	-06	
P	+22h	YO9HP		Romania	20	FT8	-19	
P	+22h	KO4CHB	AL	United States	20	FT8	-12	
P	+22h	KB9ELS	AR	United States	20	FT8	+06	
P	+22h	HC1TFB		Ecuador	20	FT8	-06	
P	+22h	W9TMW	IL	United States	20	FT8	-16	
P	+22h	AA8IK	MI	United States	20	FT8	-10	
P	+22h	F4EBT		France	20	FT8	-14	
P	+22h	KD5SZW	NM	United States	20	FT8	-11	
P	+22h	VE3EUR		Canada	20	FT8	+01	
P	+22h	N9KT	IN	United States	20	FT8	-13	
P	+22h	K8ETA	OH	United States	20	FT8	-12	
P	+22h	NZ2X	GA	United States	20	FT8	-02	
P	+22h	K9BDA		United States	20	FT8	-21	
P	+22h	W3YNI	PA	United States	20	FT8	-21	
P	+22h	W8M		United States	20	FT8	-04	
P	+22h	N8KPE	MI	United States	20	FT8	-01	

Query: 0.0010 sec

KC1GHR : Your Call Spotted.

S	Age	Spotter	St	Country	Bnd	Mode	Sig	DT
P	+21h	VA3FF		Canada	20	FT8	-15	
X	+21h	VA3LKI		Canada	20	FT8	-14	0.6
X	+21h	AB3AH	PA	United States	20	FT8	-10	1.1
X	+21h	KO4JUK		United States	20	FT8	-16	1.1
P	+21h	K4OMD	FL	United States	20	FT8	-14	
P	+21h	N8NI	OH	United States	20	FT8	-13	
P	+21h	KC8EGY	VA	United States	20	FT8	-19	

Query: 0.0006 sec

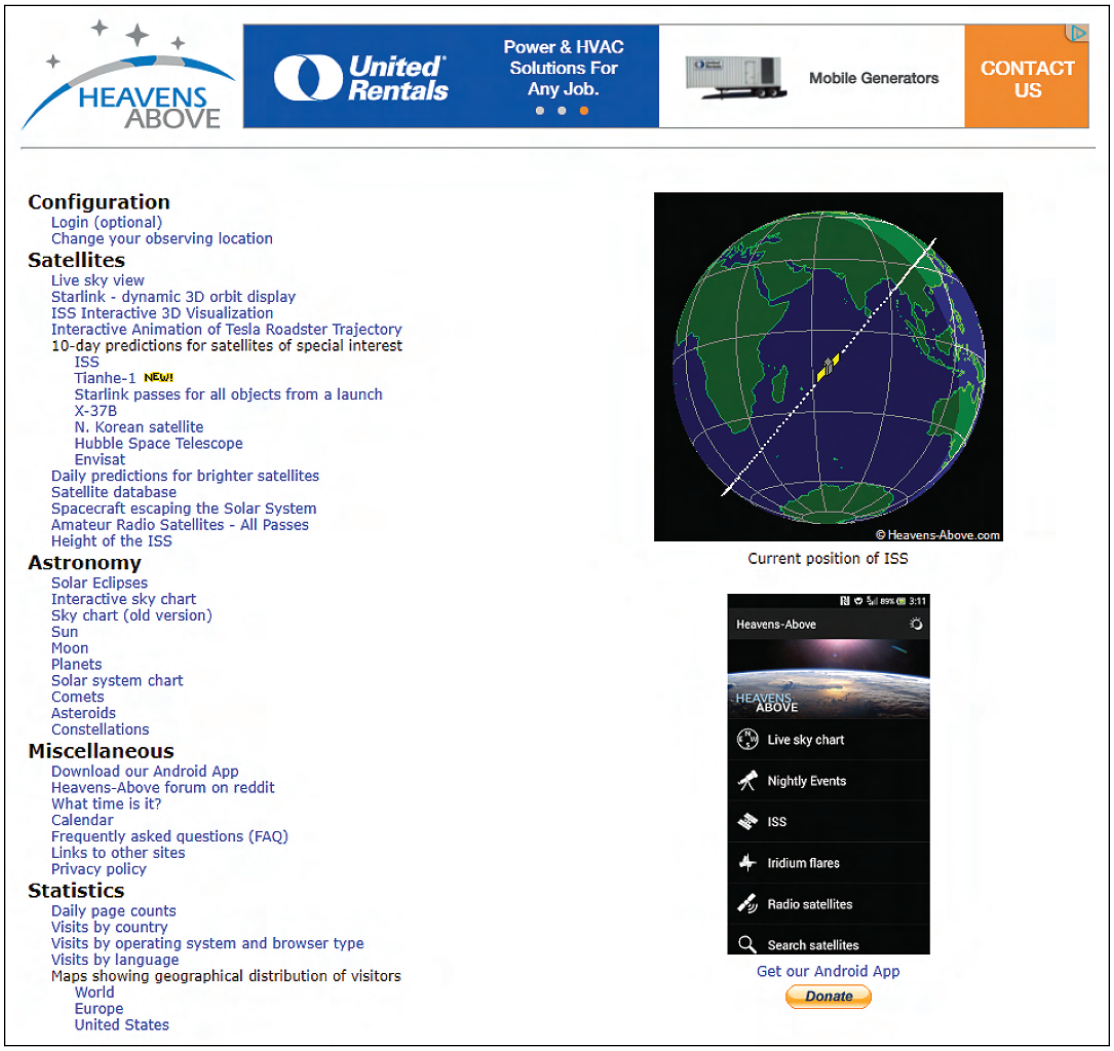
Fun Listening VHF/UHF while improving listening skills

There are many orbiting satellites and man-made objects in space. A number of these provide beacons and communications of various forms. One of the most convenient sites for this is Heaven-Above:

www.heavens-above.com

The first time you go there you will have to set your location. You can also establish a login, if you'd like, but I haven't bothered doing that.

Build & Test HAM Radio *(continued)*



You can select the Amateur Radio item from the menu to get a list of the satellites expected to pass over.

Build & Test HAM Radio *(continued)*

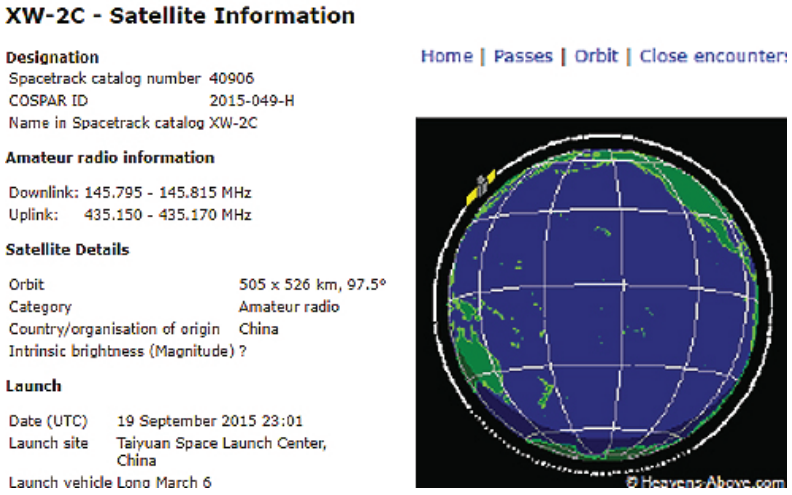
Amateur Radio Satellites - All Passes

Search period start: 21 June 2021 17:38
Search period end: 22 June 2021 17:38 < >
Location: Tewksbury, 42.6106°N, 71.2342°W

Satellite	Date	Start	Highest point		End	Downlink Frequencies (MHz)
			Altitude	Azimuth		
ITAMSAT 1	21 Jun	17:38:52	22°	63° (ENE)	17:46:45	435.822/435.867
XW-2C	21 Jun	17:41:07	63°	76° (ENE)	17:48:38	145.795 - 145.815
KAITUO 1B	21 Jun	17:43:08	28°	71° (ENE)	17:49:29	145.475/437.950
HuskySat-1	21 Jun	17:43:33	22°	226° (SW)	17:49:19	.
AAUSAT CUBESAT 2	21 Jun	17:50:25	41°	262° (W)	17:58:19	437.432
CUTE-I	21 Jun	17:54:54	66°	73° (ENE)	18:05:25	437.470
ZACube-1	21 Jun	17:55:47	15°	269° (W)	18:00:48	437.345
XW-2F	21 Jun	17:56:39	71°	76° (ENE)	18:04:07	145.980 - 146.000
FALCONSAT 3	21 Jun	17:57:11	25°	185° (S)	18:03:06	435.103
BEESAT 3	21 Jun	18:00:04	23°	114° (ESE)	18:06:05	437.485
Oscar 11	21 Jun	18:03:15	51°	261° (W)	18:11:38	145.825
AO-27	21 Jun	18:21:04	52°	70° (ENE)	18:31:05	436.795
NOAA 15	21 Jun	18:24:16	24°	63° (ENE)	18:32:31	137.6200
PSAT 2	21 Jun	18:25:30	13°	171° (S)	18:29:51	145.825 / 435.350
NO-84	21 Jun	18:34:14	13°	232° (SW)	18:37:08	435.350 FM
NOAA 19	21 Jun	18:44:36	69°	72° (ENE)	18:55:30	137.1000
BEESAT	21 Jun	18:45:30	12°	90° (E)	18:49:28	436.000
METEOR M2	21 Jun	18:45:32	35°	67° (ENE)	18:55:11	137.100 / 137.900
ITUPSAT 1	21 Jun	18:54:30	16°	91° (E)	19:00:08	437.325
NUDT-PHONESAT	21 Jun	18:58:41	51°	261° (W)	19:05:42	437.300
TIGRISAT	21 Jun	19:01:42	16°	90° (E)	19:07:16	435.000
STRAND 1	21 Jun	19:05:35	23°	93° (E)	19:13:41	437.568
XW-2D	21 Jun	19:08:18	12°	270° (W)	19:11:07	145.860 - 145.880
XW-2B	21 Jun	19:12:53	11°	270° (W)	19:15:16	145.730 - 145.750
ITAMSAT 1	21 Jun	19:16:55	49°	260° (W)	19:26:56	435.822/435.867
KAITUO 1B	21 Jun	19:17:25	19°	266° (W)	19:22:45	145.475/437.950
CAS-4A	21 Jun	19:21:00	15°	143° (SE)	19:25:52	145.870
CAS-4B	21 Jun	19:34:25	18°	145° (SE)	19:40:01	145.925 MHz USB
FALCONSAT 3	21 Jun	19:36:11	14°	200° (SSW)	19:40:04	435.103
BEESAT 3	21 Jun	19:36:45	31°	311° (NW)	19:43:38	437.485

From that, depending on the time in relation to when you can listen, you can click on the satellite name to get additional information about the pass:

Build & Test HAM Radio *(continued)*



XW-2C - Satellite Information

Designation
Spacetrack catalog number 40906
COSPAR ID 2015-049-H
Name in Spacetrack catalog XW-2C

Amateur radio information

Downlink: 145.795 - 145.815 MHz
Uplink: 435.150 - 435.170 MHz

Satellite Details

Orbit	505 x 526 km, 97.5°
Category	Amateur radio
Country/organisation of origin	China
Intrinsic brightness (Magnitude)	?

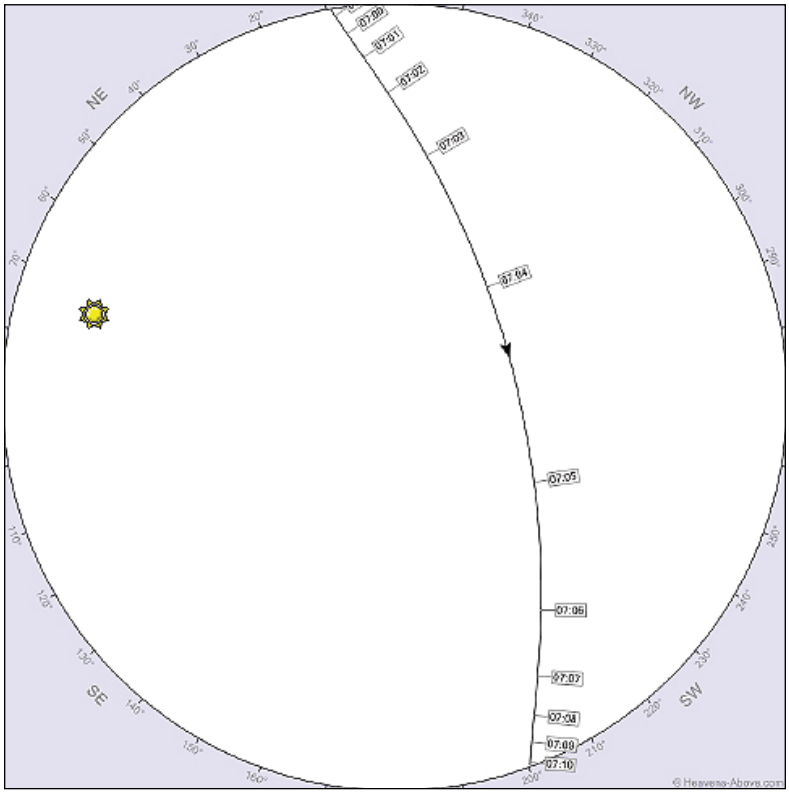
Launch

Date (UTC)	19 September 2015 23:01
Launch site	Taiyuan Space Launch Center, China

Launch vehicle Long March 6

Home | Passes | Orbit | Close encounters

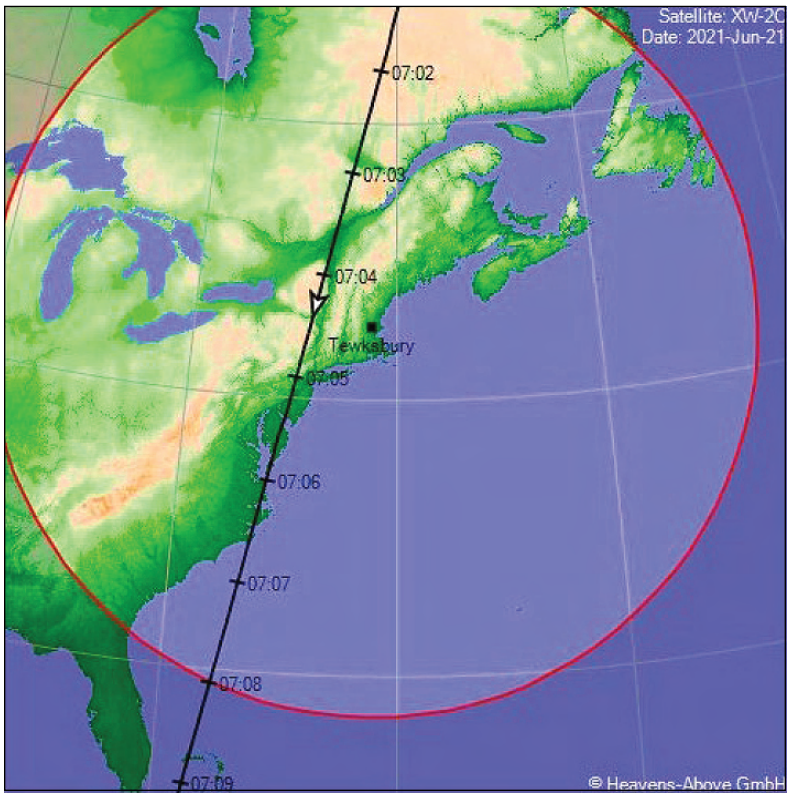
You'll see a menu in the upper right, above the graphic, which will show you the pass details and then pick a specific pass for viewing (I like passes that are at least 45 degrees above the horizon):n click on the satellite name to get additional information about the pass:



Build & Test HAM Radio *(continued)*

Note that the drawing has East on the left with the intention that the viewer would hold the graphic overhead looking up at it with north aligned to the top of the page. That would make East and West align correctly on the sky. The ground track can help put the pass in perspective:

Ground Track



Note that an arrow antenna hooked up to an HT is fun to work with tracking and polarity and helps to build better tracking skills:
http://www.arrowantennas.com/arrowii/alaskanarrow.html

Final Note on Transmit/Receive Testing

It's really not about power with radio transmission and reception. Power plays a role, but is only part of the picture. Having a properly tuned antenna for maximum propagation, not just antenna matching where a lot of the power goes into the matching system. Try to maximize the antenna, which includes as much height as you can afford to accomplish. Try to get up at least ¼ wavelength (λ). NASA spoke to the astronauts with about 25W over about 240,000 miles but awesome line-of-sight. Similarly, operators routinely communicate with the International Space Station (ISS) with less than 5W but, again, direct line of sight. Other factors, like sunspots and gray-line propagation, mean that certain times of day and space conditions will strongly influence ultimate success.

Communications Licenses

Links to classes to acquire HAM radio license

- ARRL | Licensing, Education & Training | Getting on the Air
- HamTestOnline™ (hamradiolicenseexam.com)
- License Courses – Ham Radio Prep

FRS (Family Radio Service), GMRS (General Mobile Radio Service), & Amateur HAM radio licensure
FRS does not require testing or licensing for the FCC.

GMRS does not require testing BUT DOES REQUIRE A LICENSE (good for 10 years for an entire family) FCC is lowering the cost of the GMRS license from $70 to reportedly $35. This has not taken effect yet.

- GMRS vs FRS for Emergency Communication in 2021 (survivalandmore.com)
- 6 Things You Should Know about FCC Changes for FRS and GMRS Radios | Midland Radio (midlandusa.com)
- General Mobile Radio Service (GMRS) | Federal Communications Commission (fcc.gov)
- How To Get A GMRS License – Easy Guide To GMRS Licensing On The FCC Website – The NotARubicon
- When will the new FCC license fees take effect? (buytwowayradios.com)

Amateur HAM radio requires successful testing to be licensed. There are three classes of licensure.

- Technician – allows a person to use UHF & VHF frequencies (local communications)
- General – allows a person to use UHF, VHF & HF frequencies (local and worldwide)
- Extra – allows a person to use small exclusive bands on the above frequencies

About the different levels of amateur radio licenses | Ham Radio Answers (dcasler.com)

Getting Started Guide

The purpose of this guide is to help you identify and prepare methods to stay in contact with other CORAC members, friends, and family under adverse circumstances. Please note: the use of new communication methods requires experimentation and learning, and there are no guarantees that they will work exactly as anticipated.

