

On the Air

NOV/DEC 2025
ARRL.ORG/OTA

**Make Time
for the
10-Meter
Contest**



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On the Cover: The ARRL 10-Meter Contest is coming up on December 13 and 14. It's a terrific first contest for Technicians and other new contesters. Read "Get On the Air for the ARRL 10-Meter Contest" for more info.

On this Page: This wintry scene was captured on the Åland Islands between Sweden and Finland. The home and antennas belong to Einar Lindholm, OHØNJ. [Henryk Kotowski, SMØJHF, photo]

On the Air Yearbooks



Get more of *On the Air* magazine with a collection of articles featured in issues from 2020-2021 and 2022-2023. The *On the Air* Yearbooks cover a range of ham radio interests and topics, delivering introductory techniques and stories that help hams get the most out of their amateur radio license.

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From the Editor

Try Your Luck in the 10-Meter Contest

The end of the calendar year places us squarely in contest season, with some of the most popular contests being scheduled for November and December. One of those, the ARRL 10-Meter Contest (being held this year on December 13 and 14) is a perfect opportunity for newer hams to test their skills in an event that's open to hams of every license class.

You can learn more about the 10-Meter Contest's rules and requirements in this issue, but to hear about how much fun it is, go to the contest's "Soapbox" — an online forum that hams post in after a contest.

The Soapbox for the most recent running of the ARRL 10-Meter Contest is at contests.arrl.org/10m/soaps/2024/. Here are a few highlights from the participants:

Ruth, KI5MDO; Rodney, KJ5FWC, and Steven, KJ5IL, all enthused that this was their first contest ever!

Stephen, K4NU, who is back on the air after a hiatus of more than 40 years, operated single sideband in the contest with just 100 watts output and a dipole mounted at 40 feet, and had this to say:

"Great fun and exhausting. This was my first serious contest, and I was thrilled at how well everyone worked together. Virtually everyone spent as much time as necessary to get every call through while still moving as quickly as possible."

Kelly, KE2L, echoed the sentiment that you don't need powerhouse equipment to be successful in the 10-Meter Contest:

"Had a great time and worked a bunch of new countries using a simple dipole I made that morning."

Michael, WB2KHE, wished he'd spent more time operating (the 10-Meter Contest lasts 48 hours, and the rules allow you to stay on the air the entire time, if you wish), but said, "15 [contacts is] better than 0!"

He definitely has the right idea! Tailor your contest operation to what works for you. If you can only give it 2 hours, then give it 2 hours. If you have only 100 watts — or 50, or 25 — fire up your rig and find out who you can hear. Every operation is a learning experience — and you might be in for some fun, too!

73,

Becky W1BXy



Resources

On the Air Information and Archive
arrl.org/ota

On the Air Podcast
blubrby.com/arrlontheair
podcasts.apple.com

On the Air Blog
arrl.org/ota-blog

ARRL Learning Network
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On the Air Live
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On the Air

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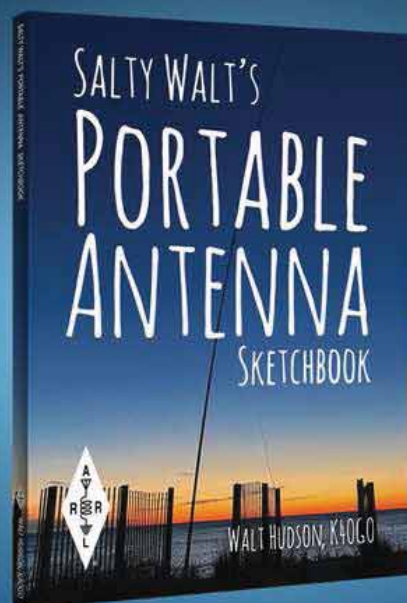
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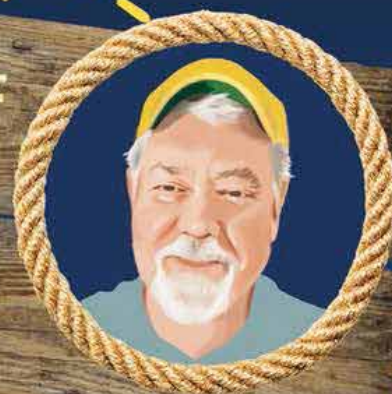
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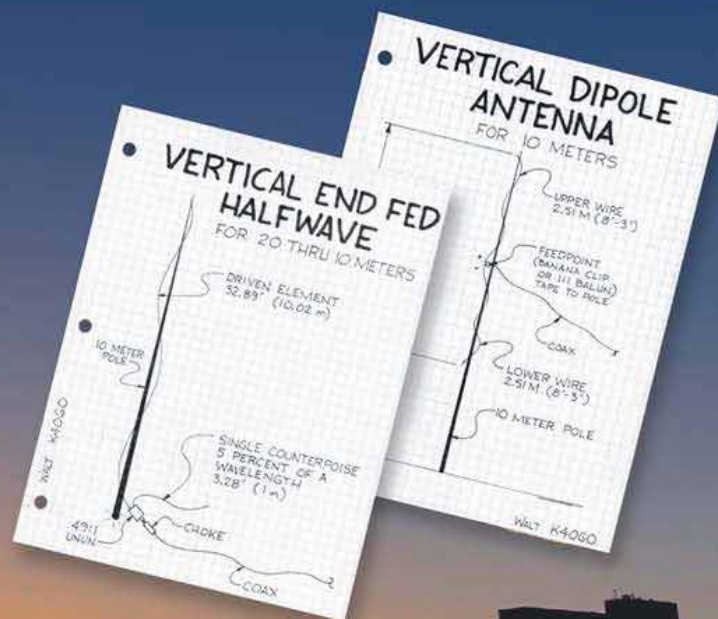
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ANTENNA BOOKS,
IT'S THE JIMMY BUFFETT."
— SALTY WALT, K4OGO



15 PORTABLE ANTENNAS, BEAUTIFULLY RENDERED!

Join **Salty Walt, K4OGO**, of the Coastal Waves & Wires YouTube channel, where all the action happens — right on the beach! Ham radio adventure awaits with these portable antenna designs. In addition to his sketches, Walt offers portable construction and operating tips, and just enough about counterpoise wires and ground to get you making contacts in no time.

Walt pairs each antenna with a dining spot you can try. He guides you to the best chowders, fish tacos, crab legs, and more, all while building antennas, making contacts, and soaking up some coastal rays.



Salty Walt's Portable Antenna Sketchbook

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((On Frequency))

Pass the Bill • License Classes • Contests • Online Code Practice • Hamspeak • ARRL Newsletters

ARRL Wants Every Ham to Help Us Pass this Bill



ARRL needs every radio amateur in the US to send letters to Washington as we continue our nationwide grassroots campaign to pass the Amateur Radio Emergency Preparedness Act. The process is simple; click the “Send Your Letters Now” button at arrl.org/HOA, put in your call sign, and press the red “Send My Letters” button. It takes seconds!

The letters will be automatically sent to your elected officials to encourage them to support the bipartisan bills. This legislation is intended to prevent restrictive HOA rules that currently prohibit or severely limit the installation of amateur radio antennas. Passage would give amateur radio operators the same rights to install antennas on their property as those enjoyed by users of TV antennas, wireless internet, and flagpoles.

You can also send pre-drafted letters to your US Representative and Senators quickly and easily via send-a-letter.org/hoa/. The page also includes a PDF brochure that you can print and share with others to educate them about the importance of amateur radio.

ARRL CEO David Minster, NA2AA, was a guest on the Ham Radio Crash Course

YouTube channel this fall (youtube.com/live/xMLDannix2M). Host Josh Nass, K16NAZ, spoke with Minster for 45 minutes about this important letter-writing campaign.

Watch the video to learn why every letter matters. Join ARRL's grassroots campaign and let your elected officials know that the passage of this legislation is important to you.

Find a License Class Near You

If you're ready to upgrade your license and want the structure of a license class to help you prepare for the exam, visit arrl.org/find-an-amateur-radio-license-class to find a class in your area. New classes are added frequently, so keep checking back.

Hint:

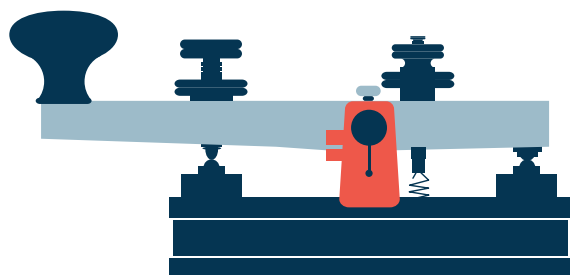
Search by zip code, and increase the search radius to 100 or 250 miles to find online classes — there are now more of them than ever!



Upcoming Contests

Contest season is here, with some of the most exciting and popular events taking place in November, December, and early January.

Date	Contest	Rules
Nov 15-17	ARRL Sweepstakes Contest, SSB	arrl.org/sweepstakes
Dec 5-7	ARRL 160 Meter Contest	arrl.org/160-meter
Dec 13-14	ARRL 10 Meter Contest	arrl.org/10-meter
Dec 21	ARRL Rookie Roundup, CW	arrl.org/rookie-roundup
Jan 3-4	ARRL RTTY Roundup	arrl.org/rtty-roundup
Jan 3	Kids Day	arrl.org/kids-day



Build Your Morse Code Skills With Morsle

Practice Morse code with Morsle, a free daily challenge game available at morsle.fun. Each day brings a new word played out loud in 40 WPM Morse code. Playback decreases by 5 WPM every three tries, and you have a total of 21 tries to guess the word. The display will indicate if you guess a letter in the correct spot. The game keeps track of your win rate, current streak, and best streak. For an additional challenge, play in hard mode, which removes the visual aids and extra letter spacing. A practice mode is also available, where you can select the starting speed and practice words or call signs.

HAMSPEAK

Skywave

Radio signal that propagates via the ionosphere, in contrast to a *ground wave* that travels along the ground, or *line-of-sight* signals that go directly between antennas.

F region

Highest of the identified layers of the ionosphere, and the most important for long-range propagation of high-frequency (HF) signals. During the day it often acts as two distinct sub-regions, F1 and F2. These appear to merge at night into a single region.

Maximum usable frequency (MUF)

The highest frequency that will be propagated via ionospheric propagation modes between a particular pair of end points. Higher frequencies pass through the ionosphere and are useful for space communication.



ARRL Newsletters Bring You More Ham Radio Info

If you haven't already opted into ARRL's e-newsletters, there's no time like the present! As an ARRL member, you have access to the ARES Letter (monthly public service and EmComm news), the Contest Update (biweekly radiosport tips and news), the ARRL Current (monthly overviews and extras from ARRL's magazines), and more.

To make your selections, log into the ARRL website at arrl.org and click the yellow name near the top of the page, after "Hello." That should take you to a page titled "My Account."

You'll see a bar down the left-hand side of the page, titled "My Account," with several subheads beneath it. Scroll down to the "Communication" subhead, and click "Opt In/Out." This will take you to the "Opt In/Out" page, where you should see a list of publications, with a check box next to each one. Check the boxes of the publications you'd like to receive, then click the "Save" button that's below the list. That's all it takes!

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CLUB SPOTLIGHT



Some RASON members operating SSB and FT8 on ARRL Field Day.



