Listening for Long-Delayed Echoes | 30

QST
DIGITAL EDITION

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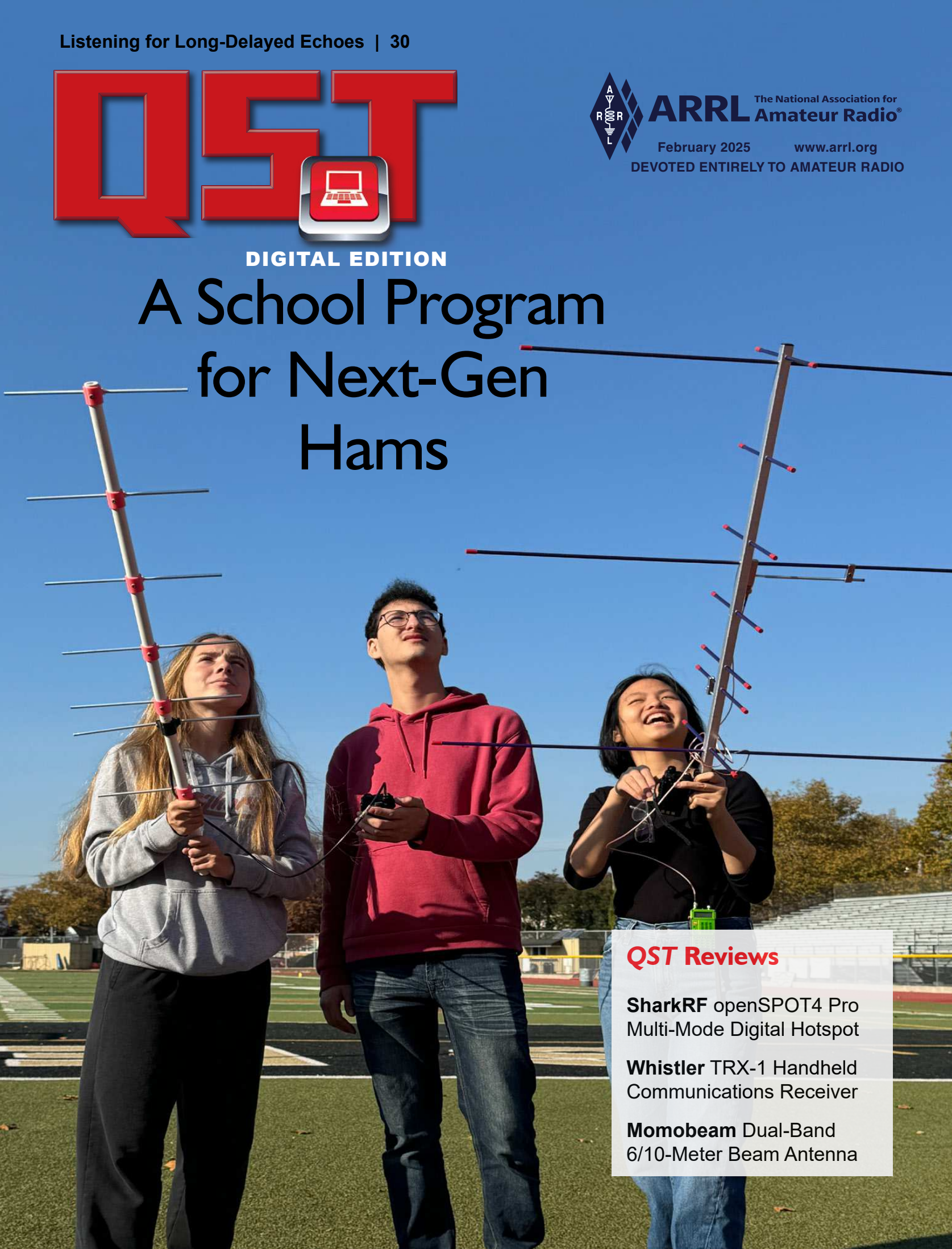

QST Reviews

SharkRF openSPOT4 Pro Multi-Mode Digital Hotspot

Whistler TRX-1 Handheld Communications Receiver

Momobeam Dual-Band 6/10-Meter Beam Antenna

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FTM-150R ASP

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FT-3165R ASP

Super DX | ASP Audio Signal Processor

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  - BDR : 127dB+
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  - TX Phase Noise : −143dBc/Hz
- **Band-Pass-Filters dedicated for the amateur bands to eliminate out-of-band unwanted signals**
- **Built-in High-speed Automatic antenna tuner**
- **Effective QRM rejection by Dual-core DSP**

*Multi-signal receiving characteristic: 14MHz band/2kHz separation
*TX Phase Noise: 100W, CW mode

- **AESS** (Acoustic Enhanced Speaker System) with SP-40 speaker to create High-fidelity audio output
- **3DSS**, real-time 3-Dimentional Spectrum Stream presentation
- **High Resolution 4.3-inch TFT Color Touch Panel Display**
- **VMI** (VFO Mode Indicator) shows the current operating mode
- **"PRESET" Mode functions most suitable for FT8 operation**
- **Equipped with the External Display terminal**

FT-710 AESS

- Includes External Speaker SP-40

FT-710 Field

- Includes Carrying Belt
- To use the AESS function, External Speaker SP-40 (Optional) is required

- Display is not included. The image is shown with an optional third-party external display that may be connected using a DVI-D digital cable.

* Photo shows the FT-710 AESS

HF/50MHz 100W SDR TRANSCEIVER w/ SP-40

FT-710 Aess

Acoustic Enhanced Speaker System

HF/50MHz 100W SDR TRANSCEIVER

FT-710 Field

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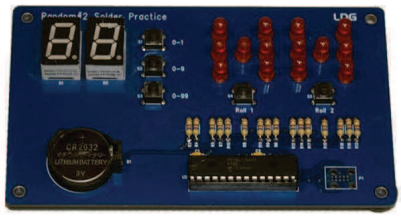

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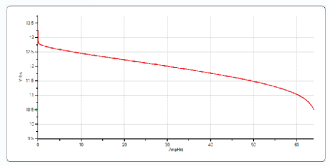

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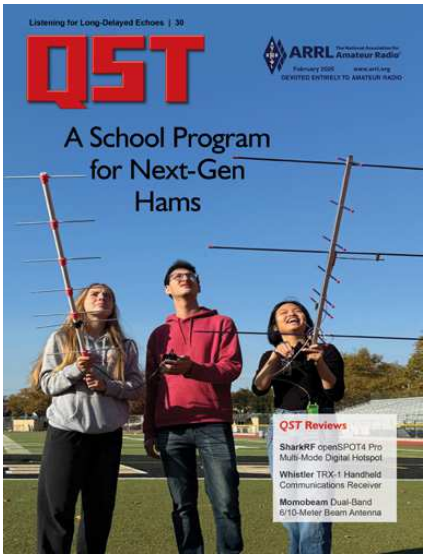
Contents

February 2025 ♦ Volume 109 ♦ Number 2

An icon next to an article means there's bonus content in the digital edition at **www.arrl.org/qst**.

Columns

Departments



Our Cover
Staten Island Technical High School (SITHS) has woven amateur radio into their engineering curriculum with help from ARRL. Not only did the school receive an ARRL Education & Technology Program School Station Grant, one of their engineering teachers attended the ARRL Teachers Institute on Wireless Technology specifically to learn how to bring amateur radio into his classroom. Learn how the SITHS students are enthusiastically engaging with ham radio in "Connecting Youth with Ham Radio in the Classroom," by classmates Ashley Li and Olivia Wojtczak. [Steve Goodgame, K5ATA, photo]

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ARRL members can access the digital edition via a link at **www.arrl.org/qst**, download our iOS app from the iTunes Store, and download our Android app from the Google Play Store.

Write for *QST*

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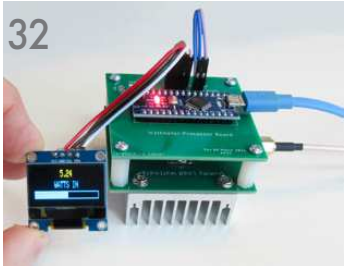

QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, Inc., 225 Main St., Newington, CT 06111-1400, USA. Volume 109, Number 2. Periodicals postage paid at Hartford, CT, USA and at additional mailing offices.

POSTMASTER: Send address changes to: *QST*, 225 Main St., Newington, CT 06111-1400, USA. Canada Post: Publications Mail Agreement #90-0901437. Canada returns to be sent to The Mail Group, 1501 Morse Ave., Elk Grove Village, IL 60007.

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Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421.

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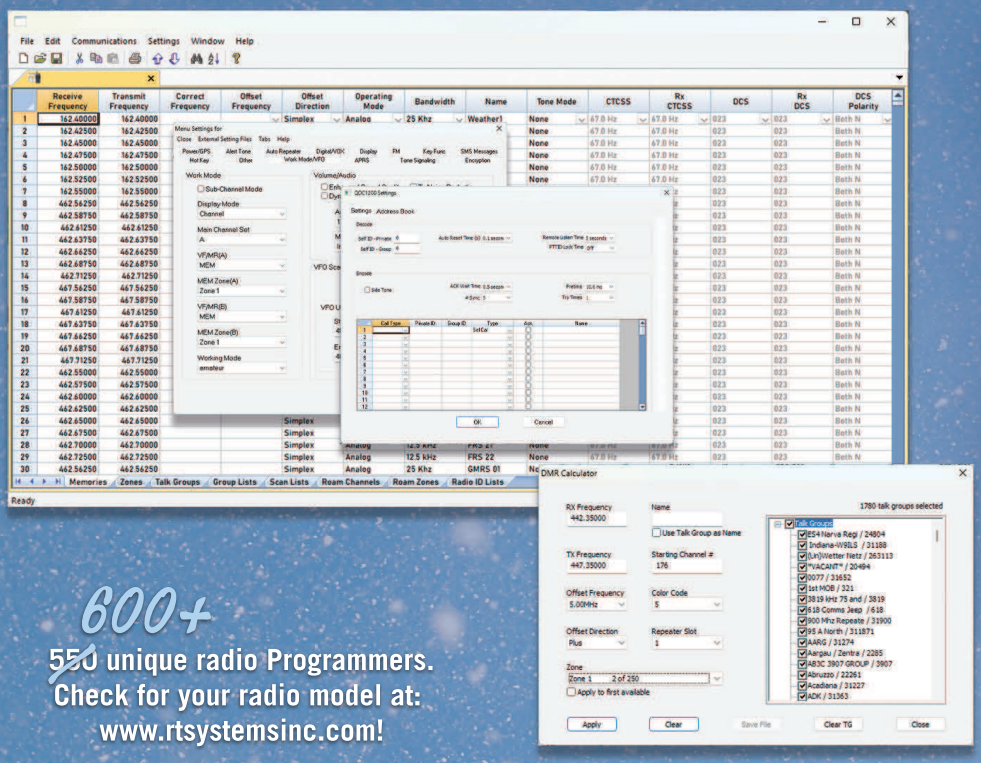

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X510HD (3 Section)	2m/70cm	17.2	330/250	UHF or N
X300A (2 Section)	2m/70cm	10	200	UHF or N
X200A (2 Section)	2m/70cm	8.3	200	UHF
X50A (1 Section)	2m/70cm	5.6	200	UHF or N
X30A (1 Section)	2m/70cm	4.5	150	UHF
Monoband Base Station/Repeater Antennas				
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F22A (2 Section)	2m	10.5	200	UHF
CP22E (Aluminum)	2m	8.9	200	UHF
F718A (Coax Element)	70cm	15	250	N
Dualband Mobile Antennas				
SG7900A	2m/70cm	62.2 in.	150	UHF or NMO
SG7500A	2m/70cm	40.6 in.	150	UHF or NMO
NR770H Series	2m/70cm	38.2 in.	200	UHF or NMO
MR77 Series	2m/70cm	20 in.	70	Mag Combo
AZ504FXH	2m/70cm	15.5 in.	50	UHF
AZ504SP	2m/70cm	15.5 in.	50	UHF
NR7900A	2m/70cm	57 in.	300/250	UHF
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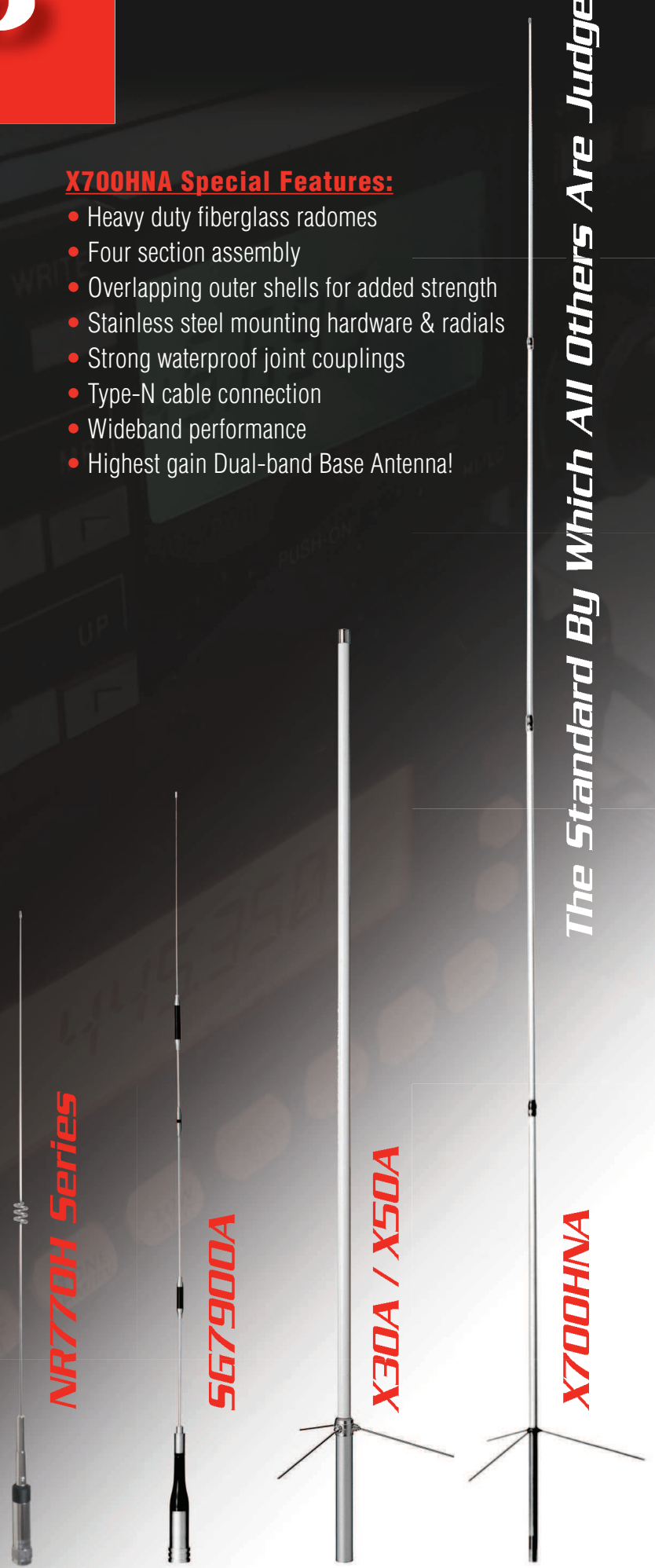
NR22L	2m	96.8 in.	100	UHF
M285	2m	52.4 in.	200	UHF or NMO



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David A. Minster, NA2AA, ARRL Chief Executive Officer, na2aa@arrl.org

Second Century

Time for Shack Automation?

With the long, dark months of winter upon us, most of us can't do much outside with regard to our stations. However, now is the ideal time to look at the operating position and ask: What else can I do to enhance my amateur radio operating capabilities? One answer that springs to mind is computing and automation.

Long ago, personal computers were vastly more expensive than the ones today, with little or no software available, and certainly no internet access to amateur radio resources. Today, there is a huge array of hardware and software solutions available, not to mention a myriad of amateur radio data sources online. It has become routine to see pictures of shacks with four or more monitors fanned out around the operating position to provide access to logging, awards tracking, real-time spotting tools, digital modes, satellite tracking, and so on. Having all of this on a screen and at your fingertips has rewritten the game of amateur radio.

At ARRL Headquarters in 2021, we undertook an initiative to redefine our club station, W1HQ. Gone are the old desks and walls covered with maps, certificates, and paper QSL cards. Today, the shack appears to be wireless. Two racks house the equipment; a cable management system hides the wiring; there are Bluetooth-based accessories including wireless connection to our Bencher paddles using a solution from Glen Popiel, KW5GP, and Green Heron products control the two rotators and assortment of antennas. With the help of Dave de Coons, WO2X; Kyle Krieg, AAØZ, and our Lab's Digital RF Engineer John McAuliffe, W1DRF, we've fully automated the shack using a Raspberry Pi-hosted Node-RED environment. To us, this looks like the shack of the future, which is already here!

Most hams today use PC computers running Windows. There is an ocean of software to perform all sorts of amateur radio-related functions, and the innovation continues every year. Two of the most popular programs are *N1MM* and *WSJT-X*. Tom Wagner, N1MM, has built a strong team for the development, documentation, and support of his namesake contest logging program. I use it in DXpedition mode for everyday logging, along with the contests I participate in throughout the year. If you are not logging by computer, consider using *N1MM*. *WSJT-X* is designed by a team led by Dr. Joe Taylor, K1JT. They have been developing various weak-signal digital modes, including FT8, FT4, and now SuperFox FT8, to help everyone make contacts irrespective of how modest their station is or how poor propagation might be.