Consider whom you would like to contact in an emergency. Then acquire and practice with the equipment and services you may need, as described below:

- If you are a CORAC member and wish to be added to your regional Signal Group, install the Signal app on your phone and/or computer from https://signal.org/download/ (We recommend that you download the app to both – Signal on your phone will synchronize with Signal on your PC automatically. You can also send documents from your PC more easily, if necessary.) Then contact the Signal Group leader for your region and request to be added to the group. This group may enable you to communicate situational information with the regional team. Signal relies on the Internet to relay messages. If your home Internet service is down, but your cell service is still working, you may be able to use the Signal app on your phone. If 'The' Internet is down (as in a widespread outage), Signal will not work.
- If you already have a landline telephone, buy a line-powered phone that will operate without batteries or grid power.
- If you have a smartphone, purchase a Zoleo unit **https://www.zoleo.com/en-us** to enable texting via satellite if your phone is not able to text normally. A monthly subscription is required. The person you are texting only requires a Zoleo unit if their cell service is also disabled. Zoleo may be the right solution to reach family members across country.
- For communications from a fixed, rural location, consider Starlink **https://www.starlink.com/** or another satellite Internet service.
- If you would like to listen to CORAC amateur radio and/or public radio broadcasts, consider acquiring a shortwave (high frequency) radio receiver and antenna system. **https://corac.co/2021/10/18/shortwave-radio-listening/**
- To communicate locally (within a few miles of your home) acquire handheld radios that use GMRS, FRS, or MURS, technology. **https://corac.co/2022/10/09/how-to-create-an-emergency-plan-using-gmrs-radios/**
- In weak signal areas, install one or more cell phone signal boosters to use if your cell phone service is still operating.
- To charge your electronic devices when the grid goes down, you should consider acquiring a small solar + battery backup system. Remember to shake / warm batteries to maintain them in freezing weather.

Getting Started Guide *(continued)*

Learn and Practice Skills

As important as it is to have backup communications equipment, it is equally important to acquire and practice skills for operating your communications equipment. You may also choose to specialize in services you can provide for others, such as battery charging or setting up shortwave receivers with antennas. Obtaining your amateur radio licenses (Technician, General and Extra) will open up opportunities to communicate at greater distances on the amateur VHF, UHF and HF bands.

Initiate and Respond to Messages

- When you receive any communication, it is critical to promptly respond in kind (reply with an acknowledgement) to make it clear to others that you 'got it.'
- If the received message was complex or received over a lossy channel (or one where it is not clear which message you are replying to), repeat back the basics of what was said to ensure they know which communication you received. ('I understand that you are well and staying put but packing in preparation for possible evacuation,' for example.) If you do not have time for this, even a simple 'Thanks, I understand' or 'message received' or 'copy that' is better than no reply at all.
- It may not always be possible to respond 'in kind' (via the same communications system – for example, you hear a message broadcast over shortwave radio but you cannot transmit back, or you receive a text message but are unable to send a text.). In this case, simply do your best to respond via some other communications method if possible. Briefly summarize the message content (or timestamp / message number) so it is clear to the recipient which message you are acknowledging (for example: 'Received your broadcast regarding saving fuel for evacuation').
- Keep in mind that your replies may be received much later, or not at all – but you should still try.
- You should plan to communicate with others clearly, rapidly, and proactively as their situations and decisions change.

Try Various Options

Under the scenarios presumed by this document, not all communications methods may work all the time. It is also possible that some technologies will continue working, or function intermittently. You should plan to try a variety of methods and access points; just because a particular network is broken for you doesn't mean it's broken for everyone else. Find something that works, and use it until it doesn't. For example:

- Cell service may only fail in certain areas; some towers may have emergency backup power, etc.
- Text messages will often work even when cellular calls do not.
- If the cell network is down, landline phones may still work.
- If you can't get to a landline phone you could still use a pay phone.
- Some landline phones work without batteries.
- Do not forget e-mail; if a cellular or wireless Internet connection is down, try to find a wired or satellite one.

Getting Started Guide *(continued)*

- A radio operator in your family or neighborhood could relay messages through another operator outside the affected area.
- Your friends or family may have access to communication systems and sources of info you do not (e.g., local government, emergency services, corporate systems, amateur radio, etc.)
- A family member outside the affected area may be able to serve as a communication hub.
- You can text to e-mail and e-mail to text.
- Find a local amateur radio operator (someone in your church, a neighbor, a friend) who could pass a message for you (for example, via the National Traffic System or NTS.

Appendix: Fundamental Communications Concepts

- It is critical that messages be concise, clear, and in plain English. If necessary, work with the message originator (or a communications specialist) to craft a concise, clear message before sending it out.
- Distinguish between communicating and decision-making / dispatching.
- Understand, and be clear to others about, what role(s) you hold and what authority you do or do not have.
- Be clear about who a message is from and who it is to; their title and authority should be clear, e.g., from '<location> refuge lead' and name or member ID number.
- Do not speculate. Do not start rumors.
- When relaying, pass messages exactly as received.
- Do not use acronyms. Always spell them out ('CORAC' may be understood between members if you know the message is going directly to another member. but if it is going through a non-CORAC radio operator you will need to spell out the acronym.)
- Use standardized forms to record messages and log communications.
- In some cases, for example when operating in a 'denied area,' it may be most prudent to not communicate plans and actions, or avoid mentioning certain details. All forms of electronic communication as described in this document should be considered inherently insecure against the most determined attackers. Some, such as communications over radio, are by default 'broadcast' to all in range, while texts, calls, e-mails, and social media messages can be easily monitored or retrieved by government and corporate entities.
- When a communication or discussion must be completely secure, the best way to ensure this is to exchange the message in person, outdoors, far away from all electronic devices and any person who might try to listen in.
- A 'denied area' is defined by the U.S. Department of Defense as 'an area under enemy or unfriendly control in which friendly forces cannot expect to operate successfully within existing operational constraints and force capabilities.'

For more information on CORAC Communications, please visit:
https://corac.co/communications-teams/

CORAC Radio Network Schedule (Update)

Note: All times are Eastern Time Zone.

The CORAC radio network meets on Sunday evenings at 7:30 PM Eastern time. The net starts with a digital meeting using the JS8Call digital radio application, and then switches to voice at 8:00 PM Eastern. The frequencies depend on the time of the year.

Spring and Summer (March 1 - September 30)

DIGITAL (JS8Call)

7:30 PM – 7:45 PM 10.130 MHz	10.130 MHz
7:45 PM – 8:00 PM 7.078 MHz	7.078 MHz

VOICE

8:00 PM – 8:30 pm	7.284.1 MHz LSB
(40 meters)	7.178 MHz LSB
	7.244 MHz LSB
	7.249.5 MHz LSB
8:30 PM – 8:45 pm	14.277 MHz USB
(20 meters)	14.271 MHz USB
	14.326 MHz USB
	14.278.5 MHz USB

Fall and Winter (October 1 - February 28)

DIGITAL (JS8Call)

7:30 PM – 7:45 PM 10.130 MHz	10.130 MHz
7:45 PM – 8:00 PM 7.078 MHz	7.078 MHz

VOICE

8:00 PM – 8:30 pm	7.284.1 MHz LSB
(40 meters)	7.178 MHz LSB
	7.244 MHz LSB
	7.249.5 MHz LSB
8:30 PM – 8:45 pm	3.982 MHz LSB
(80 meters)	3.962 MHz LSB
	3.762 MHz LSB
	3.921 MHz LSB

Getting Your HT to Work

GOALS/OBJECTIVES

- Understand the difference between one-way and two-way communications.
- Understand difference between simplex and duplex communications with HTs.
- Understand what squelch does.
- Understand difference between carrier and tone squelch.
- Understand what CTCSS & DCS is.
- Understand what a repeater is.
- Know how to access repeater lists.
- Be able to program your HT
- Yaesu FT-60R
- Yaesu FT-65R
- Yaesu FT-70D
- BaoFeng BF-F8HP
- This article is not inclusive of everything concerning HT programming. This information is simply to "shorten your learning curve."

RADIO COMMUNICATIONS INVOLVE 2 PRIMARY METHODS.

In a loose sense, anyone with a radio could be considered a radio station. Radio stations can broadcast signals in one of two ways: One-way broadcasts and two-way broadcasts.

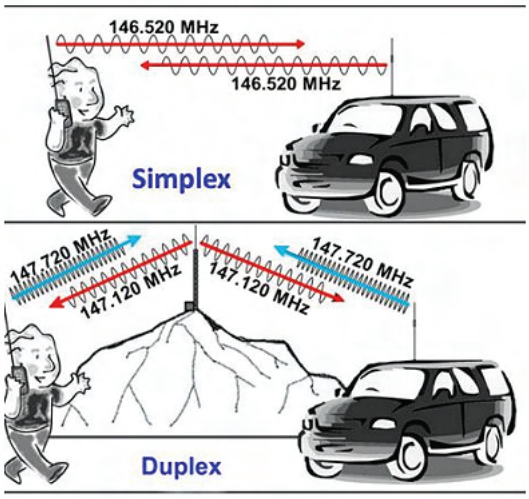
- **One-way broadcasts** tend to be the more professional side of amateur radio communications. A oneway station broadcasts information to be received by someone. The person receiving the information cannot respond to or transmit back to the originating station. Weather reports and Emergency Medical Services (sheriff's departments, police departments, fire departments, and ambulance services) fall into this category. Handheld transceivers (HTs) can receive some of these communications. Most one-way radio broadcasts occur as a digital signal or mathematical code sent in block segments. There tends to be less interference that occurs with this type of radio communication. However, when interference occurs the entire signal is lost.
- **Two-way broadcasts** are at the heart of amateur radio broadcasts. A person with an HT can transmit and receive information or signals. A person with an HT can act as an originating station or as a receiving station. Most two-way radio broadcasts occur as an analog signal or continuous flow of electrical signal. Due to the electrical nature of analog signals, interference can occur more often. Although the signal is less likely to be entirely lost, as with digital, it can vary in quality over time due to the interference.

TWO-WAY BROADCASTS INVOLVE TWO TYPES OF COMMUNICATION: SIMPLEX AND DUPLEX

- **Simplex communication** occurs when two radios are communicating with each other directly on the same frequency. Both radios take turns transmitting and receiving on the same frequency without a repeater or other device in between. Think of simplex communications as one simple step to talk to someone. Set your radio's carrier squelch and a frequency and you can communicate.

Getting Your HT to Work *(continued)*

- **Duplex communication** occurs when two radios are transmitting on one frequency and receiving on a different frequency. Both radios take turns transmitting and receiving with a repeater in between. Think of duplex as a double step to talk to someone. Set your radio's carrier squelch along with a frequency and the repeater's tone squelch to be able to communicate. Terms above will be further explained in the rest of this document.



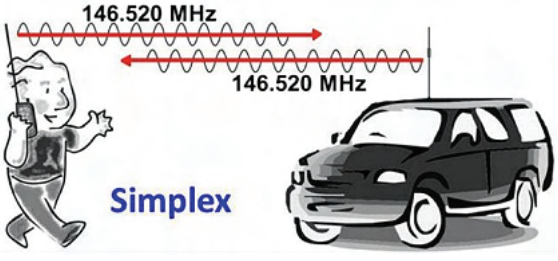
SQUELCH

Squelch is a circuit function that acts to suppress annoying background noise when a radio is not receiving a transmission. There are two types:

1. **Carrier Squelch** operates strictly on the signal strength. A transceiver mutes the audio when no signal is present.
   - Should be set before performing Simplex Communications.
   - Squelch can be adjusted with a knob, push buttons or a sequence of button presses.
   - Adjusts the threshold at which signals will open (un-mute) the audio channel.
   - Backing off the control will turn on the audio, and the operator will hear white noise (also called "static" or squelch noise) if there is no signal present.
   - Setting carrier squelch once operates on all frequencies for both simplex and duplex.

   Carrier Squelch Benefits
   - Simple to use, and easy to set up in the radio.
   - Not much technical knowledge required to operate.
   - Limited range means less people can pick up the signal.

   Limitations
   - Line of Sight
   - Antenna Height
   - Power
   - Obstructions
   - Terrain
   - Vegetation
   - Curvature of the Earth



Getting Your HT to Work *(continued)*

EXAMPLES OF SIMPLEX NATIONAL CALL CHANNELS

2-Meter Band Calling Frequency (VHF) – 146.520 MHz

70-Centimeter Band Calling Frequency (UHF) – 446.000 MHz

The above examples may not be the most commonly used in your area. The most common national simplex call frequencies may vary from county to county or state to state. Do a search for 2M simplex frequencies and for 70cm frequencies by your state and then by your county to discover which are most commonly used in your area. Simplex frequencies are great for making initial contact.

WEATHER RADIO FREQUENCIES NWR

Station Listing (weather.gov)

Use the above link to access your state and your county to locate the frequency for your area.

2. **Tone squelch**, or selective calling, is sometimes used to solve interference problems.
   - Where more than one user is on the same channel, tone squelch targets a subset of all receivers.
   - Should be set for Duplex Communications.
   - Differs for each frequency using a repeater.
   - Instead of turning on the receive audio for any signal, the audio turns on only in the presence of the correct selective calling code.
   - Similar to the use of a lock on a door.
   - A carrier squelch is unlocked and will let any signal in.
   - Tone squelch (selective calling) locks out all signals except ones with the correct code.

There are four ways to utilize selective calling or tone squelch. We will focus on only two of the ways. HTs, recommended by CORAC, may use one of following two techniques: CTCSS or DCS.

CTSS

- Stands for Continuous Tone Coded Squelch System.
- CTCSS adds a sub-audible tone into your transmission at a certain frequency.
- Uses analog tones below 300 Hz
- Other radios must have the same CTCSS tone or code set to hear the transmission.
- It will also be heard if the radio has CTCSS and DCS off
- Different CTCSS codes have different frequencies, and this is how it filters out other people – as long as they have a different CTCSS, or no CTCSS, then your radio will not pass any audio to the speaker.
- CTCSS is often called PL tone (for Private Line, a trademark of Motorola), or simply tone squelch.

DCS

- DCS works the same, apart from it being digital instead.
- Stands for Digitally Coded Squelch.
- It sends a number repeatedly encoded in digital as you speak, in the low frequencies so you do not hear it.

Getting Your HT to Work *(continued)*

- If someone else transmits on the channel with a different or no DCS, the radio will not unmute.
- If they transmit with the same DCS as you, then your radio will unmute.
- DCS is newer than CTCSS and has more combinations.
- DCS is also referred to as DPL tone (for Digital Private Line, another trademark of Motorola).

DUPLEX – Duplex operation means that a radio transmits on one frequency and receives on a different frequency with a repeater in between.

Types:

- Full Duplex – Operating Duplex with the ability to transmit and receive simultaneously.
- Half Duplex – Operating Duplex but having to switch between transmit and receive (aka Semi duplex).

Benefits

- Less occurrence of limitations as with simplex.
- Increases range for communication.

Challenges

- Conversations can be heard by others, who you may not want to hear, at long ranges.
- Repeater systems get congested with traffic.

Repeater

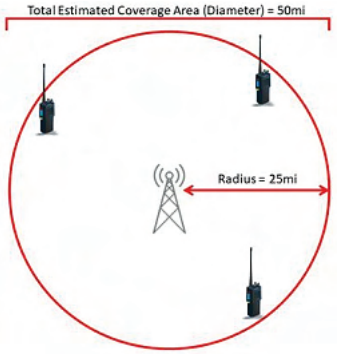
- Essentially a good set of radios with a really good antenna system
- A device that links a weak FM radio signal to a stronger VHF signaL
- Usually setup in a tall building, a high hill or mountain.
- Uses two different frequencies: transmit frequency & receive frequency.
- Repeaters are referred to by their transmit frequency, the frequency a user listens on.
- When a user transmits, the radio automatically changes frequency as required by the repeater's offset.

Getting Your HT to Work *(continued)*

Repeater

- The difference between the transmit and receive frequencies with Duplex communications.
- Can be a + offset or a – offset.
- HT's normally use an offset of 5 MHz (5000 kHz)) for the 70 cm/420 MHz band (UHF).
- + offset example: 425.5 MHz + 5 MHz = 430.5 MHz.
- – offset example: 425.0 MHz – 5 MHz = 420.0 MHz.
- HTs normally use an offset of 600 kHz (0.6 MHz) for the 2 M/144 MHz band (VHF).
- + offset example: 145.0 MHz + 0.6 MHz= 145.600 MHz.
- – offset example: 145.0 MHz – 0.6 MHz = 144.400 MHz.

Repeater lists will provide whether the offset is + or – Since a repeater is at a centralized location, and can potentially reach out 25+ miles, this can give a total range of over 50 miles, allowing communications over a broad area.



Let's use a circle example to explain range. If the repeater is at the center of a circle, and the radius is 25 miles, the diameter of the circle is 50 miles. This diameter is the repeaters total range. Meaning if you are on the edge of the repeater's coverage area (the edge of the circle) you can communicate completely to the other edge of the circle approximately 50 miles from your location.

THIS IS SIMPLY AN EXAMPLE. Typical communication distance of an HT is 2-6 miles without a repeater (Simplex), 6-30 miles with a repeater (Duplex). Greater than 30 miles is possible but unlikely.

Repeater Lists

There are many ways to access lists of simplex frequencies and duplex repeaters. Below are recommended lists and images of the sites.

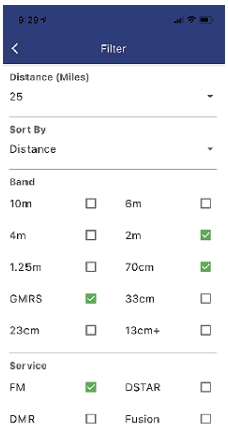
- RepeaterBook phone app
- Radioreference.com
- Repeaterbook.com
- ARRL Repeater Directory

DO NOT NEED A CALLSIGN TO ACCESS
Able to access list of repeaters without being licensed.

Go to first icon on upper right side (circle sight). Input your ZIP Codeor Auto Location.

Getting Your HT to Work *(continued)*

- Go to middle icon on upper right side (inverted lined triangle).
- Filter for desired selections: for distance (25 miles), sort by (distance), Band (2M, 70cm, & GMRS), Service (FM), Emergency Nets and Advanced.
- Go to last icon on upper right side (magnifying lens).
- Search for different locations around the country if you are traveling.