RADIO AMATEUR SOCIETY OF NORFOLK
WWW.NORFOLKHAMS.ORG

Radio Amateur Society of Norfolk (RASON), W4NPS

ARRL Section: VA

Meetings: Fourth Monday of the month, 7:00 p.m., American Legion Hall, Norfolk, VA

Year Founded: 2005

Members: 32

Dues: \$20 individual

Specialties: Contests, digital modes, DX, general interest, public service/emergency, repeaters, school or youth group, VHF/UHF

Services: Club newsletter, license classes, license testing, mentoring, on-air bulletins, repeater, TVI/RFI committee

About RASON:

RASON is a diverse group of radio amateurs primarily serving the city of Norfolk, VA, but with a membership that reaches from Virginia Beach to Chesapeake, Portsmouth, and Suffolk, VA and numerous other small communities throughout the area. The group is committed to enhancing public awareness of amateur radio and actively supports ARES®, SKYWARN, and CERT. Additionally, there is a small contingent that is actively involved in competitive DXing and radiosport contesting. Technical members provide a variety of repeater services throughout the area, including networked repeaters on 220, 440, and 144 MHz, with links to Echolink and the National Weather Service. RASON hosts a weekly SKYWARN Area 5 net and a weekly VHF/UHF net, both on the W4VB repeater system. RASON sends meeting invitations to new licensees, and new members receive a welcome packet upon joining, that contains information about the club, as well as resources for new hams.

A New Member's Experience: I have been involved with RASON since June 2025. I have benefited from club programs including the Club NET Program and Social Access. Both of these programs have allowed me to interact directly with club members who have helped me by answering my many questions and offering solutions to technical problems. Chief among these issues has been my limited options for antennas at my rental property. Several solutions have been discussed, one being to use the rain gutter on the building, which works fairly well, especially on 40 meters. Additionally, I've received advice about window pass-through systems, and more recently a club member visited my property to assess the antenna situation and also to troubleshoot my VHF/UHF rig, which abruptly stopped transmitting on VHF (ultimately it was agreed that I should send the unit back to the seller for evaluation). In the future I hope to learn more about POTA and also using digital modes. In short, RASON has supported me during my early experiences with amateur radio and I look forward to continuing my involvement.

— Maddie Dietrich, KR4EXB

To find a club in your area, visit arrl.org/find-a-club.

Contact: norfolkhams.org; Richard Davis, W4NMH, info@norfolkhams.org

Getting Set Up with VarAC

Wayne Greene, KB4DSF

VarAC is quickly becoming one of the most popular amateur radio data modes. It's a real-time, keyboard-to-keyboard chat platform with forward error correction and good weak-signal propagation capabilities, but it has many more capabilities, including posting bulletins that can be read by anyone tuned to the same frequency, store-and-forward messaging, and transferring of files from one operator or another. VarAC's suite of capabilities makes it very attractive for general contacts and emergency communications.

VarAC is mostly used on the HF bands, but it can be used on the VHF and UHF bands as well. No large or expensive equipment is required — you need only an FM VHF or dual-band handheld radio for line-of-sight communications.

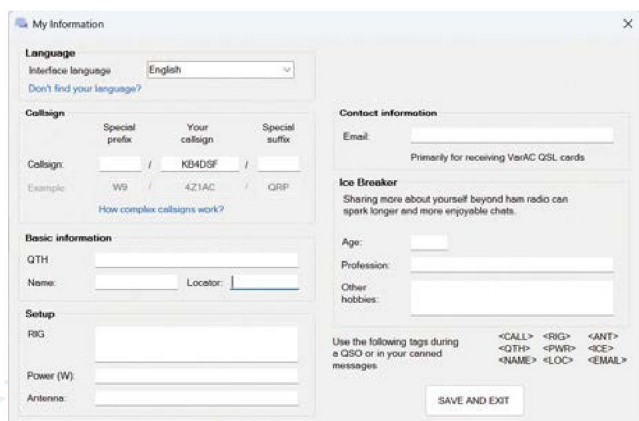
This article will walk you through downloading, installing, and setting up VarAC along with the required VARA FM software modem. While VARA FM and VarAC are available for Windows, Mac, and Linux operating system, this article will focus on Windows, but the instructions should be similar for the operating system of your choice. For more information on using VarAC, visit learn.arrl.org to view the recording of the *On the Air Live* October 2025 demonstration of using VarAC for sending email messages to family members outside of a disaster area.

Download and Install VarAC

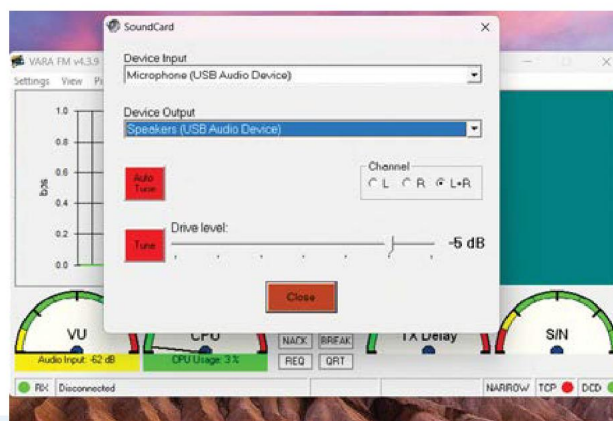
Download VarAC at varac-hamradio.com/ download by hovering your mouse over “Download VarAC” in the menu bar and selecting the VarAC Installer for your operating system. You will be directed to a form where you will need to enter your name, call sign, and email address. Then click the “Download” button. You may see a warning regarding whether you trust the VarAC install. VarAC is a trusted program, so go through any steps you need to allow your operating system to install the program. I accepted all of the default settings throughout the installation.

Once the installation is complete, a browser will open to a location where you can download the VARA FM modem. Select the link for VARA FM. A web browser should open and guide you to a Winlink

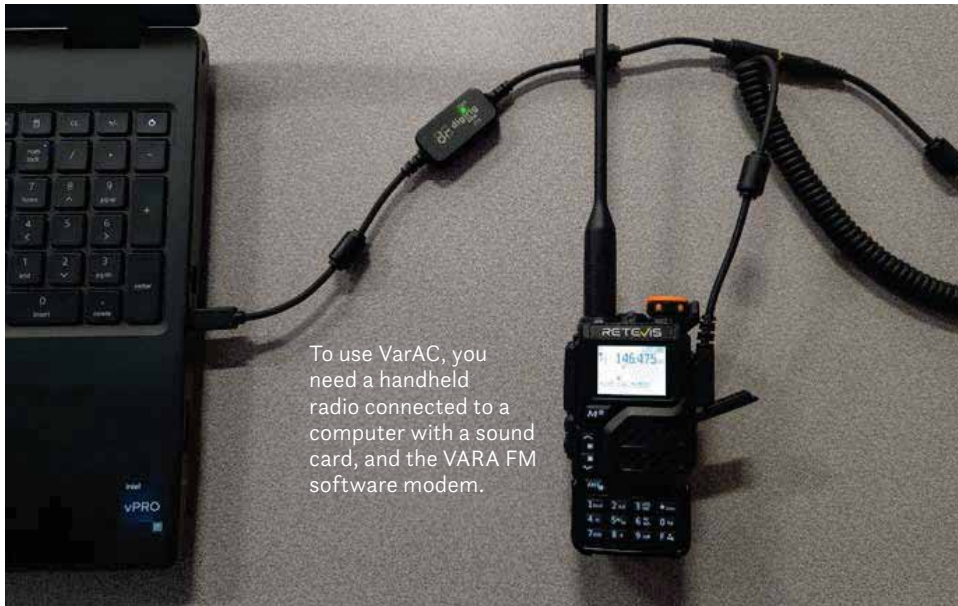
page listing the available VARA modems. Select “VARA FM.” A zipped file will download into your downloads folder. You will need to extract that file. I extracted my file inside of the downloads folder, but you can extract it into any folder you wish. Once extracted, you will see “VARA FM setup” (Run as Administrator). Right-click that link and select “Run as administrator.” On Windows, you may see the Windows Defender warning about trusting the file. Select the “More info” link, then “Run” anyway. Follow the default prompts from here to complete the installation. You will be asked if you want to run VARA FM when the installation completes. Go ahead and run it so we can configure VARA FM.



Enter your call sign and any other information you wish in Settings ⇒ My Information.



Point the VARA FM modem to your sound card in Settings ⇒ Sound Card.



To use VarAC, you need a handheld radio connected to a computer with a sound card, and the VARA FM software modem.

Configure VARA FM

Go into “Settings,” then “VARA Setup.” If you have a registration key, enter your call sign and your registration key. Everything else should be fine as-is. At this point you can select the “Close” button. Go back into “Settings,” then “Sound Card.” Select the Device Input and Output to match your sound card. For this installation, my sound card’s input and output are “USB Audio Device.” Click the “Close” button. Go back into “Settings,” then “PTT.” You will need to set the appropriate PTT method for your sound card. The Digirig Lite is a VOX PTT device. Once that is set, you can click the “Close” button and close out the VARA FM modem.

Configure VarAC

Open VarAC. VarAC will let you know you will need to input your call sign before connecting the VarAHF modem. Click “OK” even though we’ll be connecting the VARA FM modem rather than the VARA HF modem. Click the “OK” button, enter your call sign and any other information you would like to enter into the resulting form, then click “Save and Exit.” You will be warned you have not set any rig control information. Click the “OK” button to open VarAC. VarAC should now open in its Simple configuration.

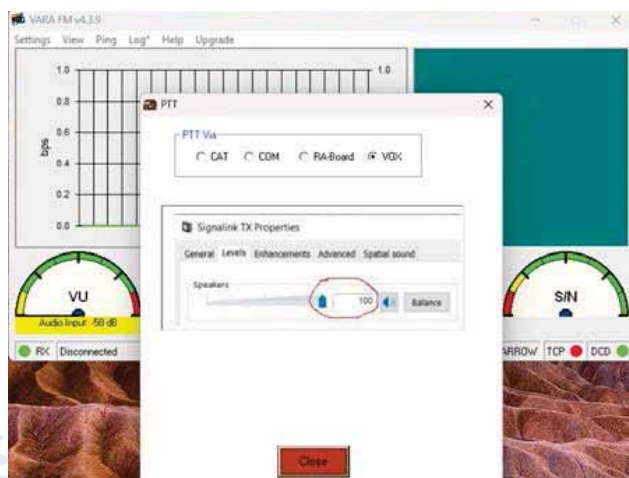
VarAC will open to its default 20-meter frequency. If you click the down arrow in the frequency box, you will see other

default frequencies that include one for 2 meters FM. We can add frequencies to the drop-down list by selecting “Settings,” then “Edit Frequency Drop-Down List.” We should add at least one VHF simplex frequency to that list to use with our handheld radios. The list will open in a text editor. You can enter any frequency you would like as long as it fits within the band plan. I added 146.475.000 MHz, which falls within the simplex portion of the 2-meter band plan. You will need to save the text document and restart VarAC for the new frequency to appear in the frequency list.

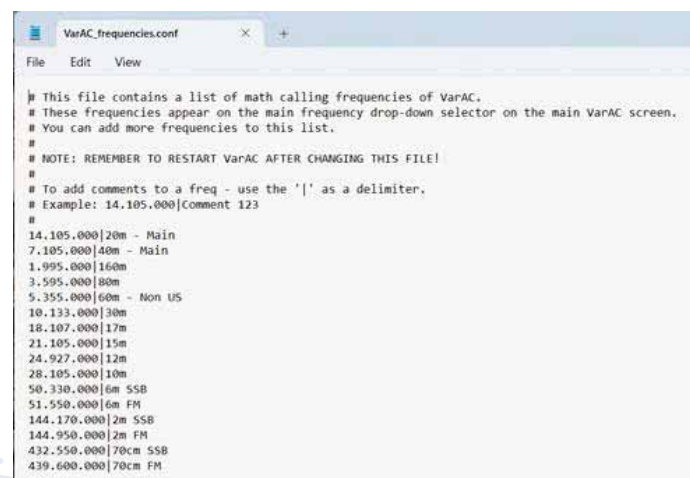
Lastly, VarAC has to be pointed to the VARA FM modem. Select “Settings,” then select the “Vara” tab. Click the down arrow for VARA modem type and select “VARAFM.” You will need to change the VARA file path to the path for VARA FM. This can be found by opening the Windows file manager, selecting “OS (C:),” and opening the VARA FM folder. Right-click on the VARAFM.exe program and select “copy as path.” Go back into the Vara modem configuraton and paste that path into the VARA file path. Delete any quotation marks that may appear in the path. Click “SAVE AND EXIT.” VarAC will require a restart for the settings to take effect.