Another computing platform you may want to leverage in your shack is the Raspberry Pi (RPi). The single-board computer costs well below $100 and uses a version of the Linux operating system configured for the RPi. The RPi comes in a few different models, with the most powerful being the latest version, the RPi 5. There are many add-on HATs ("Hardware Attached on Top" — boards that attach to the RPi) specifically developed for amateur radio, including the MMDVM HAT for digital VHF/UHF radio, DRAWS HAT for supporting digital modes like FT8, and other HATs that can control relays, Voice over IP, and even CW. Getting started isn't as difficult as you might think with resources like Jason Oleham, KM4ACK, and his 73 Linux, among other builds especially for hams.

If you have a latest-generation radio with a single USB interface port, you're in luck when it comes to shack computing. Usually with just the addition of a simple software driver, not only can you control the radio's settings from popular logging and contest programs, but you can also use the digital modes without additional interfaces or radio-specific cables. Even more, you can use apps like *AnyDesk* or *RealVNC* to remote into your computer and run FT8 from anywhere! This is a simple gateway to remotely controlling your entire shack and experimenting with your own Node-RED control panel.

Over the next few months, spend some computing time in the shack. Take on projects in line with your level of experience, and use YouTube and website-based tutorials for shortcuts or suggestions on completing them. Be radio active by building your computing skills. Be a connector by taking on a club project, like HamClock. And look for ways to make your amateur radio experience more fun and fulfilling!

David A. Minster, NA2AA
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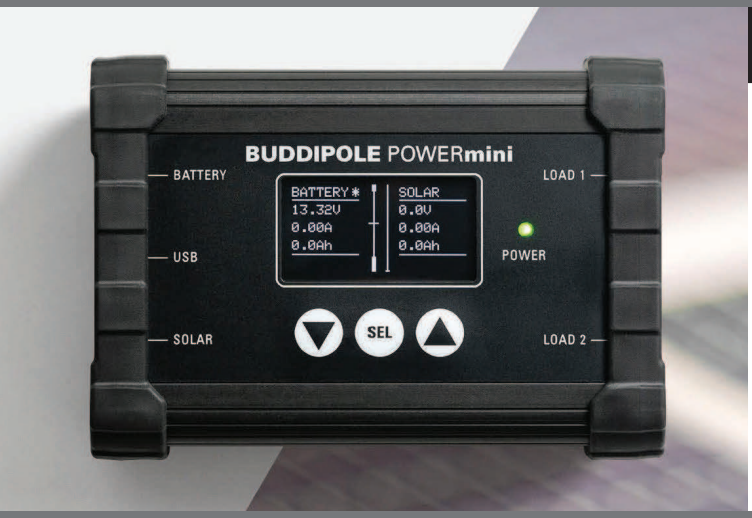

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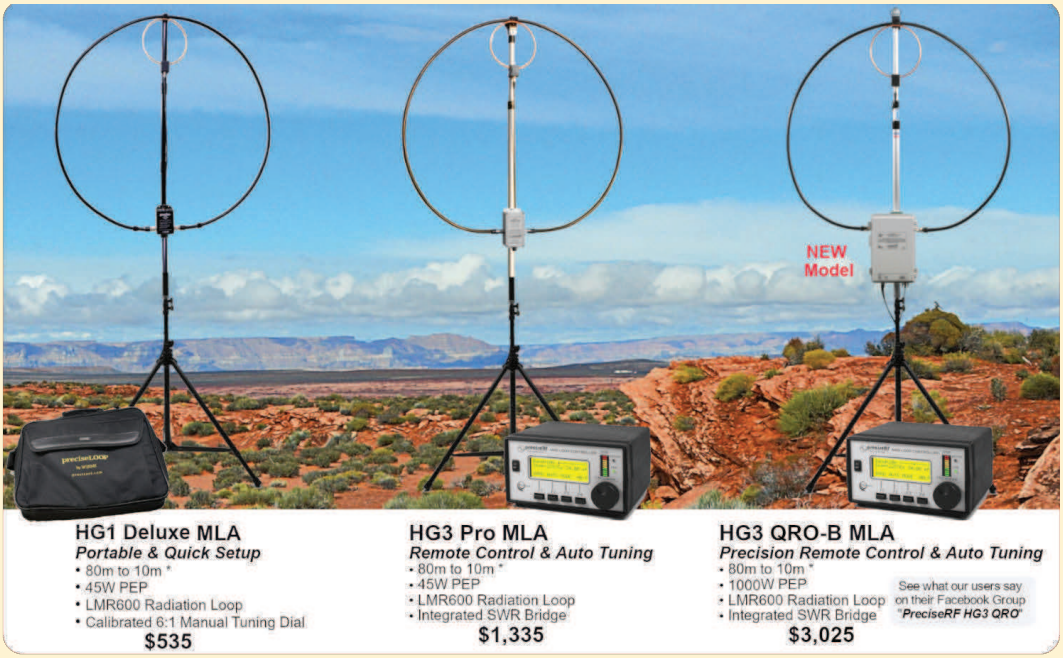

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Steve Ford, WB8IMY, wb8imy@arrl.net

Member Spotlight

Neil Foster, N4FN

Neil discovered amateur radio in the late 1950s while enjoying his newly purchased Hallicrafters S-77A shortwave receiver. But while exploring the S-77A's circuitry, he received a nasty shock that sent him to the floor. Neil said that's when he realized he needed more education and guidance before he could join the ranks of the hams he had been monitoring. Fortunately, both came courtesy of the late Irwin Kane, WA2VGM, who became his mentor. Irwin was an accomplished electrical engineer who developed several early audio products for ham radio.

With help from WA2VGM, Neil first became licensed in 1960 as a Technician; he decided to skip Novice because it was non-renewable and valid for only 1 year. At that time, the Technician-class license required a 5 WPM CW test, and the written exam was the same as that of the General-class license. So, to move up to General, one had to pass only the 13 WPM CW exam — that was his next step.

Once he earned his General-class license, Neil pursued his Advanced-class license. He had to take only the written exam, but he considered it to be his most challenging test. After diligent study, Neil secured his Advanced ticket with the call sign KC4MJ. He upgraded to Amateur Extra in 1984. When vanity call signs became available, he became N4FN (his initials in reverse).

A Lifetime of Service

Throughout his long amateur radio career, Neil has made service a priority. Over the years, he has served as president of the Atlanta Radio Club (twice), the Southeastern DX Club (SEDX), and the Quarter Century Wireless Association. Neil remains a member of SEDX, and he is also a member of the North Fulton Amateur Radio League, having once served as its president, too. He was an ARRL Volunteer Examiner Coordinator at the Georgia Institute of Technology for several years.

A Passion for DX

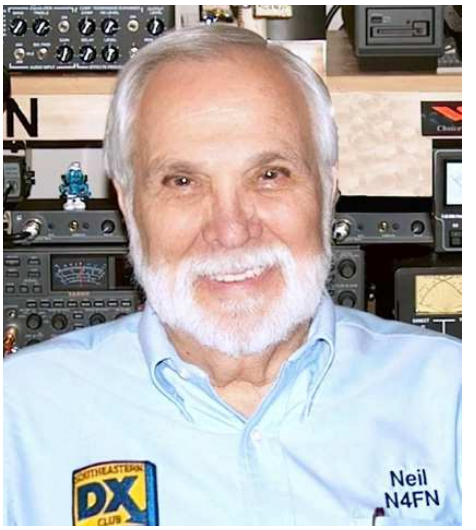
Neil holds 12 ARRL DX Century Club (DXCC) Awards. When asked what he would do next, he replied, "Go back and do it all again, but this time [low power]!" As an active DXer, Neil has contacted 347 entities and operated from 13 of them. He is a member of the DXCC Honor Roll, needing only three more contacts for the #1 Honor Roll Award.

He is proud of his Arabian Knights Award (number 568 in the world). Neil also holds the Royal Jordanian Silver Award (number 191 in the world), which was personally signed by the late King Hussein of Jordan, JY1.

Neil has achieved the Radio Society of Great Britain (RSGB) Commonwealth DX Award (number 332 in the world). He holds a British Full-class license and the call sign GØNBJ. Neil is a member of the Echelford Amateur Radio Society in the United Kingdom, as well as RSGB.

A Second Career in Education

Neil retired from working in agricultural irrigation in 2000, where he specialized in microirrigation (drip irrigation). But after being retired for 6 months, he found himself longing for another way to channel his intellectual energies. At the suggestion



of his wife, Dr. Nancy Foster, who was a school/district administrator, Neil became certified as a substitute teacher in his local school system. He taught science, language arts, and math. Before he realized it, 16 years had passed in two middle schools. Neil said he has always enjoyed working with the middle school students, and he even sponsored an amateur radio club at a local charter school.

Spitfire Keys

Neil has a keen interest in aviation, particularly regarding the World War II Supermarine Spitfire aircraft. This led him to achieve what may have been the first CW contact between two amateurs using keys formerly installed in Spitfires. In addition to Neil's Spitfire key, his contact partner, John Farrar, G3UCQ, is the proud owner of a lovingly restored Spitfire key.

After 65 years in the hobby, Neil is happy to quote his friend, the late Bob Allphin, K4UEE, who said that ham radio "is still magic!"

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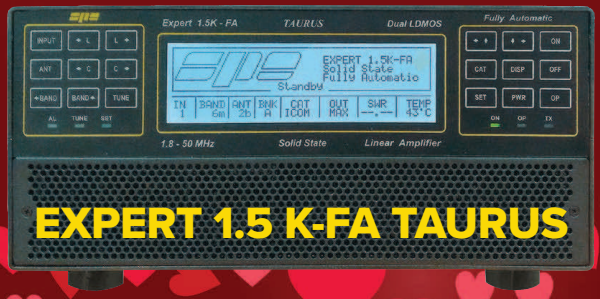

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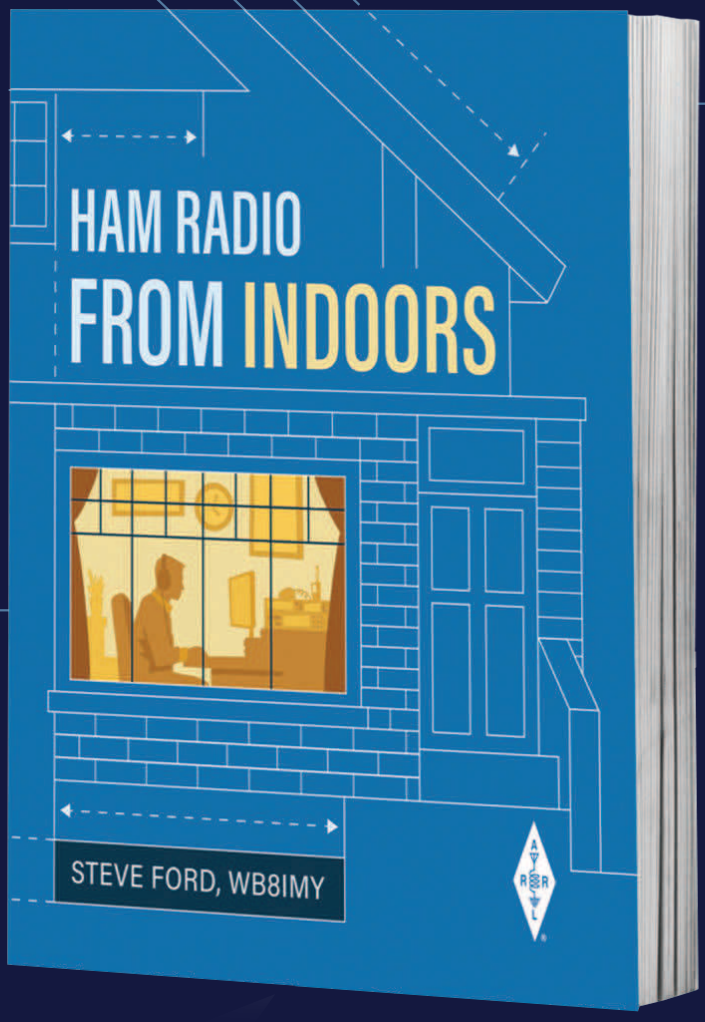

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Up Front

WA9AKT History

WA9AKT has been in Bob Meyer's, K9IO, family since 1961 — 64 years!

In 1961, at age 15, Bob was issued the call sign WN9AKT. When he upgraded to General in 1962, the call changed to WA9AKT. He held WA9AKT from 1962 to 1997.

In 1998, at age 15, his daughter, Amie Meyer, applied for and received WA9AKT. She held the call from 1998 to 2018. The license was not renewed and defaulted into the call sign pool.

In 2023, at age 15, Sophie Krummick, Amie's daughter — Bob's granddaughter — applied for and received WA9AKT.

Three 15-year-olds, three caps, and three generations. [Bob Meyer, K9IO, photo]

Supermarket Surprise!

Alain Minard, F5LIW/N5LIW, shopped at his local supermarket and received a pleasant surprise when checking the total on his receipt — 88 and 73 put a smile on his face. In his amusement, though, he forgot to ask the cashier if she was a ham. [Alain Minard, F5LIW/N5LIW, photo]


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Hams Play Key Role in Washington's Birthday Parade

Alexandria Radio Club, W4HFH, has provided communication services for the City of Alexandria, Virginia's annual George Washington Birthday Parade for more than 30 years. Members of the club monitor the numerous last-minute changes in the order of the march, which includes hundreds of people in many formations, such as bands, floats, and motorcades. Using handheld 2-meter radios tuned to a local repeater, they relay the changes to the parade's review stand so the stand's announcers have correct information as the parade passes. Alexandria is about 15 miles from Mount Vernon and is considered Washington's hometown. This photo was taken at the February 19, 2024, parade, where the city celebrated their 275th anniversary, and the Alexandria Radio Club marked its 70th anniversary.

Members of the Alexandria Radio Club, W4HFH, pictured with George Washington interpreter Brian Hilton before the parade stepped off. From left to right: former club President Rick Bunn, N4ASX; Secretary Carol Myers, KN4LLL, and Vice President Robert Crumley, KO4ZIK. [Jan A. Maas, photo]

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Letters from Our Members

Curing the Buzz

During one of our club's nets, I checked in with my Yaesu FT-60 handheld and its external MH-34 speaker/microphone. To my dismay, I heard a terrible buzz from the MH-34, and I assumed the speaker's diaphragm had failed. I disassembled the MH-34 and was startled to see that a metal staple had somehow been pulled through the front grid by the speaker's magnet and was stuck to the diaphragm. It was vibrating and causing an obnoxious sound.

I plucked out the staple and reassembled the MH-34 — problem solved and lesson learned! It is best to keep speakers/microphones far away from small metallic items; you never know where they may wind up.

John Powell, KF6EOJ
Downey, California

A Musical Morse Code Coincidence

Ludwig van Beethoven's Symphony No. 5 starts with "dit dit dit dah, dit dit dit dah." That is the letter V in Morse code, and in Roman numerals, V represents the number five.

So, was Beethoven a ham? No. His Fifth Symphony was written between 1804 and 1808. Electromagnetism wasn't discovered until around 1820, and Morse code wasn't created until around 1838.

However, it's fun to imagine that Samuel Morse made the connection between the Fifth Symphony and the Roman numeral V.

John Majka, K9AAN
Louisville, Kentucky

Defending "Elmer"

• I read with amusement the "Retiring 'Elmer'" letter in the "Correspondence" column of the November 2024 issue.

"Elmer" is part of our hobby's unique lingo, and I use it only with other hams because the general public wouldn't understand its meaning. I simply introduce my "Elmer" to another non-ham friend as my "friend."

If I want to inspire people, I will show them my shack and tell them about all the fun and cool things we can do with ham radio, including talking to people around the world, making new friends, and helping in an emergency disaster — now that's inspiring!

Michael Arsanis, N6HBJ
Carlotta, California

• Elmer E. Bucher was a real person and may have been the first Elmer. It is unfortunate he has been lost to history over the decades. Elmer supported radio and wrote several radio-related books in the early 1900s. He was also a driving force in getting amateur radio stations and classes in YMCAs across the country and was involved with getting women into radio. All of us should strive to be an Elmer!

John Lenahan, KØRW
Gold Canyon, Arizona
Life Member

Back to CW

When I first became a ham, I overcame the 5 WPM Morse code challenge to get on the air. I nervously sent out my first CQ and made my first contact. They had to repeat their call sign and information at least three times so I could get it right.

Increasing my Morse code speed to 13 WPM was the key to moving up to a General license. Practicing was a challenge because the only place in the house I found quiet enough, without being bothered, was the bathroom.

So, I took my small tape recorder and tape into the bathroom and worked on achieving 13 WPM at least twice an evening. I also practiced for 15 minutes during my lunch break at work every day. After about 4 months, I took my test and passed with flying colors. Shortly after, I got my new call sign, WD6BQX, which I still have.

Once I received my General and phone privileges, I got a Kenwood TS-520, and sadly, that was almost the end of my CW days. But after 46 years, I am going back to it because the CW portion of the band is wide open, with very few on the frequency for any band. You can still make contacts with no amplifier in most cases and at a slow, relaxed speed.

Also, I think it is the most important mode. When a disaster strikes, if the only thing you can get out is a carrier on a frequency due to radio malfunctions, you can still get help if you can send Morse code. So, I hope every ham still knows Morse code at 5 WPM at least.

I needed a slight refresher, so I downloaded a program from **www.g4fon.net** that allows me to control all aspects of learning Morse code, from the noise level to the speed and spacing of the characters.

Get back to the basics and pick up Morse code. The bands are awaiting your CQ.

Art Aronsen, WD6BQX
Vacaville, California

Send your letters to **letters@arrl.org**. We read every letter received, but we can only publish a few each month. We reserve the right to edit your letter for clarity, and to fit the available page space. Letters published in "Correspondence" may also appear in other ARRL media. The publishers of *QST* assume no responsibility for statements made by correspondents.