RadioReference.com

DO NOT NEED A CALLSIGN TO REGISTER

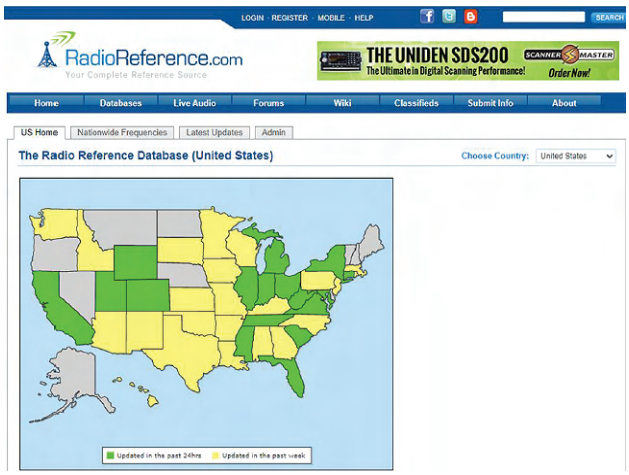
Recommended but not required

To set up an account you need an email address and password

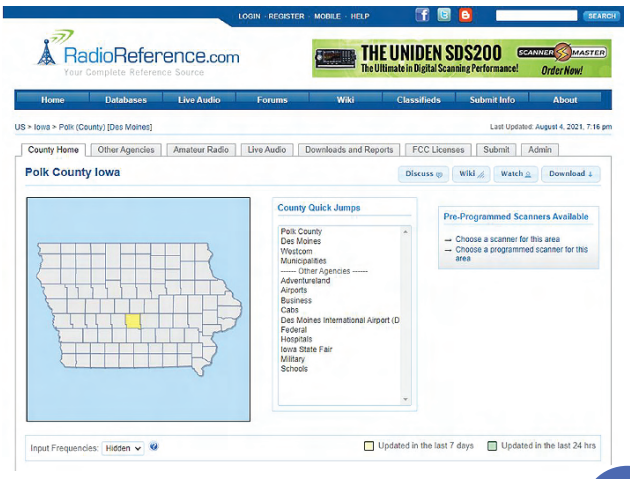
Able to access list of repeaters without being licensed

Go to Databases

Go to Frequency Database

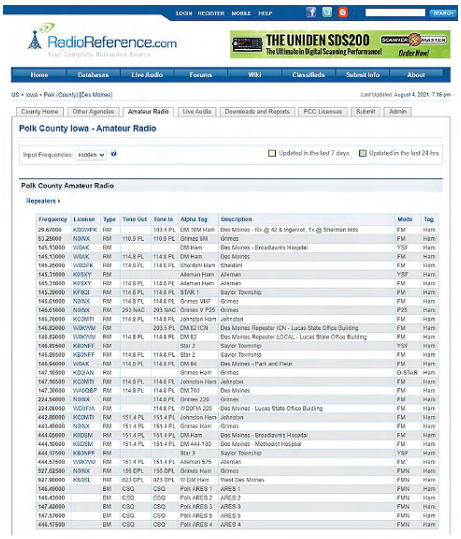


Click on your state.



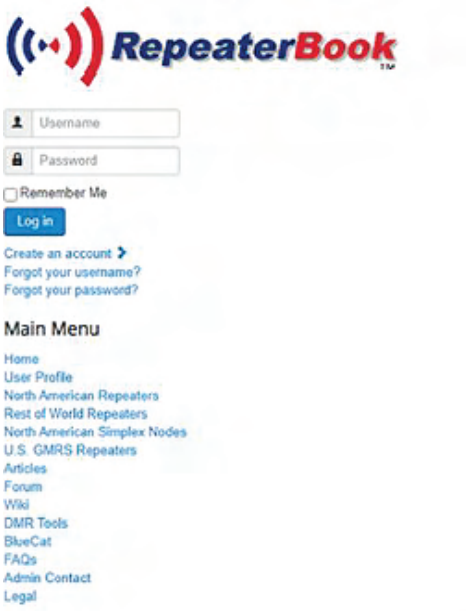
Click on your country.

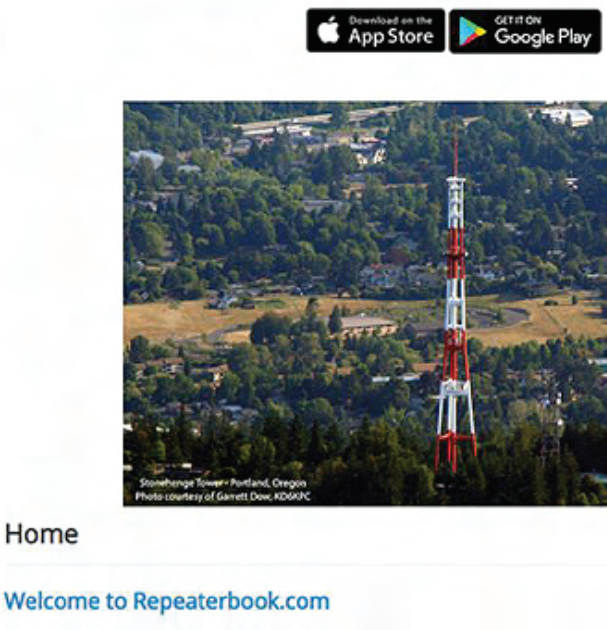
Getting Your HT to Work *(continued)*



List includes:

- Location of repeater
- Frequency of repeater
- Tones: out & in
- Mode (FM needed)
- Tag (Ham needed)

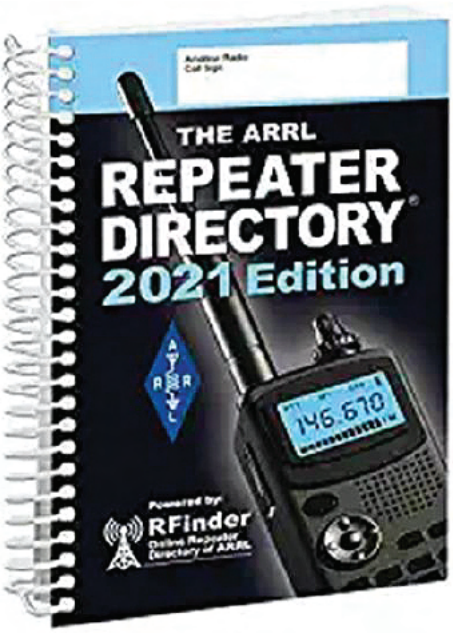




Repeaterbook.com
REQUIRES A CALLSIGN TO REGISTER

Able to access a larger list of repeaters
Go to Databases
Go to Frequency Database
Phone app available, without a callsign needed, for manual programming

Getting Your HT to Work *(continued)*



AR**RL Repeater Directory**

- Most complete -worldwide
- Most up-to-date
- Compiled by the state or regional frequency coordinator group
- Contact details for all the local frequency coordinators listed in the front
- Online Subscription available ($12.99/annually)
- Books available ($19.95)
- Spiral bound edition
- Tiny pocket size

Knowing how to program your HT radio manually is a very important skill to have.

With that said, initial programming is easier and quicker with computer software called CHIRP.

What should you program into your HT?

- Simplex frequencies for 2M (VHF) & 70cm (UHF) bands
- NOAA Weather Alerts(for receiving NOT transmitting)
- Emergency Services for receiving NOT transmitting (Sheriffs' Department, Police Departments, Fire Departments, Ambulance Services)
- Duplex (Repeater) frequencies for2M (VHF) & 70cm (UHF) bands
- FRS/GMRS channels/frequencies (for receiving NOT transmitting)

What order should you program channels and frequencies into your HT?

- Personal preference. However, the above listing would be a good order.
- Be sure to keep a physical record of whatever channels or frequenciesyou program into your HT.
- It is a good idea to leave some open channels for inputting frequencies into memory at a later date if need toon the fly.

Getting Your HT to Work *(continued)*

List of YouTube videos for programming your HT

- How to program the Yaesu FT-60R Transceiver
  https://www.youtube.com/watch?v=bc9aGe9OATg
  Manual programming for the Yaesu FT-60R

- How to Program the Yaesu FT-60R with Chirp
  https://www.youtube.com/watch?v=1uQcJ4g0akM
  Computer software programming for the Yaesu FT-60R

- Yaesu FT65 Manual Programming, editing, and deleting
  https://www.youtube.com/watch?v=9FWg21-JrzQ
  Manual programming for the Yaesu FT-65R

- Ham Radio Programming with CHIRP - Latest walk-through tutorial
  https://www.youtube.com/watch?v=OjFkxZTqglc
  No specific video guide for CHIRP programming of the Yaesu FT-65R
  WATCH THIS CHIRP TUTORIAL FOR ANY HT RADIO YOU HAVE

- Yaesu FT-70D Manual Programming and Feature overview
  https://www.youtube.com/watch?v=5CJ0-gm65DI
  Manual programming for the Yaesu FT-70D

- FT-70DR Programming with CHIRP
  https://www.youtube.com/watch?v=jH4_wFLsRVE
  Computer software programming for the Yaesu FT-70D

- How To Program The Baofeng UV-5R or BF-F8HP
  https://www.youtube.com/watch?v=0mzY5vIH718
  Manual programming of the Baofeng BF-F8HP

- Baofeng for Dummies UV5R+ HAM Radio Tutorial
  https://www.youtube.com/watch?v=GoVZ_8f3jPU
  Reviews settings of Baofeng radios. Great review if you are just listening and NOT transmitting.

  How To Use CHIRP Software To Program A Baofeng UV-5R & BF-F8HP
  https://www.youtube.com/watch?v=0l_kdktZAkI
  Excellent video for explanation of CHIRP functions and programming the Baofeng BF-F8HP
  BE CERTAIN TO WATCH THE ENTIRE TUTORIAL BEFORE ATTEMPTING TO USE.

Getting Your HT to Work *(continued)*

CHIRP (danplanet.com)

This is a FREE (donation requested) software program for programing an HT radio. Verify your HT radio is listed on the Home page first before downloading software. If your HT is listed, go to the download tab to access the program to download to your computer.

You should have enough information and knowledge to program your HT with the following material available on CORAC's website.

- Radio Basics & Handheld Radios
- What Do I Need To Know To Get My HT To Work?
- Programming a Yaesu FT-60R
- Baofeng BF-F8HP

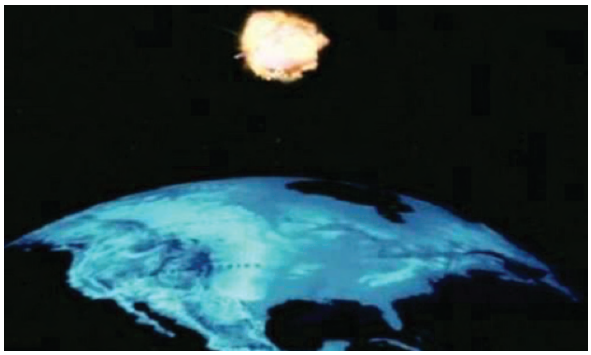
Be confident and venture into programming your Yaesu or Baofeng radio(s)! If you need further help reach out to your Regional Coordinator for CORAC or their Regional Communications Coordinator. Once you have programmed your HT, I recommend you scan the frequencies to listen into the communications going on in your area. It is exciting to connect with others!

Guide to Protecting Critical Electronic Devices From EMP

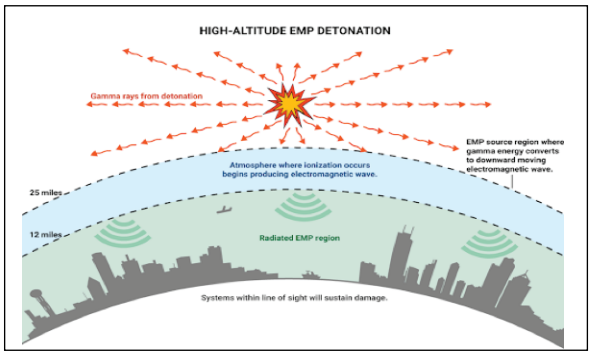
An Electromagnetic Pulse, or EMP, can be produced in our atmosphere either from a high-altitude nuclear device or from the Sun. When the pulse comes from the Sun, it is called a Coronal Mass Ejection or CME. An EMP from either source can destroy or partially disable our electric grid as well as our personal communication devices such as computers, VHF and HF radios, televisions, and appliances.

A good description of the EMP mechanism from a nuclear weapon or device is stated in paper from the Washington State Division of Environmental Health and Office of Radiation Protection:

> *This pulse of energy, which produces a powerful electromagnetic field, particularly within the vicinity of the weapon burst, is called an electromagnetic pulse. EMP can also be produced from non-nuclear sources, such as electromagnetic bombs, or E-bombs. High-altitude nuclear detonations and electromagnetic bombs can generate EMP that has the potential to damage or destroy electronic devices over widespread areas. Electric power systems would also be at risk from surges produced by such weapons. However, the EMP from a kiloton-range surface nuclear explosion would not be expected to produce serious damage outside the radius of severe destruction from blast.*
>
> *A 1.4 Megaton bomb launched about 250 miles above Kansas would destroy most of the electronics that were not protected in the entire Continental United States. During the brief return to atmospheric testing in 1962, a 1.4 megaton nuclear weapon was detonated over Johnston Island at an altitude of about 250 miles. The effects of EMP were observed in Hawaii, 800 miles east of the detonation. Streetlights and fuses failed on Oahu and telephone service was disrupted on the Island of Kauai.*



An electromagnetic pulse is a burst of electromagnetic energy produced by a nuclear explosion in the atmosphere, considered capable of widespread damage to power lines, telecommunications, and electronic equipment. [Fm: US Department of Homeland Security].

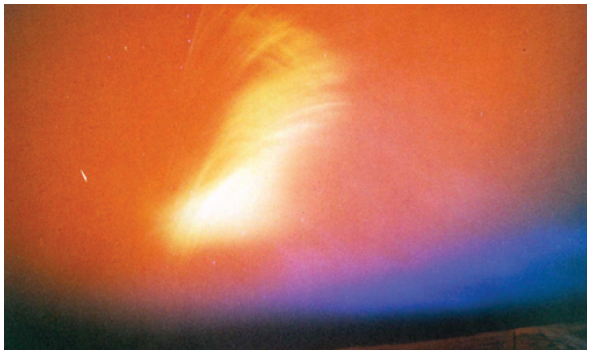


[From: Anne, Arundal XCity, MD]

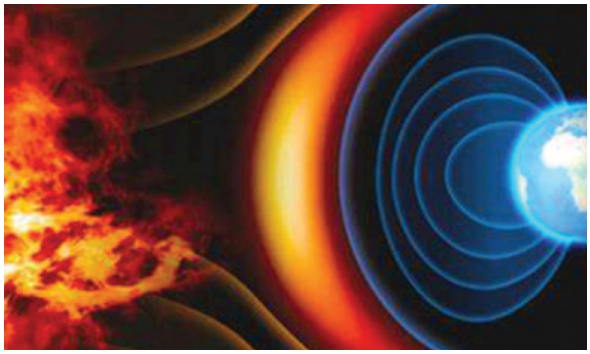
Solar EMP
When the Sun puts out a Coronal Mass Ejection (CME) from a geomagnetic solar storm, the atmosphere becomes highly charged which can induce severe currents in power lines, satellites, computers, radios and other electronic devices.

In a solar storm called the Carrington Event of 1859, a huge Coronal Mass Ejection caused untold damage to the telegraph systems in the US, causing fires and destroying entire relay telegraph stations.

Another example of a solar CME occurred in 1989, when a CME produced a blackout across the entire province of Quebec in Canada.



On July 8, 1962, the EMP from the high altitude (250 miles above Johnston Island) "Starfish Prime" [From Atomic Archives.com]



A geomagnetic disturbance is a temporary disturbance of the Earth's magnetosphere caused by a solar wind shock wave and/or cloud of magnetic field that interacts with the Earth's magnetic field. [Fm US Department of Homeland Security]

https://www.dhs.gov/science-and-technology/publication/electromagnetic-pulse-and-geometric-disturbance-resiliency-fact-sheet

An EMP resulting from a high-altitude nuclear detonation (as described above) may also be referred to as a High-Altitude EMP, or HEMP.

Fast Forward to Today
Most modern-day electronics have very small internal runs of thread-like circuits with multiple microchips, which are vulnerable to the high current caused by an EMP from either a HEMP (High Altitude EMP) from a nuclear device or a solar CME.

EMP Affected Systems
Many of our enemies have noticed our lack of action in hardening our electric grid and other critical systems to a HEMP. North Korea, China, Iran, and Russia all have the capability to launch a high-altitude nuclear attack. Such an attack would not harm those on the ground, but would certainly inflict major damage to our electrical grid.

A HEMP would induce extreme currents in power lines, which will act as a sort of antenna to cause explosions in transformers and melting of relay station equipment.

A solar CME event might be similar but could also occur on a more regional level.

Guide to Protecting Critical Electronic Devices From EMP *(continued)*

A solar CME event might be similar but could also occur on a more regional level.

Why Communication is Absolutely Essential, even as it is related to our power grid (from *The Report from the Commission to Assess the Threat to the United States from Electro Magnetic Pulse):*

> *Loss of telecommunications would not, by itself, cause immediate system collapse except as needed to address issues caused by the above disruptions. However, the lack of telemetered control data would make the system operators effectively blind to what is going on, but personnel at substations, if they can get there and communicate with the system operators, could overcome much of that. Malfunction of protective relays could cause system collapse by contributing to several of the above scenarios through misinformation or by operating incorrectly.*

Importance of our CORAC Mission
Our mission as CORAC members is of course to be prepared to help in charitable ways when there is a national or regional emergency.

Since communications is a critical element of being able to access and respond to any local or national emergency, it is imperative that we protect our various electronic devices in order to remain in contact with our members and the general public. In short, if we cannot communicate with each other, we will be of little help.

Levels of Protection for our Devices
In *The Report from the Commission to Assess the Threat to the United States from Electro Magnetic Pulse*, four (4) different levels of protection are indicated for equipment and the electrical grid. Classified as levels one (1) through four (4), going from simple techniques to military-level hardening measures, our interest lies in the first two levels due to simplicity of achievement and relatively low cost.

In simulated EMP testing, varying results were obtained when exposing different pieces of electronic gear including computers and HF, VHF, and UHF radios to a simulated EMP environment. Some smaller devices including radios did well, while computers failed or sometimes lost only some USB port locations. Any long wire or antenna connected to radios greatly exacerbated the damage to that equipment.

To increase our communications resilience on behalf of our CORAC sections, here are the first two ways to help mitigate an EMP or CME event (taken from the *National Coordinating Center for Communications Manual of Electromagnetic Pulse (EMP) Protection and Resilience Guidelines for Critical Infrastructure and Equipment*).