VarAC

VarAC should now be ready to use with your handheld radio. You can test the PTT by pressing the TUNE button and confirm that your handheld goes into transmit.



Enter the PTT method at VARA FM modem, in Settings ⇒ PTT.

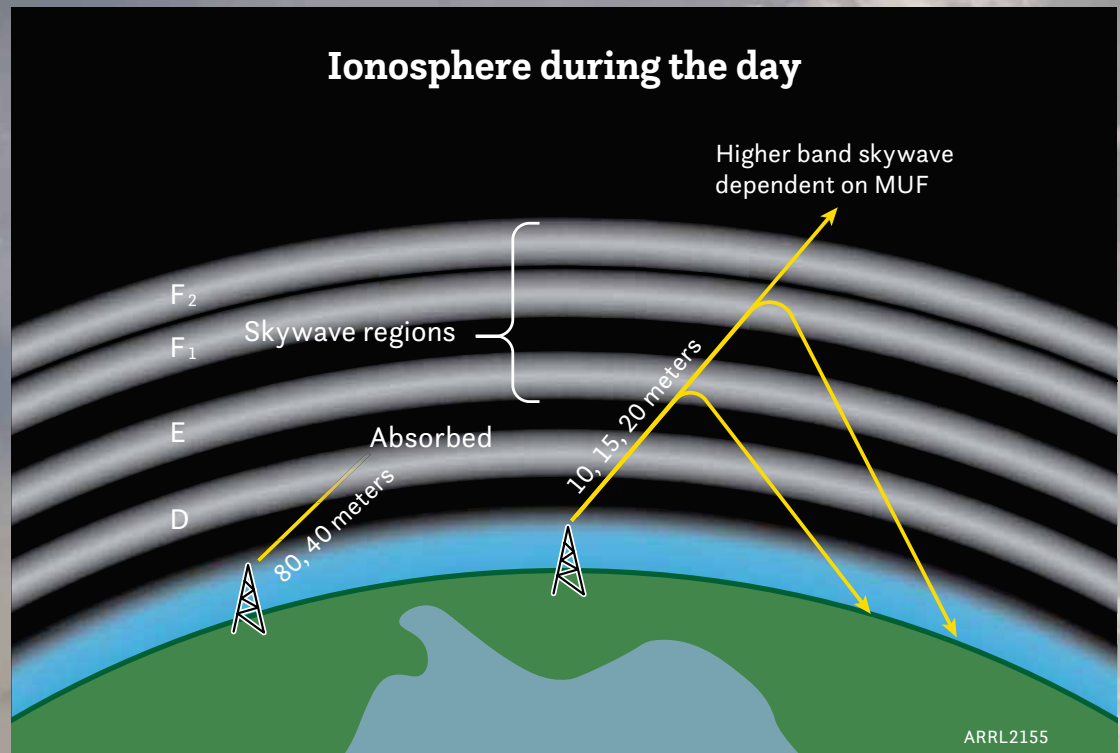


Edit the VarAC frequency list by selecting Settings ⇒ Edit Frequency Drop-down List.

The Magic of the Ionosphere

Scott Freeberg, WA9WFA

This mysterious, wondrous radio phenomenon can't be seen, tasted, or touched, but it is what makes possible our worldwide radio communications. Here's a practical discussion of how the ionosphere helps or hinders our communication on the high-frequency (HF) bands.



Communication on the HF bands occurs using signal *propagation* methods (methods by which radio signals travel) called *ground wave* and *skywave*. Ground wave is where radio signals follow the curvature of the Earth for a short distance, on the order of a few hundred miles. In this article, we are going to talk about skywave propagation, where radio signals are *refracted* or bounced off the ionosphere and are heard many hundreds to thousands of miles away.

The *ionosphere* exists in the upper atmosphere, approximately 31 miles to 372 miles above the Earth. Intense solar radiation from the sun reacts with gases occupying this space freeing large quantities of ions, which can act like mirrors to our radio signals. The ionosphere is comprised of several *layers* or *regions* called D, E, and F. Each region affects HF communication in one way or another, sometimes good and sometimes not so good, so it is helpful to have a basic understanding of each region and what to expect from it.

D Region — The Absorber

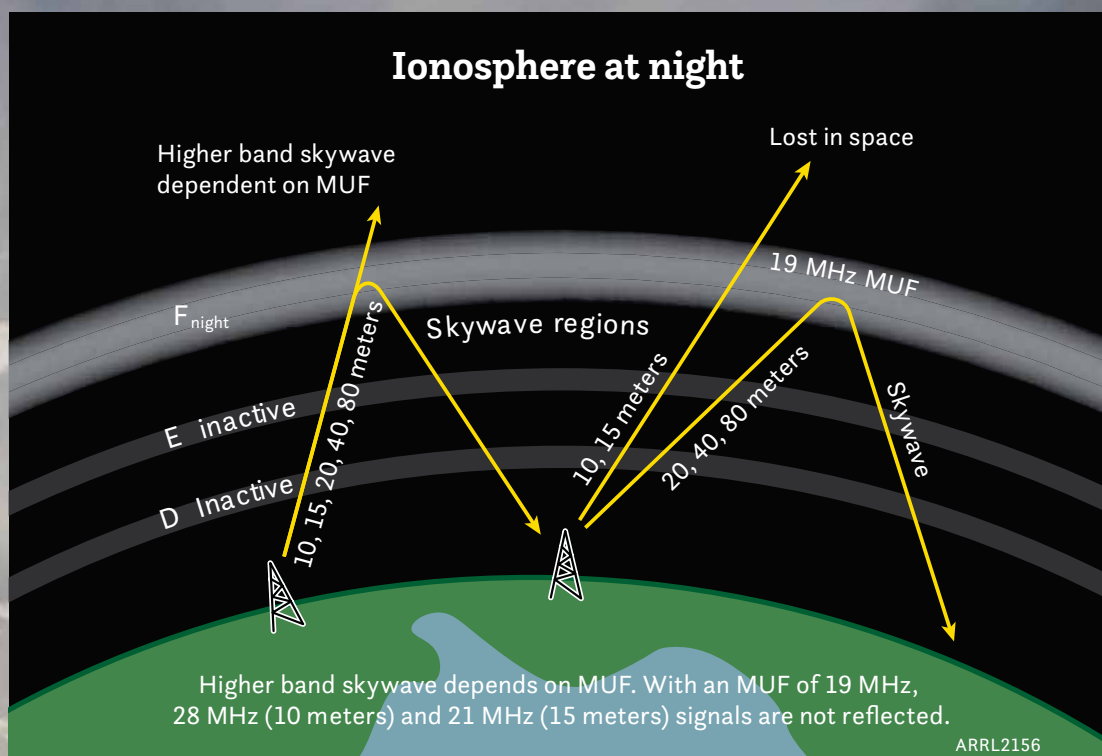
The D region is closest to Earth, and exists only during the day when solar radiation creates a dense layer of free electrons and ions that greatly interact with RF signals trying to pass through. It is a highly *frequency dependent* region that absorbs lower HF frequency signals while weakening higher frequency signals and allowing them to pass through to reach higher skywave regions of the ionosphere. This means the lower HF frequency signals on 80 and 40 meters will be absorbed, preventing skywave during the day, so contacts are limited to a few hundred miles. At the same time, higher frequency signals on the 10, 12, 15, 18, and 20 meter bands can pass through the D region and reach the higher regions where skywave propagation is possible.

As the sun goes down, the D region fades away and it is no longer absorbing signals, allowing them to reach higher into the ionosphere to the skywave regions. The band you're on may seem to be *opening*

up as the D region starts fading away and signals are starting to be heard. The band *goes long* when the D layer completely disappears and skywave signals from across the world start pouring in.

E Region — Modest Skywave, Medium Distances

The E region is the next higher layer of the ionosphere and also exists only during the daylight hours. This region offers skywave distance of 1,200 miles and more *if* your HF frequency is high enough to pass through the absorptive D region for 10, 12, 15, 17, and 20 meters. If you transmit on higher frequencies, signals will pass through the E layer and become skywave in the F region. As night approaches, the E region and its medium range skywave characteristics disappear. Signals refracted by the E region are now allowed to reach the higher F region for even longer distance skywave propagation.



F Region — Skywave Magic

The F region is the highest layer of the ionosphere, and signals reaching this region can refract or bounce back to Earth thousands of miles away. This layer is divided into two separate layers during the day, called F1 and F2, and then combine into a single F layer at night. The F region is active 24 hours a day, and signals will propagate via skywave if they are below something called the Maximum Usable Frequency.

The *Maximum Usable Frequency (MUF)* is exactly as the name suggests. Frequencies at or lower than the MUF can travel via skywave propagation, while frequencies above it will pass through the F layer and travel out into space. As I write this article, the 10-meter band is quiet and there are no signals heard, while 15 meters has just a few weak signals. The predicted MUF is 18 MHz, so 28 MHz (the 10-meter band) and 21 MHz (the 15-meter band) are too high for skywave. The MUF doesn't usually approach 20 meters, explaining why this is a great band for long-distance communications 24/7.

The MUF is calculated and published on the web for our reference. One MUF website I regularly consult is at prop.kc2g.com/ where you can simply see your location on a worldwide map and the predicted MUF for that area. With this, you can predict if the band is open now or might open a little later. Other MUF prediction webpages are available using the search term "amateur radio MUF."

Bouncing Around the World

We talk about signals refracting or bouncing off the ionosphere like it's a single incident, but it is not. Multiple bounces, where signals bounce between the ionosphere and Earth multiple times in order to travel around the world, are common. This is appropriately called *multi-hop*.

A few propagation points to remember:

- For operation on the 10- and 15-meter bands in particular, look at the MUF predictions to see if propagation will be good when you are in the shack. You might be all set to get on the air only to find the band is dead due to a low MUF. Propagation on the 80- and 40-meter

bands is bad during the day due to D-region absorption. Propagation gets better as sunset approaches, and then is wonderful overnight, before fading away once again the next morning.

- 20 meters is open day and night. Use the predicted MUF to tell if an otherwise dead-sounding band has good propagation. If the frequency you're using is lower than the MUF, then skywave propagation is possible. Check the MUF to be sure. I recently listened on 12 meters and didn't hear a single station for a while. Eventually I heard a Hawaiian station calling CQ. I answered and we chatted for 45 minutes on a supposedly dead band.
- Ionospheric propagation is always changing, and it will be different throughout the day and night.

The next time you get on the air, think about what region of the ionosphere you're likely accessing, and how your signal is reaching across the state, country, or even on the other side of the world.

First Steps On the POTA Path

Kiara Johnson, KI7RES

This young ham's first-ever POTA activation was a learning experience.



The gear we take to our POTA activations includes an Elecraft KX3 radio, a battery pack, random-wire antenna, headphone splitter, two pairs of headphones, a fiberglass pole for mounting the antenna, a clipboard with a POTA log, a pen and pencil, three stools, and bungee cords.

On January 1, 2024, I did my first Parks on the Air activation, with my dad, KF6MIQ. Parks on the Air (POTA) involves going to a park, setting up your station, and *activating* the park by making 10 or more contacts from it in one day. You can also be a POTA *hunter* by contacting people who are at parks.