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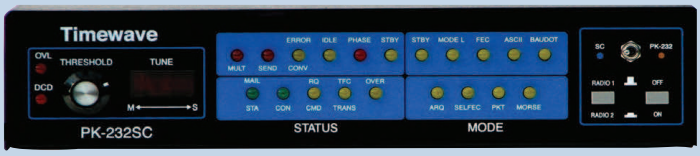

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W1AW Schedule

PAC	MTN	CENT	EAST	UTC	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM	1400		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-12^{45} PM	8 AM-1^{45} PM	9 AM-2^{45} PM	10 AM-3^{45} PM	1500-2045	VISITING OPERATOR TIME				
1 PM	2 PM	3 PM	4 PM	2100	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	2200	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	2300	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	0000	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	0100	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	0200	DIGITAL BULLETIN				
6^{45} PM	7^{45} PM	8^{45} PM	9^{45} PM	0245	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	0300	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	0400	CODE BULLETIN				

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US time + 4 hours. For the rest of the year, UTC = Eastern US time + 5 hours.

♦ Morse code transmissions: Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0775, 21.0675, 28.0675, 50.350, and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13, and 15 WPM.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13, and 10 WPM.

Code bulletins are sent at 18 WPM.

For more information, visit us at
www.arrl.org/w1aw

♦ W1AW Qualifying Runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted by various West Coast stations on CW frequencies that are normally used by W1AW, in addition to 3590 kHz, at various times. Underline 1 minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any), and complete mailing address. Fees: $10 for a certificate, $7.50 for endorsements.

♦ Digital transmissions: Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095, 50.350, and 147.555 MHz.

Bulletins are sent using 45.45-baud Baudot, PSK31 in BPSK mode, and MFSK16 on a daily revolving schedule.

Keplerian elements for many amateur satellites will be sent on the regular digital frequencies on Tuesdays and Fridays at 6:30 PM Eastern time using Baudot and PSK31.

♦ Voice transmissions: Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59, 50.350, and 147.555 MHz. Voice transmissions on 7.290 MHz are in AM double sideband, full carrier.

♦ Notes: On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to 3:45 PM Monday through Friday. FCC-licensed amateurs may operate the station during that time. Be sure to bring a reference copy of your current FCC amateur license. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW code practice and CW/digital/phone bulletin transmission audio is also available real-time via the *EchoLink Conference Server* W1AWBDCT. The conference server runs concurrently with the regularly scheduled station transmissions. The W1AW Qualifying Run texts can also be copied via the EchoLink Conference Server.

During 2025, Headquarters and W1AW are closed on New Year's Day (January 1), Presidents Day (February 17), Memorial Day (May 26), Independence Day (July 4), Labor Day (September 1), Veterans Day (November 11), Thanksgiving and the following day (November 27 and 28), and Christmas and the following day (December 25 and 26).

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Further Observations of Long-Delayed Wireless Echoes

Have you ever wondered where long-delayed echoes go during their travels, and how you can search for them? VE3HX has some answers.

Alan Goodacre, VE3HX

In 1978, I carried out a search for long-delayed echoes (LDEs) on the 10-meter band. I observed and analyzed eight echoes and found that the echo delay times tended to be integral multiples of the time required for a radio wave to travel once around the world (about 138 milliseconds). I published my experimental technique and results in "Observations of Long-Delayed Echoes on 28 MHz" in the March 1980 issue of *QST*. Because I used only a single antenna, I was uncertain whether the transmitted signal went around Earth many times and then arrived on the back of my antenna.

So, in 1996, I set up a remote receiving station using two identical 10-meter, four-element vertically polarized Yagis — one facing east and the other facing west — as well as two identical receivers and a stereo tape recorder. The transmitter, which was located at my home, fed a vertically polarized, five-element 10-meter Yagi. I found that when transmitting to the east, I heard a few LDEs arriving on the west-facing antenna. When transmitting to the west, I heard a few echoes arriving from the east. This showed that east-west, around-the-world LDEs can occur. I published the information in volume 6, issue 2 of *RadCom Plus* (2022).

Advancing the Search

In 2022, I transferred my LDE search to a rural site in Quebec, Canada. My antenna consisted of two vertically polarized, horizontally stacked four-element Yagis for the 10-meter band. To make my transmitted signal distinctive, I developed a wide-band staircase signal consisting of a series of tones that rise or fall in frequency. Ultimately, I interlaced rising and falling staircase signals with frequency spreads of 1 – 2 kHz. I randomly changed the steepness of the staircase from one transmitted signal to the next in order to keep the transmitted signals unique. This ensured that I would be able to assign each echo to the correct corresponding signal.

I discovered that LDEs exhibit small amounts of dispersion, in which the lower frequencies in the signal arrive later than the higher frequencies. This dispersion indicated that the radio wave spent part of its life in a plasma. Waves travel more slowly in a plasma, depending on the frequency of the wave and the plasma density (electron density). The LDE delay might be due entirely to its having been in a plasma. However, if there are many electron collisions per second in the plasma, the wave will be quickly attenuated. The length of time that the wave can travel in a plasma before it is attenuated beyond audibility is inversely proportional to the frequency of the collisions. Given the amount of dispersion I observed on 10 meters, an echo traveling within Earth's ionosphere would be undetectable after about 12 milliseconds, as discussed in my *RadCom* article.

Understanding the Findings

As I had never explicitly looked for the possible presence of dispersion in east-west, around-the-world echoes, I erected a four-element, horizontally polarized 10-meter Yagi on a separate tower at my rural site so I could transmit in one direction and receive from the opposite direction. The eight-element stacked array was oriented to the west, and the four-element antenna faced east. I operated for a total of 3 hours while searching for east-west LDEs. In three cases, while transmitting to the west, I observed two single echoes and a double echo coming from the east. On a fourth occasion, while transmitting to the east, I observed an

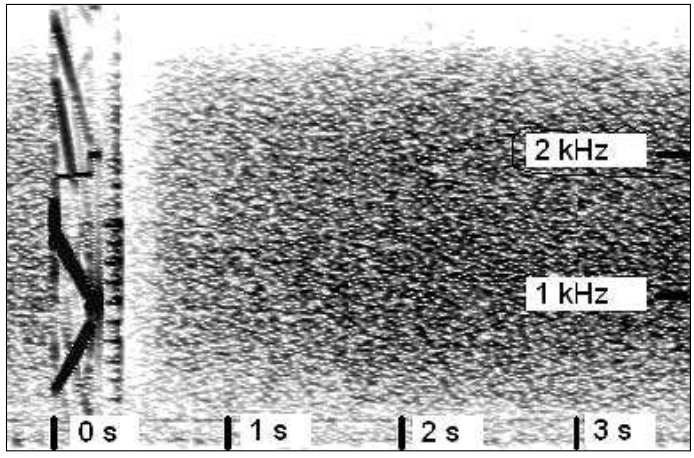


Figure 1 — The frequency spectrogram of a long-delayed echo exhibiting dispersion. The top-most part of the rather ghostly echo arrives with a delay of about 1.0 second, whereas the bottom-most part arrives with a delay of 1.2 seconds. There is apparently a noise burst at about 2 seconds.

echo coming from the west. This confirmed the existence of east-west, around-the-world echoes as I first determined in 1996.

These echoes also exhibited varying degrees of dispersion, indicating that they spent some time propagating through a plasma. An example of dispersion can be seen in Figure 1, which I captured via the excellent freeware program, *Spectrogram* version 5.1.7, written by R.S. Horne and available for download at **www.w5big.com/spectrogram.htm**. We can see that there is an around-the-world echo delayed by about a second, and the lower frequencies in the echo arrive later than the higher frequencies. The echo appears to have been rotated, but it was actually sheared by dispersion.

Using the arrival time of the uppermost part of an echo, the delay times are shown in Table 1. I looked for periodicities in these delay times by using the same statistical analysis method I used in the *QST* article referenced earlier. It depends upon dividing a delay time by a given period, and then finding the closest integer resulting from the division. For example, if the result of the division is 3.24, the remainder is 0.24, and the nearest integer is 3. But if the result is 3.69, the remainder is 0.69, and the nearest integer is 4. In our calculations, we use what is termed the *modified remainder*. If the remainder is between 0.0 and 0.5, the modified remainder is simply the actual remainder. But if the remainder is greater than 0.5, the modified remainder becomes equal to 1.0 minus the actual remainder. For instance, if the remainder is 0.69, the modified remainder is 0.31.

Figure 2 shows a plot of the root-mean-square value of the modified remainder versus periodicity (P). When looking for any significant minima in the plot, you will see nothing at the around-the-world ionosphere time of 0.14 second. But there is a prominent minimum at 0.48 second, which is statistically significant at the 95 percent level. This suggests that the time it takes for an east-west, around-the-world echo may be about 0.5 second. In this case, the around-the-world echoes appear to travel in the toroidal — or doughnut-shaped — plasmasphere aligned with Earth's equatorial plane and lying between the inner and outer Van Allen belts. While this path is largely speculative at this point, it is interesting to note that upon re-running the eight delay times given in the earlier-referenced *QST* article, a prominent secondary minimum occurs at 0.53 of a second.

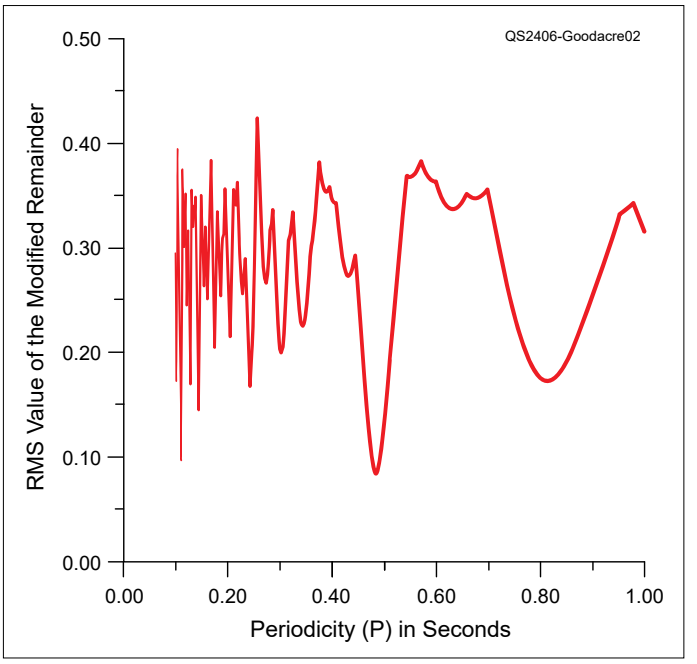


Figure 2 — The root-mean-square value of the modified remainder versus periodicity (P).

Table 1 — LDE Recorded Delay Times

Echo	Date and Time (GMT)	Arrival Time (seconds)	Direction Received From
055L	2022 10 11 2041	0.90	East
396L	2022 10 11 2102	0.99	East
481L	2022 10 11 2154	1.43	West
303La	2022 10 30 1812	1.89	East
303Lb	2022 10 30 1812	2.45	East

These east-west LDEs are distinct from magnetospheric-ducted echoes (MDEs), as discussed in Poul-Erik Karlshøj's, OZ4UN, "Observation of Long Delayed Echoes on 80 Meters" in the November 2009 issue of *QST*. The MDEs travel south and north along Earth's magnetic field lines and have not been observed at frequencies higher than about 6 MHz.

If you want to hear LDEs, your chances will increase if you use two east-west-facing antennas. It would also be helpful to run legal-limit power in an electrically quiet location.

Alan Goodacre, VE3HX, was first licensed in January 1953. He operated mainly on 6 meters in the 1950s as VE7AIZ. In the 1960s, he carried out moonbounce experiments as VE3BZS/2 on 6 and 2 meters. Since the early 1980s, Alan has searched for and studied LDEs as VE2AEJ. He received his PhD in Geophysics from Durham University in England, and he worked as a geophysicist for 35 years in the Canadian Federal Civil Service. Alan can be reached at **ve3hx@rogers.com**.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

A Wideband Dummy Load with a High-Accuracy Wattmeter

This inexpensive dummy load/Arduino-based wattmeter for 2 meters, 70 centimeters, and 23 centimeters is easy to build and performs like a commercial device.

The completed dummy load/wattmeter.

Bob Fontana, AK3Y

In their November 2018 *QST* article "Build an Inexpensive 150 W Dummy Load with Wattmeter," authors Jack Purdum, W8TEE, and Al Peter, AC8GY, designed and built an Arduino-based wattmeter with a dummy load that was limited to the HF through the lower VHF bands.

In "A High-Power Dummy Load for DC through VHF" in the August 2023 issue of *QST*, Stephen Werner, AG4W, used high-power flange-mounted resistors in a dummy load that could handle legal-limit power at up to 225 MHz.

My local FM repeater club recently decided to design a dummy load/wattmeter that covers 2 meters, 70 centimeters, and 23 centimeters. It had to accurately measure power levels from a few tens of milliwatts to 100 W, and it had to be compact enough to use for ARRL Field Day or other portable operations. Another desirable feature was the ability to use the same instrument in the VLF through HF spectrum, as several of us were also experimenting in the 630- and 2200-meter bands. A truly wideband device was of paramount interest. To achieve these requirements, it uses a flange-mounted high-frequency/high-power resistor with a diode detector and an Arduino microcontroller. The associated software uses a few techniques to achieve very high accuracy, even at very low power levels.

Flange-Mounted Resistors

Flange-mounted resistors typically use either a thin beryllium oxide (BeO) or thick aluminum nitride (AlN) film for the substrate material. Tantalum is often used as the resistive material. The mechanical and electrical properties are well controlled, resulting in superb high-frequency behavior — often well into the microwave range. Because of their thermal conductivity, these flange-mounted resistors can dissipate a lot of power despite being quite small. They are usually inexpensive, at less than $5 for a 250 W unit. But before acquiring one, understand that beryllium is highly toxic. Don't ever open one of these devices.

Design Concept

The dummy load/wattmeter consists of two printed circuit boards (PCBs): one for the wattmeter detection circuitry and another for the Arduino/display circuitry and interface. The detector board is flush mounted to a 45 × 60-millimeter aluminum heatsink, and the load

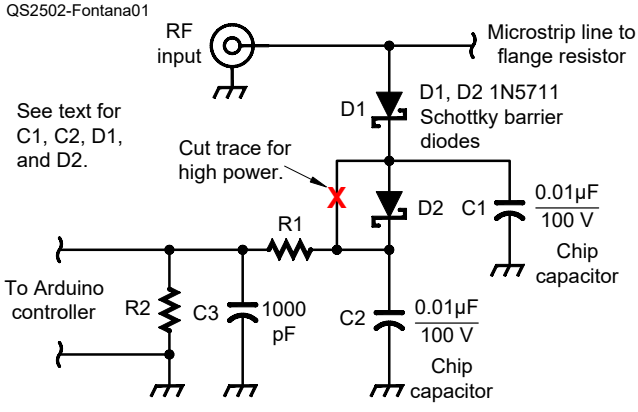


Figure 1 — The dummy load schematic.

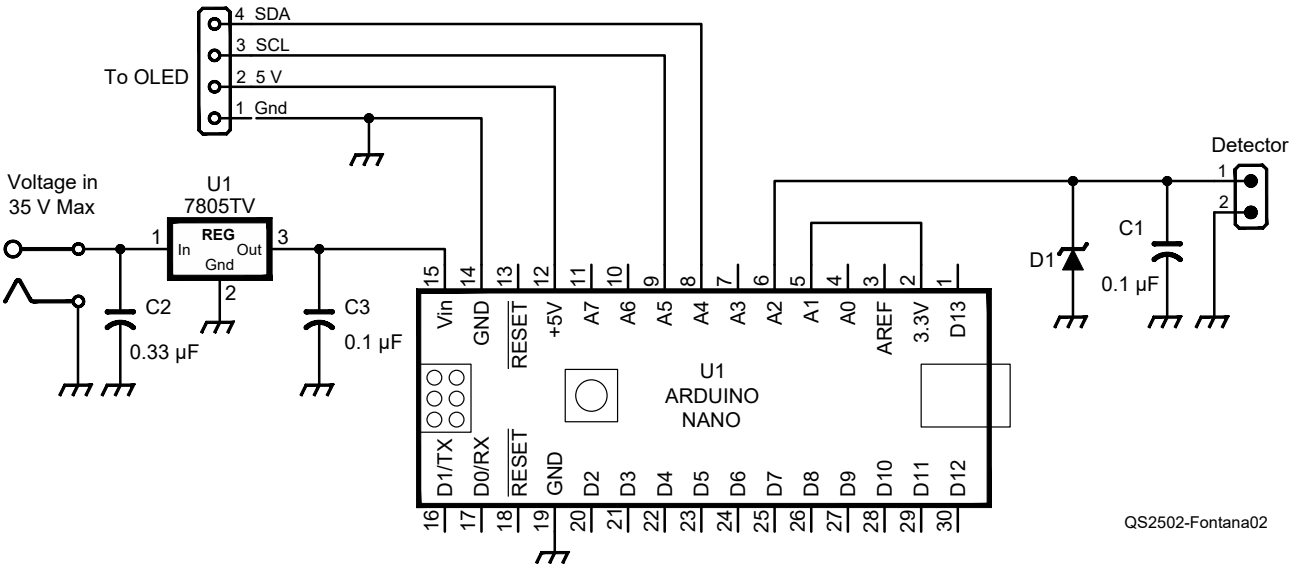


Figure 2 — The Arduino controller and display schematic.

resistor is also mounted on the heatsink. The PCB construction allows for the use of 50 Ω microstrip interconnects, which results in a wide frequency response. The Arduino-based wattmeter portion of the project incorporates automatic calibration of the resistor-divider network using the on-board 3.3 V reference voltage. The resistor-divider network limits the detector voltage into the Arduino's analog inputs. More detailed descriptions of the calibration techniques used and the associated software design can be found at **www.arrl.org/qst-in-depth**. There, you will also find the Gerber files for the detector circuitry and Arduino-based controller PCBs.