Level 1

A. *Unplug power and data lines from spare or backup equipment where feasible. Best practice for lightning and energy savings and there is no extra cost to leave a cable unplugged. $0*

B. *Turn off equipment that cannot be unplugged and is not actively being used. Best practice for lightning and energy savings and there is typically no extra cost to turn off something. $0*

C. *Use at least a lightning rated surge protection device (SPD) on power cords, antennas, and data cables; maintain spare SPDs. Best practice for lightning and energy savings as well as EMP; thus, assume these are already deployed or will be used if it's a new installation.*
D. *Power Supply SPD (e.g., $15 for 6 outlet APC Surge Arrest that will alert the operator when it's no longer fully operational).*
E. *SPDs with Gas Discharge Tubes (GDTs) that are not soldered are preferred for easy replacement. For example, the Alpha Delta TT3G50 lightning SPD costs around $50, its replacement cartridge costs under $15. $0*
F. *Wrap spare electronics with aluminum foil or put in Faraday containers.*
G. *Store spare electronics in an area with at least 20 dB protection. This is adequate for smaller electronic devices (or battery powered devices) as might be required for an HF site. $0*

Level 2

A. *HF Transceiver & PA Power Supply SPD – To obtain an SPD (Surge Protective Device) for the power cable that protects against EMP, the SPD's recovery time should be 10 ns or less. Note: The $200 Transtector 6 outlet AC Surge Protection device SLV Surge Cord has a published tested specification of 5 ns. It costs about $180 more than a lightning only SPD.*
B. *Shielded RF Antenna Cable – No extra cost since low inductance and lightning protected cables can be selected that also provide EMP protection. For instance, RG-213 is double shielded/braided, or one can use low loss LMR-400, which is braided plus has a foil shield; (this is not as good as double shielded/braided).*
C. *Antenna RF Cable SPD (Surge Protection Device) – The NexTek HF (1-50 MHz) SPD part FPNNMNFBCA3B, which has been tested per MIL-STD-188-125-1, costs approximately $200 (minimum order may apply). Note: This is $150 more than the Level 1 SPD listed (plus the replacement cost is considerably higher). $200*
D. *Antenna Cable Ferrites – Can buy a package of these for under $10. $10*
E. *Antenna Tuner SPD – Use extra SPD outlet purchased above or can connect into the UPS for surge protection.*
F. *Computer Power Cable SPD – Connect to UPS for surge protection. $0*
G. *Fiber Optic Media Converter SPD – Connect to UPS for surge protection.*

Now here are my suggestions for protecting spare receivers, cables, spare batteries, computers and other devices susceptible to EMP:

Use a Faraday Cage – What is a Faraday Cage?

- *A Faraday cage is named after Michael Faraday, the scientist who discovered its properties The Faraday for shielding against electromagnetic waves, including electricity. You can build simple Faraday cages at home at a very low cost that will work just as well as the expensive ones that the government uses. All it takes is some common household items.*

How does a Faraday cage work?

- *A Faraday cage protects its contents by preventing electromagnetic energy from getting inside. You can build your own at home using aluminum foil and a galvanized steel trash can.*
- *By the way, Faraday shielding doesn't actually have to be a "cage." It's simply any container that blocks electromagnetic radiation.*

- Many places on the Internet claim that a microwave oven or Mylar bag protects devices from EMP. Mylar bags do not seem to provide good protection. The microwave oven as a Faraday container isn't something you can rely on as it generally protects only microwave frequencies (hence
- microwave oven).
  The frequencies for EMP range from approximately AM radio to approximately FM radio. The important thing to know is that you can test how effectively a container shields electromagnetic frequencies by using an AM/FM radio or an HT or Walkie Talkie.

Testing the Faraday container

- It's a simple process to determine if a container will function as EMP shielding.
- First, use a Handy Talkie [handheld ham, FRS, GMRS, MURS, etc. radio] or Walkie Talkie and turn up the volume. Put it into the Faraday cage you're testing, along with a second cell phone and transmit the HT and listen to see if the other radio is still being picked up via the cell phone to an outside phone.
- Anything that can block your HT or Walkie Talkie signals should be a good Faraday cage.

Making the Faraday cage

A good Faraday cage can be an ammunition box or even a galvanized aluminum trash can. When using one of these, line the ammo can or trash can with cardboard (to insulate stored devices from the metal exposed to the EMP) and then wrap each item to be stored with aluminum foil (at least two layers thick). This thick aluminum foil itself is a good shield against RF radiation.

Items to protect include radios, receivers, small batteries, coaxial cable, laptops, etc. Remember to store an extra one or two antennas. Coax is susceptible to melting foam dielectric with ultra-high currents from EMP's.



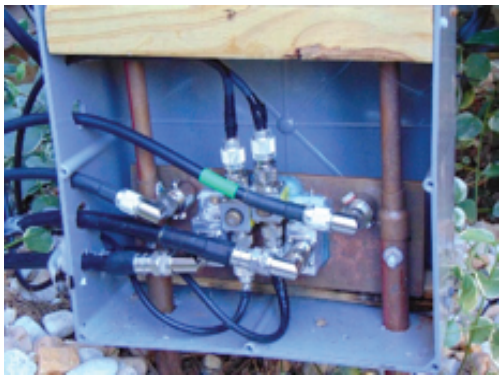
Metal Tape- Get metal tape at your nearest hardware center and be sure to seal all openings on the lid, handle, side seam and bottom seam.

I have put away many items in both these trash cans and ammunition cans.

For all of my coax (antenna line) runs, I use gas discharge type lightning arrestors before the coax enters my shack (the radio room). For window or ladder type antenna line, I also use surge protectors, although these are not as good as gas discharge units for coax, so I also use EMP Shield [a name brand suppressor] to back up the window line arrestors. **https://www.empshield.com/**

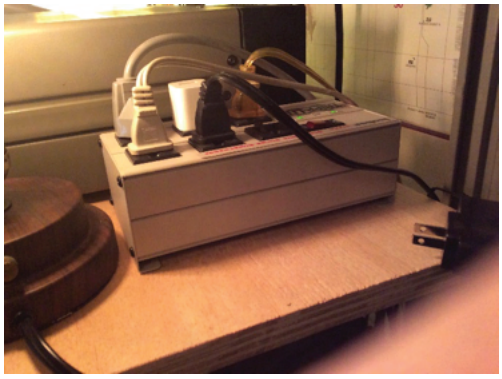
When not in use, unplug your radios from the antenna lines and electrical power, or at least have a Surge Protecting Device in each of those lines (antenna and power) connected to the radio.

Here is a picture of a coax run outside of the shack with lightning arrestors attached to ground rods.



In Summary
From the above sources, Levels 1 and 2 make the most sense for our CORAC team. Most cannot afford two sets of radios and this leaves some good basic measures listed in those levels:

When not on the air, disconnect your electrical and coaxial cables. It is highly recommended that each operator purchase a good surge protector device (SPD).



This is a picture of one of my Trip-Lite brand Surge Protecting Devices.

When bringing in coaxial cable to the shack, use a ground rod (it is best to do a triangular 3 ground rod system connected with copper strap or ribbon) with a well-rated lightning arrestor from the closest ground rod.

When using ladder or window line, use a ground rod with a window line lightning arrestor, e.g.: **https://www.arraysolutions.com/surge-and-rf-protection**

How to Create an Emergency Communications Plan Using GMRS Radios

The purpose of this document is to provide guidelines to create a plan for local emergency communications using General Mobile Radio Service (GMRS) radios. We recommend that you print this document and the webpages referenced, purchase your radios, and begin to practice with them as soon as possible. It is also wise to take notes on any videos you watch. An index is provided on page 6.

Important: We explain why GMRS is a good option for many people, however, learning to use radio technology is by nature a very self-directed effort. Unlike cell and landline phones, there are no technical support groups to call about programming or using your radios. Further, GMRS radios are not considered ham (amateur) radios because they operate on different frequencies and under different Federal Communications Commission (FCC) regulations; therefore, most ham radio clubs do not directly support GMRS. Please carefully consider these factors before you purchase radios.

1. **Why should I have an emergency communications plan that includes radios?**
   In the event of local or regional power, phone and/or Internet outages, you may find it impossible to reach your family and friends. An emergency radio communications plan that you have prepared in advance can help you reconnect with your loved ones to request assistance or check on their status. There are distance limitations that depend on many factors. (See sections 10 & 14.)

2. **How can I prepare an emergency communications plan?** *Review this entire document, then:*

   - Create a list of the people you will want to contact when an emergency occurs. These people should be within a few miles of your location. (See section 13.) Give each person a GMRS radio and a copy of your plan. People who are not covered by your family license should obtain their own license. (See Sections 5 & 6.)
   - Identify a channel for members to monitor, such as 16. You should also identify a secondary channel if the primary channel is busy with someone else's conversation.
   - Identify specific time(s) to monitor and transmit/talk (such as, every X hours starting at Y pm, monitor your (primary) channel Z for five minutes. Having prearranged call times enables you to turn off your handset and preserve the batteries.
   - Program the radios beforehand. For family members, you can place a sticker on each one with the FCC callsign you receive with your GMRS license.
   - Print out your plan, including contact names, primary and secondary channels, and timeslots to use in an emergency. Laminate the plan and give it to each contact. Ensure each person also has printed instructions on how to use the radio.
   - Assess your plan by trying it out. Tell your contacts to 'meet' you at a specific time on a specific channel. Take turns speaking into the radios. Make note of whom you can reach and where you are when you do so. Even using repeaters, some people will be beyond your radio's range.
   - Encourage everyone to continue practicing with their radio, and to place it where they can easily reach it in an emergency.

For more information on how to create an emergency communications plan, go to:

- *How To Make a Family And Group Emergency Radio Communications Plan – Livestream* **https://youtu.be/T9J0VukHr6c?t=860** (Start at 14:20.)
- *Emergency Communication Preparedness - An Introduction* **https://youtu.be/NGD7Mr7-2tg?t=19**
- *A Prepper's Guide to Communicating in an Emergency* **https://theprovidentprepper.org/a-preppers-guide-to-communicating-in-an-emergency/**

A note about privacy: Conversations on radio channels/frequencies are not private, so be cautious about sharing information because others may be listening in without your knowledge. Also, it is unlawful for unauthorized persons to use encryption.

3. What is General Mobile Radio Service (GMRS)?

- GMRS is a licensed radio service for short-distance, two-way voice communications. If you walk into a department store and purchase a walkie-talkie, you purchased a GMRS or FRS radio. GMRS frequencies operate in the UHF range which perform better in wooded environments, around town, or any situation where there are obstructions. You are required to obtain a license to transmit on a GMRS radio. It is primarily for family members to communicate to each other, or other licensed users to talk to each other. Source: https://oregongmrs.com/gmrs-faq/
- The General Mobile Radio Service (GMRS) is a licensed radio service that uses channels around (the frequencies of) 462 MHz and 467 MHz The most common use of GMRS channels is for short-distance, two-way voice communications using hand-held radios, mobile radios, and repeater systems. Each licensee manages a system consisting of one or more transmitting units (stations.)
- None of the GMRS channels are assigned for the exclusive use of any system. You must cooperate in the selection and use of the channels to make the most effective use of them and to reduce the possibility of interference. Normally, you and your family members would communicate between yourselves directly or through a repeater station. Source: **https://www.fcc.gov/wireless/bureau-divisions/mobility-division/general-mobile-radio-service-gmrs**
- You can find more information here: **https://en.wikipedia.org/wiki/General_Mobile_Radio_Service**

4. Why should I choose GMRS (General Mobile Radio Service) radios?

The CORAC Communications team recommends GMRS as an alternative technology to connect families when phones and the Internet are unavailable. GMRS radios:

- Are able to connect people within one to 25 or more miles of each other (see section 14);
- Require no exam to obtain a license for the whole family, and the license is inexpensive (now only $35);
- Have a shorter learning curve compared to UHF/VHF ham (amateur) radios and other options; and
- Operate at higher power and with a longer range compared to Family Radio Service (FRS) radios, while still being compatible with them.

Please review the chart on slide 11 of the CORAC Communications Team presentation on radio basics for an excellent overview of radio technologies and to make sure GMRS is right for you: **https://corac.co/wp-content/uploads/2021/06/Conference-Communications-Presentation.pdf**

Handheld GMRS radios are the smallest, most portable, and cost-effective among the GMRS model types, therefore you may want to start with handheld radios. However, if you are more than ten miles away from GMRS repeaters (see section J) you may want to purchase a base station GMRS radio and a better antenna, rather than a handheld model.

Most Powerful 10 Best GMRS Base Station Radio 2022 (includes handheld, mobile and base models) **https://www.radio4all.org/best-gmrs-base-station/**
Mobile and Handheld radios: **https://www.4wheelparts.com/the-dirt/rugged-gmrs-mobile-and-handheld-radios-solve-all-your-communication-issues/**

5. **Why do I need a GMRS license, and how do I get one?**
The FCC requires you to have a GMRS license to regulate the frequencies that are used by two-way radios. Before operating a GMRS radio, a consumer must have a valid license. Any radio using the shared FRS/GMRS frequencies that is able to transmit above 2 Watts of power was reclassified as GMRS only after the recent FCC Changes in September 2017. GMRS licenses are authorized to those 18 years and older by the FCC. The cost is $35. You can learn how to get your license here: **https://midlandusa.com/blogs/blog/why-do-i-need-a-gmrs-license-how-do-i-get-it**

6. **With whome may I share my license?**
Your family members may operate under your GMRS license. The family members are defined as spouse, children, grandchildren, stepchildren, parents, grandparents, stepparents, brothers, sisters, aunts, uncles, nieces, nephews, and in-laws.

7. **What radio should I choose?**
GMRS radios are available in handheld, mobile, base, and repeater models. Most people purchase handheld models when they start out due to their low cost, portability, and simplicity. Be sure to compare features and prices and check to make sure that the radio is certified by the FCC for use on GMRS frequencies. (Most VHF/UHF amateur radios cannot legally be used for GMRS.) We recommend that you purchase at least two radios for yourself, plus additional units to share. Consider buying extra batteries, and a headset for comfort. Here's a partial list of possible GMRS radio options:

Figure 2: With the BTech GMRS-V2, you can quickly add or edit up to 200 GMRS or NOAA channels.

Figure 3: Midland GXT1000VP4 GMRS radios are packaged with rechargeable batteries but can also use four AA batteries.

- *BTech GMRS-V2*
  https://baofengtech.com/new-release-btech-gmrs-v2/
- *Midland GXT1000VP4*
  https://midlandusa.com/products/gxt1000vp4
- *Best GMRS Handheld Radio 2022 | GMRS Radios Compared*
  https://www.youtube.com/watch?v=MOO6jL0duCk

8. **Can I use Baofeng UV-5R and Baofeng BF-F8HP radios on GMRS channels?**
NO, the FCC prohibits the use Baofeng UV-5R and Baofeng BF-F8 HP radios on GMRS channels/bands, even if you have a GMRS license or a ham radio license. These two VHF/UHF radios can only be used by licensed ham radio operators on the ham VHF/UHF bands, not the GMRS bands.

9. What channels are available on GMRS radios?

GMRS radios have twenty-two channels, which are pre-assigned and pre-programmed shortcuts to radio frequencies. Here's a link to a list of the channels with their associated frequencies: **https://www.cert-la.com/downloads/radio/FRS-GMRS-Frequency-Chart.pdf**

You can also program frequencies associated with local repeaters and services such as the National Oceanic and Atmospheric Administration (NOAA) for weather. **https://midlandusa.com/blogs/blog/noaa-frequencies-use-your-radio-to-hear-weather-broadcasts**

Loc	Frequency	Name	Loc	Frequency	Name	Loc	Frequency	Name
0	462.562500	GMRS 1	7	462.550000	GMRS 15	15	462.550000	550 Rpt
1	462.587500	GMRS 2	8	462.575000	GMRS 16	16	462.575000	575 Rpt
2	462.612500	GMRS 3	9	462.600000	GMRS 17	17	462.600000	600 Rpt
3	462.637500	GMRS 4	10	462.625000	GMRS 18	18	462.625000	625 Rpt
4	462.662500	GMRS 5	11	462.650000	GMRS 19	19	462.650000	650 Rpt
5	462.687500	GMRS 6	12	462.675000	GMRS 20	20	462.675000	675 Rpt
6	462.712500	GMRS 7	13	462.700000	GMRS 21	21	462.700000	700 Rpt
			14	462.725000	GMRS 22	22	462.725000	725 Rpt

Figure 4: GMRS channels are assigned to specific frequencies.

10. What are repeaters and why do I need them?

A repeater is a radio system that receives a signal and re-transmits it at another frequency in real-time, enabling your signal to reach people at a greater distance. You can look up GMRS repeater lists on the Repeater Book website. A 10-mile radius is a good place to start when you are identifying which repeaters to program into your radio. Repeaters are privately owned and the FCC rules do not allow an owner to charge for services. However, service can be restricted to members who donate to the repeaters upkeep. Most are open with no fee for all licensed users. You can find GMRS repeaters here: **https://www.repeaterbook.com/gmrs/index.php?state_id=none**

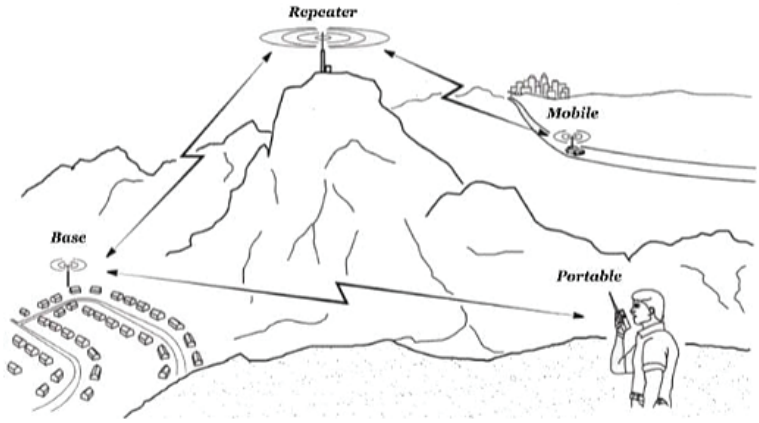


Figure 5: GMRS communications can include portable (handheld), base, repeater, and mobile stations. Using repeaters can help your radio signal travel farther. Image source: ***https://www.onpointpreparedness.net/***

To learn more, please review this video: How To Use A GMRS Repeater - How To Find A Repeater, AND GMRS Repeater Rules AND Etiquette **https://www.youtube.com/watch?v=KLWxwwzXXcc**

11. How do I program repeaters on my radio?

Programming instructions are specific to your radio, so please refer to the user guide. This video may also be helpful:
How To Program A GMRS Repeater On Your GMRS Walkie-Talkie - Step by Step How To Connect A Repeater **https://www.youtube.com/watch?v=kxbL2g4E7KU**

12. **How can I learn how to use my radio?**
We recommend that you refer to the user guide and any webpages or videos that apply to the radios you have selected to learn how to use them. Be sure to print out pages and take notes. If you have Midland radios, you can view this video: *How to Set Up Your Midland Walkies:* **https://www.youtube.com/watch?v=A-7ArQRKNcE**

13. **How far can my radio signal reach?**
The distance your radio signal will reach will depend on many factors, including the quality and specifications of the radio, the antenna, whether two radios are within line of sight of each other or if obstacles such as buildings or mountains are in between, and whether repeaters are used. In general, the range may be anywhere from one to twenty-five miles or more, but there are no guarantees. You will need to test the radios at the specific locations where they will be used to gain the best understanding of how far your signal will reach. See also *GMRS Radio Range Chart:* **https://www.buytwowayradios.com/blog/2016/12/gmrs_radio_range_chart.html**

Figure 6: Your signal will reach farther if there are no hills or tall buildings between you and your contact.