My dad and I had been hunting parks and thought it would be cool to try an activation. We looked on the POTA site, pota.app, to find a park near us that qualified for the program and found Lower Hobbie Creek Wildlife Management Area State Wildlife Area, which has the unique POTA park designator of US-10067. It was only a few miles away from us and hadn't been activated much. We had to wait for a warm day because it was winter. When it was finally warm outside (which happened to be January 1) we gathered our gear and went to the park. When we arrived we *spotted* ourselves on pota.app, creating a listing that told POTA hunters where we were so they could try to contact us.



Setting up our fiberglass pole for the antenna.

Setup and Operating

We walked around the park trying to find a good spot to set up. Eventually we decided that there was a good spot near where we had parked, which was unfortunately really close to the freeway, so it was noisy. We set up our antenna and radio by extending our 30-foot fiberglass pole with the antenna on it and securing it to a signpost using bungee cords. We walked a few paces away and attached the antenna to our radio, put the radio on a stool, and started calling CQ. We logged our contacts on paper to later upload to the POTA website.

When the UTC time changes to a new day, your activation ends and becomes a new one.

While we were activating, we managed to make a contact with KL4JP in Alaska, which we thought was amazing because we were transmitting on a 10-watt radio with an antenna that was just a random-length wire on a pole. For about half of our activation we were transmitting on 5 watts because our batteries were dying. After about an hour, it started to get cold outside and no one was really calling us, so we decided to call it a day and go home. Of course, after we decided this, we got a really big pileup that lasted for about 30 minutes. →



I secured the antenna mast to a signpost using bungee cords.

We learned that if you have two people activating a station, then you should find a rhythm.

Lessons Learned

One thing that we learned on our first POTA activation is that batteries are hard to change in the cold. Our radio batteries died and when we changed them, we kept dropping them in the snow because our fingers were frozen. We decided that we need a battery pack for future activations so we won't need to change batteries during the activation. Something else we learned was that when the UTC time changes to a new day, your activation ends and becomes a new one. We learned this because as we were making contacts, the UTC date changed to a new day and we had only six contacts before it changed. After we entered the activation on the POTA website, we discovered that the activation didn't count because the UTC day had changed.

We also learned that if you have two people activating a station, then you should find a rhythm. The rhythm we liked was that one person would call CQ, then when they got a contact they would say, "Please hold for my second operator," and pass the mic to let the other person get the contact. After the contact, that person would start calling CQ, and so on.

One thing we'll change for our next activation will be to bring a headphone splitter. We had only one pair of headphones, and discovered that trying to talk to people that were very quiet was difficult over the noise of the freeway. With a splitter, we'll both be able to listen and help each other make the contact.



Activating with a view of the Lower Hobbie Creek Wildlife Management Area behind me.

We didn't really know what we were doing; we just did a little bit of research then went out and got on the air, using what we had with the intention to upgrade later if we wanted to. We messed up a lot, but that's okay because we learned new things for next time. Even with all of these problems we still felt successful and had fun. Not having the best setup is okay. Our setup was a random wire antenna on a pole connected to a radio! The biggest thing is just going out there and getting on the air! Messing up and having problems might not be funny at the moment, but later you will be able to look back and laugh at what happened, and you'll be able to see how far you've come with your new knowledge and experiences.

I enjoyed being able to get on the radio and trying something new. I also enjoyed being able to do one of my hobbies with my dad. Activating a park for POTA was a great, fun reason to go outside and be on the radio.

Kiara Johnson, K17RES, was licensed in 2017 at the age of 8 after attending an ARRL Field Day operation. She enjoys POTA, contesting, and getting QSL cards. Beyond ham radio, Kiara plays piano, violin, and bagpipes, and is learning ballroom dance.

Get On the Air for the ARRL 10-Meter Contest

This 48-hour annual event can be a fun first contest for newer hams.

The ARRL 10-Meter Contest is right around the corner on December 13 and 14. Every class of US license — Technicians, Generals, and Extras — has privileges on the 10 meter band, so the contest has something for everyone, whether you're a newcomer with low power and wire antennas, or a long-established station with directional antennas.

It's a 48-hour contest, starting at 0000 UTC on Saturday and running through 2359 UTC Sunday, and you can operate as much as you want — there are no mandated off-times, as there are in some other contests. There are entry categories for Single Operator and Multioperator, so you can choose to operate with friends or go it alone.

A Contest Within a Contest

Single Operator entrants may choose to enter using the Limited Antenna Overlay, which is for hams using single-element antennas such as a single vertical, end-fed wire, or single dipole antenna that is no more than 50 feet above ground at its highest point. Entering in an overlay category means that your score will be ranked among other hams in the overlay, as well as among everyone who entered — an overlay is like a contest within a contest! And a simple dipole antenna at 20 feet will do wonders at 100 watts on SSB and CW, both of which are allowed in the 10-Meter Contest.

2024's Great Stats

The 2024 ARRL 10-Meter Contest was the biggest ARRL contest of the year, with a record-setting 6,661 logs submitted and more than 2.03 million contacts reported. That's a lot of on-air fun packed into 48 hours! Almost 2,000 participants



Christian Claborne, N1CLC, operated Summits on the Air-style from a mountaintop in southern California for the 2024 ARRL 10-Meter Contest. [Christian Claborne, N1CLC, photo]

took advantage of the Limited Antenna Overlay, and 55 of them were age 25 or younger, a great sign that this contest truly is for everyone.

More Information

So, make 2025 your year to get on the air for the ARRL 10-Meter Contest. There's more information at arrl.org/10-meter, with the complete rules at contests.arrl.org/ContestRules/10M-Rules.pdf. If you have questions, email them to contests@arrl.org.

Preston Moore, N5YIZ, combined operating in the 2024 ARRL 10-Meter Contest with a Parks on the Air activation at Galveston Island State Park in Texas. [Preston Moore, N5YIZ, photo]



Ten Tips for Programming Your 2-Meter Handheld

George Thurner, W8FWG

Programming your handheld radio can seem daunting, but these tips can make the task easier.

1. After unboxing your new radio, please read — and follow — the instruction that says, *Charge your new radio for 14 hours before its first use.*
2. Most modern radios are *menu-driven*, meaning you don't crank a knob to a frequency and adjust the volume and squelch for a comfortable listening level. They rely on the use of a menu within the radio. You'll see the menus on the screen and use the keypad to navigate them.
3. Know the power settings of your new handheld radio. Check the Specifications page of your radio's manual to find out what the power levels are. Use the lowest power that is necessary for transmitting.
4. At the very least, skim the manual so that you can find the subject you want instantly.
5. Check the SWR of your antenna system before resorting to high power. Get at least a 2:1 figure or better. Adjust the antenna length to minimum SWR. If you don't have a watt-meter, enlist the aid of a friend who has one.
6. Insert the frequencies numerically instead of alphabetically. That makes them easier to find.
7. Write down the frequencies, so you have a record of them for reference. I have a small laminating machine, and I put the frequency list on a credit card-sized laminated sheet that I carry in my wallet.
8. Select your local repeater frequencies first, followed by simplex, ARES, and other favorites.
9. Program your radio while it's in the VFO mode, then insert the channels into the Memory mode.
10. Some radio manuals have tiny print that's hard to read. Go to the internet and download a $8\frac{1}{2} \times 11$ -inch copy of your manual, and keep it with the transceiver.





Once you've programmed your radio, you'll want to test everything to be sure it works —hopefully, that's the fun part! But if something goes wrong, here are some troubleshooting tips:

1. Did you really charge your new unit for 14 hours before using it? If not, make sure you give it a full charge. While you're waiting, that's a good time to read the manual.
2. You've programmed your radio, but you don't hear a peep (we call this *no received audio*). Check to make sure the volume knob isn't turned all the way down. This is a common error, often overlooked!
3. You tried to transmit to one of your local repeaters, but it didn't respond. If you were indoors, try setting the radio's power to a higher level.
4. Check the SWR of the antenna. If you have a different antenna on hand, try that one, and see if your original antenna was the problem.
5. Double-check the frequencies you input, to make sure you input them correctly. Also make sure you put them in the correct place. For example: You wanted to put in a receive frequency of 146.880 MHz, but instead you entered the transmit frequency of 146.280 MHz. This is a common error.
6. If your repeater uses a *CTCSS tone* (sometimes called a *PL tone*), double-check to make sure you have the correct tone input into your radio. The repeater won't respond to you without it. For more about tones, see "Tones: The Keys that Unlock Repeaters" in the March/April 2020 issue.
7. Double-check your repeater's *offset* — the difference between its transmit and receive frequencies — and make sure you programmed it into your radio correctly. The offset of a repeater's receive frequency is usually 600 kHz above (noted as *positive* or *+*) or below (noted as *negative* or *-*). When you activate your radio's push-to-talk switch, you should see the readout change by 600 kHz (0.6 MHz) up or down. If it doesn't go the right way, you will need to change it.
8. When all else fails, download the manual for your particular transceiver (if you haven't already) and read it. Sometimes the manual has a troubleshooting procedure near the back. Have a look.

George Thurner, W8FWG, is a Registered Instructor with ARRL and a Volunteer Examiner for two of his local radio clubs, The Keweenaw County Repeater Association, K8MDH, and the Copper Country Radio Amateur Association, W8CDZ. CW is his favorite mode. He can be reached at w8fwg@arrl.net.

Build a Bifilar Helix Antenna for Satellite Contacts

An easier-to-construct, less-expensive alternative to the popular quadrifilar helix antenna.

John Portune, W6NBC,
and Jim Bailey, W6OEK

Tools and Materials

- Soldering iron and solder, as needed
- Wire cutter and stripper
- Hacksaw
- Drill motor
- Step drill bit (with steps up to 1 inch)
- Pipe center-drilling guide
- Pliers and screwdrivers
- Rat-tailed file or handheld rotary grinding tool and bits
- Heat-shrink tubing or plastic electrical tape
- (11 ft.) AWG 14 stranded insulated house or primary wire
- (5 ft.) ½-in. Schedule 40 PVC pipe
- (3 ft.) ¾-in. Schedule 40 PVC pipe
- (2) 6-32 1¼ in. stainless machine screws with 2 nuts each
- (4) #6 lug ring terminals, crimp or solder type, for 14 AWG
- (1) 10-15 ft. 50 Ohm coax for feed-line pigtail (length to suit)
- (1) Coax connector (type to suit your radio)
- (1) 2-meter/70-cm diplexer (for dual-band radio)

Table 1

Cross-Arms Length	Mast Hole Spacing
13.6 inches	12.7 inches



Easy-to-build bifilar helix antenna for 2 meters.

The QFH (quadrifilar helix) has long been a favorite of ham satellite aficionados. Its two rectangular loops are connected in parallel, twisted half a turn lengthwise, and mounted at right angles on the same axis, to permit it to transmit/receive equally in all directions, side to side and up and down. What’s even better is that it is circularly polarized over its entire radiation pattern, making it ideal as an antenna on spacecraft that tumble or rotate in flight. But the QFH is also excellent as a satellite antenna that you can put on your roof without a rotator.

The QFH does not lend itself to the ham home workshop, so we tried to find simplifications that wouldn’t compromise performance. The result is the BFH (bifilar helix).

On spacecraft that typically tumble or rotate in flight, radiation pattern *nulls* (directions in which the radiation is weaker) are significant. At a ham’s ground station, where the same ham satellite usually passes overhead from the same direction, the nulls can be ignored by simply turning them crosswise to the satellite’s orbit.

A good percentage of the satellites hams use for making contacts are *Low Earth Orbiting* (called *LEOs*). They pass over the Earth’s poles and then all locations on Earth in a north/south or south/north direction. A 2-degree offset from the poles causes ground station passes to be roughly at the same time each day.