Circuit Details

The schematics for the two PCBs are shown in Figures 1 and 2. The assembled PCBs are shown in Figures 3 and 4. The complete parts list for the two boards and pictures of the bare PCBs are shown at **www.arrl.org/qst-in-depth**.

The flange-mounted power resistor mounts to the heatsink using thermal compound. A short length of 50 Ω microstrip connects it to the SMA input connector. Because the heatsink is small, operation at 100 W should probably be limited to no longer than 1 minute. For higher power levels, or for longer transmit durations, you can flip the unit so that the heatsink is on top. If you flip the unit, you must also flip the OLED display. This requires a couple of lines of code change. Add the line "display.setRotation(2);)" after each instance of "display.clearDisplay();"

The completed assembly is shown in Figure 5, which demonstrates the power from a Baofeng UV-5R being

Figure 3 — The assembled dummy load/detector.

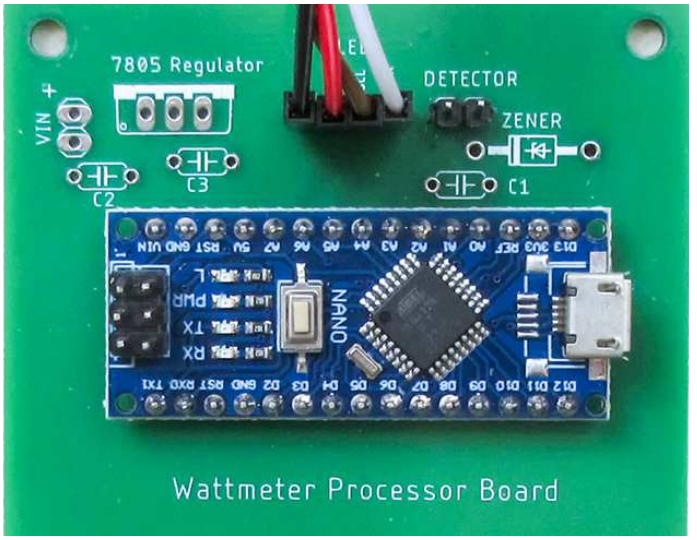


Figure 4 — The assembled Arduino controller.

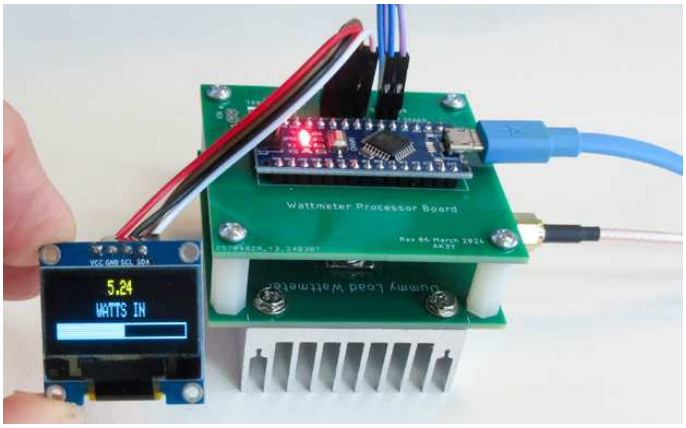


Figure 5 — The assembled and unpackaged dummy load/wattmeter.

measured at 146.52 MHz. The software provides an adaptive bar graph display so that changes in power level can be observed both numerically and graphically — the latter is useful for tuning applications. The lead photo shows the dummy load/wattmeter packaged in a 3D-printed case. The 3D STL files are included at **www.arrl/qst-in-depth**.

Performance and Recap

The measured standing wave ratio was less than 2.0:1 to 1360 MHz and less than 1.5:1 from dc to 755 MHz. Using my Icom IC-9700 as a signal source, I compared this unit to an Agilent 8482A power sensor and HP437B power display on 2 meters, 70 centimeters, and 23 centimeters. The results are shown in Figure 6.

You can see how close the two setups compare, down to the tens of milliwatts (the minimum readable signal level for this unit is approximately 5 mW). On 2 meters, the worst-case error was 1.6% (0.069 dB). On 70 centimeters, the worst-case error was 3.3% (0.14 dB), and on 23 centimeters, it was 9.9% (0.41 dB). However, keep in mind that the Agilent 8482A sensor element has specifications for only ±1.6%, and the HP437B power sensor can add another ±1.5% variation.

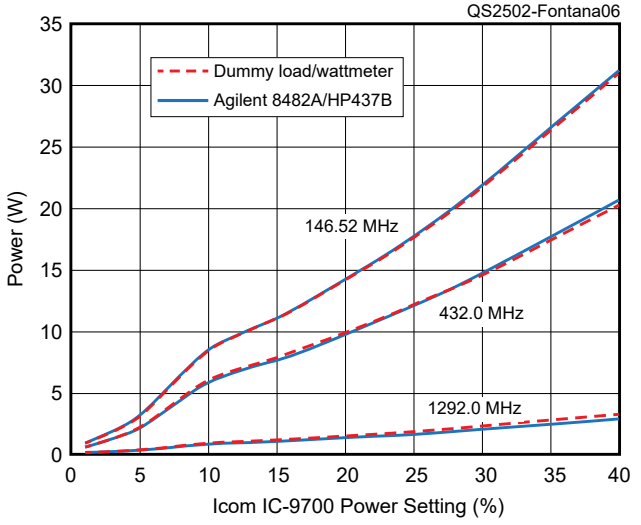
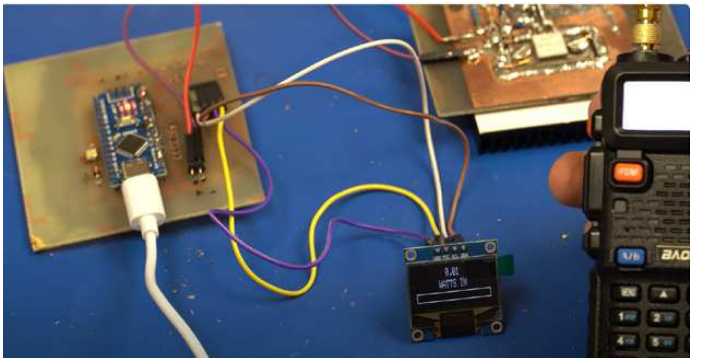


Figure 6 — A power measurement comparison between the dummy load/wattmeter described in this article and the commercial Agilent 8482A sensor.



Click here to watch ARRL Lab Digital RF Engineer John McAuliffe, W1DRF, take you along as he builds a wattmeter.

This article describes a field-portable dummy load/wattmeter that can be used from dc to the 23-centimeter band with an accuracy rivaling that of expensive Agilent test equipment. With the ability to measure power levels down to 10 mW, the unit is ideal for QRP and QRPP operations as well.

See *QST* in Depth for More!

Visit www.arrl.org/qst-in-depth for the following supplementary materials and updates:

- ✓ Calibration techniques for the resistor-divider network and associated software design
- ✓ Gerber files for the detector circuitry and Arduino-based controller PCBs
- ✓ Complete parts lists for the dummy load PCB and the wattmeter PCB
- ✓ Pictures of the bare PCBs
- ✓ STL files for the device's 3D-printed case

All photos provided by the author.

Dr. Robert J. "Bob" Fontana, AK3Y, was first licensed as a Novice in 1965. He holds a PhD in electrical engineering from Stanford University, and he is a Life Fellow of IEEE. Bob worked as an RF and systems engineer at Raytheon and Litton-Amecom. He was also part of the electrical engineering faculty at Carnegie Mellon University. Prior to his retirement, Bob was the president of Multispectral Solutions, Inc., a small business that specialized in the development of ultra-wideband technology for communications, radar, and tracking/positioning applications. Now retired, Bob enjoys working satellites using SSB, CW, FT4, and GMSK packet, as well as operating low power, CW, and digital modes on HF. Bob can be reached at **ak3y@arrl.net**.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

A Square Beam for 20, 15, and 10 Meters

A carbon fiber mast makes this two-element antenna lightweight and easy to deploy.

Ignacy Misztal, NO9E

Everyone knows that beam antennas are useful for pulling stations out of the noise. However, they can take significant time to construct and raise. To solve this issue, here's a square beam that weighs only 10 pounds (with a mast), takes seconds to raise, and performs as well as a hexbeam.

The components of this lightweight beam are a carbon fiber mast that is stronger yet lighter than fiberglass, carbon fiber fishing poles, a light spreader made from an aluminum angle, and thin magnet wires that minimize sag. This design also allows for a way to keep the conductors from touching the carbon fiber.

Beam Geometry

Two-element beams can be constructed in many geometric configurations. For an overview, visit **www.karinya.net/g3txq/wire_beams**. They can be linear (a regular two-element beam), triangular, square, pentagonal, or hexagonal (the popular hexbeam). One of the best choices in terms of gain, front to back (F/B), and standing wave ratio (SWR) is a two-element square beam supporting a **U**-shaped reflector and an **M**-shaped driven element (see Figure 1).

Similar to a hexbeam, the square beam can be made multiband by nesting multiple reflectors and joining multiple driven elements. For a 20-, 15-, and 10-meter beam, the dimensions of the wire conductors are shown in Tables 1 and 2. Figures 1 and 2 show how the wires should be mounted; note that the driven elements are longer than the reflectors due to bending. Because carbon fiber is conductive, the wires must be separated from the poles via cable clamps or similar components. The complete parts list is provided in Table 3. For links to where you can buy the parts, additional construction details, and more photos of the final product, visit **www.arrl.org/qst-in-depth**.

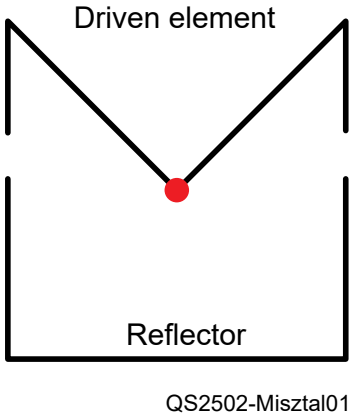


Figure 1 — The G3TXQ two-element square beam configuration.

Step-by-Step Instructions

1. Cut the aluminum angle into three 2-foot pieces. Screw two pieces together in the center to make an **X**. Attach the third piece perpendicular to the other pieces to form an interlocking spreader.

2. Assemble the carbon fiber fishing poles, keeping only 14 feet of the thickest elements. Tape the joints with electrical tape.

3. Attach the poles to the spreader using two stainless-steel hose clamps for each pole.

4. Cut the wires to size and leave 4 extra inches for folding, and then cut sections of rope to close the gaps. Create loops at each end of the rope sections.

5. Push three cable clamps onto each pole. Each one should be separated by about 40 inches. Secure the clamps temporarily with binder paper clips.

6. Push the reflector elements through the holes in the cable clamps. Attach the ropes to the wires.

7. Cut the driven elements in half. Attach each half to the center post. Push the wires through the holes in the cable clamps and attach them to the ropes. Readjust the position of the cable clamps as needed so that the layout is symmetrical and the cables do not sag much.

8. Drive the fence post into the ground. Try to keep it as straight as possible.

Table 1 — Wire Dimensions (Meters)

Meter band	20	15	10
Driven element	10.14	6.87	5.04
Reflector	9.96	6.68	4.98
Insulating gap	1	0.6	0.5

Table 2 — Wire Dimensions (Feet and Inches)

Meter band	20	15	10
Driven element	33'3"	22'6"	16'6"
Reflector	32'8"	21'11"	16'4"
Insulating gap	3'3"	2'	1'7"

9. Attach the nested carbon fiber mast to the fence post with two large stainless-steel clamps or rope.

10. Pull up the smallest element of the mast, insert a guy ring, and attach it to the spreader with two stainless-steel hose clamps.

11. Attach coax to the center insulator and then to the end of the mast. Loop the coax a few times through a clamp-on ferrite to create a balun.

12. Divide the remaining rope into three pieces. Attach a guy rope to the guy ring and find three locations for a guy attachment. If on the ground, screw in the dog tie-out stake. Attach Nite Ize® carabiners and secure them with electrical tape. Insert the other ends of the guy ropes into the carabiners.

13. Extend the mast. If it is not windy, the mast can be extended with the guy ropes loose.

Table 3 — Complete Parts List

Quantity	Part Description
1	33- or 49-foot carbon fiber mast
4	21-foot carbon fiber nesting fishing poles
1	6-foot, 1-inch aluminum angle
1	100 feet of #20 AWG magnet wire
1	Radio Wavz DPH center insulator
1	Type 31 ½-inch clamp-on ferrite
12	Cable clamps in assorted sizes
10	2-inch stainless-steel hose clamps
1	200 feet of ⅛-inch Dacron® or nylon rope
1	Dog tie-out stake
3	Nite Ize® carabiners
1	6-foot fence post

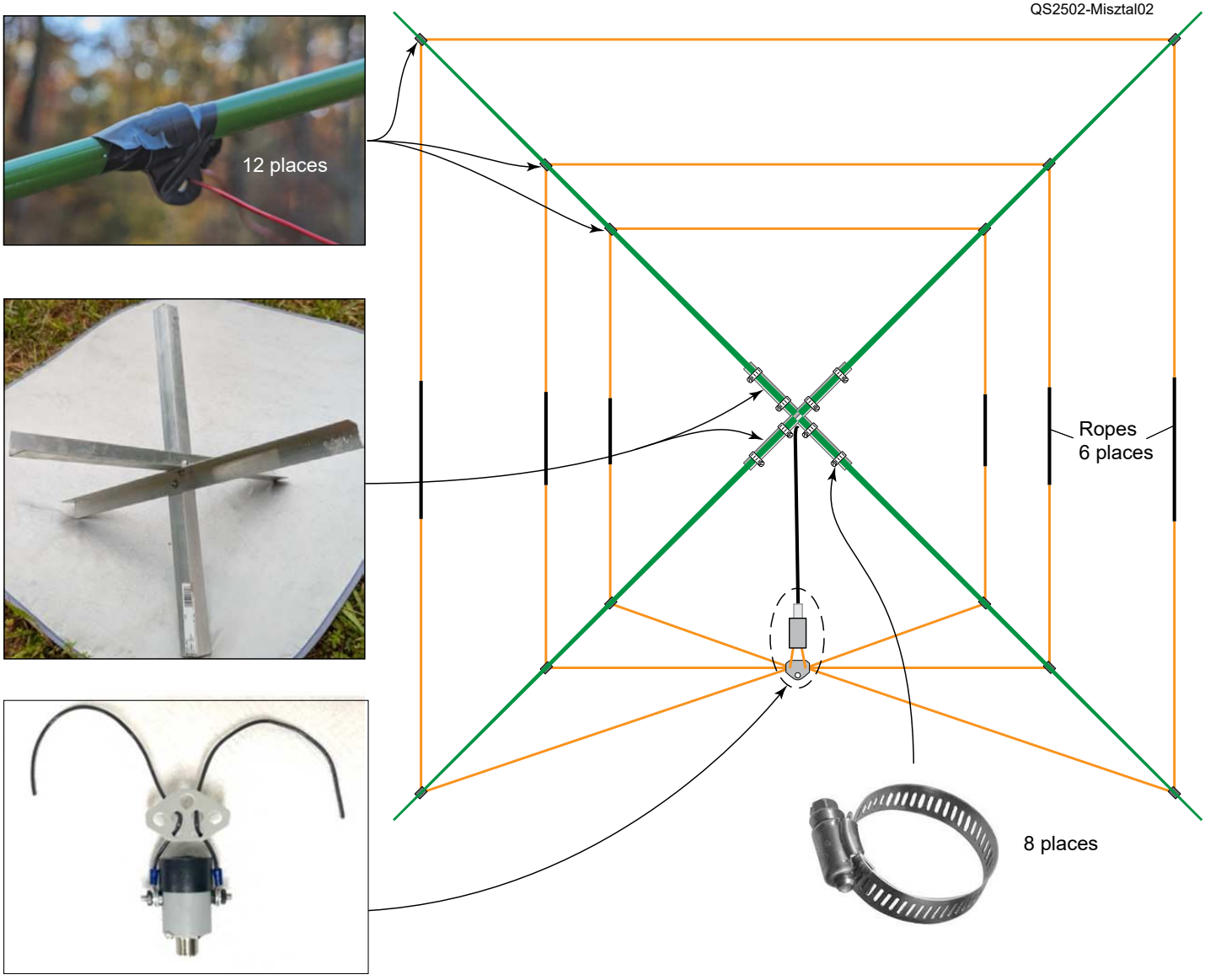


Figure 2 — Part locations for the square beam.

14. Lightly tighten the guy ropes so that the mast does not move.

15. Check F/B and SWR across the bands. If needed, tune the elements as described in the next section.

16. After tuning, secure the cable clamps to the spreaders with electrical tape so they do not move.

Tuning Notes

Tuning is not too critical for performance, as the frequency of best F/B has little impact on gain, and if you use a tuner, losses with an SWR as high as 3:1 will be small. But if you find tuning necessary, it should be done in two stages. First, adjust the reflector for best F/B in the middle of each band. The simplest way is to use a signal generator (e.g., from an antenna analyzer) at least 100 feet away from the beam. Orient the beam backward, and measure the signal strength on a few frequencies. The same can be accomplished by feeding a low-power wide-band noise generator to the antenna and observing the signal on another antenna via a panadapter. Shortening the reflector by 1 inch increases the frequency for best F/B by about 40 kHz on 20 meters, 80 kHz on 15 meters, and 140 kHz on 10 meters. The driven elements should then be adjusted for the lowest SWR in the middle of the band. For simplicity, small adjustments can be made to only one side of the driven element. In my beam, the SWR was less than 2:1 on all of 20 and 15 meters and most of 10 meters. More information about tuning for F/B ratio is provided at **www.arrl.org/qst-in-depth**.