14. **Why do I need to practice with my radio?**
Imagine what would happen if you did not practice with your radios before you find yourself suddenly in the dark after a major storm. The power is out for three days, and you do not know when it will be back on. Your cell and landline phones are not working, nor is the Internet. How are you going to find out what is going on with your family members? You can take your radio out of the box, but do you know how to reach someone, and when? How will you know if anyone is listening at that time? Your options will be extremely limited. Having an emergency communications plan, sharing it with your contacts, and practicing with your radios will give you much more confidence and peace of mind when other communications technologies fail.

15. **How can I keep my radio batteries charged during a power outage?**
Handheld devices are usually sold with a charging station and power cord to recharge the radio battery via an A/C outlet. When the power to your home goes out, you will need backup power, such as a power station containing a larger battery that you have kept fully charged. Many companies sell generators containing batteries that are charged via AC outlet, solar panel, or car port.

Figure 7: A power station with a solar panel can provide backup power to recharge the batteries in handheld radios and other small electronic devices. Brand shown: Bluetti

16. What should I do if I need technical assistance with my radio?

Learning to use radios is by nature a very self-driven effort. Unlike cell and landline phones, there is no technical support group to call with questions about programming or using your phones. If a radio is broken and still under warrantee, contact the manufacturer. If you purchased the radio from a radio outlet, you may be able to submit an inquiry at the outlet.

If you have specific questions that are not answered in this document, you can submit them to the CORAC Comms Helpline Signal group. If you do not already have access to Signal – Private Messenger on your phone and PC or Mac, go to: **https://www.signal.org/download/** Once Signal has been installed, you can access the CORAC Comms Helpline Signal group by clicking here: **https://signal.group/#CjQKIPmxm16iRQckmRDCr2nVnDjub--yKurb-W6waogOLW3FEhCIDyR6NIYOXmedIuUl3XIs**

17. Where can I find more information?

The internet is your best resource to learn about GMRS radios and emergency communications planning. Seek out answers to your radio questions on www.duckduckgo.com or YouTube. We urge you to print what you can and take notes. The Ham Radio Crash Course YouTube channel is a great place to learn more: **https://www.youtube.com/c/HamRadioCrashCourse/search?query=gmrs**

Communicating with radios requires patience, experimentation, and persistence. May God bless you as you as you prepare your family's emergency communications plan!

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Programming a Yaesu FT-60R

BACKGROUND

This document is created to help owners of the Yaesu FT-60R program their radio for use with repeaters.

NOTE: The Dial knob is used frequently in the steps below. This knob is the one on the top of the radio, on the far right when viewing the radio from the front.

1. Look up the information for the repeater you wish to program into your radio.
   a. Go to www.repeaterbook.com (I also recommend buying a hard-copy repeater book at Amazon (https://www.amazon.com/ARRL-Repeater-Directory-2016-Pocket/dp/1625950535/ref=sr_1_1?s=books&ie=UTF8&qid=1483567244&sr=1-1&keywords=arrl+repeater+directory+2016-2017) so that you still have a list even if the Internet goes down or you are in a place where you cannot access the Internet)
   b. Click on “North American Repeaters” under the Main Menu on the left-hand side of the page.
   c. Click on the appropriate state (either your home state, or the state that you are currently in, whichever is appropriate)
   d. Under “Repeaters by nearest city/town:”, look for the closest city to your current location and click on it.
   e. In most cases, you will see only one repeater, however, there may be multiple repeaters listed for your city. Look for a repeater that is listed as “Open” under the “Use” column, preferably one in the 144 Mhz range under Frequency (the 144 MHz range will travel further with less power in this range than in the 440 MHz range).

Frequency	Tone	Location	County	Call	Use	
145.1800-	107.2	Poway, Woodson Mountain	San Diego	K6KTA	OPEN	
147.1950+	110.9	Poway	San Diego	K6JCC	CLOSED	
147.3000+	103.5	Poway	San Diego	N6PWY	OPEN	
448.5200-	DMR	Poway, Mt Woodson	San Diego	KI6KQU	CLOSED	
449.7800-	141.3	Poway, Woodson Mtn	San Diego	KI6BJN	OPEN	

Programming a Yaesu FT-60R *(continued)*

f. In the above repeaterbook example, we will use the first frequency.
g. Note the frequency (145.1800 Mhz)(NOTE: The trailing 0 will NOT be entere
h. radio).
Note the sign following the frequency (+ or -), as this represents the offset t
to be set if Automatic Repeater Shift (ARS) is not used (in this case, "-").
i. Note the Tone (in this case, 107.2).

2. Turn on the radio by turning the Power knob (knob between the antenna and the Dial knob on the top of the radio) clockwise.
3. To start, make sure you are in the Variable Frequency Oscillator (VFO) mode (VFO is the mode that allows you to manually input a frequency, either by direct input from the keypad or through turning the Dial knob). Push the [V/M] button on the radio until you see a frequency on the LCD screen. If you see a small, blinking number on the upper left (such as 001, 002, etc), then you are in the memory mode and need to press the [V/M] button again.
4. Manually enter the frequency (145.180) on the keypad (note that you will NOT be required to enter the ".", so you would enter [1][4][5][1][8][0]. The frequency is set once the last key is pushed.
5. Next, ensure the Automatic Repeter Shift (ARS) is turned on
   a. Press the [F/W] key on the keypad, then press the [0] key (has the word "SE
   b. Rotate the Dial knob until you see ARS on the screen.
   c. Press the [F/W] key momentarily to adjust the ARS.
   d. If you see ARS.OFF on the screen, then turn the Dial knob until you see ARS otherwise proceed to the next step.
   e. Push the Push To Talk (PTT) (located on the left side of the radio when view from the front. It is the big key at the top) switch to save this setting and ret normal operation.
6. Next, set the radio to use a tone (if a tone is noted under "Tone" for your selected frequency, otherwise skip this step).
   a. Push the [F/W] key, then press the [1] key (has "SQ TYP" above it).
   b. Turn the Dial knob until you see the word "TONE" on the screen (this config radio to send a tone to access the repeater. If you want to keep your radio (muted) until you receive a signal with the appropriate tone, then turn the k more click, where you will see "TSQL" on the screen. NOTE: This is NOT reco as some repeaters do not retransmit the tone, in which case your radio wo broadcast any return signal. Setting "TONE" would cause your radio's receiv activate for any signal returning on the offset frequency (preferable). Now p button to set this function.

Programming a Yaesu FT-60R *(continued)*

7. Set the specific tone to be used (if a tone is noted under "Tone" for your selected frequency, otherwise skip this step).
    a. Push the [F/W] key, then press the [2] key (has the word "CODE" above it).
    b. Rotate the Dial knob until the display shows the tone frequency you need to use (in the above example, 107.2HZ should be shown in the screen.
    c. Press the [F/W] key to save the selected tone and return to normal operations.

Your radio is now programmed for the specific repeater you would like to use! Now, if you want to save this specific repeater in memory, use the following steps:

1. Press and hold the [F/W] key for one second.
2. The screen should display a small blinking number in the upper left portion of the screen (001, 002, 003, etc).
3. Press the [F/W] key again within 10 seconds.

The repeater frequency, offset and tone are now all stored in memory. If you want to assign a name (limited to 6 characters) to this frequency (for example, "POWAY" in the above example), use the following steps:

1. Press the [F/W] key, then press the [0] key (has the word "SET" above it).
2. Rotate the Dial knob until you see "NM WRT" on the screen.
3. Press the [F/W] key to see any previous label, then press the [F/W] key again to clear.
4. Rotate the Dial knob until the first character (in our example, "P") is displayed on the screen.
5. Press the [F/W] key to save the character and move to the next character.
6. Follow steps 4 and 5 for the remaining characters until all characters are set. NOTE: You can use the down arrow key (has "MHz" above it, and "B" to the right of it, and is the second key from the top on the far right side of your keypad) to back-space the cursor if you need to correct a character entry.
7. If the label is less than 6 characters, you will need to press the [F/W] key for one second. If your label is exactly 6 characters in length, then the final momentary press of the [F/W] key in step 5 will be sufficient to save the label.

Now your radio is fully programmed with a repeater, and all the information is saved in a memory slot on the radio under the specific name you have given it ("POWAY" in our example above).

Generally, when you turn your radio on, it will return to the last state you had it in when you turned it off. This means that if you had it in memory mode (using the repeater information saved in memory) it will turn on in that state. If you have multiple repeaters programmed in to your radio, just turn the Dial knob until the repeater you want to communicate with is listed on the screen.

If, however, you are in the VFO mode, and you want to use a repeater frequency that is stored in memory, then push the [V/M] key once and you should be in memory mode now. Just rotate the Dial knob until the repeater frequency (or name, if you have labeled it) is displayed on the screen.

Radio Basics (& Handheld Radios)

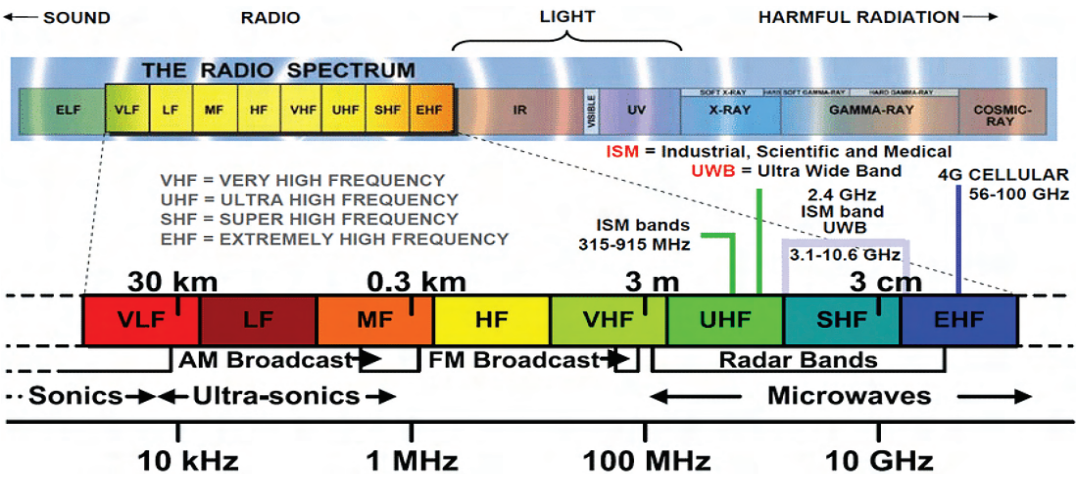
GOALS & OBJECTIVES

In this time of chaos, do you find yourself asking these questions?

- Basic understanding of radio waves.
- Basic understanding of the types of handheld radio technology.
- Understanding of the legal requirements for this technology.
- Be aware of HAM radio education resources.
- Access to HAM radio testing sessions.
- Be able to make a decision regarding your family or local community communication needs.
- Get your questions answered about handheld radio technology.
- This presentation will NOT involve programming the radios. There are instructions in PDF format at corac.co on the Communications team page. Understanding some of the concepts can help with programming.
- ***This presentation is no inclusive of everything concerning radio waves and radios; this information is simply to "shorten your learning curve."***

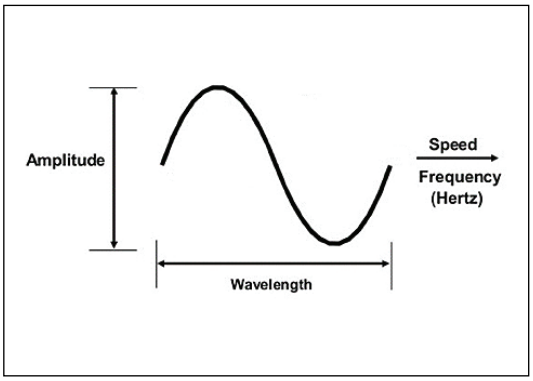
RADIO WAVES & EMS

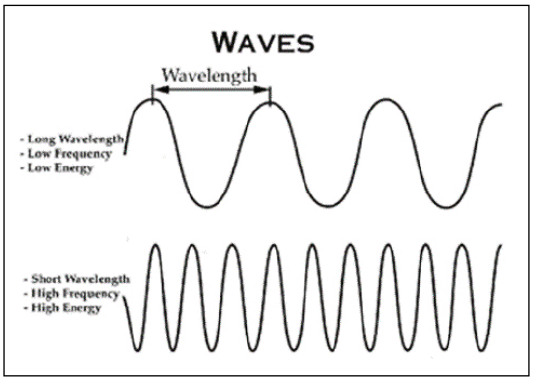
- Part of the electromagnetic spectrum (EMS).
- EMS comprised of many different types of waves.
- EMS waves can be controlled by electricity and magnets or their fields.
- Consists of the longest waves of the EMS; according to NASA, ranging from more than 62 miles (100 kilometers) long down to @ 0.04 inches (1 millimeter).
- EMS organized by 2 measurements: wavelength and frequency.



Radio Basics (& Handheld Radios) *(continued)*

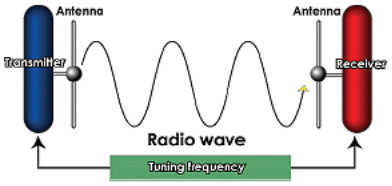
RADIO WAVE COMPONENTS

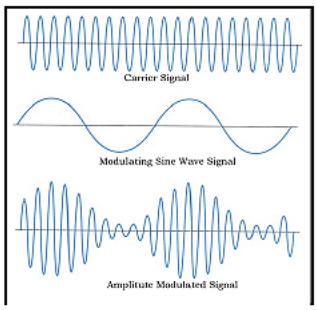


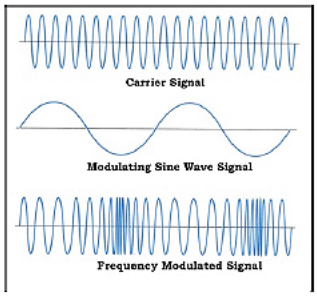


- Amplitude = height.
- Frequency = rate of occurrence.
- Wavelength = length.
- Measured in hertz.
- 1 hertz (Hz) is one cycle per second.
- A cycle is measured from crest to crest of a wave.
- 1000 Hz = 1 kilohertz (kHz).
- 1000000 Hz = 1000 kHz = 1 megahertz (MHz).

- **The longer the wavelength, the lower the frequency and energy.**
- **The shorter the wavelength, the higher the frequency and energy.**







RADIO WAVE MODULATION

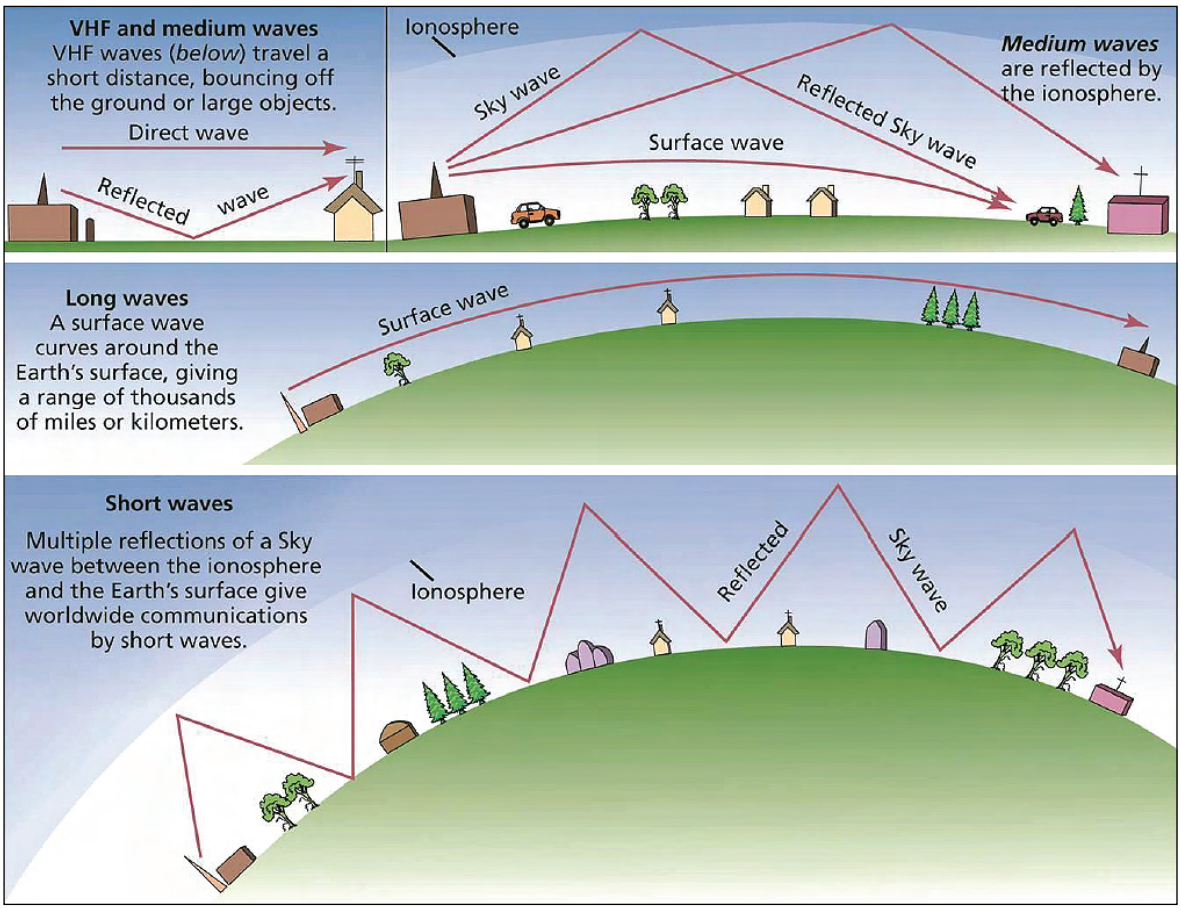
- A radio that sends radio waves is a transmitter.
- A radio that receives radio waves is a receiver.
- Radio waves can be produced by radio transmitters and received by
- radio receivers because of antennas.
- A single radio that can transmit and receive radio waves is called a transceiver.
- To send information by radio waves, it has to be coded in some way.
- Requires two different waves: 1) The carrier wave, 2) The information bearing wave (the modulated or modified radio wave).
- There are two main methods: 1) Amplitude modulation (AM) encodes the information by varying or modifying the amplitude, or height, of the waves. 2) Frequency modulation (FM) encodes the information by
- varying or modifying the number of waves per second.
- AM waves are impacted by environmental factors that affect sound quality.
- FM waves have better sound quality because they are not impacted by environmental factors as much