A single-loop bifilar helix antenna, therefore, can be mounted in a fixed position, without the need for a rotator. There is no need to track LEO satellites. One simply fix-mounts the BFH with its top and bottom arms pointed in the direction of the satellite pass. Therefore, with two fix-mounted BFH antennas on your roof — one for 2 meters and one scaled down for the 70-centimeter band — the world of ham LEO satellite contacts is wide open to you.

Table 1 gives dimensions for building the antenna for the 2-meter band. This physical design, using the same wire and the same PVC pipe, easily translates to other bands via scaling. Multiply the overall dimensions by the ratio of the operating frequencies, e.g. 0.33 for the 70-centimeter band, 2.88 for the 6-meter band.

Construction

Step One

Cut three equal lengths of ½-inch PVC pipe for the cross-arms, see Table 1. Using a rat-tailed file or a handheld rotary grinding tool, cut two roughly ⅜ × ⅛-inch notches into the opposites ends of the middle cross-arm, (see ①). The notches do not have to be precise in size but must be rotated 90 degrees from each other at opposite ends.

Then cut a length of ¾-inch PVC pipe for the vertical/mast section, twice the spacing between the arms, see Table 1, plus an extra 8-12 inches or more to provide space for a coax balun (see the lead photo and ⑦) and for mounting the antenna. The amount of extra length is, similarly, not critical.

Step Two

Beginning 1 inch from the top end of the vertical/mast section, mark the locations of the cross-arms on one side of the mast. Table 1 gives the arm spacing. Note that the top and bottom cross-arms lie parallel to each other (in the same plane), but that the center cross-arm is rotated 90 degrees, as can be seen in the lead photo.

Then, with a pipe center-drilling guide, accurately drill ⅛-inch pilot holes all the way through the vertical/mast section at the marked cross-arm positions. It is best, however, before using the drilling guide, to first drill an ⅛-inch hole, on the marked side only, to help position the center drill guide for through drilling.

Step Three

Using a step drill, drill ¾-inch holes on both sides of the vertical/mast section for the three cross-arms, (see ③), using the ⅛-inch guide holes drilled in step 2. These ¾-inch holes as drilled will be slightly too small for the cross-arms to pass through. You will need, therefore, to use a rat-tailed file or a handheld rotary tool with a small grinding-stone bit to enlarge the holes a little at a time until the cross-arms fit and hold snugly in place. Alternatively, you may drill 7/8-inch holes with the step drill and use sheet metal screws or PVC cement to secure the cross-arms.

Step Four

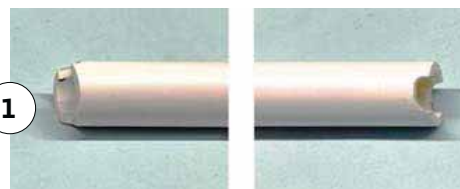
Using the pipe center-drilling guide, drill 9/64-inch holes, (see ④), through the bottom cross-arm, ⅞ inches to both sides of the center of the cross-arm. Also drill ¼-inch holes 2 inches also to both sides of center, but only through one side of the cross-arm.

Install all three cross-arms in the vertical mast section.

Step Five

Cut 10½ feet of 14 AWG stranded insulated primary or house wire. String it loosely through the cross-arms and then between the cross-arm ends as shown in the lead photo. Allow the wire ends to exit from the ¼-inch holes at the center of the bottom cross-arm. Pay close attention to the stringing direction also shown in the lead photo. This establishes the right-hand circular polarization needed for most ham satellites.

Install 1¼-inch 6-32 stainless screw and nuts in each of the 9/64 through holes at the center of the bottom cross-arm. These are the connection terminals for the antenna's feed-line coax, (see ⑤).



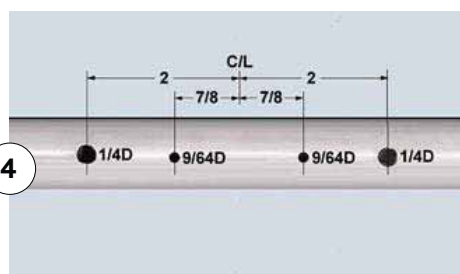
Notches at opposite ends of the center cross-arm, rotated 90 degrees.



Using a center-drilling guide to accurately drill 1/8-inch guide holes through to both sides of the marked cross-arm positions on the vertical mast section.



Drilling cross-arm holes in the vertical section/mast with a step drill.



Feed-point holes in bottom cross-arm. ¼-inch holes in one side only.



Feed-point detail.

Continues on following page.



PROJECT BUILD

6



Sequence for separating the shield and center conductor into two separate conductors at the feed-point end of the coax pigtail.

Crimp or solder a #6 ring terminal onto one wire end. Attach this ring terminal to one of the two 1¼-inch antenna terminal screws. Then pull the loop wire to remove the slack so that the loop looks as seen in the lead photo. Lastly, trim the loose wire end and install a second ring terminal that will just reach to the other 6-32 terminal screw. Attach the ring terminals to the feed-point screws under the nut.

Step Six

Follow the sequence in (6) to prepare an 8- to 10-foot length of small diameter coax (e.g. RG-mini 8, LMR-200 or similar) as a “pigtail” at the beginning of the feed coax to your shack. Part of this pigtail will also be formed into a 1:1 coax choke balun.

Using a hobby knife, carefully remove an appropriate length (e.g. 2 inches) of the plastic coax jacket, being careful not to nick the braid — it is soft copper and easily cut. Bend the coax away from you as you gently cut through the jacket to help the jacket split.

Unbraid the shield into its individual wires by pulling them outward between your thumb and index finger (see the first image in (6)). Do not remove the plastic dielectric covering the center conductor of the coax.

Twist the fine braid wires together, making a single separate conductor (see the second image in (6)).

To weatherproof the conductors, cover each of them with heat-shrink tubing or plastic electrical tape (see the third image in (6)).

Add ring terminals for #6 lugs to each of the conductors (see the fourth image in (6)).

Add ring terminals, crimp or solder type, for #6 lugs to each of the conductors. (fourth image). Leave the other end of the pigtail without a connector at this time.

Step Seven

One inch below the bottom cross-arm, using the pipe center-drilling guide, drill a ¼-inch hole through the mast. One inch farther down, drill another, (see (7)). These holes will be used to form and secure a 1:1 choke balun for the BFH.

Pass the unprepared end of the feed-line pigtail all the way through both top ¼-inch balun securing holes in the mast. Then wind turns of the coax around the mast to fill up the 1 inch of space between the securing holes. Insert the coax back through the bottom two mast holes, then work the turns of the balun into a tight coil. Lead the coax down the back of the mast and secure it to the mast with a couple of zip-ties. Finally, install a suitable coax connector on the pigtail.



Forming the choke balun.

7

Mounting the Antenna

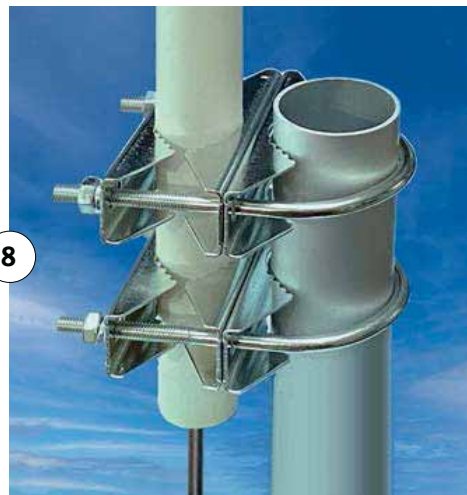
If you plan to mount the antenna other than just above rooftop height, it is best to convert the PVC vertical pipe section to a metal mast with a double TV antenna mast clamp, (see 8). Double mast clamps are readily available on the internet or from local electronics parts stores.

Tuning and Matching

As built, the BFH will present a safe and efficient SWR of less than 2:1 across the entire 2-meter band. For frequency adjustment, as is the case for virtually all antennas, the method is to simply change the length of the wire loop. The simplest way, if the frequency is too low, is to shorten both ends of all three cross-arms in small increments (e.g. ¼ inch) and then to add a new ring terminal to the end of the shortened wire loop. If the frequency is too high, three new cross arms can be made. It is not necessary to change the length of the mast. BFHs and QFHs can be any shape, from squares to long thin rectangles.

A Diplexer for Dual-Band Radios

If your 2-meter and 70-centimeter BFHs have separate feed coaxes, you can work through the ham satellites using two separate handheld radios or transceivers. Alternatively, you can use a dual-band transceiver or dual-band handheld radio by adding a *diplexer* to combine the two antennas into the single connector on the dual-band radio. Diplexers like the one shown at right are readily available from ham radio dealers or on the internet. In this case you will switch back and forth between bands on your transceiver for transmit and receive. For more information on diplexers, see “Demystifying Diplexers” in the July/August 2022 issue.



Double TV antenna mast clamp.



Example of a 2-meter/70-cm diplexer.


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You Can Find it in *The ARRL Handbook*

Greg Lapin, N9GL

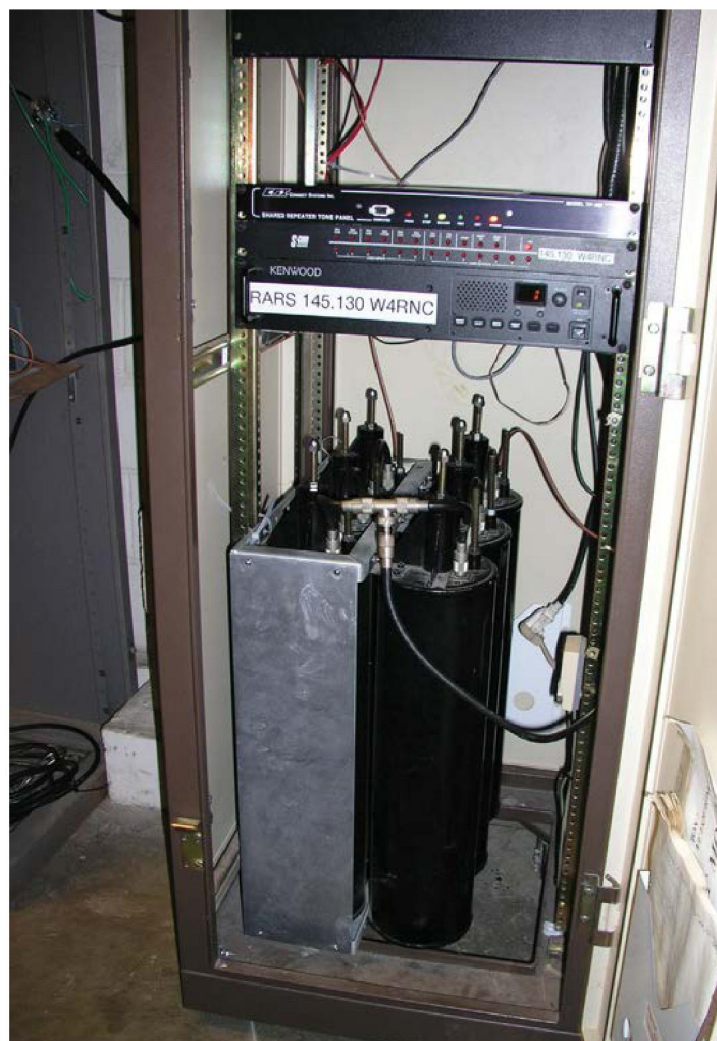
The ARRL Handbook for Radio Communications can help you understand every aspect of communication that ham radio offers. Here, the editor of this formidable repository of knowledge points out some key chapters.

Amateur radio is a hobby that gives you the freedom to do a lot of different things. You need to decide what aspects of the hobby interests you, and then learn about them. Don't worry about choosing the wrong thing to pursue. Many radio amateurs eventually practice many different things that the hobby offers, and you are always free to try something new. The *Handbook* describes virtually everything you may want to do in amateur radio. Look through it and see what grabs your fancy. Here's a small sample of what you'll find.