Performance

I have been using this beam fixed to the southeast (the Caribbean) for more than half a year. I generally use it to get contest multipliers, and I'm pleased with its performance.

Compared to a Spiderbeam, which has three bent elements on 20 and 15 meters and four elements on 10 meters, signals from the square beam are only slightly weaker. However, they are much stronger than with an end-fed or vertical antenna. The only problem I experienced (after a long run of contesting at 1.5 kW) was that the cable clamps supporting the driven elements on 10 and 15 meters melted. This was caused by heat from a relatively thin wire. Melting can be prevented by either putting insulation around the wire in the clamp or substituting the #20 AWG wire with #18 AWG wire for 15 and 10 meters only; a heavier wire would cause too much sag on 20 meters.

I have had no other mechanical problems in almost a year, despite occasional strong winds at my location in Georgia. The antenna's strength is due to the flexibility of the elements, as they bend or sag instead of breaking. I am not sure whether the beam would withstand an ice load, but in bad conditions, it can easily be brought down. As a multiplier antenna, it works much better than a dipole. Altogether, the beam costs about $1,000 for a 33-foot version and slightly more for a 50-foot version. It is ideal for DXpeditions, especially because the spreader easily folds with the removal of one screw. It can also be extended to five bands like a typical hexbeam, although that may require more tuning because additional elements influence each other.

See *QST* in Depth for More!

Visit www.arrl.org/qst-in-depth for the following supplementary materials and updates:

- ✓ Links to where you can buy the project parts
- ✓ More photos of the antenna described in this article, with additional construction details
- ✓ Information on tuning for F/B ratio

Ignacy Misztal, NO9E, was first licensed in 1972 as SP8FWB before becoming NO9E in 1986. At 17, he homebrewed an SSB rig using crystals from tank radios. As a 21-year-old in 1976, he homebrewed a transceiver with double crystal filters, VOX, and RF speech processing. Ignacy is now a DX Century Club Honor Roll holder. He enjoys contesting on many bands, including 160 meters, and he often scores first place in Georgia. Ignacy has operated from 60 countries around the world — his goal is to reach 100. He has bought a 26-acre property with no antenna restrictions, primarily for ham radio purposes. You can reach Ignacy at **ignacy.misztal@gmail.com**.

Solutions for Winding Toroids

Four methods to make working with toroids easier.

A finished toroid after spacing the turns.

Jack Purdum, PhD, W8TEE

A longtime ham friend of mine enjoys looking through past issues of *QST* and editions of *The ARRL Handbook* for projects. The only thing that disqualifies a project for him is working with toroids, as winding them can be time-consuming and unforgiving. The turn count must be precise and without overlap, and he has trouble getting an accurate count. It's also difficult for him to hold the core while winding, and his fingertips get sore, especially when using small cores.

Still, there are a lot of nice projects that contain toroids. While most of the hams I know tolerate winding them, very few seem to enjoy the process. Let's see if we can make winding toroids a tad easier using the methods discussed in this article.

Preparing the Wire

Before winding your toroid, it's important to prepare the wire first. Most wire that's used for toroids is small-gauge magnet wire. Kits and Parts sells cores and provides a measurement table for estimating the length of wire needed for different inductances on various cores (**https://kitsandparts.com/xtoroids.html**).

First, cut your wire to the required length and gently manipulate it to remove any kinks. Next, grasp each end of the wire using two sets of pliers and stretch it by gently pulling on the ends. You should end up with a straight piece of wire that doesn't want to re-curl itself.

Magnet wire has a thinly insulated coating, so I use fine-grit sandpaper to remove it from one end of the wire (you can also scrape it away using a box cutter) before I start winding the toroid. I pass the stripped end through the core, leaving about ¾ inch as a pigtail for attaching the toroid to the circuit. I remove the insulation from the other end only after the toroid is finished.

Winding Methods

Once you've prepared your wire, you can begin the winding process. Here are four winding methods to try.

Chopstick

Cut a tapered chopstick in half, secure it in a small vise, and put the chopstick through the toroid core. Now, slide the core onto the chopstick, leaving space to feed the stripped end of the wire through the center of the core. Push the core back down the chopstick to pinch the wire in place, as shown in Figure 1. Next, slide the core up slightly so you can feed the other end of the wire through the center of the core and pull the wire so it's snug. Repeat these steps until the required turns have been added. The chopstick method works best with small cores; larger ones just fall to the base of the chopstick.

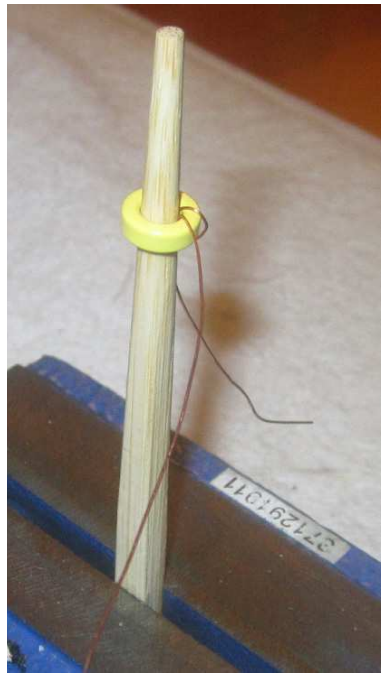


Figure 1 — The chopstick method works best with small toroid cores.

Twine Lock

Thread a 6-inch piece of stout twine through the core of the toroid, pull it taut from below the core, and tightly pinch the twine in a

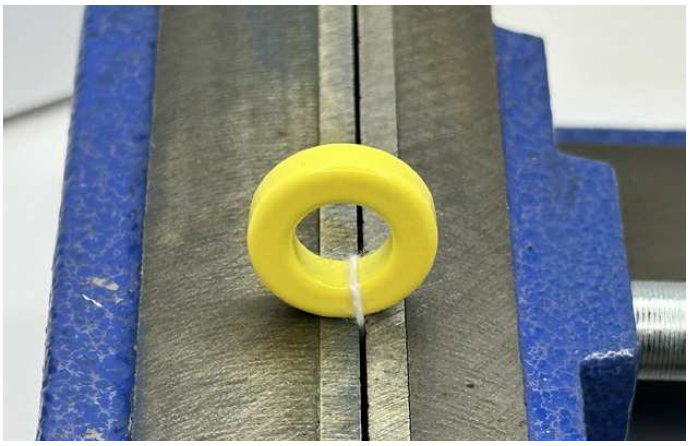


Figure 2 — The twine-lock method can be used with virtually any core size.

vise (see Figure 2). If all the turns won't fit, loosen the vise and rotate the toroid so the twine covers some of the turns that were added earlier. The advantage of the twine-lock method is that virtually any core size can be used.

Crochet Hook

Based on the twine-lock method, the crochet-hook method (introduced to me by Dave Shantz, AJ4XV) uses a crochet hook to route the wire through the core. Once you've pulled the wire snugly against the core and made three turns, push the crochet hook (a 2.5-millimeter hook works great for T37 cores) through the center of the core, snag the wire with the crochet hook, and pull it back through the center of the core (see Figure 3). You will find that you quickly develop a rhythm that allows you to wind most toroids (with fewer than 20 turns) in less than a minute. Be careful not to overlap turns.

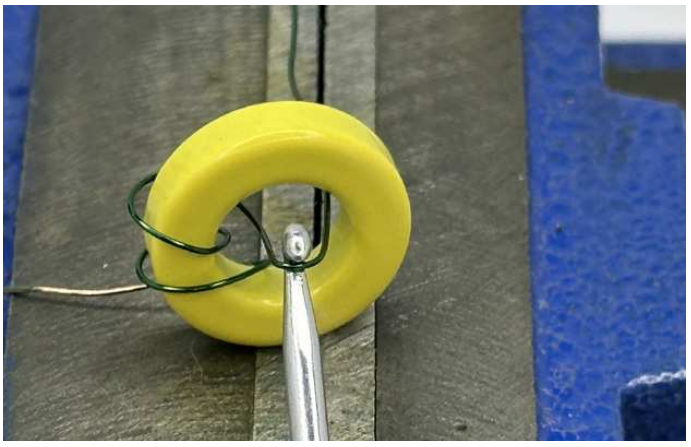


Figure 3 — The crochet-hook method is based on the twine-lock method, but uses a crochet hook to pull the wire through the center of the core.

This method can be modified by simply adding a small holder for the core (see Figure 4). A 3D-printed core holder with hooks at the top holds the core, and two thumb screws allow you to tighten the core holder. Small ridges on the top of each of the holder's hooks keep the core in place more securely. (Thanks to Al Peter, AC8GY, for this tip.) The file for this 3D-printed holder can be found on the *QST* in Depth web page (**www.arrl.org/qst-in-depth**).

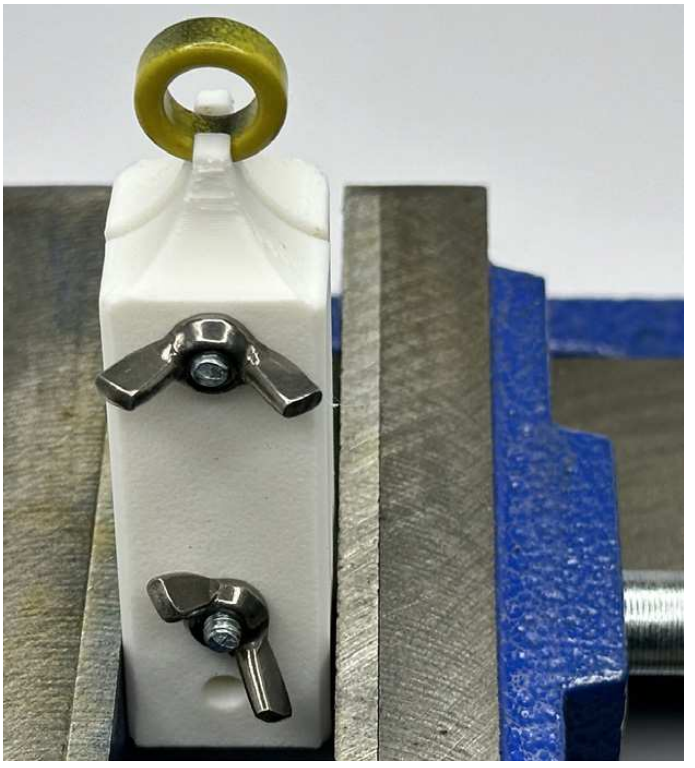


Figure 4 — A 3D-printed toroid core holder can help to stabilize the core while using the crochet-hook method for winding.

Shuttle

When a project involves using very fine wire and making lots of turns, try putting the wire on a shuttle (or a long stick). This can make it easier to pass a long wire through the toroid without it getting tangled. A popsicle stick, or even a wooden matchstick, can be used as a shuttle. You'll want to make notches on both ends of the stick to hold the turns (see Figure 5).

Counting and Spacing Turns

Once you've finished winding the toroid, you should check your turn count to make sure it's correct. Cores that have high turn counts are difficult to verify. I often take a picture of the toroid and zoom in (either on my

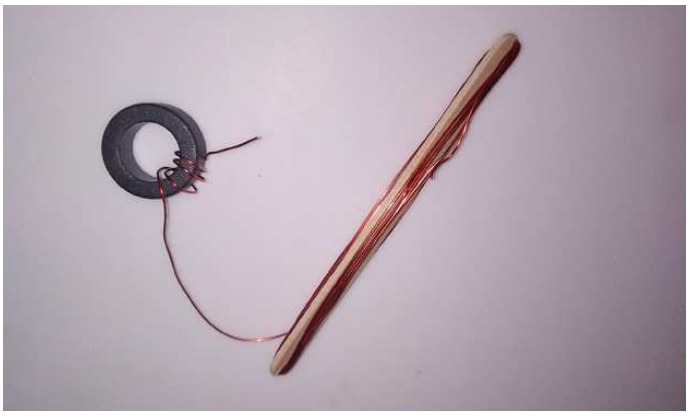


Figure 5 — When making lots of turns with a very fine wire, a shuttle can make it easier to pass the wire through the toroid without tangling the wire.

smartphone or the computer) to see it better. This makes it much easier to count the turns. Once you're sure the turn count is correct, try to evenly space the turns on the core. It should look similar to the toroid in the lead photo when you're done. Trim the leads to the desired length and remove the insulation from the other end of the wire. Read "How To Wind a Toroid" in the March/April 2022 issue of *On the Air* (**www.arrl.org/ota**) for more helpful tips on working with toroids.

Final Thoughts

Winding toroids can be a challenge, but implementing the techniques and methods mentioned here should make the task a bit easier. I hope this article helps you to feel confident enough to try building something that involves toroids.

See *QST* in Depth for More!

Visit www.arrl.org/qst-in-depth for the following supplementary materials and updates:

- ✓ Additional photos
- ✓ Parts list

All photos provided by the author.

Jack Purdum, PhD, W8TEE, was first licensed in 1953 and is an ARRL Life Member. From 1977 to 1994, he had his own software company that specialized in programming tools including the Eco-C88, an MS-DOS C compiler and Microstat, which was an advanced statistics package. In 2009, Jack retired from Purdue University's College of Technology, where he taught various programming courses. He has written dozens of magazine and journal articles, along with 20 books, including *Beginning C for Microcontrollers: Making Electronics Dance with Software,* and co-authoring *Digital Signal Processing and Software Defined Radio* and *Microcontoller Projects for Amateur Radio* with Al Peter, AC8GY. In 2022, the Radio Society of Great Britain awarded Jack (and Peter) the Bennett Prize for their double-double magnetic loop antenna project. Jack is also a co-founder of the Greater Cincinnati Builders Group (**https://groups.io/g/GCBG**). He can be reached at **jjpurdum@yahoo.com**.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

Write for *QST*

The membership journal of ARRL is always open to manuscript submissions from ham radio operators.

QST looks for material that appeals to a broad cross-section of readers within the diverse amateur radio community. Feature articles published in *QST* fall into one of two broad categories: *technical* and *general interest*.

Technical articles outline a construction project or a technical concept. General interest articles are "everything else" that's not technical: recaps of DXpeditions, grid expeditions, or public service activities, or personal accounts of trying a new mode or style of operating — anything relating to operating or the ham radio avocation.

Whether your manuscript has a technical or general focus, a strong "how-to" component will make it stand out. Readers should come away from the article with specific ideas for recreating your experience.

General interest submissions should be in the range of 1,200 – 1,800 words, with 3 – 5 high-resolution images. Technical article submissions may be longer and include more images, as the subject matter requires (for example, if there are step-by-step instructions for a build project). Please submit images as separate attachments (rather than embedded in your manuscript), and include caption information for all images at the end of your manuscript. Send all manuscripts, with images, to **qst@arrl.org**.

For even more information on what *QST* is looking for, and further details on how to submit manuscripts, see our Author Guide at **www.arrl.org/qst-author-guide**.

Pascal Villeneuve, VA2PV, va2pv@arrl.org

Product Review

SharkRF openSPOT4 Pro Multi-Mode Digital Hotspot

Reviewed by John Leonardelli, VE3IPS
ve3ips@gmail.com

Digital mode users can connect their radios to digital mode trust servers via the internet using "RF hotspots." An RF hotspot consists of four main components: a low-power RF transceiver, hardware codecs and software for digital modes and signaling protocols, a software user interface, and an Ethernet or a Wi-Fi interface. Essentially, it acts as a repeater that connects your digital radio using RF to other digital mode users globally over the internet. You will find in Figure 1 a block diagram extracted from the openSPOT4 manual showing the RF hotspot concept.

I have used these devices in various settings, including homes, offices, coffee shops, campsites, vehicles, and even a ferry. Cellular data internet connectivity is also supported through a smartphone's hotspot mode. As a result, I no longer need a physical repeater within range to communicate.

I was seeking a portable, dedicated RF hotspot with a long battery life, designed as an appliance-style unit. Improved audio transcoding was also a key requirement. The SharkRF has new hardware technology, enhanced software, a better user interface, and a built-in battery, so I thought it might be time to upgrade my current RF hotspot solution.

Description

My first SharkRF product was the LAN-based openSPOT. Since then, the product line has evolved significantly, with enhanced features, improved software, and now a portable standalone version. New applications, such as SharkRF Link, extend the user interface to smartphones, tablets, and personal computers, further increasing its versatility.

The SharkRF openSPOT4 is the latest iteration in the openSPOT series of digital voice hotspots. The openSPOT4 Pro is a battery-powered, portable, standalone digital radio internet gateway (hotspot) designed for amateur radio use. With an openSPOT4 Pro, you can connect to digital radio networks using Wi-Fi internet access and your digital transceiver or software application, enabling seamless communication with others.

The openSPOT4 utilizes fully embedded software running on a custom-tailored real-time operating system. The hardware has been redesigned from previous models, featuring a multi-core CPU and an upgraded Wi-Fi module, resulting in significantly faster web interface performance and updated downloads. These enhancements contribute to improved reliability and quicker start-up times.