Radio Basics (& Handheld Radios) *(continued)*

RADIO WAVE PROPAGATION

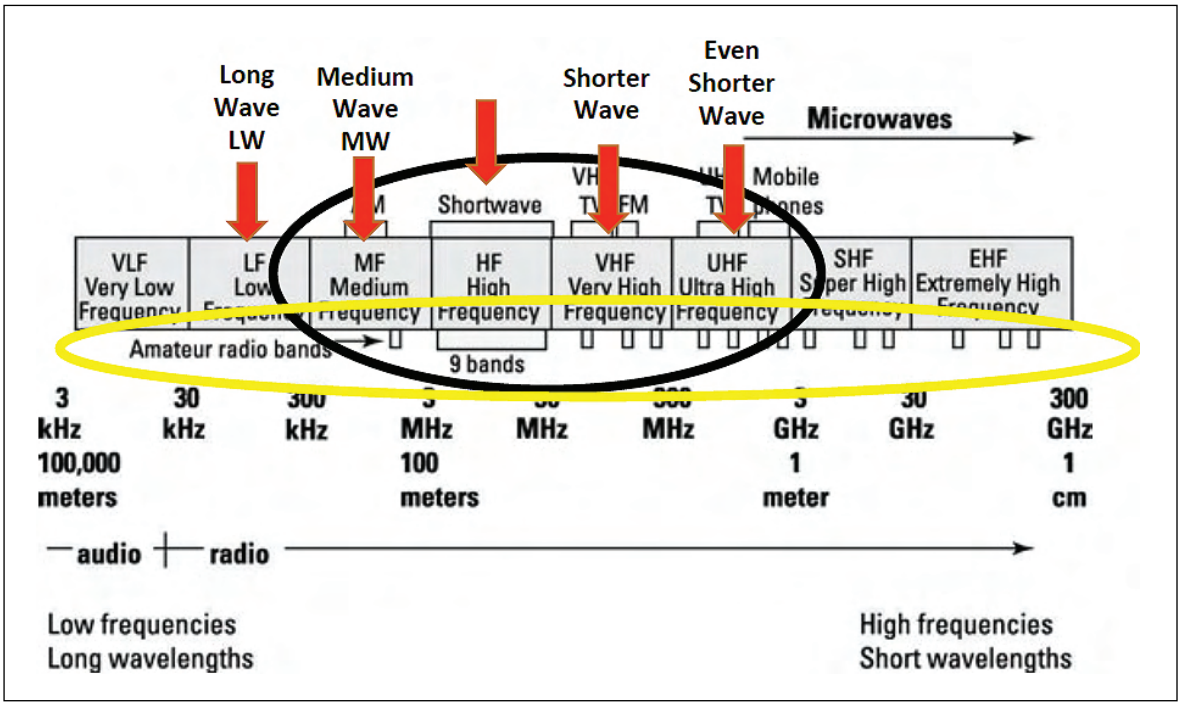
- Radio waves of different frequencies contain various characteristics of propagation (behavior as they travel) along the Earth's surface and in the Earth's atmosphere.
- Longer waves (LW & MW) can bend around different obstacles and follow the outline of the horizon.
- Shorter waves (SW) reflect off the ionosphere and get back over the horizon of sky waves (HF).

The longer the wavelength the lower the frequency and energy, lower energy waves bend more. The shorter the wavelength the higher the frequency and energy, higher energy waves bend less.



Shortwave radio can be used for very long distance communication (HF), in contrast to radio waves of higher frequency (VHF/UHF) that travel in straight lines (line-of-sight propagation).

Radio Basics (& Handheld Radios) *(continued)*



Radio Waves are grouped into bands of related waves and frequencies

- Bands do not mix with each other.
- Your radio is designed for picking up specific bands.
- HF radios can not pick up VHF/UHF signals.
- VHF/UHF radios can not pick up HF signals.
- A HAM operator may have his or her "radio station or HAM shack" set up with equipment to transmit or pick up the different bands (HF/VHF/UHF).

Band	Frequency range	Wavelength range
Extremely Low Frequency (ELF)	<3 kHz	>100 km
Very Low Frequency (VLF)	3 to 30 kHz	10 to 100 km
Low Frequency (LF)	30 to 300 kHz	1 m to 10 km
Medium Frequency (MF)	300 kHz to 3 MHz	100 m to 1 km
High Frequency (HF)	3 to 30 MHz	10 to 100 m
Very High Frequency (VHF)	30 to 300 MHz	1 to 10 m
Ultra High Frequency (UHF)	300 MHz to 3 GHz	10 cm to 1 m
Super High Frequency (SHF)	3 to 30 GHz	1 to 1 cm
Extremely High Frequency (EHF)	30 to 300 GHz	1 mm to 1 cm

Radio Basics (& Handheld Radios) *(continued)*

AMATEUR RADIO BANDS

Wavelength

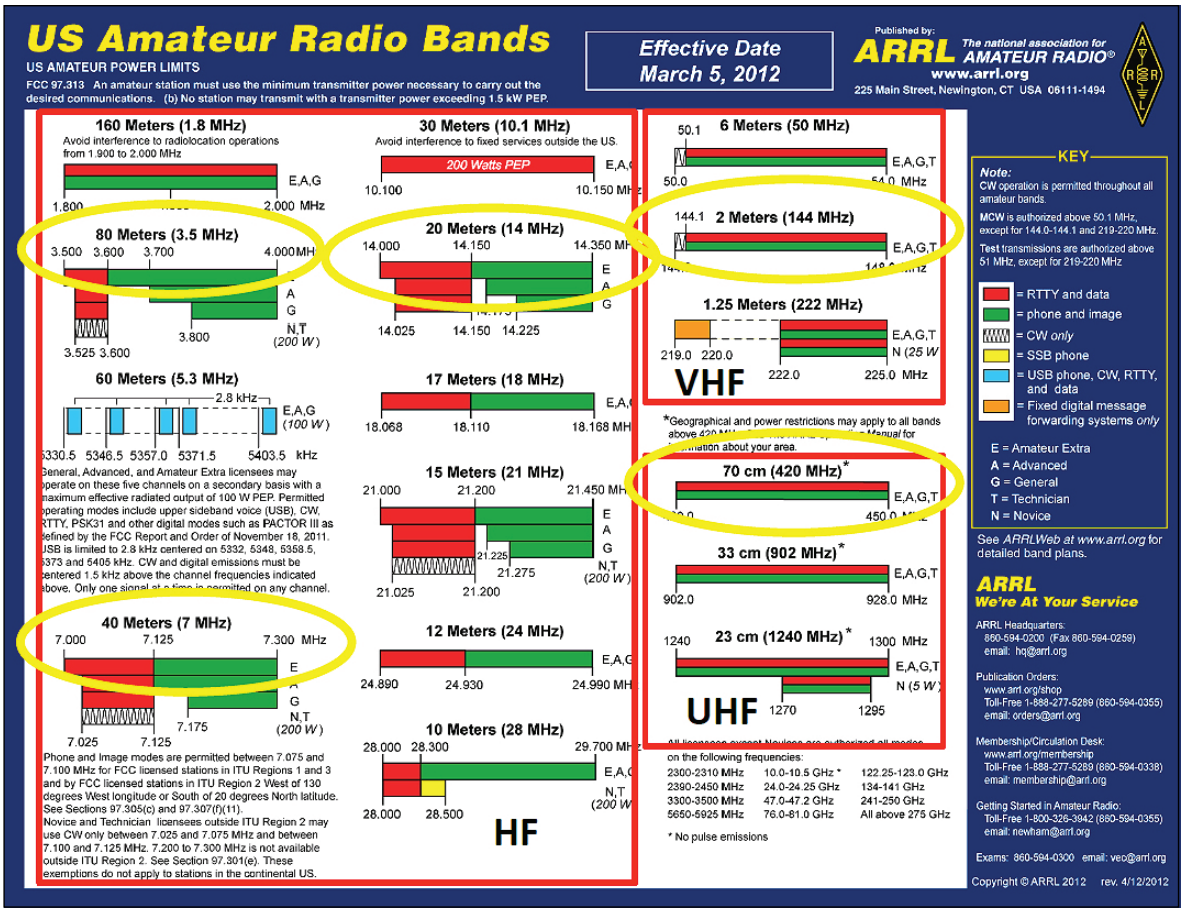
- 70cm for UHF
- 2M for VHF
- 20M, 40M for HF

Frequency (FQ)

- 420 MHz for UHF
- 144 MHz for VHF
- 14 MHz, 7 MHz for HF

Notice that as wavelength increases, frequency decreases.

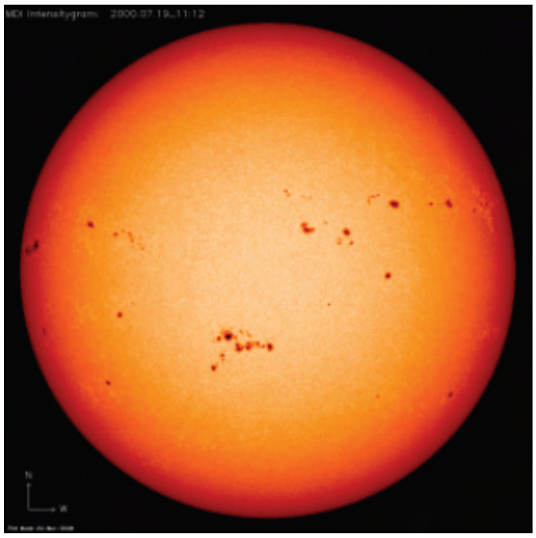
- 20M - 14 MHz
- 40M - 7 MHz
- 80M - 3.5 MHz



Radio Basics (& Handheld Radios) *(continued)*

INTERFERENCE/NOISE WITH AMATEUR RADIO SIGNALS

There are many reasons a person can have the best equipment and yet have problems sending or receiving a radio signal.



Natural

- Sun
  - Decrease is good for VHF/UHF
  - Increase is good for HF
- Atmosphere
- Weather (lightening, clouds, rain, snow)
- Trees

Manmade

- Power lines
- EMPs (electro-magnetic pulse)
- Radar
- Consumer Electronic Devices
- HAM radios on nearby FQ's
- Buildings (outdoor obstacles)

"One man's noise is another man's signal." - Dave Casler KE0OG

Radio Basics (& Handheld Radios) *(continued)*

WHAT IS MOST IMPORTANT WITH A RADIO?

Power or wattage? Antenna? Why?

Both can increase the effective range of the radio!

SINGLE BAND/DUAL BAND

- A radio designed for only operation on the UHF frequencies is known as a single band radio.
- A radio designed for operation on VHF/UHF frequencies is known as a dual band radio.
- As a general rule, radios with access to VHF and/or UHF frequencies work best outdoors.

Which band is better?

Depends on your needs.

UHF vs. VHF

- Works slightly better indoors.
- Possible to penetrate walls.
- Travel shorter distance.
- Better in urban areas.

Manmade

- Works slightly better outdoors.
- No possibility to penetrate walls.
- Travel farther distance.
- Better in suburban and rural areas.

FRS RADIOS

- FRS is the abbreviation for Family Radio Services.
- "Walkie-talkies", mobile radios designed to be used for family activities.
- No test or license required by the FCC.
- Power output is 0.5 Watts to 2 Watts.
- Operates on FM UHF band (SINGLE BAND).
- Work on dedicated frequencies called channels. 22 FRS channels available.
- Shares channels 1-7 and 15-22 with GMRS since 2017.
- Many FRS radios only work on Channels 8-14 but may be numbered 1 – 7.
- NOAA Weather alert.
- Typical communication distance is 0.5-2 miles.
- Requires a fixed antenna (stubby antenna due to limited range).
- Great for short distances, dense woods or around
- buildings.
- About $50.00 per two pack.

LXT600VP3

LXT630VP3

Radio Basics (& Handheld Radios) *(continued)*

GMRS RADIOS

- GMRS is the abbreviation for General Mobile Radio Services.
- "Walkies-talkies", mobile radios designed to be used for family, group, or business activities.
- No test BUT license required by the FCC (good for the whole family for 10 years).
- Currently license is $70 but FCC is working to reduce to $35 (waiting for @ 1 year).
- Power output is 0.5 Watts to 5 Watts.
- Operates on FM UHF band (SINGLE BAND).
- Work on dedicated frequencies called channels.
- 30 GMRS channels available.
- Channels 15-22 are GMRS-FRS and GMRS Repeater outputs.
- NOAA Weather alert.
- Typical communication distance achieved is 2-6 miles.
- Better for slightly longer distances and few obstructions.
- Usually a fixed antenna (stubby antenna due to limited range).
- About $70.00 per two pack.

GXT1000VP4

FRS/GMRS CHANNELS & FREQUENCIES

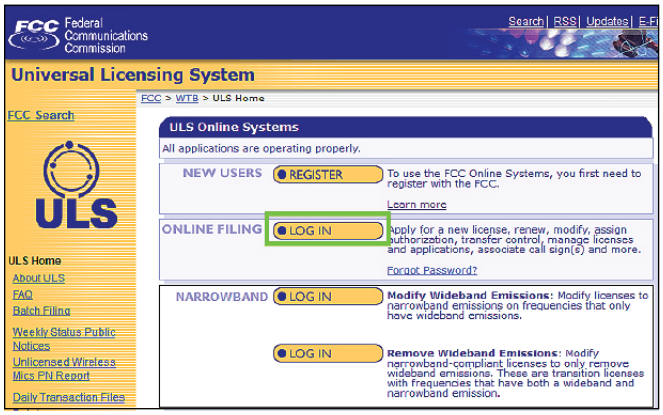
Channel	Frequency	Description	Channel	Frequency	Description
1	462.5625 MHz	GMRS/FRS	12	467.6625 MHz	FRS
2	462.5875 MHz	GMRS/FRS	13	467.6875 MHz	FRS
3	462.6125 MHz	GMRS/FRS	14	467.7125 MHz	FRS
4	462.6375 MHz	GMRS/FRS	15	462.5500 MHz	GMRS/FRS
5	462.6625 MHz	GMRS/FRS	16	462.5750 MHz	GMRS/FRS
6	462.6875 MHz	GMRS/FRS	17	462.6000 MHz	GMRS/FRS
7	462.7125 MHz	GMRS/FRS	18	462.6250 MHz	GMRS/FRS
8	467.5625 MHz	FRS	19	467.6500 MHz	GMRS/FRS
9	467.5875 MHz	FRS	20	467.6750 MHz	GMRS/FRS
10	467.6125 MHz	FRS	21	467.7000 MHz	GMRS/FRS
11	467.6375 MHz	FRS	22	467.7250 MHz	GMRS/FRS

Radio Basics (& Handheld Radios) *(continued)*

HOW TO APPLY FOR A GMRS LICENSE

Visit **https://radioreference.com** forums for detailed information on how to apply for a GMRS license and receive your FCC call sign.

- Create an FCC Universal Licensing System account.
- Log in to the ULS.
- Begin application for a GMRS license.
- Submit the application & fee.
- Receive call sign and download authorization documents.



HT RADIOS

- HT is the abbreviation for Handheld Transceiver HAM Radios.
- “Handy-talkies”, mobile radios designed to be used on VHF/UHF HAM bands.
- A radio with access to VHF/UHF is a DUAL BAND radio.
- Test AND license required by the FCC (good for an individual for 10 years).
- Requires at least a Technician license to transmit.
- No license required to listen, but DO NOT PRESS THE PTT (push-to-talk) BUTTON.
- Can transmit if emergency exists without a license.
- If used and no emergency exists other HAMS can & will report you.
- FCC penalty for unauthorized use can include seizure of equipment, fines and other civil and criminal penalties.
- Works on some dedicated frequencies called channels and free frequencies.
- Cannot be used on FRS/GMRS channels.
- NOAA Weather alert.
- Typical communication distance 2-6 miles without a repeater, 6-30 miles with a repeater.
- Comes with a “rubber-duck” antenna.
- “Your radio is only as good as your antenna.”
- To improve reception upgrade antenna(s).

Radio Basics (& Handheld Radios) *(continued)*

YAESU FT-60R

- Power output is 5 Watts
- Japanese made radio
- Cost @$155.00 + tax, shipping & accessories
- Sturdy, well built radio

Package usually comes with the radio, one battery, standard "rubber duck" antenna, a standard battery charger, USB cable, belt clip, warranty card and instruction manual.

Be sure to check out what is included in your radio purchase.

Vendors

- **dxengineering.com**
- **gigaparts.com**

Recommended minimum:

- The radio.
- One or more extra batteries.
- Upgraded antenna to increase range of radio (Diamond SRH77CA).

Consider adding one or more of the following:

- Rapid charger (normal charger takes @ 9 hours to fully charge battery, @ 3 hours with this).
- Car charger (allows the vehicle battery to charge the transceiver battery).
- Solar battery bank (allows the battery to be charged directly with solar battery).
- Cloning cable if two or more of the same radios are purchased. Allows you to easily clone additional similar radios once you program the initial radio.