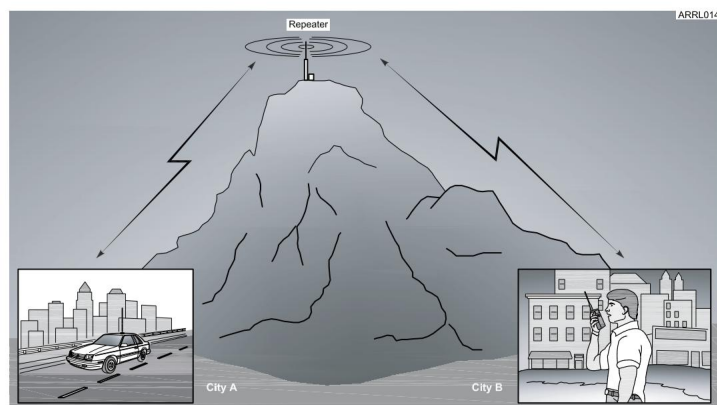
So Many Ways to Carry a Signal

If you're a Technician licensee, you're most likely using a hand-held radio to communicate over a repeater. *Chapter 18, Repeater Systems*, can help you to understand how your signals are getting to the other operator.

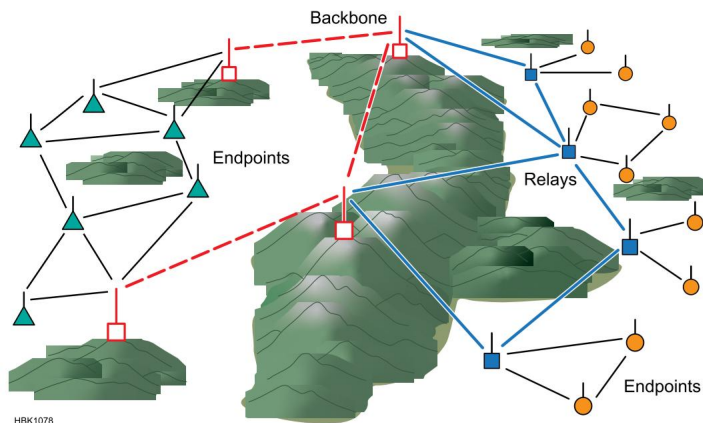
Amateurs have been involved with satellites since they were first used for communications. Amateurs have designed communications satellites and have gotten them launched into space. Most amateur satellites are called OSCAR (Orbiting Satellite Carrying Amateur Radio). OSCAR-1 was put into orbit in 1961, and since then there have been 121 other OSCARs, plus other satellites that amateurs can use to communicate. You can learn about amateur satellite operation in *Chapter 16, Amateur Radio Data Platforms*.



The repeaters chapter of the *Handbook* discusses this W4RNC 2-meter repeater, which includes the repeater receiver, transmitter, and controller in the rack. The large object underneath is the duplexer. [Photo courtesy Gary Pearce, KN4AQ]



A repeater extends the range of its users, allowing them to communicate over longer distances. The *Handbook* covers these and other repeater basics.



The *Handbook* can teach you the basics of mesh networking. A mesh network is created by connecting the individual user stations (endpoints) either directly or through relay nodes that communicate through backbone links. In this way an entire region can be connected using standard networking technology.

Chapter 15, *Digital Protocols and Modes*, describes mesh networking, where each signal is received and retransmitted by many *nodes* that help a signal traverse distances and rough terrain that it would normally not be able to. The chapter describes several applications of the Amateur Radio Emergency Data Network, AREDN, that acts like an alternate internet to carry data to places that could be out of reach if a disaster causes the internet to fail.

Perhaps you have read about recent attempts to provide wide-area cellular telephone service with balloons. Amateurs have been using balloons for a long time to access large geographical areas with signals that normally only travel short distances. Chapter 16, *Amateur Radio Data Platforms*, contains information that you can use to make your own balloon repeater to carry amateur radio signals over long distances.

The Basics of Building

You most likely bought the radio that you are using now, but many radio amateurs enjoy designing and building their own radios. Even if you are not an electrical engineer, the *Handbook* contains information that you would need to do this. Chapter 2, *Electrical Fundamentals*, helps you to understand how electricity is harnessed to do amazing things, like communications. The various components that are used for this purpose are introduced in this chapter. Chapter 4, *Circuits and Components*, tells you about the practical aspects of using these components to build radio circuits. Once you have decided what you want to build, Chapter 23, *Construction Techniques*, gives you techniques that you can use.

All-Important Antennas

Even if you are not interested in building your own radios, every amateur radio station needs antennas. Chapter 21, *Antennas*, introduces you to many types of antennas and explains how they work. Armed with this knowledge, you can choose the best antenna to complement your needs and your location, including places where you can't have a visible antenna. Once you decide on a type of antenna, this chapter also has advice about building them, as well as several antenna projects that you may want to try.

Troubleshooting

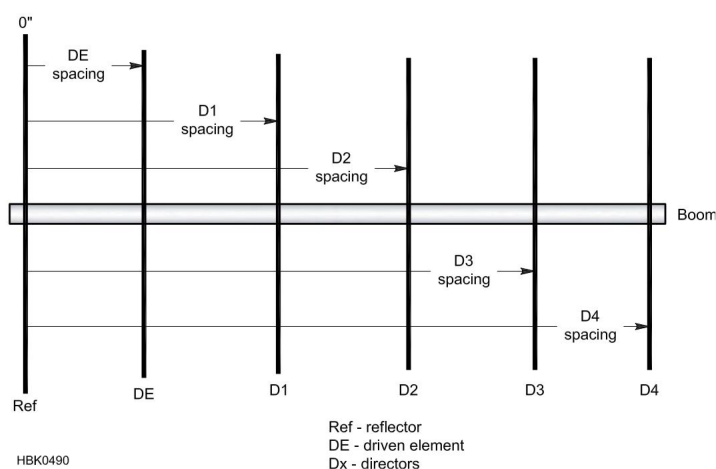
Out of necessity, most amateurs become well versed in the skills needed to fix things. Chapter 26, *Troubleshooting and Maintenance*, describes common ways that you would take care of your equipment to keep it from failing and what to look for if it does. Chapter 27, *RFI and EMC*, describes communications failures due to noise and interference. In today's world, there are so many different devices that put RF signals into the air, and some of them can be heard by sensitive amateur radio receivers. Conversely, amateur radio stations have to be designed to avoid causing interference to other devices. This chapter covers the many techniques to identify the sources of interference and to reduce their effects on our stations.

Safety

If you follow the news, you may see articles about the dangers of radio waves. Your family or neighbors may have concerns when they read things like that. RF signals have been used safely for over 100 years. The Chapter 22, *Safe Practices*, section on RF Safety includes information on what scientific study has found in terms of amateur radio's risks, as well as information about how you can continue to operate safely. With this information under your belt, you can intelligently discuss safe operation of radios with people who may be concerned.

There are some actual dangers that may pose a threat while you are working with your radios. Electrical wiring can be hazardous if not used properly. Lightning strikes can damage your equipment and do damage to your home and family. The Chapter 22, *Safe Practices*, section on Electrical Safety covers the right way to perform electrical wiring and how to properly ground your station to provide a path for lightning to safely get to ground. Another potential source of danger discussed in Chapter 22 is from high-capacity lithium batteries. Proper handling of these batteries and recognizing signs of potential failure make use of these batteries much safer.

The *ARRL Handbook* is available in three different forms: A single volume that is about 2 inches thick, a set of six thinner volumes, and an electronic format that can be read on your computer. Whichever form you prefer, it is an unparalleled reference for every radio amateur, no matter how experienced they are.



Element spacing for the "Cheap Yagi" that works on 144 – 421.25 MHz. You can find build instructions in the *Handbook*.

Confidence in Preparedness Starts with Knowing Your Equipment

Jessica Crotty

Even experienced operators fall into the trap of tossing a new radio into the go-bag and never touching it until it's needed. That's when mistakes happen. Spending just a few minutes now and then to practice using your radio, run through power options, or even watch a short demo builds confidence that can't be faked in a crisis.

Don't wait until the middle of a storm to use your radio. Building familiarity and skill ahead of time can make a big difference during a weather event.

The power's out, a storm is howling, your phone is at 20%, and the road is blocked. This story has two endings. One is built on confidence, the other on confusion. Which one you live through depends less on luck and more on how familiar you are with your radio.

In one version, you're scrambling, reading directions by flashlight to figure out how to set the right power source. You've got the wrong charging cable for your phone. You don't know where to tune for reliable information — or worse, you bought a radio with poor reception and features you'll never use, and now it's useless. All of this causes more stress in an already stressful situation.

The other version is much different. You take out your emergency bag, which has everything you need, and you're completely familiar with how to use your radios. Within seconds, you're tuned in, you know the batteries are good because you checked them last week, and you even bought one with a phone charger. You know your local stations and already have them pre-programmed into presets, you're familiar with how to change bands, and there might even be a reminder cheat sheet on the battery compartment cover, depending on your radio, or maybe you've created your own because you're not leaving anything to chance.

You know that if things get worse, you can start monitoring the 2-meter band and hear what's going on around you. You've practiced with your gear for a moment like this, and that practice has led to true preparedness.

Radio Stands Apart

The modern world runs on digital systems until it doesn't. Reports from the Department of Homeland Security and others have warned that cyberattacks, grid failures, and natural disasters can all knock out critical infrastructure. When that happens, even short outages ripple across every part of life. That's where radio stands apart. It continues to work when the lights go out, but that reliability only matters if you know how to use it. Familiarity with your equipment turns a simple radio into a true lifeline. Knowing how to tune efficiently, change power sources, or find key frequencies under pressure can make the difference between silence and connection. Skill comes from practice — and the more time you spend with your radio now, the more capable and confident you'll be when it matters most.

When disaster strikes, it's not the time to start learning how your radio works. Emergencies are loud, confusing, and fast-moving — and the ability to calmly reach for a radio you already understand is its own kind of security.



The Value of Listening

Of course, not all communication is equally urgent. Single sideband (SSB) or 2-meter coverage can carry traffic ranging from routine check-ins to emergency calls for help. If you've never listened, it can be hard to know the difference, and that understanding only comes from time on the air. Make it a habit to spend 10 minutes each week tuning in to local nets or listening to on-air exchanges. Over time, you'll start to recognize what routine traffic sounds like, regular call signs, signal reports, and friendly chatter, versus the focused tone and urgency that mark an emergency or directed net.

Listening helps you become familiar with frequencies, cadence, and the rhythm of communication. That's what "radio-ready" really means: being confident enough with your equipment and your ears to find and follow reliable information when it matters most. If you're looking for extra guidance, local ham clubs and ARRL offer training, weekly nets, and community events where you can practice and ask questions. It's one of the best ways to build skill and confidence before you ever need to rely on it.

Practice Makes Preparedness

Getting to know your radio isn't complicated — it just takes consistent attention over time. When the lights go out or the signal drops, these small preparations can make all the difference.

- **Know your power sources.** Check your batteries and power options regularly. At least once a month is a good habit. Make sure rechargeable batteries are holding their charge and that you have fresh spares ready to go. If your radio includes solar, hand-crank, or external power options, test them occasionally so you know how long they last and what they're rated for.
- **Understand your tuning and programming.** Spend time setting frequencies, scanning bands, and saving key stations or repeaters to memory until it feels natural. During an emergency, muscle memory and calm repetition can make tuning feel effortless instead of stressful.
- **Create a reminder cheat sheet.** Some radios come with one printed on the battery cover, but if yours doesn't, make your own. Keep it simple — include your local AM/FM news stations, power source options, battery type, and a few quick steps for tuning or switching bands. Laminate it or tape it to the back of the radio so it's always there when you need it.
- **Test your radio in different environments.** Try it inside, outside, and even in the car. Reception can vary depending on buildings, trees, and terrain. The more you use it in different situations, the better sense you'll have of how it performs when conditions change.
- **Check in regularly.** Once a week or so, take a few quiet minutes to power it up, tune in, and listen. You'll keep your skills sharp and your gear ready for when it counts.