Designed as a standalone appliance, the openSPOT4 requires no additional components or prerequisites for operations. The Pro version includes hardware transcoding, which enhances audio quality, particularly during cross-mode communications. Additionally, the web interface now leverages WebSockets technology, providing extremely low latency and a host of new real-time features. See Figure 2 for the web interface

Bottom Line

The SharkRF openSPOT4 Pro offers advanced features with cross-mode functionality that establish it as one of the most versatile portable digital hotspots available today.

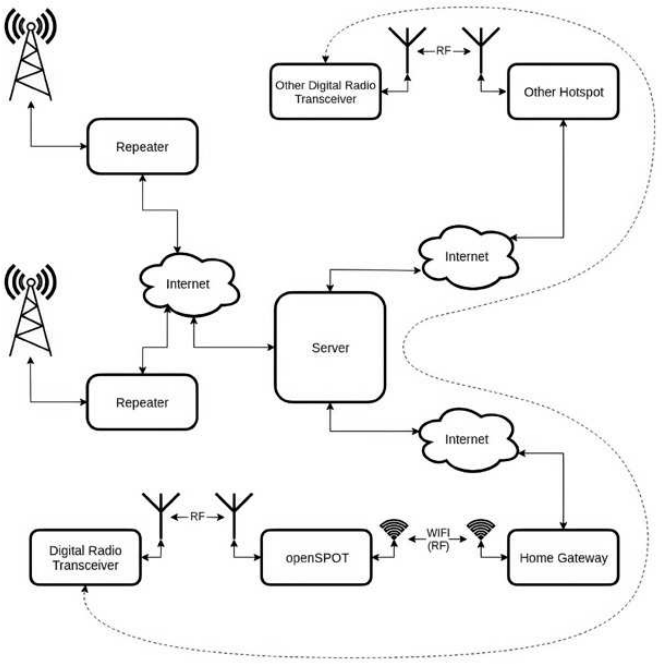


Figure 1 — The openSPOT4 hotspot block diagram (courtesy of SharkRF).

screen capture from a Windows PC. The openSPOT4 combines the latest technology components to deliver an enhanced digital experience. The new feature highlights include: supports for D-STAR cross mode, 10 configuration profiles, a built-in Li-ion battery with up to 30 hours of operation, a USB-C charging port, a UHF-band RF transceiver, an embedded web server, support for call audio playback on the web interface, and the SharkRF Link smartphone application. See Table 1 for the manufacturer's specifications.

The unit is compatible with the following digital protocols and networks: DMR (BrandMeister, DMRplus, DMR-MARC, Phoenix, XLX, TGIF, and others), D-STAR (DCS, REF/DPlus, XRF/DExtra, XLX), System Fusion/C4FM (FCS, YSF Reflector, XLX), NXDN (NXDN Reflector), P25 (P25 Reflector), POCSAG (DAPNET), and APRS messaging and location data forwarding (APRS-IS).

The openSPOT4 Pro supports D-STAR cross mode, enabling you to use your D-STAR transceiver to access DMR, C4FM, NXDN, and P25 networks. Likewise, you can use DMR, C4FM, NXDN, or P25 radios to access D-STAR networks. This versatile feature is a key factor when deciding which openSPOT4 model suits your needs, as it greatly expands your digital mode capability. It's especially valuable for operators on the go, thanks to its portable design, though it also performs well in a home station setup.

The Pro version further enhances functionality with transceiver-less operation through the SharkRF Link application. Your smartphone or computer can serve as the microphone and speaker, so no physical radio is required. This innovative feature unlocks new operating possibilities — all packed into a device that fits comfortably in the palm of your hand.

My review will focus on using the D-STAR cross-mode support not only as an access radio but also to communicate via various reflectors, rooms, talk groups, and other digital modes. I will also evaluate radio-less operation across several platforms using my Google Pixel smartphone.

Design and Build Quality

The openSPOT4 Pro features a built-in battery, a USB-C port with fast charge support, built-in Wi-Fi, and a UHF antenna. It also includes a 1 ppm TCXO for very low bit error rate (BER). The device boasts improved voice transcoding hardware, which powers the D-STAR cross-mode feature. It is lightweight and has a solid build quality with a durable plastic case that can withstand daily use.

A multi-color status LED provides essential information at a glance, including mode, status, and connection details. However, there is no LCD display on the unit itself. Instead, display capabilities are handled by the lightweight and fast SharkRF Link application, which is available for any device using a web-based interface. There is a beeper function that assists in determining the status of the device.

Table 1 — SharkRF openSPOT4 Pro

Manufacturer's Specifications (not tested in the ARRL Lab)

Receive/transmit frequency range:	421 – 458 MHz
RF power output:	Maximum 13 dBm (20 mW, between 433 and 434 MHz)
Oscillator frequency stability:	1 ppm
Wi-Fi-supported protocols:	IEEE 802.11b/g/n
Wi-Fi band:	2.4 GHz
Power supply:	5 V dc through the USB-C port (minimum 2000 mAh)
Power consumption:	Maximum 1 A
Battery:	Integrated 1300 mAh polymer lithium-ion
Dimensions:	3.94 × 2.28 × 0.73 inches
Weight:	2.68 ounces
Operating temperature range:	14 – 113°F

The openSPOT4 supports fast battery charging with USB charger detection through its USB-C port. The unit can draw up to 1 Ah during operations and requires a USB power supply with a minimum of 2 Ah. In my tests, I used a 30 W power cube and a Goal Zero Sherpa power bank for extended use. More portable devices for radio operators should be designed with this type of USB port for enhanced usability and flexibility.

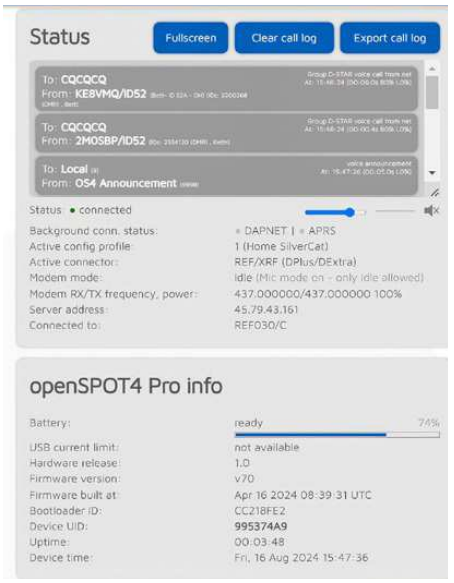


Figure 2 — The openSPOT4 web interface screen shown on a Windows PC.

Setup and User Interface

One of the standout features of the openSPOT4 is its ease of setup. Configuration is handled through a web interface that is both intuitive and user-friendly with a straightforward setup process. I found the instructions easy to follow, making setup and configuration seamless. Firmware updates are also easily managed through the interface, ensuring users have access to the latest features and bug fixes. I was able to access the web interface using my Google smartphone, iPad tablet, and laptop computer. Importantly, no internet connection is needed for the initial setup, as it uses its own web server.

However, you must register your call sign with the digital mode registrars and trust servers for authentication and security. You will need to have a registered DMR ID, which can be obtained from **www.radioid.net**. D-STAR registration can be acquired from D-STAR Gateway (**www.dstargateway.org**), while Yaesu C4FM mode registration is handled within the radio itself.

Initial Setup

First, let's get the basic necessities operating, and then we can check for any software updates to ensure we're running the latest release.

If the device is operating with the factory default configuration, there is an initialization boot-up that lasts about 5 seconds, during which the status LED will begin flashing white.

Once this process is complete, the LED will slowly flash white, indicating that the device has entered access point (AP) mode. In this mode, the openSPOT4 broadcasts its own Wi-Fi network called openSPOT4 AP. The AP mode is the default mode of operation if no Wi-Fi networks are configured. This mode allows you to select and configure a Wi-Fi network by showing which access points are in range and then connect to one. You can enable AP mode at any time by pressing the Wi-Fi button for about 3 seconds until the status LED turns white, signaling that AP mode has started.

To configure the device, connect your web browser device (phone, tablet, or computer) to the Wi-Fi network called openSPOT4 AP. If the initialization setup does not open automatically, you can manually access it by entering **http://192.168.99.1** into your web browser while connected to the openSPOT4 AP network. The initialization routine will display the initial web page.

The **QUICK SETUP** feature simplifies configuring the openSPOT4 with your transceiver and connecting to your preferred network.

First, select your country to set the appropriate UHF band frequencies. Next, choose the Wi-Fi network to connect to (in this case, my home Wi-Fi gateway).

After clicking the **NEXT** button, the openSPOT4 will turn off its openSPOT4 AP Wi-Fi network. The status LED will turn green or alternate between green and orange, indicating that the null connector is active and the device is connected to the selected Wi-Fi network. The **QUICK SETUP** screen will then appear.

Now you will be able to complete the configurations and save them as Profile 1. Enter your call sign, and if already registered, your DMR ID will auto-populate. Choose your web page display as light or dark, and save your information as Profile 1. Set some basic settings, like the frequency, and select the network you want to connect to; in my case, it was REF/XRF reflectors. Select the reflector to connect to (like REF030 C), and click on the **CONNECT** button. My D-STAR radio will hear the openSPOT4 voice announcement of it being connected to reflector "30 Charlie." You can also configure D-STAR APRS to pass along GPS location information with your transmissions.

After the openSPOT4 is connected to the selected reflector server, it is ready to use with your transceiver. The device will flash green and orange, and a **STATUS**

screen will appear on the device's web interface, displaying connectivity and a full range of operating parameters.

The web application is fully featured and very fast, and does not slow down my smartphone or laptop. Users will appreciate the wealth of information available, including last-heard stations in the display window and battery status.

Once I confirmed connectivity to my initial digital mode, I navigated to the **TOOLS** menu to update to the latest software release. The update process completed in just a few minutes.

The **STATUS** page includes two key features: real-time received signal strength indicator (RSSI) and BER charts. The RSSI measures how well your device hears a signal from an access point or router, helping to determine if you have enough signal for a solid wireless connection. In digital transmission, the BER reflects the number of bit errors in a data stream over time, typically caused by noise, interference, or synchronization issues. High BER rates indicate distortion and poor audio quality. These features essentially function as modern digital S-meters, making them valuable for troubleshooting.

Now that the initial configuration is complete, let's move on to setting up the other digital modes using the excellent online user guide.

POCSAG Pager Setup

The openSPOT4 Pro will also send paging messages to your UHF-based pager. See the Decentralized Amateur Paging Network (DAPNET) wiki for more information about POCSAG and DAPNET. I did not set this up, but compatible pagers are about $60, which could lead to some interesting experimentation.

Cross-Mode Use Case

I wanted the ability to use a single radio for multiple digital mode communications. A standout feature of the openSPOT4 Pro is its cross-mode operation using an on-board AMBE codec chip. With this, I can use my D-STAR transceiver to access DMR, C4FM, and NXDN digital networks. The device converts D-STAR mode to transmit and receive in the mode of my choice, so I don't need a Fusion- or DMR-equipped radio — the conversion happens within the openSPOT4 itself.

I quickly connected to the busy D-STAR Reflector 030 C, receiving excellent audio reports. Using the drop-down menus, I accessed an updated list of rooms, easily connecting to the active America Link (32592). YSF and FCS are supported, though WIRES-X is not.

YSF and FCS are two reflector systems used with Yaesu's System Fusion, while WIRES-X and internet multi-linked repeater system (IMRS) are independent networking systems. Hotspots like the openSPOT4 can connect to only YSF or FCS reflectors, but some repeaters have bridges between these reflectors and the WIRES-X network.

One important configuration tip is ensuring that the modem connector is set to your default digital mode — in my case, D-STAR. Otherwise, you won't hear cross-mode traffic. You can configure it to translate all traffic to D-STAR by default.

Navigating between digital modes with just my D-STAR radio as the interface, while letting the openSPOT4 Pro handle the mode translations, has been a joy. The audio quality stands out as superior to other digital radio dongle and hotspot devices.

Configuration Profiles

You can save up to 10 profiles and name them as needed. For example, I have profiles set up for my home Wi-Fi gateway and another for my smartphone hotspot with D-STAR. Each profile can be configured for different digital modes, streamlining your connectivity process and making it easier to switch between setups.

You can also set up different Wi-Fi connections; this is a very useful feature to toggle between your home and mobile internet gateways.

SharkRF Link Application

The openSPOT4 technology simplifies operations with two applications available to access and manage modes, reflectors, status details, and Wi-Fi settings.

SharkRF Link

This allows easy access to the openSPOT4's browser-based web interface. Enter the device's unique identifier (UID; found on the sticker at the bottom of the openSPOT4) and click the **CONNECT** button. This opens a complete browser page for accessing the device at **https://sharkrf.link**. The device UID is saved in your web browser's local storage, so you don't have to enter it again. Just click the **CONNECT** button for quick access. I found the connection and screen refresh speeds to be very fast. Importantly, your computer, tablet, and phone and the openSPOT4 need to be connected to the same network for this to work.

Mobile Apps

For increased flexibility, you can use the Android or iOS versions of the app. I used my Google Pixel 6 as the primary device, downloading the app from the Google

Play Store. My older iPad worked properly with the iOS app, available from the Apple App Store.

The call audio is also playable in the web browser application, as well, for increased functionality. Please note that not all smartphones and tablets are supported, so check compatibility before purchasing your openSPOT4.

Android SharkRF Link Application

In addition to the **https://sharkrf.link** web page, the downloadable SharkRF Link app (see Figure 3) provides convenient access to manage your SharkRF devices using their UIDs and can also function as a transceiver.

The app displays active call status, including the call sign and location of the user currently transmitting. It also features a bit error status indicator, which helps you monitor the impact of the internet lag on audio quality. This makes it easy to identify any connectivity issues.

The **LOG** tab shows recent users on the selected reflector, while the **SWITCH** tab allows you to change the active reflector and configuration profile. The **SETTINGS** menu provides options to adjust microphone gain and gain settings.

Figure 3 — The openSPOT4 SharkRF Link Android application.

The large **PTT** icon at the bottom of the screen enables transmissions without needing a physical radio, which is a fantastic feature for using the openSPOT4 at a club meeting or other events. You can connect via a conference room's Wi-Fi gateway to make contacts or monitor various nets while at work.

The app's interface is clean and straightforward, with fast connectivity to get you operational quickly. The smartphone application, combined with the openSPOT4's cross-mode operation, is a powerful feature that can help you decide if this digital radio hotspot device is right for you.

Use It Everywhere

As long as there is a public Wi-Fi gateway available at your location, you can connect for worldwide digital communications. Simply press the Wi-Fi button in the top left corner for 3 seconds to activate the AP mode, which will bring up the web page interface. From there, scan for the connection point, connect, and the device will link you to the Wi-Fi gateway.

For in-car use, I typically use my Icom mobile, but when I'm portable, such as in a park, I prefer the Icom IC-705. For activities like cutting the lawn or washing the car, I use my Icom handheld to monitor reflectors. The SharkRF Link application on my smartphone allows me to communicate, change reflectors, and adjust settings conveniently.

For travel, all you need to do is pack the openSPOT4 in your pocket. You can stay connected with friends in various locations. Pair your smartphone or notebook-sized laptop with a headset, and you're all set. This setup allows me to leave behind extra equipment like handheld radios, batteries, etc.

Mobile Operation

I needed a portable hotspot solution because the two local clubs managing D-STAR repeaters have shifted their focus to analog repeaters. Mobile operation is essential to me, and I've successfully used my Google Pixel 6 as a Wi-Fi gateway in hotspot mode over the 5G cellular network. With its built-in battery or an easy connection to a USB-C power adapter (ensuring it supports at least 10 W) and a smartphone data plan, I was able to use it effectively in my car.

Using my Icom D-STAR mobile in low-power mode with a memory channel and frequency set up specifically for my openSPOT4 device made digital mode communication as simple as using a local repeater. My cellular provider offers excellent 5G coverage, though RF-based issues like gaps in coverage and underground areas occasionally affect audio quality. Generally, this was not a significant problem. I appreciated the convenience of keeping the openSPOT4 in my cup holder or jacket pocket, avoiding the extra wires required with other hotspot devices.

When I get into the car, I activate the hotspot mode on my smartphone. To connect to the openSPOT4, I press the Wi-Fi button for 3 seconds to activate AP mode and scan for available network connections, specifically the one from my smartphone in hotspot mode. I have this network saved as a profile, so setup is quick with a boot time of just seconds.

Overall, regardless of the access method, the experience was straightforward and manageable, largely due to the user-friendly smartphone interface while mobile. Be careful if you use your cell phone in the car, and make sure you follow the laws if you are driving.

Performance

The performance of the openSPOT4 Pro is impressive. It supports cross-mode operations, allowing seamless connection across different digital modes without noticeable lag or loss in audio quality. The audio remains clear and consistent.

The device's battery operation makes it an excellent choice for portable use, with a battery life rated up to 30 hours. However, battery life can decrease with increased traffic through the device, so it's wise to keep a USB power source handy for extended use.

Overall, the design team's attention to detail and user experience is evident.

Advanced Features

Many advanced features explained in the manual provide a wealth of information. Features like an application programming interface, AutoCal for tweaking, and network tools are interesting ones to employ.

I enabled the CW ID to announce my hotspot with my call sign ID every 10 minutes.

Conclusion

The SharkRF openSPOT4 Pro is a great digital hotspot that offers versatility, reliability, and excellent performance. Its ease of use, combined with multi-mode and cross-mode capabilities, make it a valuable tool for any amateur radio enthusiast. While the price may be on the higher side, the features and high quality justify the investment. The extensive feature set and cross-mode functionality establish it as one of the most versatile and portable RF hotspots available today. Whether you're at home or on the go, the openSPOT4 Pro is a dependable companion for all your digital voice communication needs, no matter what access device you use.