Radio Basics (& Handheld Radios) *(continued)*

YAESU FT-70D

- Power output is 5 Watts
- Japanese made radio
- Cost @$175.00 + tax, shipping & accessories
- Sturdy, well built radio

Package usually comes with the radio, one battery, standard "rubber duck" antenna, a standard battery charger, USB cable, belt clip, warranty card and instruction manual.

Be sure to check out what is included in your radio purchase.

Vendors

- **dxengineering.com**
- **gigaparts.com**

Recommended minimum:

- The radio.
- One or more extra batteries.
- Upgraded antenna to increase range of radio (Diamond SRH77CA).

Consider adding one or more of the following:

- Rapid charger (normal charger takes @ 9 hours to fully charge battery, @ 3 hours with this).
- Car charger (allows the vehicle battery to charge the transceiver battery).
- Solar battery bank (allows the battery to be charged directly with solar battery).
- Cloning cable if two or more of the same radios are purchased. Allows you to easily clone additional similar radios once you program the initial radio.

Radio Basics (& Handheld Radios) *(continued)*

BAOFENG BF-F8HP

- Power output is 8 Watts
- Chinese made radio
- Cost @$65.00 + tax, shipping & accessories
- Relatively inexpensive radio

Package usually comes with the radio, one 2100 mAh battery (small battery), standard "rubber duck" antenna, a standard battery charger with wall adapter plug, single PTT OEM ear-piece kit, belt clip, warranty card and instruction manual.

Be sure to check out what is included in your radio purchase.

Vendors

- **baofengtech.com**

Recommended minimum:

- The radio.
- One or more extra batteries (BL-5L 3800 mAh battery, large battery).
- Upgraded antenna to increase range of radio (Nygoya NA-771).

Consider adding one or more of the following:

- USB to 10V Smart Charger (allows the battery charger dock to be used with a USB solar battery).
- BT1013 USB Direct Battery Charger Cable (allows the battery to be charged directly with a USB solar battery)
- BL-5 AA Battery Pack (allows the use of AA batteries, standard or rechargeable)
- BL-5 Battery Eliminator Car Charger (does not charge the battery, allows the radio to use the vehicle's battery to power the transceiver)
- PC03 programming cable (will need to download CHIRP software, which is FREE) **https://chirp.danplanet.com/projects/chirp/wiki/Home**

Be careful of counterfeits

Radio Basics (& Handheld Radios) *(continued)*

HAM RADIO EDUCATION RESOURCES

Online

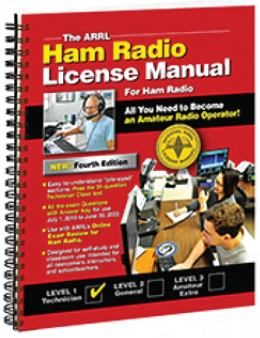
- **hamtestonline.com** ($24.95 for 6 months access)
- **hamradioprep.com** ($35.00 for lifetime access)
- **hamradioschool.com** (best coupled with the book)

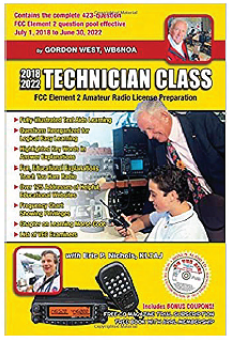
Phone Apps

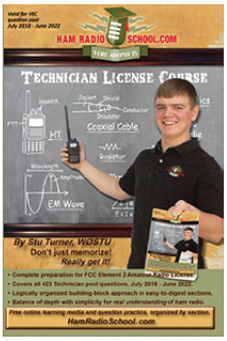
- HAM Radio Exam - Tech

Books

- The National Association for Amateur Radio - **https://arrl.org**
- Gordon West Technician Class - **https://www.gordonwestradioschool.com**
- HAM Radio School - https://hamradioschool.com

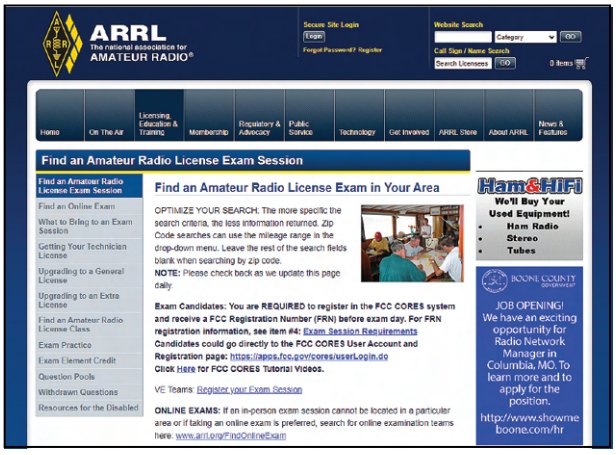






Testing Session

Find an Amateur Radio License Exam in your year at arrl.org.
http://www.arrl.org/find-an-amateur-radio-license-exam-session



Radio Basics (& Handheld Radios) *(continued)*

WHAT TO DO NEXT?
Learn the phonetic alphabet to give yourself a call sign.

The International Telecommunications Union Standard Phonetic Alphabet:

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

Example
Whiskey Tango Foxtrot

WTF = *Where's the Fun?!*

Shortwave Radio Listening

OBJECTIVES

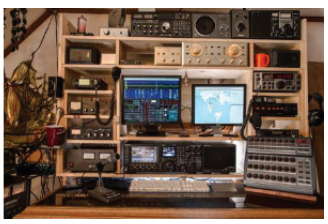
- Understand what a shortwave (SW) radio can pick up and NOT pick up for radio waves.
- Know 3-4 common antennas to use for Shortwave Listening (SWL).
- Understand how to orient your antenna.
- Perform the steps to tune in and listen to a specific frequency.
- Additional resources to practice SWL skills.

WHAT A SHORTWAVE (SW) RADIO CAN PICK UP AND NOT PICK UP FOR RADIO WAVES

- Shortwave Radio Listening is not like listening to AM and FM stations in your car.
- Commercial AM and FM radio stations are professionally designed for profit, and relatively static free.
- Amateur radio stations are designed by amateurs, usually not for profit, and experience static.
- Various SW radios can be used, not just the Tecsun PL880 recommended by CORAC. However, the SW radio must have the SSB (Single Side Band) feature.
- A shortwave radio can only receive radio signals, it cannot transmit them.
- A shortwave radio is a radio that can pick up high frequency (HF) radio waves.
- HF radio waves are referred to as the shortwave band of frequencies
- Shortwave frequencies are best for long-distance communication over mountains and across the country.
- Amateur radio base units are designed for transmission and reception of HF waves.
- A base unit can be a mobile (backpack or vehicle) or desktop setup.
- A base unit should not be considered a handheld device.

Backpack HF base unit

Vehicle HF base unit



Desktop HF base unit

Shortwave Radio Listening *(continued)*

A SW radio can NOT pick up ultra-high frequency (UHF) or very high frequency (VHF) radio waves. Handheld transceivers (HTs) transmit VHF & UHF radio waves and are best for line-of-sight communications.

Yaesu FT-60R

Baofeng BF-F8HP

Know the 3-4 Common Antenna Types to Use for SWL

HF radio waves are actually very long radio signal waves although they are called shortwaves. The adage "the longer your antenna the better" applies to reception of shortwaves. The telescopic antenna can pick up some HF radio waves but it is short. It is best to have an antenna as long as possible to receive HF radio waves.

- **The telescopic antenna attached to the top of the radio.** Fully extend the telescopic antenna. Rotate the antenna at the base to improve reception
- **An Indoor Active Loop Antenna**

Tecsun AN-48X
Indoor Active Loop
AM/LW/SW Radio Antenna
@$45.00 on Amazon
(attaches inside on a window)

Instructions on proper use come with the product.

- **An SW External Antenna**
  - Tecsun PL880 comes with a 15.6 ft SW wire antenna
  - Others can be purchased which are longer (23 ft)
  - Connect the antenna plug end to the socket marked SW ANT on the side of the radio.
  - Orient the antenna broadside to the transmitting location (Map details below).

XHDATA AN80
Shortwave External Wire
Antenna FM/SW Radio
@$13.00 on Amazon
23 ft long

Sangean ANT-60
Short Wave Antenna
@$14.50 on Amazon
23 ft long

- **Homemade long wire antenna** (instructions below)

Shortwave Radio Listening *(continued)*

After months of trying out the above antennas, I have found SWL the most successful with the following antenna. Yet, I have heard from CORAC members who have listened successfully to CORAC's netcasts using the telescopic or external shortwave antennas. It depends upon various factors. SWL is not a situation where "one answer for the question fits all", as much as we would like it to be. My recommendation is to first try the telescopic antenna. If you have problems picking up CORAC's netcasts, then try the SW external antenna included with the TECSUN or either of the above SW External Antennas. If you still have a challenge, make the antenna described below.

The simplest and probably most successful SWL antenna is a single 14 AWG stranded wire connected to the shortwave radio.

- The longer, the better. However, that is not always possible.
- There are calculations to determine what you need. (468/ frequency in MHz)
  - 468/7.28410 = 64.25
  - 468 is a "magic HAM number" for calculating antenna lengths.
- 7.28410 is the CORAC netcast frequency on Sunday nights.
- A good receiver antenna is @ 64.25 feet long (64 ft 4 inches). An average antenna is @ 32.125 feet long (32 ft 2 inches).

What is needed to make a SWL long wire antenna?

Southwire
100 ft of 14 AWG stranded wire
@$21 on Amazon

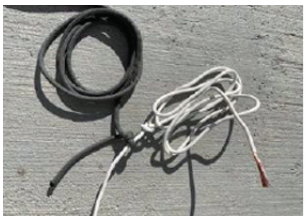
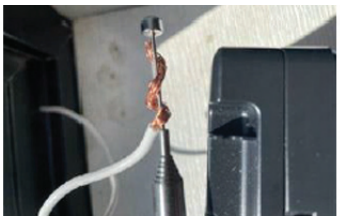
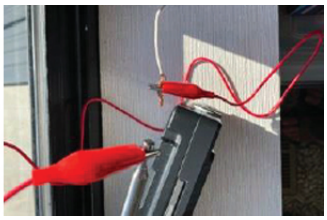
Paracord

Alligator Clips

Instructions:
Two lengths of rope (3-10+ ft) for attaching one end of the wire to your house or a tree, and one end to attach to a tree about 65+ feet away. (I used paracord rope.)

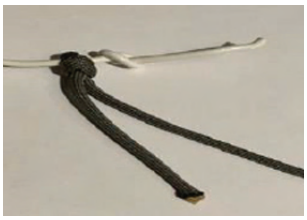
Strip about 1 inch of insulation from one end of the wire. This is the end that will be wrapped around the antenna or connected by alligator clips (one clip to the stripped wire and one clip to the telescopic antenna).

Shortwave Radio Listening *(continued)*

Tie a knot at least 3-5+ ft from the stripped wire end. You need the 3-5+ ft to run into your house, most likely a window, to connect to the telescopic antenna.

Attach a small diameter rope, with a slip knot, behind the knot and away from the stripped wire end. This rope will be attached to your house. Use a semi-circular hook or nail as an anchor on the house to tie the rope to the house.



Tie a knot in the other end of the wire. Use a dab of caulking or silicone over the open insulation end to prevent water from getting to the wire. Attach a small diameter rope, with a slip knot, in front of the knot in the wire. Attach the other end of the rope to a tree and tie it to the tree, so the wire can be extended as long as possible. Keep the previous noted lengths in mind when measuring from knot to knot for the antenna.

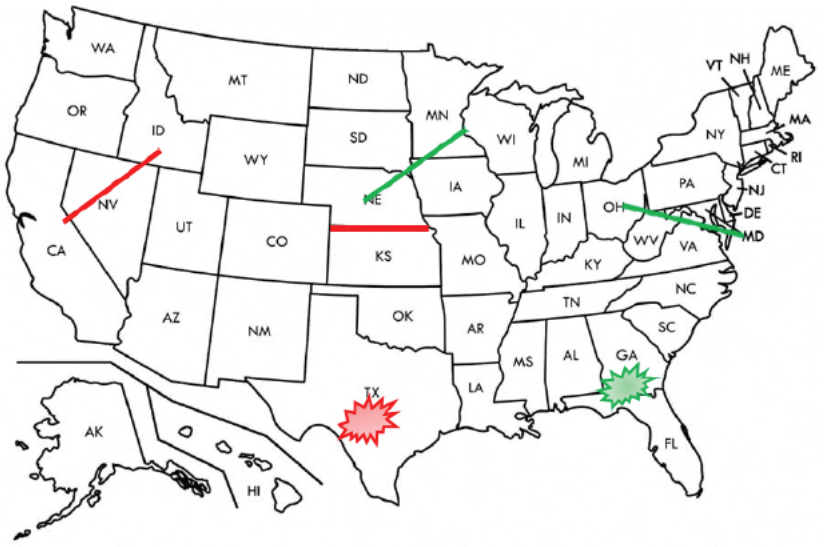
Orient the antenna broadside to the transmitting location (Map details below). The long wire antenna needs to be fairly taut. Use the rope ends to adjust the snugness of the wire. When placing an antenna to listen on shortwave radios, do the following:

- Antennas used indoors will work, dependent on your household's electrical interference.
- It is best to place your antenna outdoors.
- Place an outdoor antenna as high as possible, 10 feet is recommended but 6 feet can work.
- Place the antenna away from buildings, as best as possible, and definitely away from powerlines.
- It may be prudent, if a lightning storm is in your area, to disconnect the stripped wire end of your homemade long wire antenna from the radio and cover the exposed wire with a rubber material. The antenna is not grounded.

ORIENTATION OF YOUR ANTENNA

It must be as close to broadside as possible to the transmitting base station to catch the shortwave. For example, orientation of the "green antennas" are less likely to catch the shortwave from the "red base station".

Shortwave Radio Listening *(continued)*



PERFORM THE STEPS TO TUNE IN & LISTEN TO A SPECIFIC FREQUENCY

- Once your antenna is set up, turn your SW radio on.
- Push the SW button for shortwave.
- Input a frequency, for example 7284 (the display should show 7284)(the SW radio does not display decimals ahead of the first 4 digits).
- Push the USB or LSB button. (the display may now show 7284.00) This focuses on a section of the radio signal.
- Turn the fine-tuning dial from 7284.00 to 7284.10 (the display will show 7284.10)
- USB and LSB may be alternated to discover which captures the radio signal best. One is usually better than the other.

Currently, CORAC is using the 7.284.10 frequency of the 40M band on Sunday nights for its netcast. The times are 7:30 PM EDT, 6:30 PM CDT, 5:30 PM MDT, & 4:30 PM PDT.

CORAC's Communication Team is performing a transmitting relay. One member transmits initially. This is followed by 1-3 additional members located throughout the nation retransmitting the initial message. Listen for 15-20 minutes. The current location of the originating station is in Georgia with relay stations in Texas, Minnesota, and Kansas. More are being added.

Successful shortwave radio listening is dependent on the sun, atmospheric conditions and electrical interference. SWL can be challenging but not impossible. The netcast may be crystal clear or full of static. You may hear a netcast one day and not the next, on the same frequency, due to changing conditions of interference sources. ***We need to trust that we will hear what we need to hear when we need to hear it.***

Shortwave Radio Listening *(continued)*

ADDITIONAL RESOURCES TO PRACTICE SWL SKILLS

Below are three netcasts that occur throughout the nation every day. Tune your radio to the frequency listed and practice. I encourage you to check out netlogger.org for additional practice.

The Saltminers Net (originates out of Ohio but not affiliated with CORAC)

- 40M FQ: 7.284.10
- 1 hour duration
- Begins at 8:00 AM EDT, 7:00 AM CDT, 6:00 AM MDT, 5:00 AM PDT
- The SouthCARS Net (originates out of Region 4 but not affiliated with CORAC)

SCARS – South Coast Amateur Radio Service (southcars.com)

- 40M FQ: 7.251.00
- 4 hours duration
- Begins at 9:00 AM EDT, 8:00 AM CDT, 7:00 AM MDT, & 6:00 AM PDT

MidCars Amateur Radio Service (originates out of Region 6 but not affiliated with CORAC)

- 40M FQ: 7.258.00
- 5 ½ hours duration
- Begins at 8:30 AM EDT, 7:30 AM CDT, 6:30 AM MDT, & 5:30 AM PDT

NetLogger – Amateur Radio Logging Program

- This link provides netcasts running "right now" throughout the nation.
- https://www.netlogger.org/

If you need further help reach out to your Regional Coordinator or your Region's Communications Team Lead. They will assist in whatever way they can. Thank you to those who provided critical feedback on the challenges they were experiencing to make this document possible.

Tecsun PL880

GOALS/OBJECTIVES

- Present information on the value of communication.
- Present information on radio waves to understand the abilities and limitations of the radio.
- Present information important to improving reception of radio signals.
- Recommendation for another antenna along with additional items required to improve reception.
- Learn to set the functions/features of the Tecsun PL880.
- Clarify instructions and correct some errors in the supplied Operations Manual.
- Present some hidden features of the radio.

VALUE OF COMMUNICATION

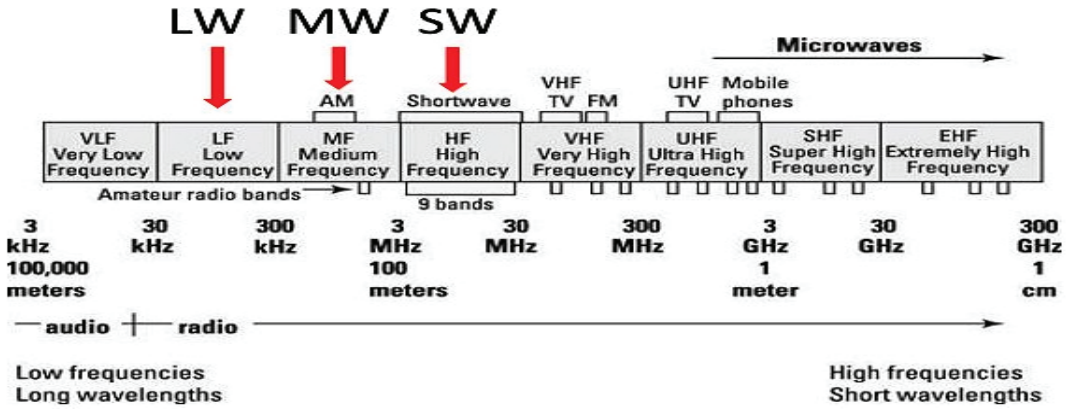
During a time of natural, man-made, or even supernatural adversity, men and women are concerned about family, friends, and others. It is only human to desire to know about another's well-being. In today's world, many of those we are concerned about are spread out across the nation, if not the world. Assistance always begins with total and complete acknowledgement and trust in God. Always. We need to trust that everyone we are concerned about, God is concerned about even more. As God aided the Israelites of old, He can and will aid us now. The aid needed will involve the gift of you. You may be helping someone's loved one, across the country, that they are concerned about. Help comes in many ways, but it is never selfish on our part if it is rooted in God.