A Closing Truth

From winter storms to wildfires to hurricanes, one truth keeps surfacing: when other systems fail, radios hold the line. Every operator, whether new or experienced, can build the peace of mind that comes from knowing their gear and being ready to use it. Preparedness isn't about fear; it's about confidence in yourself, your skills, and the equipment you can always count on.

Jessica Crotty is CEO of C. Crane, a Northern California company known for designing and supporting quality radios and communication products. She writes about preparedness and the role of radio in keeping communities informed when modern systems fail.



Experienced ham radio operators were ready to aid their communities in the aftermath of Hurricane Helene. [Thomas Witherspoon, K4SWL, photo]

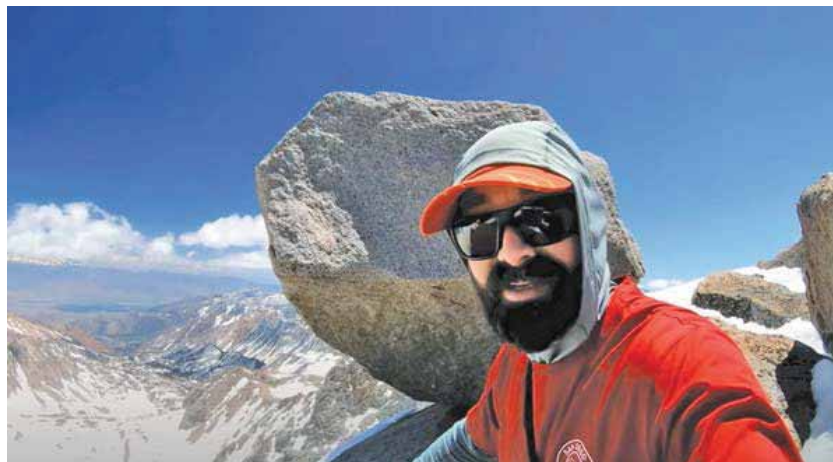
Ham Media Playlist

1:20

73:00

Presenting highlights from the growing community of YouTubers who focus on ham radio, to help you build a Ham Media Playlist of content creators who can help you learn and grow in the ham radio hobby and service.

K6ARK Portable Radio



Adam Kimmerly's, K6ARK, in his favorite place — the great outdoors.

Adam Kimmerly's, K6ARK, YouTube channel, K6ARK Portable Radio (youtube.com/c/k6arkportableradio), is a repository of videos about Adam living his best life and encouraging others to do the same.

Enjoying the Outdoors

Adam enjoys combining things he loves to make the most of his outdoor experiences. Adam is involved in mountain search and rescue, so climbing summits is second nature to him. Knowing this, it should not come as a surprise that one of Adam's true loves in amateur radio is operating Summits on the Air (SOTA). There is a course in the ARRL Learning Center (learn.arrl.org), taught by Adam, about how to get started and get your first activation in the log.

Making Contacts, and Beyond

Adam's first YouTube video showed his "ultra-portable" setup — a Yaesu FT-817 and accessories weighing in at about 5 pounds (youtube.com/watch?v=yv2-OzgsPxI). It took some time before he began creating content on a regular basis, choosing to chronicle his adventures to mountaintops for SOTA activations.

Eventually Adam also began creating content around antenna builds and other projects to help share ideas and encourage others to experiment.

Another element that makes Adam's channel a joy to watch is the fact that he makes an effort

to show just how fun and interesting ham radio can be as an enhancement to other outdoor activities. He likes to keep his videos light. His video titled "Will It can-tenna?" (tinyurl.com/k6ark-cantenna) shows him creating a 20-meter vertical antenna by welding together a stack of beer cans. Adam creates videos like this to let people know that amateur radio can be lighthearted and fun for builders and makers.

Kit Connection

Another creative outlet that Adam enjoys is creating kits and projects for amateur radio. Adam created a miniature end-fed antenna-matching unit but wanted a way to make it more accessible and easy to build, so he created a kit with build instructions. The combination of miniaturized kits and 3D printing has opened a whole new world of design opportunities. Many of his designs and 3D printer files are freely available on his website (k6ark.com).

Whether you are looking for ways to integrate amateur radio into your outdoor activities, seeking out videos of the scenic beauty the outdoors has to offer, or interested in kit building and experimentation, K6ARK Portable Radio is the channel for you.

Adam Kimmerly's, K6ARK, 20-meter vertical antenna created from cans.





From the Podcast

Unique content to help you get more out of the magazine.

arrl.org/On-the-Air-Magazine

arrl.org/On-the-Air-Podcast

youtube.com/ARRLHQ

Every month, the editors of *On the Air* release a companion podcast that extends the features, projects, and experiences presented in the magazine. Hosted by Becky Schoenfeld, W1BXY, and sponsored by Icom, the 15-minute podcast takes a deeper dive into an issue of *On the Air* to offer additional resources, techniques, and hints to help you get the most from the magazine's content.

The *On the Air* podcast is now available as a video! Visit ARRL's YouTube channel at youtube.com/ARRLHQ to watch the video version of our monthly podcast.

Here's an overview of recent episodes:



September 2025: The podcast welcomes Violetta Latham, KN2P, a young contester who has had the opportunity to operate at some big, famous contest stations such as K3LR, PJ2T, and W3LPL. Violetta talks about how she got started in contesting, how she got to where she is today, and what she'll be doing in the 2025-2026 contest season.



October 2025: ARRL Director of Emergency Management Josh Johnston, KE5MHV, joins the podcast in support of the September/October 2025 article "The EOC: Serving at the Hub," by Rick Palm, K1CE, which talks about what an Emergency Operations Center, or EOC, is, and offers tips for hams who are serving at an EOC for the first time. Josh takes us through more Emergency Operations Center functions, as well as what hams need to know before they walk into one.

You can subscribe to the *On the Air* podcast in Apple iTunes (podcasts.apple.com) or on Stitcher (app.stitcher.com). If you're using an RSS client, the feed URL is feeds.blubrry.com/feeds/arrlontheair.xml.

Share your hints (or hacks) with fellow hams by sending them to ota@arrl.org
or *On the Air*, ARRL, 225 Main St., Newington, CT 06111.

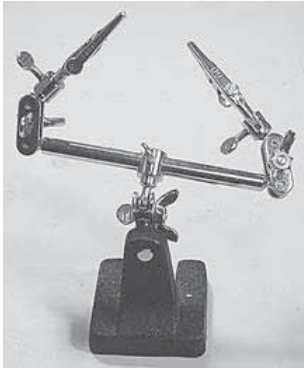


Figure 1: A “third hand” is useful for holding small parts and small circuit boards while soldering.



Figure 2: The alligator clip at the left has been crushed by over-tightening the thumbscrew that holds the clip securely in place. The clip at the right shows how a piece of 6-32 machine screw has been inserted into the hollow opening, preventing the thumbscrew from crushing the clip.

HACK

Strengthening a Third Hand

It can be helpful to use “third hand” tools with alligator clips — Figure 1 is an example of one of these devices. The shanks of the clips are easily crushed by over-tightening the holders, as shown on the left side of Figure 2. I prevent this by inserting a 6-32 machine screw into the shank and cutting off the head. The clip on the right side of Figure 2 shows the result of this modification. The alligator clip is then crushproof.

Michael A. Covington, N4TMI

“The shanks of the clips are easily crushed by over-tightening the holders...I prevent this by inserting a 6-32 machine screw into the shank and cutting off the head.”

HINT

Removing Coax-Seal

Coax-Seal can be a great product to use for making outdoor connections watertight, but it can be very difficult to remove if you ever want or need to. While working on my electrician apprenticeship many years ago, I watched a journeyman weatherproof a large split-bolt connection with something like Coax-Seal, and saw his solution that allowed for easy removal later.

After you’ve tightened your coax connector, start applying electrical tape. Start taping on the coax, next to the connector. As soon as you’ve wound about a half-turn on the coax, flip the tape over so the sticky side is now facing out. Finish wrapping the entire connector in this fashion. Cover up to, and including, the threads on the socket connector. Then form a thin layer of Coax-Seal on your fingers and spread

it over the sticky tape. Make sure you cover all the tape, extending just beyond it by at least an eighth of an inch.

Later, when you want to undo that connector, use a sharp knife to carefully cut down the length of the Coax-Seal, making sure you don’t cut the coax. The black goo that has kept the connector dry will peel off like peeling a banana, with the tape stuck to it.

Greg Truchinski, NVØP

HACK

A Case for Easy Battery Transport

My ARES group travels many miles to set up remote stations at various sites that have no electrical power. We power these stations with PowerSonic PS-12260 sealed lead-acid batteries. One 26 Ahr battery can easily power a remote station for more than a day.

However, without a handle, these 20-pound bricks are cumbersome to carry for any distance. We created a solution from salvaged .50 caliber ammo boxes. A $\frac{7}{16}$ -inch plywood insert with a cleat screwed and glue to the plywood retains the battery to one end of the case. The remaining space can be used to hold power cords, spare fuses, a distribution strip, and even a small power inverter.

It's easy to grab one of these battery cases in each hand and transport them exactly where we need them.

Gary Self, WA6MUU



Figure 3: Powerpole connector with heat-shrink tubing filled with hot glue to give mechanical strength.

HACK

Securing Thin Wire Leads

I have been using Anderson Powerpole connectors for some time now. On occasion while installing a small-diameter cable, such as a handheld transceiver's 12 volt power cord, the connector would flop around and I became concerned about flexing the small wires, perhaps breaking them off.

I cut a piece of heat-shrink tubing about 2 inches long, and big enough to slip over the assembled Powerpole connector. After connecting the wires and sliding the connector together, I slid the heat-shrink tubing about $\frac{1}{2}$ inch, onto the back side of the connector. With a very hot glue gun, I shot into the back end of the heat-shrink tubing, filling the tube with hot glue. The tubing shrank, pushing the glue forward into the Powerpole, creating a more resilient connector (see Figure 3).

I added a small shot of glue into the center locking hole on the connector, making the connection quite durable. The glue/tube provides a strain relief for the cable, while retaining some flexibility.

Hal K. Whiting, KI2U

“The glue-filled tube provides a strain relief for the small-diameter cable, while retaining some flexibility.”

US Amateur Radio Bands

Operator license classes: **E** = Amateur Extra **A** = Advanced **G** = General **T** = Technician **N** = Novice

CW operation is permitted throughout all amateur bands. Except as noted, all frequencies are in megahertz (MHz).

 = RTTY, data, phone, image

 = USB phone, RTTY, data and CW

 = RTTY and data

 = phone and image

 = SSB phone

 = CW only

LF – Low Frequency band

2200 Meters (135 kHz) E,A,G
1 W EIRP maximum



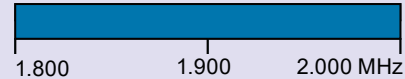
Amateurs wishing to operate on **2200 or 630 meters** must first register with the Utilities Technology Council online at <https://utc.org/plc-database-amateur-notification-process/>. You need only register once for each band.