Manufacturer: SharkRF OÜ, Lootsi 8, Tallinn, 10151, Estonia, **www.sharkrf.com**. Price: openSPOT4 Pro, $299; openSPOT4, $210.

Whistler TRX-1 Handheld Communications Receiver

Reviewed by Steve Ford, WB8IMY
ford_steven@sbcglobal.net

Right out of the box, the TRX-1 receiver exudes a sense of ruggedness and durability. The unit is compact at 5.31 × 2.12 × 1.06 inches, and weighs just shy of half a pound, yet it feels solid and well built, with a detachable rubber case that provides a secure grip (more about that case later). For the full specifications and the Lab test results, see Table 2.

The full alphanumeric keypad and backlit monochrome display make navigation and data entry a breeze. The dedicated buttons for functions like scanning, pausing, and skipping add to the scanner's user-friendly design. The buttons and other controls are easy to find and function intuitively. Even the select/enter (**SEL**) button is large and clearly marked.

The TRX-1 package includes a user manual, flexible antenna, USB cable, swivel belt clip, and microSD memory card. The card is pre-installed inside the radio, just below the battery holder. The TRX-1 comes with a

Bottom Line

The Whistler TRX-1's versatility, advanced features, and seamless integration with external devices and software make it a worthy choice for professionals and enthusiasts alike.

Table 2 — Whistler TRX-1, serial number 12309, FCC ID# HSXSC10, firmware version 5.9

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Continuous from 25 through 1300 MHz.	As specified.[1]
Modes: AM, FM, FM-MOT (Motorola), LTR (EF Johnson), CTCSS, DCS, NAC on P25, EDACS wide/narrow (GE/Ericsson/HARRIS), P25-Phase1, X2-TDMA, P25-Phase II, DMR, MOTOTRBO Tier II.	As specified.[2]
Power requirements: 4.8 V dc (4 AA NiMH batteries); 6 V dc (4 AA alkaline batteries); USB power (5 V dc 500 mA). Current draw at 8 Ω speaker at 154.1 MHz on USB power, squelched and backlight off, 170 mA.	Measured batteries, at 3.78 V dc: Max volume; no signal; backlight off 260 mA, squelched; no signal; backlight off 176 mA. USB-powered current draw not tested.
Receiver	**Receiver Dynamic Testing**
Sensitivity: VHF low; 0.2 µV, aircraft (AM); 0.4 µV, high 137 – 174 MHz; 0.3 µV, high 216 – 300 MHz; 0.4 µV, UHF low 300 – 406 MHz; 0.8 µV, UHF/UHF-T 406 – 512 MHz; 0.4 µV, UHF high 764 – 960 MHz; 0.5 µV, 1240 – 1300 MHz; 0.5 µV.	AM, 10 dB S+N/N, 120 MHz 0.46 µV (–114 dBm); FM, 12 dB SINAD[3], 100 MHz 0.33 µV (–117 dBm); 146 MHz 0.22 µV (–120 dBm); 162.4 MHz 0.19 µV (–121 dBm); 223.5 MHz 0.22 µV (–120 dBm); 300 MHz 0.39 µV (–115 dBm); 440 MHz 0.27 µV (–118 dBm); 500 MHz 0.61 µV (–111 dBm); 800 MHz 0.33 µV (–117 dBm); 1270 MHz 0.14 µV (–124 dBm).
Spurious rejection: VHF high at 154.1 MHz, 40 dB.	IF rejection 154.1 MHz, 90 dB; image rejection >57 dB.
Squelch sensitivity: Threshold AM/FM 0.5 µV.	At threshold, 146 MHz, 0.18 µV, 1.50 µV (max), 440 MHz, 0.27 µV, 2.60 µV (max), 223.5 MHz, 0.35 µV, 2.60 µV (max).
S-meter sensitivity: Not specified.	Five bars, 2.3 µV (146 MHz), 3.5 µV (440 MHz), 3.7 µV (223.5 MHz).
Audio output: At 8 Ω internal speaker 500 mW.	Internal speaker not tested, phone jack: 5 mW at 2% THD.

Size (height, width, depth): 5.31 × 2.12 × 1.06 inches (excluding protrusions).
Antenna length: 4.31 inches.
Weight: 12 ounces (with batteries and antenna).

[1] Excludes US cellular frequencies in 800 MHz band.
[2] Only AM and FM modes tested.
[3] Sensitivity increases by 0.02 µV (typical) in NFM mode.

2 GB card, but you can replace it with a larger one, up to 32 GB.

When it comes to batteries, you'll need to furnish your own to power the TRX-1. You can use a set of four AA alkalines or NiMH rechargeables. Just make sure to move the selector switch (inside the battery holder) according to the type you've chosen. If you've opted for NiMH batteries, you can recharge them by using the USB cable to connect the TRX-1 to a suitable 5 V 500 mA power source. Some have stated that the TRX-1 will not recharge NiMH batteries except when using the most robust USB ports, but I didn't find this to be the case. I used a set of NiMH batteries and was able to recharge them from a common USB wall-wart power module. The USB port on my desktop PC was able to recharge them as well, albeit slowly.

In my tests, alkaline batteries provided about 5 hours of continuous monitoring. The NiMH set made it to 7 hours. When battery power is running low, the TRX-1 issues an audible warning to get your attention.

Versatility and Compatibility

One of the standout features of the TRX-1 is its ability to decode a wide range of analog and digital transmissions from 25 to 1300 MHz. It seamlessly handles Motorola P25 Phase I and Phase II, DMR, and NXDN systems. This level of versatility is a boon for anyone involved in public safety or amateur radio, or anyone who is simply interested in keeping tabs on various radio communications.

The TRX-1 is compatible with a comprehensive list of system types, including Motorola (MOTOTRBO) Type

I, Type II, Type III Hybrid, SmartZone, and EDACS systems, among others. FM (narrow and wide) and AM are available as well. This broad compatibility ensures that the TRX-1 can be used effectively in virtually any region.

Object-Oriented Scanning

The user manual devotes a page near the beginning to explaining Whistler's approach to managing the large database contained within the TRX-1. If you're not familiar with database structures, the manual does not attempt to teach you. Instead, it briefly describes what amounts to an object-oriented database.

To avoid making the eyes of most readers glaze over, the manual explains that the TRX-1 treats collections of information, such as the details about a municipal police communication system, as individual objects. An object contains everything that is known about a particular system (at least from a communications standpoint). A "scannable object," as Whistler calls it, is any chunk of information, including frequencies, talk groups, radio service labels, etc. The idea is to make it so that all objects can easily and quickly share information, or at least be linked to each other.

And why should you care? When you are programming the TRX-1, you are doing so through an object-oriented user interface. Whistler designed this interface to make programming as straightforward as possible, so it helps to have at least a limited understanding of how (and why) they use this approach.

With that said, it is hard to say how much programming you might be doing. The TRX-1 employs the massive Radio Reference database (**www.radioreference.com**), so the receiver arrives pre-programmed. Even so, I added some amateur radio repeaters that were not included in the list.

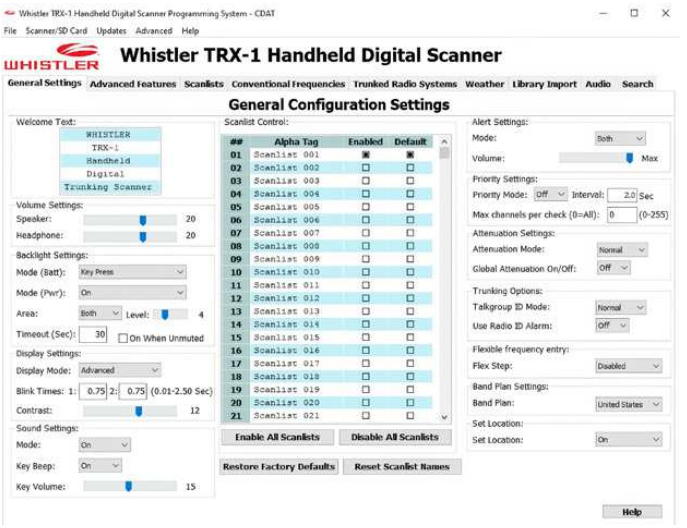


Figure 4 — Whistler's *EZ Scan* software makes programming the TRX-1 as easy as possible.

The interface does a decent job of streamlining the memory editing process, but it is much easier to accomplish with Whistler's free *EZ Scan* software for Windows (see Figure 4). *EZ Scan* will update firmware, load updated databases, and even allow you to make individual database modifications. I just connected the USB cable between the TRX-1 and my computer, and *EZ Scan* took it from there. It treats the TRX-1 like an external hard drive and assigns a drive letter. Unlike similar applications, you never have to worry about determining which COM port the software needs to see.

Out of the Box

Although you can power the TRX-1 through the USB cable, that obviously defeats the purpose of having a handheld radio. So, the first step upon unboxing the radio is to install the batteries.

This seems like a straightforward procedure, and it would be if not for the previously mentioned rubber case that surrounds most of the radio. The case is firmly attached, and the manual does not describe how to remove it. However, you can't gain access to the battery compartment without first removing the case.

I wrestled (almost literally) with the case for several minutes, pulling and tugging with little result. Fearing I might damage the radio, I turned to the internet for advice. Sure enough, there is a YouTube video that describes how to remove the case (**https://youtu.be/iUa1AnF-_fI?si=K7c-DBeFijk-m33m**). The technique amounts to forcefully stretching and pulling at the bottom of the case while pushing the radio upward from below. Fortunately, if you use rechargeable batteries you won't have to go through this exercise very often.

The next step is to connect the supplied flexible antenna to the TRX-1. I was surprised to see that the TRX-1 sported a female BNC antenna jack. It has been years since I've seen a BNC jack on a handheld radio. The antenna itself is rather short, at only 4 inches in length. This is sufficient for strong local signals, but I'd recommend a longer antenna for improved performance.

The knob at the top of the radio serves as the squelch adjustment. To adjust volume, you must use the multifunction button below the display.

Figure 5 — The TRX-1 offers several ways to set your monitoring location.

Figure 6 — NOAA weather radio is accessible with a single push on the front-panel **WX** button.

Adjacent to the knob you'll find the 3.5-millimeter headphone jack. Nothing out of the ordinary there — with one exception. The TRX-1 has the ability to route baseband audio (picked off just after the discriminator) to the headphone jack. It made me think of those amateur FM transceivers that include baseband audio outputs for 9600-baud data communication. In the case of the TRX-1, this feature might come in handy for specialized software decoders. Discriminator output is activated through the menu system, though I did not test it for this review.

Easy Listening

Settling down with the receiver and the user manual, it didn't take long to discover that the TRX-1 is packed with advanced features that elevate it above many other scanners on the market. For example, the built-in spectrum sweeper is particularly well designed, allowing you to quickly scan frequency ranges for nearby transmissions. Once a transmission is detected, the scanner automatically tunes to that frequency, ensuring that you never miss important communications.

The audio recording functionality is another feature highlight, enabling you to record received audio from selected objects and searches directly to the microSD card. With the ability to record more than 50 hours of audio on the 2 GB card, you can capture and archive important transmissions for later review. The recorded audio can be replayed on the device itself or transferred to a PC for archiving. Additionally, the TRX-1 can be programmed to wake up and start scanning and recording at specific times each day.

Along the top of the TRX-1 your eyes are drawn to a sizable LED indicator. At first, I assumed it was there to indicate the use of external power, or perhaps squelch activity, but I was wrong. Instead, it functions as a multicolored visual alerting device! You can program various "objects" to trigger customizable flashing displays whenever a signal is received. Imagine that you have the TRX-1 set to monitor your local fire dispatch, but you have the audio muted while you are working on a kit project at your workbench. With a visual alert programmed for that object, you will see a madly flashing light whenever the frequency is active. You can even program flash patterns and colors for different services — one for fire, one for police, and another for your favorite ham repeater. In addition, the backlight and LED flash patterns can be customized, providing yet another layer of visual alerting. If you don't care about visual alerts, the TRX-1 provides audio alerts as well.

Another of the TRX-1's notable features is the ability to create up to 200 customizable scan lists and special SKYWARN lists, allowing users to group and organize objects (frequencies, talk groups, etc.) in countless combinations for efficient scanning. Scan lists are analogous to favorites lists. You can set your location (see Figure 5) and the TRX-1 will scan only those objects located within your area, whether that is a city, county, or zip code.

Impressions

The TRX-1 seemed sensitive, even when using the short flexible antenna. However, attaching a longer antenna made a noticeable difference. Digital signals that would break up when listening with the short antenna were solid with a longer antenna. Of course, connecting the TRX-1 to my outdoor antenna brought an avalanche of signals — so many strong signals, in fact, that I often had to resort to the attenuator (**ATT**) button to reduce the front-end gain.

When I wanted to access National Oceanic and Atmospheric Administration (NOAA) weather radio, it was as easy as tapping the **WX** button. The TRX-1 would instantly scan the NOAA channels and lock onto the strongest signal (see Figure 6). The radio also supports detailed Specific Area Message Encoding (SAME) alerts. SAME allows National Weather Service broadcasters to designate specific counties affected and the specific type of watch or warning involved (tornado, flood, hurricane, etc.).

I found the monochrome display to be fully readable, even outdoors, so long as the backlight was on. The default backlight time is only 5 seconds; I preferred 30 seconds. All it took was a quick menu adjustment to change it.

While the Whistler TRX-1 is not a new product, it remains prominent in the world of digital trunking scanners. Its versatility, advanced features, and seamless integration with external devices and software make it a worthy choice for professionals and enthusiasts alike.

I would be remiss if I didn't point out the TRX-1 is not a beginner-level radio. In addition to its object-oriented scanning architecture, the radio is complex in other ways. The TRX-1 is not a receiver that most hams will be able to enjoy fully without investing in some significant self-instruction and experimentation.

And while the price may induce sticker shock among some, note that unlike some radios, the TRX-1 does not require additional purchases to implement select features.

Manufacturer: Whistler Group, 557 North 13th St., Rogers, AR 72756, **www.whistlergroup.com**. Price: $569.99.

ARRL Dual-Band Momobeam 6/10-Meter Beam Antenna

Reviewed by Phil Salas, AD5X
ad5x@arrl.net

With the current Solar Cycle 25, both the 10- and 6-meter bands are having some nice openings. Enter the new ARRL Dual-Band Momobeam. This antenna is produced for ARRL by Momobeam, an Italian manufacturer. It consists of a two-element 6-meter Yagi and a 10-meter Moxon. It is lightweight and mast-mountable, and includes extra hardware for fixed and portable use.

The Moxon antenna, named after Les Moxon, G6XN, is a two-element directional antenna. The 6-meter portion of the antenna consists of a two-element Yagi. The advantage of the Moxon 10-meter antenna is that the 6-meter Yagi fits nicely within the footprint of the Moxon. The antenna specifications are given in Table 3.

The Momobeam arrived in a 6 × 6 × 5.33-inch package weighing about 12 pounds. Figures 7 and 8 show the boxed and unboxed components. The assembly manual and additional video resources can be found at **www.arrl.org/beam**. Assembly was quite easy, as all parts are clearly marked, and there are no measurements to make. You have a choice to use standard

nuts or wing nuts (both are supplied). The wing nuts make assembly/disassembly easy if you are using this antenna for portable operation. I chose to use the wing nuts because they will make it easier for me to disassemble the antenna. There was also a bag of spare hardware, in case you lose any, and even a wrench to tighten the nuts. The coax feed consists of a short coax pigtail terminated in lugs on the antenna side, and a female UHF connector on the feed-line side. The coax connects to the 10-meter driven element only. The 6-meter driven element is excited via the coupled-resonator technique described in numerous publications, including *QST*. It took me a little more than 1 hour to complete the antenna assembly. You can see the final antenna in Figure 9. It is quite light as I am holding it off the ground with one hand.

Bottom Line

The ARRL Momobeam 6- and 10-meter antenna is lightweight and easy to assemble. It is perfect for home or portable operation.

Table 3 — ARRL Dual-Band Momobeam 6/10-Meter Beam Antenna

Manufacturer's Specifications (not tested in the ARRL Lab)

	10 Meters	6 Meters
Gain 20 meters above ground:	11.46 dBi	11.6 dBi
Gain-free space:	4.09 dBd	3.83 dBd
Front/back ratio:	20 dB	10 dB
Power handling:	1500 W	1500 W
Elements:	2 (Moxon)	2 (Yagi-Uda)
SWR <1.5:1:	28 – 28.8 MHz	50 – 50.6 MHz
Turning radius:	6.56 feet	
Mast diameter:	1.5 to 2 inches. A smaller mast can be used for portable or temporary use, but is not recommended for permanent installations.	
Wind area:	2.15 square feet	
Wind survival:	60 mph	
RF input:	SO-239 female attached to coaxial pigtail	
Weight:	10.8 pounds	

Next came mounting the antenna on my roof (see the lead photo). This was easily a one-person job due to the light weight of the antenna. And the light weight and low wind loading means that this antenna can easily be rotated with an inexpensive TV rotator.

Figure 7 — The packaged Momobeam beside the author, Phil Salas, AD5X.

I first made a broadband standing wave ratio (SWR) sweep, as shown in Figure 10. You can clearly see the 10- and 6-meter resonances. Figures 11 and 12 show the SWR plots for the 10- and 6-meter bands, respectively. As you can see, the antenna favors the most popular sections of these two bands.

Operation

Now it was time for some fun on the bands. As you can see in the lead photo, I currently don't have a rotator. As I am located in the central part of the country, I just pointed the antenna east for a week and then west for a week. There were numerous QSO opportunities on 10 meters, and a few QSO opportunities on 6 meters during these times. All worked well at 100 W. However, when I went to 500 W with my KPA500 amplifier, I got a lot of garbled audio into my home intercom system when operating on 6-meter SSB. The coaxial cable drapes across my roof and the intercom wires are strung across the attic just under the roof and just inches away from the coax.