To assist you in learning of others well-being, if usual means of communication breakdown, CORAC will be communicating information over shortwave amateur radio frequencies. None of us fully knows what that may look like. Yet, CORAC is prudently preparing to help. We strive to "be a sign of hope for others". If you are like many, you have never or rarely used a shortwave radio receiver in the past. This document hopes to educate you on operating the Tecsun PL880 shortwave radio receiver. Although God created radio waves and we make use of them, he communicated directly with mankind in the Old and New Testaments. Let us not forget.

ABILITIES AND LIMITATIONS OF THE RADIO

During the late 19th and early 20th centuries, radio waves were discovered. The radio spectrum of the electromagnetic spectrum was divided up by their discovered wavelengths: Long Wave (LW), Medium Wave (MW) and Shortwave (SW). As time progressed other radio waves were discovered, yet they kept the historical terms and jointly added additional terms to better classify the waves by frequency.

Tecsun PL880 *(continued)*



Why is this important? AM radio waves (think of your car's radio) travel on LW in Europe, Asia, and Africa and on MW in North America, for the most part. So, what travels on SW? Amateur radio waves known as High Frequency (HF) waves. The Tecsun PL880 has the capability to pick up SW radio signals, along with AM and FM signals. THIS INFO HELPS TO UNDERSTAND PROGRAMMING THE RADIO. Of course, this has probably oversimplified radio waves, but it can shorten your learning curve with a basic understanding.

Various natural events and man-made items can interfere with radio wave reception including SW. Natural events include: the sun (sunspots and/or coronal mass ejections), atmosphere, and weather to name a few. Man-made items include powerlines, EMPs, consumer electronics, and buildings to name many.

IMPROVING RADIO WAVE RECEPTION

The simplest way to improve reception of radio signals is to avoid man-made items that interfere with reception. Avoid being near powerlines and consumer electronics as best as possible. Consumer electronics include cell phones, stereos, TVs, light bulbs, microwaves, etc. Any device that uses electromagnetic frequencies can interfere with radio frequencies.

AM BAND

To improve reception of the AM band, simply rotate the body of the radio to align with the transmitted AM radio signal. When the internal AM antenna (called a ferrite bar) is aligned properly, the audio output will sound better.

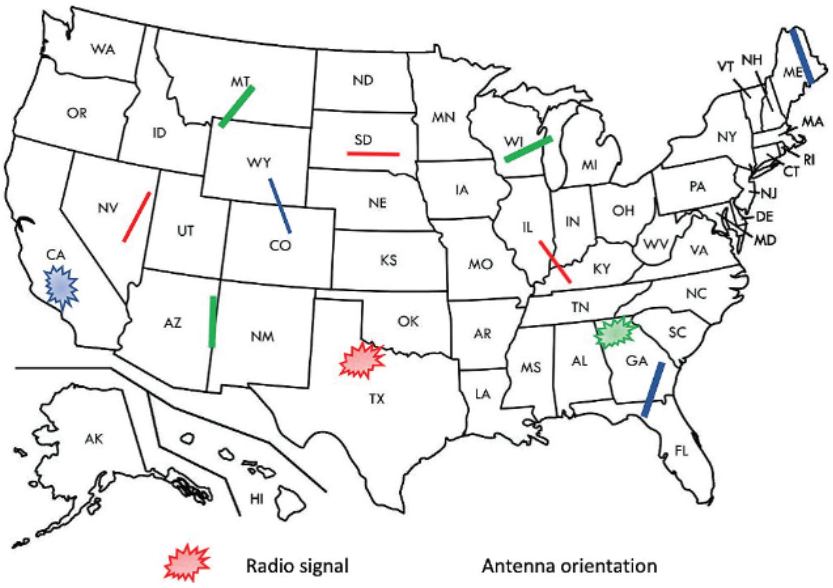
FW BAND

To improve reception of the FM band, simply extend the external telescopic antenna and rotate the antenna to align with the transmitted FM radio signal. I recommend rotating the antenna at its base to prevent bending or breaking the antenna. When aligned properly, the audio output will sound better.

Tecsun PL880 *(continued)*

SW BAND

To improve reception of SW BANDS (aka HF BANDs), plug the SW antenna (a 15.6 ft. black wire) into the correct socket on the left side of the radio. Extend the antenna as long as possible. You can attach the clip of the SW antenna holder to a curtain rod, curtain, or tree. Be sure the antenna is still attached to the holder; you may need to apply a small piece of electrical tape to keep it attached. Attempt to orient the wire perpendicular to the direction of the SW radio signal. CORAC's primary locations for the broadcast net are in Georgia, Texas, and California. If you are located North of Georgia, the antenna should be oriented horizontally in a West to East direction. Three colored examples are below: red radio signal with red antenna orientation, blue with blue and green with green. Notice how orientation must change for antenna to pick up the radio signal. The location of the transmitted signal determines the antenna orientation. By nature, SW radio signals are difficult to hear. However, they can be heard. Bandwidth selection can improve the sound.



The Communications Team provides information on how to make a dipole antenna here:

- **Basic Dipole Antenna: https://corac.co/2021/06/17/basic-dipole-antenna/**

You might want to simply buy an antenna. Choose one of the three listed below along with the cable, adapter and carabiner clips.

Tecsun PL880 *(continued)*

Dipole antenna that is already made. Covers the 20M band that CORAC will be transmitting on. SO239 female socket connector.

Dipole antenna that is already made. Covers the 40/20M bands that CORAC will/may be transmitting on. SO239 female socket connector. Accepts a PL239 male plug. **https://www.ebay.com/itm/124132668530?hash=item1ce6e23472:g:dWAAAOSwPLRc7rzL**

Dipole antenna that is already made. Covers the 80/40/20 M bands that CORAC will/may be transmitting on. The antenna connector is a SO239, a female adapter, for a male PL259 plug.
https://www.ebay.com/itm/123981450962

RG58 coax cable used for HAM radio reception. Get the shortest length you need. Cable has PL239 male plugs that fit into SO239 female sockets. Cable connecting the antenna to the radio adapter below.

Adapter to connect the radio to the coax cable.

1 clip suspends the body of the antenna and two to attach to the insulators or wire loops. Use a small piece of rope to tie through the insulators/loops to secure the clips. Secure the rope with the clips to a stake or branch. Carabiner clips May be found at any camping dept. of a store. Or order online.

SETTING THE FUNCTIONS/FEATURES OF THE RADIO

There are two ways to access the functions of the buttons on the keypad:

- When the radio is turned off (POWER OFF), includes clock and system settings.
- When the radio is turned on (POWER ON), includes scanning, programming frequencies and stations into memory, and removing from memory various frequencies and stations. This is accomplished three ways:
  - Manually tuning the dial to a frequency or station
  - Scanning for a frequency or station, and
  - Direct keypad entry.

Tecsun PL880 *(continued)*

The radio's LCD display panel symbols and keypad are pictured at right.

Be sure to look at page 5 in the Operations Manual for the symbol descriptions.

ETM in the lower right corner of the display is not used on this radio.

The display/skeleton key button works in the POWER OFF or POWER ON position.

Pressing the button once lights up the display panel.

(Pressing any button on the keypad will cause the display panel light to turn on.)

Pressing and holding the display/skeleton key button for 1 second locks or unlocks the keypad.

RADIO POWER OFF FUNCTIONS

Clock/Time

- Time is designated as 24 hour aka military time.
- Press the time button for one second. Hours position flashes.
- Rotate the course tuning dial or input numbers to desired hour.
- Press the time button again. Minutes position flashes.
- Rotate course tuning dial or input numbers again to desired minutes.
- Press the time button again.
- Time is set.

Alarm

- Alarm time is designated as 24 hour, aka military time, in upper right corner of display panel.
- Press the alarm button for one second. Hours position flashes.
- Rotate the course tuning dial or input numbers to desired hour.
- Press the alarm button again. Minutes position flashes.
- Rotate course tuning dial or input numbers again to desired minutes.
- Press the alarm button again and rotate the course tuning dial to set the Alarm Off Timer from 1 to 90 minutes for desired time.
- Press Alarm again, your alarm time and alarm off timer are set.
- To activate alarm, press alarm button and the "speaker alarm" icon displays.
- To deactivate alarm, press alarm button and the "speaker alarm" icon disappears.

Tecsun PL880 *(continued)*

Sleep Timer

- Press and hold the POWER button until the “sleep timer” icon displays.
- Rotate course tuning dial to desired sleep time, from 1 to 120 minutes or to the ON position.
- This is activated by pressing the SNOOZE button on top of the radio.

System Settings (orange markings)

- FM SET Different parts of the world use a different setting for the lower end of the FM frequency band.
- The lower end of the FM frequency band in America is 88 MHz.
- So, the FM band in America transmits between 88 MHz and 108 MHz.
- Press the number 1 (FM SET): the lower end of your frequency band can be set to 64, 76, 87 or 88 MHz by pressing and releasing the button to cycle through the choices.
- Set to 88 MHz in America.
- The upper end of the frequency band is automatically set to 108MHz.

LW On/Off

- The AM band is made up of Medium Wave (MW) frequencies (@500 kHz to 1700 kHz) or
- Long Wave (LW) (@150 kHz to 300 kHz) frequencies.
  This button turns reception of LW frequencies ON or OFF.
- Just press the number 2 (LW ON/OFF) and hold until ON or OFF is displayed.
- The term displayed is the setting, so now release the button.
- Do so a second time if you wanted the other option.
- Usually this is turned OFF in North America. 9/10kHz Different parts of the world tune the AM band in different increments. North America tunes in 10 kHz increments while Europe, Asia, and Africa tune in 9 kHz increments.
- Press the number 3 (9/10KhZ) for 2 seconds and either the 9 or 10kHz increments will be set.
- Do so a second time if you want the other option.

Auto-Sorting Station List

- This automatically sorts stored station memories.
- Press the number 0 for 2 seconds and the memory page in the upper right side of the display panel starts running. This function will remove duplicate stations and auto-sort all stored stations from low to high frequency and in sequence of FM, SW, (AM) MW, and LW.

Radio Power on Functions

- Include VF/VM scan, tuning frequencies, storing frequencies into memory, listening to stored frequencies, and deleting stored frequencies.

Tecsun PL880 *(continued)*

VF/VM Scan

- Press this button to View Frequency (VF) on the display.
- If the frequency displays twice, you are in VF mode.
- Press this button to View Memory (VM) of preset stations or frequencies stored in memory.
- If the station memory, in the upper right of the display panel, flashes 3 times, you are in VM mode.
- Once you have chosen VF or VM, press the button for 1 second and release.
- The radio will scan frequencies if in VF mode or the presets in memory if in VM mode.
- Press the button once to stop scanning. This works in FM, AM, or SW frequencies and memories.
- Before the radio has any stations or frequencies stored into memory, you cannot switch between VF/VM mode, the radio will automatically be in VF mode.

Tuning Frequencies or Stations

There are 3 ways to tune in desired frequencies or stations.

- MANUAL TUNING. Turn the course and/or fine-tuning dials to make your selection.
- AUTO BROWSE. Manual refers to this as SEMI-AUTO. While in VF mode, press and hold the VF/VM button for 1 second. The double arrowhead symbol flashes indicating it is scanning for frequencies or stations, staying on each for 5 seconds before proceeding. Press any button on the keypad to stop scanning.
- DIRECT KEYPAD ENTRY. While in VF mode, press the numbered buttons to directly enter in a frequency or station. Ignore the decimal point when inputting numbers. If the frequency is not within the covering range, the error symbol “ERR” will be displayed.

Storing Memories

I recommend going outside away from buildings and overhead powerlines, if possible, for the best access to available stations and frequencies in your area.

Manual Storage

- Enter VF mode, select FM, AM, or SW button for band selection.
- Dial to or input the numbers of a station desired.
- Press the MEMORY button, PRESET will flash in upper right corner of display panel.
- Rotate course tuning dial to select a memory address of where to store station.
- Press MEMORY again or wait 3 seconds for station to be stored in place.

A***uto Browse (Semi-Auto) Storage***

- Enter VF mode, press and hold VF/VM button to scan available stations.
- The double arrowhead will flash while advancing and stopping on each available station for 5 seconds.
- Press the VF/VM button to store station into memory.
- It will then continue scanning until you store another choice or stop scanning.

Tecsun PL880 *(continued)*

AUTO-TUNING STORAGE (ATS)

For AM

- Enter VF mode Press and hold the AM button for 1 second.
- PRESET will flash and the radio runs through the band storing all available stations into memory.
- When storage is complete, the radio will begin broadcasting the first stored station.
- Rotating the course tuning dial will play each stored station as the dial is turned.

For FM

- Perform the same steps as you did for AM with two exceptions: fully extend the telescopic antenna and press and hold the FM button for 1 second.

For SW

- Perform the same steps as you did for FM with two exceptions: fully extend the telescopic antenna and press and hold the SW button for 1 second.
- Now choose whether to store all available frequencies within all meter bands or within a chosen meter band.
- Press and hold the down-arrowhead button to run through all available stations within all meter bands.
- Press and hold the up-arrowhead button to run through all available station within a given meter band.

Memory Page Selection

- Press FM, AM, or SW button for band selection.
- Tune to a desired station.
- Press the MEMORY button, the memory address flashes in upper right corner of display panel.
- Go to the PAGE buttons. Press the + to advance up in page number.
- Press the – to advance down in page number.
- Rotate the course tuning dial to choose your desired memory address location.
- Press the MEMORY button or wait 3 seconds for the new location of the memory address to be stored.

LISTENING TO STORED STATIONS

Manually Browse Stored Stations

- Press FM, AM, or SW button for band selection.
- Press VF/VM button to enter VM mode.
- Go to the PAGE buttons. Press the + to advance up in page number.
- Press the – to advance down in page number.
- Rotate course tuning dial to tune to a desired station within a memory page.

Tecsun PL880 *(continued)*

Auto-Browse (Semi-Auto) Browse Stored Stations

- Press FM, AM, or SW button for band selection.
- Press VF/VM button to enter VM mode.
- Press and hold the VF/VM button until PRESET flashes in the upper right corner of the display panel.
- Go to the PAGE buttons.
- Press the + to advance up in page number.
  Press the – to advance down in page number.
- Rotate course tuning dial to tune to a desired station within a memory page.
- The radio will auto browse all stored stations in a selected page, staying on each for 5 seconds.
- Stop auto browsing by pressing VF/VM button or rotating course tuning dial.

DIRECT ENTRY OF STORED STATIONS

I will not cover this. Why? A person would need to remember the exact page and location of where each station is stored in memory. It is easier to AUTO BROWSE stored stations.

BANDWITH SELECTION WHILE LISTENING

- While listening on AM or SW, press the AM BW button.
- Press the AM BW button repeatedly to cycle through the options: 9, 5, 3.5 or 2.3 kHz of AM bandwidth.
- Stop pushing the AM BW button when your selection appears in the display.
- While listening on SW, choose either USB or LSB. USB or LSB will be displayed above the frequency.
- CORAC's communications occur on USB of SW.
- Press the AM BW button repeatedly to cycle through the options: 4, 3, 2.3, 1.2, or 0.5 kHz of AM bandwidth.
- Stop pushing the AM BW button when your selection appears in the display.
- Select a higher number to widen the bandwidth when receiving strong signals or local stations.
- Select a lower number to narrow the bandwidth for weak signals or long-distance stations.
- Doing so will limit interference and reduce background noise.

DELETING STATIONS

This function ONLY WORKS IF the delete button is pressed within 3 seconds. Otherwise, this function is exited with no changes saved.

MANUALLY DELETING A SINGLE STATION

- Rotate the course tuning dial to a stored station in memory.
- Press the DELETE button and release.
- PRESET and DEL will flash in upper right corner of display panel.
- Press the DELETE button again to remove the unwanted memory address.

Tecsun PL880 *(continued)*

AUTO-BROWSE (SEMI-AUTO) DELETING A STORED STATIONS

- nter VM mode Press and hold the VF/VM button.
- PRESET will flash and the radio will cycle through stored stations pausing for 5 seconds on each station.
- Press the DELETE button to remove unwanted stations in memory.
- Press and hold the VF/VM button to continue the process.
- If finished with the process, simply do not push the VF/VM button to stop.

MANUALLY DELETING ALL STATIONS WITHIN A PAGE

- Enter VM mode Press and hold the DELETE button for 3 seconds DEL and page number in upper right corner of display panel will flash.
- Note which page of stored memories you are on.
- Go to the PAGE buttons.
- Press the + to advance up in page number.
- Press the – to advance down in page number.
- Press DELETE button once more to delete all stored stations within a selected page.
- If the DELETE button is not pressed within 3 seconds for confirmation, the delete function exits automatically.

HIDDEN FEATURES OF THE TECSUN PL880

There are quite a few. We will cover just four of the most important.

Adding seconds to the display panel clock

- Radio POWER OFF Press and hold the number 8 on the keypad.
- Seconds will be displayed on the clock readout.
- Use the same process to toggle between settings.

How to display all readouts in the display panel and radio's firmware version

- Radio POWER OFF Press and hold the AM BW button.
- The full display panel will turn on. Press and hold AM BW button again.
- Radio firmware version will display in panel.

Synchronous Detection (SD)

Allows the radio to lock onto the USB or LSB of a radio signal, often improves reception. Reviews indicate the Tecsun PL880 SD has a problem providing a stable lock on a signal which produces unstable shifting audio (poor audio output). In those cases, it is better to turn off SD. Know that CORAC's communications occur on USB.

Tecsun PL880 *(continued)*

- Radio POWER ON
- Select AM or SW button for band selection.
- Press and hold USB/NORM or LSB/NORM button until SYNC appears on display panel.
- Press the same button again to toggle SYNC off.

Dynamic Noise Reduction

- Allows the radio to reduce noise from a radio signal, often improves audio.

Radio Power On

- Press and hold the number 4.
- Additional features are enabled if display panel readout shows ON.
- If display panel readout shows OFF, press and hold the number 4 again.
- Press and hold the number 6.
- If display panel readout shows ON, dynamic noise reduction is on and enabled.
- If display panel readout shows OFF, dynamic noise reduction is off and disabled.