MF – Medium Frequency bands

630 Meters (472 kHz) E,A,G
5 W EIRP max, except in Alaska within 496 miles of Russia where the limit is 1 W EIRP

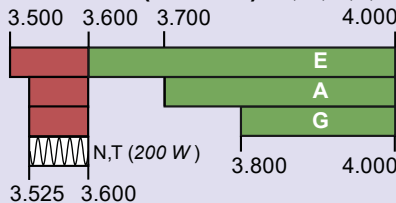


160 Meters (1.8 MHz) E,A,G

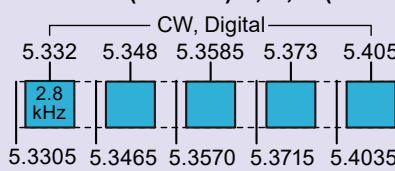


HF – High Frequency bands

80 Meters (3.5 MHz) E,A,G,T,N

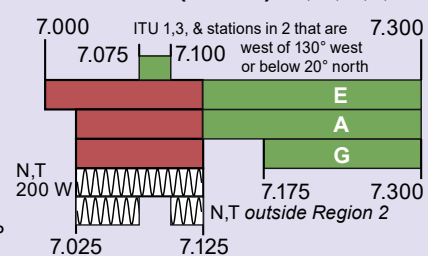


60 Meters (5.3 MHz) E, A, G (100 W)



General, Advanced, and Extra licensees may operate on a secondary basis with a maximum ERP of 100 W (relative to a half-wave dipole antenna).

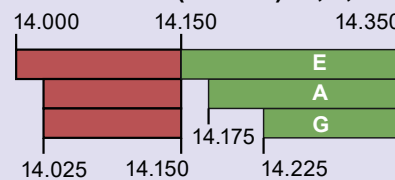
40 Meters (7 MHz) E,A,G,T,N



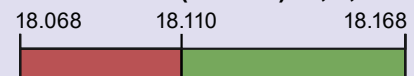
30 Meters (10.1 MHz) E,A,G



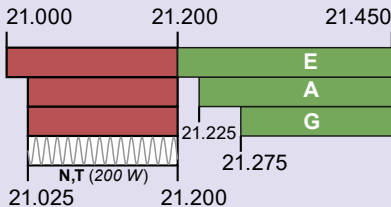
20 Meters (14 MHz) E,A,G



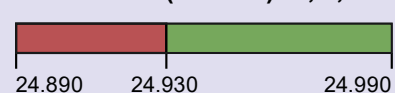
17 Meters (18 MHz) E,A,G



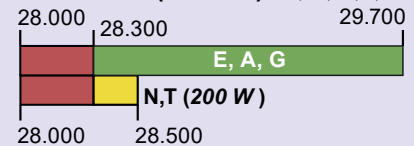
15 Meters (21 MHz) E,A,G,T,N



12 Meters (24 MHz) E,A,G

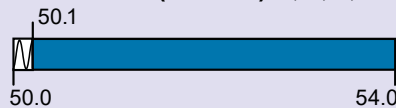


10 Meters (28 MHz) E,A,G,T,N

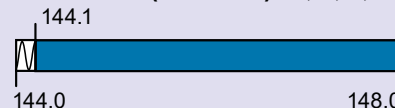


VHF – Very High Frequency bands

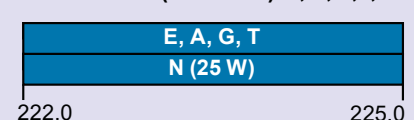
6 Meters (50 MHz) E,A,G,T



2 Meters (144 MHz) E,A,G,T

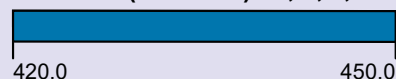


1.25 Meters (222 MHz) E,A,G,T,N



UHF – Ultra High Frequency bands

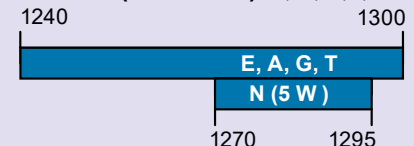
70 cm (420 MHz) E,A,G,T



33 cm (902 MHz) E,A,G,T



23 cm (1240 MHz) E,A,G,T,N



SHF&EHF – Super and Extremely High Frequency bands

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

2300-2310 MHz	3400-3450 MHz	10.0-10.5 GHz	47.0-47.2 GHz	122.25-123.0 GHz	241-250 GHz
2390-2450 MHz	5650-5925 MHz	24.0-24.25 GHz	76.0-81.0 GHz	134-141 GHz	All above 275 GHz

See www.arrl.org/band-plan for detailed band plans.

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OTAbands rev. 07/25/2024

The Next Steps

Try your hand at a couple of questions you may encounter on your upgrade exams.

General

Question G3B02

What factors affect the MUF?

- A. Path distance and location
- B. Time of day and season
- C. Solar radiation and ionospheric disturbances
- D. All these choices are correct

The correct answer is D. Maximum Usable Frequency (MUF) is the highest frequency that will provide skywave propagation between two specific locations. Different distances and directions will often result in very different MUF values. The MUF depends on conditions in the ionosphere, and those conditions will vary by time of day as well as the season of the year. The amount of solar radiation striking the ionosphere varies significantly depending on the timing of the 11-year sunspot cycle. Any solar flares, coronal mass ejections, and other disturbances on the sun can also result in ionospheric disturbances that will affect the MUF.

For Further Study

For the entire General or Amateur Extra question pools, along with simple answers like the ones shown here, pick up a copy of ARRL's *General Q&A* or *Extra Q&A*. For in-depth explanations of the answers, get a copy of *The ARRL General Class License Manual* or *Extra Class License Manual*. These resources are available from the ARRL online store (arrl.org/shop), Amazon, or your favorite ham radio dealer.

As you're studying, take free practice exams at arrl.org/exam-practice.

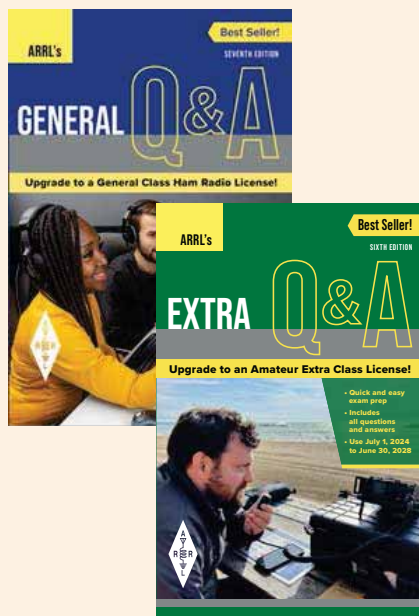
Amateur Extra

Question E7H04

How is positive feedback supplied in a Colpitts oscillator?

- A. Through a tapped coil
- B. Through link coupling
- C. Through a capacitive divider
- D. Through a neutralizing capacitor

The correct answer is C. *Colpitts* starts with a C, and so does *capacitor*. You can use that as a mnemonic to help you remember that the Colpitts oscillator uses a capacitive voltage divider to provide the positive feedback needed for operation.



HAPPY
Holidays
from
ARRL!





Just Push the Button

Stephen Rygiel, KC1QWH

Age 48, Middletown, CT

Credentials: Technician, licensed in 2022.

Q: Why did you want to get licensed?

When I was 13, I got a scanner for my birthday. Besides listening to all the public safety frequencies, I also had a local repeater programmed in, and begin listening to the amateur radio operators. I thought to myself, I want to do that. I wanted to talk to people from all over the world.

Q: What were the first things you did after you got your license?

My first HF contact was made with Italy while at the Meriden Amateur Radio Club (MARC) with club members guiding me.

Q: What do you currently do with ham radio?

I spend most of my time on local repeaters. I also operate as net control for MARC's Just Push the Button Net.

Q: Favorite non-radio activities?

Being with my family, music, kayaking, Freemasonry, and my newest activity, range shooting.

Q: Biggest ham-related embarrassment?

Operating outside of my band.

Q: Biggest ham-related success?

The Just Push the Button Net, a weekly amateur radio net I started that is specifically geared toward newly licensed amateur radio operators to assist them in getting over mic fright and help them with any questions they may have regarding amateur radio. Every week we are joined by new amateurs and seasoned amateurs who act as mentors.

KC1QWH's three must-haves for ham radio:

Every ham operator has to have **multiple handheld radios** — one for the car, one for the house, and a bunch of others to back those up, whether they're for everyday chats or emergencies.

A **notebook and pen**, for logging all the contacts you make.

Most important is a **supportive and loving spouse**. There are so many different things you can do once you get your license that the person you share your life with must be able to understand the ham operator's interest in spending time on the hobby.

Q: Finish the sentence: "My family/friends think ham radio is..."

Well, that depends on who you ask. Some ask what the point is of having your amateur radio license is when you have a cell phone. Other others think it's really neat.

Q: What would you say is your best quality?

Wanting to help others.

Q: Who or what inspires you to get out of bed in the morning?

My twin teenage boys and wife.

Q: What do you say to the idea that ham radio is dying out?

I don't agree. I see so many stories of young people getting licensed and enjoying the hobby. I do believe that we should do a lot more to get and keep youngsters involved with ham radio. There is so much competition for a youth's attention and we've got to bring amateur radio to the forefront of their minds.

Q: What do you, personally, get out of being an ARRL member?

A wealth of knowledge and support.

bhi

GOT NOISE PROBLEMS? GET A BHI DSP NOISE CANCELLING PRODUCT!

Don't put up with noise & interference any longer

"I can hear better - weak stations come in much clearer. I have diminished hearing, and the unit makes listening much easier. I am very impressed." - Mark Habberfield KB9OPW



NES10-2 MK4

- 5W amplified DSP noise cancelling speaker
- 8 to 40dB noise cancelling
- Audio bypass feature
- Use mobile or base station



Dual In-Line

- Dual channel DSP noise cancelling module
- Use in-line with a speaker and headphones
- 8 filter levels, 9 to 40dB
- Works with all radios, receivers, and SDRs



In-Line Module

- Advanced DSP noise cancelling technology
- Compact, powerful 5W amplified module
- 8 filter levels, 8 to 40dB
- Use in-line with a loudspeaker



DESKTOP MKII

- 10W Amplified DSP noise cancelling base station speaker
- 8 DSP filter levels
- "Real-time" adjustment
- Suitable for all radios



Compact In-Line

- Powerful audio processor
- Removes noise to leave clear speech
- Use with headphones
- Easy to use with "real-time" audio adjustment

Don't forget to check out our range of retrofit DSP install modules and our unique bhi accessories

bhi



DX
ENGINEERING

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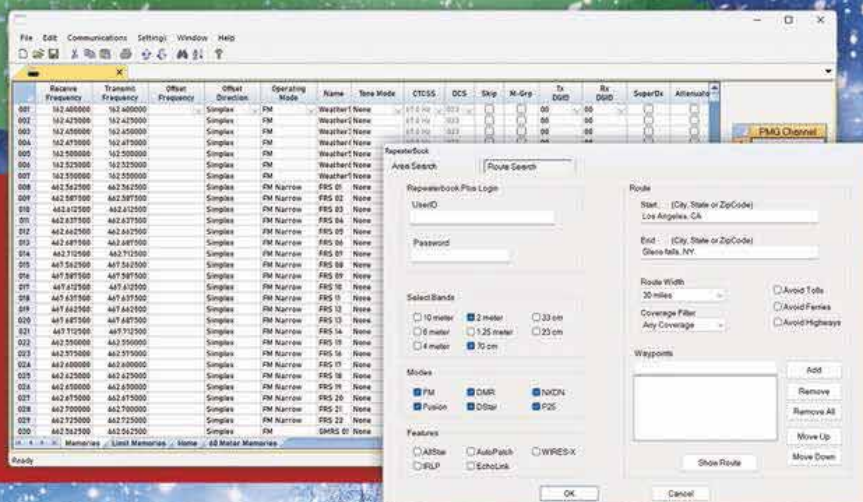
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