This problem is by no means unique or specific to the antenna. To solve this issue I built a common-mode

Figure 8 — The unboxed ARRL Momobeam components.

Figure 9 — The completed antenna build.

choke consisting of about five to six turns of RG8X wound through an FT240-61 toroid (see Figure 13) and installed this at the pigtail feed. With my VNA, I measured 16 dB common-mode rejection on 10 meters, and 18 dB common-mode rejection on 6 meters. This completely solved my intercom problem.

Conclusion

The Momobeam 6- and 10-meter antenna from ARRL is very easy to assemble and mount. There is no tuning needed, as the markings on all components result in resonance in the popular sections of the two bands. As you just have two elements on the two bands, the beamwidth is pretty broad and the gain is not that high at 4 dBd. However, every little bit helps!

Manufacturer: Momobeam, 508 Contrada Berbarello, Marsala, TP 91025 Italy, **www.momobeam.com**. Available exclusively from ARRL (**www.arrl.org/beam**). Price: $329.95 (includes ground shipping in the US).

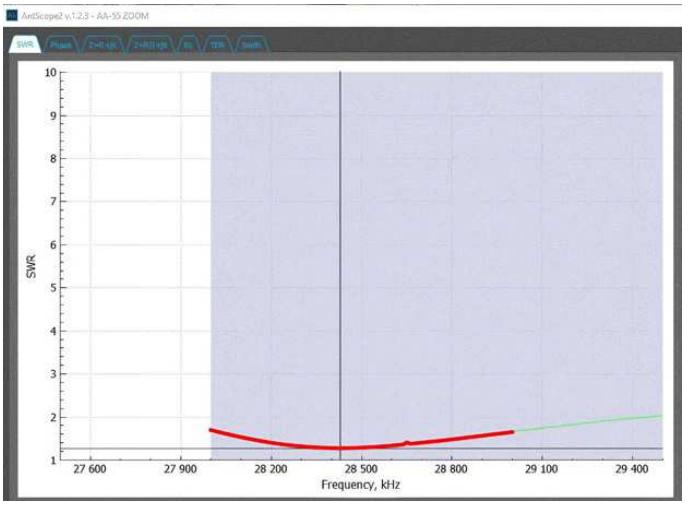


Figure 11 — The ARRL Momobeam 10-meter SWR sweep.

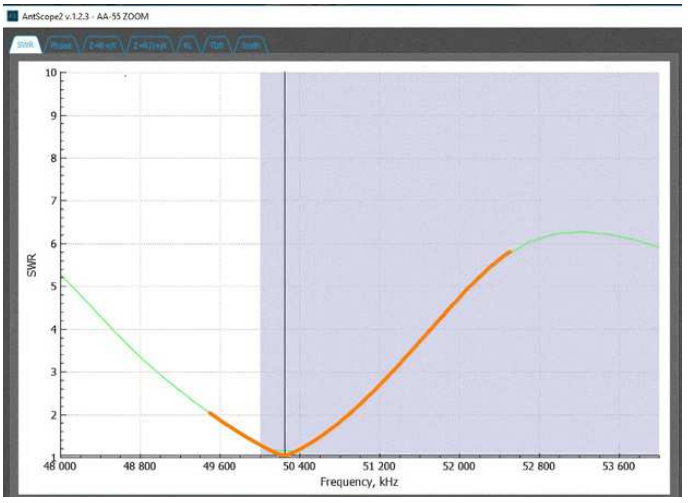


Figure 12 — The ARRL Momobeam 6-meter SWR sweep.

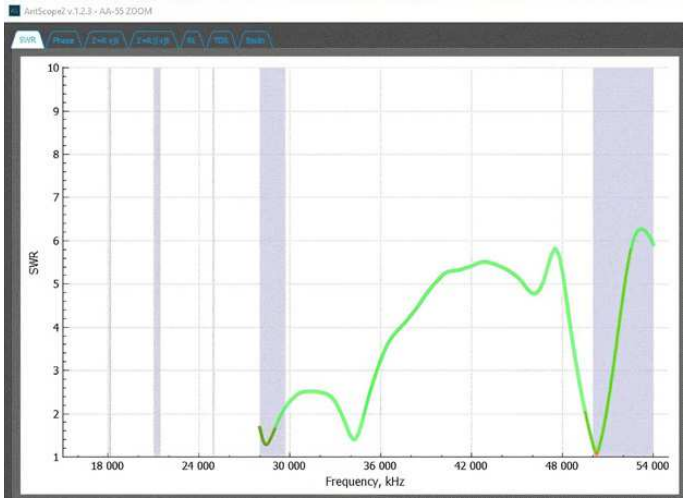


Figure 10 — Broadband SWR sweep of the Momobeam antenna.

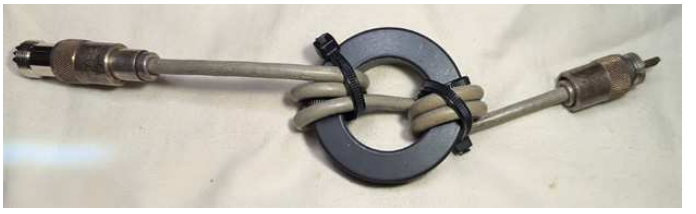


Figure 13 — Homemade common-mode choke.

Dave Casler, KEØOG, askdave@gmail.com

Ask Dave

Get more information from the "*QST:* Ask Dave" YouTube playlist at **https://bit.ly/3z2MBMI**.

Ionosondes, Budget Gear, and Antennas

The Diagonal on the Waterfall

Q Bob Pyke, K6ECM, asks: There appears to be a frequency-hopping transmitter running left to right across my software-defined radio's (SDR's) spectrum display, creating a diagonal dotted line in the waterfall. Do you have any ideas about the source and what its use is? The signal is quite strong.

A You are watching an ionospheric sounder (ionosonde) at work. A sounder is like radar that shoots straight up. It starts at a low frequency, sends a pulse skyward, listens to and measures the reflection, and then repeats this at a slightly higher frequency. The entire process is automated. Those who use these sounders don't care what frequencies they use because they're on any given frequency for a fraction of a second. They scan all of HF and not just the ham bands. The transmitted pulse is not reflected straight down; it gets bounced to many other places, including your antenna.

Until the wide use of waterfall displays in ham radio, hams would hear a momentary beep during a contact. Now that we have waterfall displays, we can watch these sounders across the entire spectrum, as shown in Figure 1.

There are many sounders around the world because ionospheric reflection is different everywhere. You may see one of these ascending trails every few minutes.

Organizations use these sounding results to create ionograms. Many organizations have ionosondes and create ionograms because the ionosphere can vary widely from place and time. There are a number of HF users besides hams who carry out point-to-point communications and need this data to choose frequencies.

Tuning an End-Fed Dipole

Q George Brecosky, KC3TBI, asks: I've built a 49:1 unun, and I'm putting together an end-fed antenna to cover 10 through 80 meters. It will be suspended at 35 feet. When I fold back the part of the antenna that's too long, where does the antenna really end? What band should I start tuning at?

A New hams often ask me your first question. The direct answer is that the antenna ends at the point where it folds back. But in practice, the antenna's electrical length is affected by its physical length and thickness, its height above the ground, nearby objects (particularly metal objects), the quality of the ground, and possibly, the phase of the moon.

Yes, if you construct the dipole from the insulated wire, you can still fold the excess wire back on itself. I made a video demonstrating this, which you can view at **https://youtu.be/8mRTGwwUM0I**. After you put up the antenna, you should take standing wave ratio (SWR) measurements and adjust the wire length.

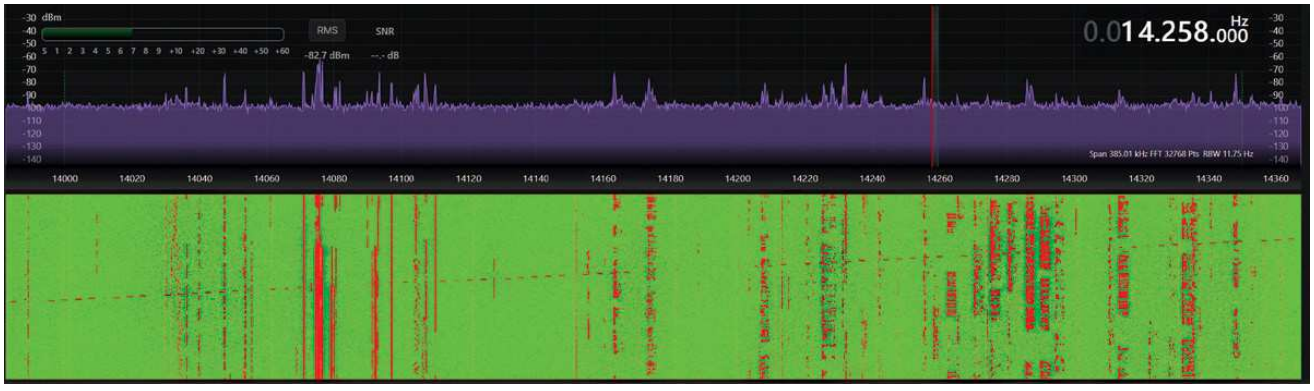


Figure 1 — This waterfall was captured using SDRplay RSPduo. The display covers all of 20 meters. The spectrum display is in blue. The red lines are the signals received. They are vertical because they don't change frequency. The green is the RF background with no signal. The diagonal red dotted line across the RF background is the ionosonde. It moves across the display because its frequency changes with every pulse. The x-axis of the waterfall is the frequency. The y-axis is the time, with the most recent time at the top. The data rolls down the display as it ages until it finally disappears at the bottom. Many HF transceivers these days offer spectrum and waterfall displays.

The end-fed dipole antenna has two issues. First, it often has a connection point for a counterpoise. If you keep your overall feed line at around 30 feet or more, the outside of the outer conductor acts as the counterpoise. Be sure that the outer layer of the coax is grounded where it enters the house. This will stop the current outside the coax shield from getting into your station. Second, there is only one way to tune the antenna — by adjusting its overall physical length. Any changes in the antenna's length affect every band. You will have to check the SWR on every band and juggle the length for the best results. Generally, this will mean tuning the antenna for the low part of the 80-meter band. The key point here is that the antenna often has a somewhat higher SWR on some bands. This is easily remedied by using the antenna tuner built into your radio.

Note that an 80-meter end-fed half-wave antenna will probably tune well on the 80-, 40-, 20-, 15-, and 10-meter bands. You may also find that it will perform reasonably well on 30, 17, and 12 meters. It most likely will not perform well on 60 meters.

Alternatives to Expensive HF Rigs

Q Ed Platt, KC1DYK, asks: I know people who are interested in ham radio but are turned off by the expense, particularly for HF transceivers. Are there inexpensive HF options such as kits, low-power or single-band equipment, or something else for beginners you recommend?

A For a new Technician, a wide variety of handheld and base (mobile) radios are available at a reasonable cost. Once you move to the General- and Extra-class licenses, the situation changes. The cost of getting on HF can be significantly higher.

For hams who are new Generals and Extras, I recommend starting with a 100 W radio. HF radios with less power are abundant and their prices are attractive, but low-power operating takes extra skill and can be frustrating for an HF newcomer. I also recommend a simple wire antenna.

Yes, there are radios that can give you 100 W at prices comparatively lower than other equipment. One is the Icom IC-718, which retails for less than $900. The Yaesu FT-891 is a compact transceiver that can also be used as a mobile or portable rig that sells for less than $700.

One option is to have another ham help you set up a station with their borrowed equipment. This gets you on the air and gives you a chance to make the big leap from VHF to HF. If you like what you have after several weeks of on-the-air experience, you may want to offer to purchase the equipment.

Other than a radio, an HF station also includes the power supply, transmission line, ground rod, lightning suppressor, and antenna. I have an HF station reference design posted on my website at **https://dcasler.com/reference**. It's based around the Icom IC-7300 (a bit more expensive) and uses a simple off-center-fed dipole from MFJ, which is less than $100. It has specific product suggestions for every element of an HF station to refer to when selecting what you will include in your station, but this is just a reference. The ARRL Store also has an end-fed half-wave antenna kit for less than $100 (**https://home.arrl.org/action/Store/Product-Details/productId/133267**). Many hams also choose to make their own dipoles or fan dipoles, which can be made for very little expense.

Common-Mode Choke Not Required for Verticals

Q Greg De Hoogh, N6PM, asks: I hear it's important to have a common-mode current choke at the feed point at the base of a ground-mounted vertical antenna with radials — the same is often done for dipoles. Is this really necessary?

A No. Although installing a choke will not cause any harm, a classic resonant ground-mounted vertical with radials is an unbalanced antenna. It can be directly fed with coax. The center lead of the coax attaches to the vertical, and the coax shield connects to the center point where all the radials come together. Some folks like to add a ground rod where the radials come together, which is also not a problem.

There is a minor caveat. Your coax is 50 W, but the classic vertical feed-point impedance is about 36 W over perfect ground. So, if you have a very good radial system, your SWR could be as much as 1.4:1. Of course, most hams don't have a perfect radial system, so ground losses will add to the 36 W radiation resistance, thereby reducing the SWR. In any case, these impedances are well within what a built-in tuner can handle. Also, because of the impedance mismatch, some common-mode current may be outside the coax shield. Be sure your coax shield is grounded before it enters your home, preferably by way of a lightning suppression device on your ground rod.

Send your questions to **askdave@arrl.org**. I answer some questions here, and some via videos on my YouTube channel (**www.youtube.com/davecasler**), or during my weekly livestream on Thursdays at 6:45 to 8:15 PM Mountain Time on my channel.

POTA Prep

An unsuccessful first activation sets up a ham for success on the second try.

Alan Kline, KB1DJ

The Newport County Radio Club was planning to activate all the parks in Rhode Island. To get ready for this Parks on the Air (POTA) event, I planned a trip to activate the Block Island National Wildlife Refuge (K-0513) because I didn't have any POTA experience other than Field Day.

To prepare, I read ARRL's *The Parks on the Air® Book*, and then I found the Ham Radio 2.0 YouTube channel, which helped a lot. I also reached out to local hams like Jim Garman, KC1QDZ, who only operates POTA due to restrictions where he lives, and Bill Desjardins, W1ZY, because he has some great presentations of his experiments with temporary verticals near the ocean and marshes.

Portable Equipment Preparations

Recently, I restored a 2004 Jeep Wrangler TJ to make it a ham radio emergency vehicle. I added an OPTIMA® high-performance battery and a higher-output 160 A alternator. The first radio I installed was an Icom IC-V3500 high-power 2-meter radio with a dual-band Comet CSB-770A whip antenna mounted on the driver's side cowl. I needed a 60 W output and a higher-gain antenna because the repeater reception is spotty in southern Rhode Island.

The only way to get to Block Island is via the Block Island Ferry. Getting on the ferry was an experience because the boat loaded from only one end. As I was backing up my vehicle, I realized my Comet antenna was too tall and was scraping the ferry's ceiling, so I had to take it down.

The hour-long ferry ride was uneventful. Once we arrived, I drove around and explored, and then headed to the Block Island National Wildlife Refuge to enjoy my lunch. Once I got there, I was underwhelmed because there were no picnic tables or trees to provide shade.

I set up my station on the back of my Jeep, where I installed a drop-down table for this portable/mobile operation. Even though most of my research showed POTA operations with small, homemade go-kits, I opted to bring just about everything I had in my low-power arsenal because I didn't know what to expect.

I brought a uBITx V6 HF/software-defined radio transceiver that I built from a kit, a Xiegu G90, and a Yaesu FT-891 compact mobile radio. Instead of putting the radios in an Apache hard plastic case, I opted for a

A close-up of Alan's portable operating setup for his first activation.

sturdy aluminum suitcase that I use as a musician to carry my guitar accessories. This was much safer because I took the Jeep over some nasty ruts on dirt roads.

Both rear corners above the taillights have brackets designed to support antennas. The one on the left is not permanently wired to the cab because it is for a CB or hamstick antenna. I can run coax, possibly to a picnic table (if there were any here). The bracket on the right has a coaxial cable that runs to the center console, to use in the future with the FT-891. I had plenty of room on the drop-down table for the low-power transceiver and a Bioenno Power 12 V 20 Ah battery that the G90 used.

To be better organized and make sure I brought everything for this trip, I put all the accessories for the G90 transceiver and various coax connectors in plastic sandwich bags. I labeled the bags with my DYMO label maker.

I brought hamsticks for 20 and 40 meters, an Opek HVT-600 antenna, a 20-meter dipole, and a 17-foot telescopic whip. I also brought a Yaesu ATAS-120A, but it didn't load because it had a bad ground. Additionally, I took an extra 20 feet of coax, a 100-foot hank of nylon rope, and a lead fishing weight to throw over any trees (if there were any).

I brought a few pieces of odd equipment, including an Allen wrench set for the hamsticks, a pair of small vise grips, a screwdriver, a stenographer pad of paper, pens, headphones, and of course, the manuals for the radios.

At the last moment, I took an MFJ-223 compact antenna analyzer and a battery-powered MFJ standing wave ratio (SWR) analyzer. The SWR analyzer proved to be the best of all the accessories I took because I used it to check the SWRs of all the antennas to learn that most of them were too long and needed to be adjusted. Next time, I will use only the MFJ-223.

First Activation Attempt

It was 2 PM, which was the worst possible time for band conditions. Because I was already there and set up, I tried to call "CQ POTA" on 20 and 40 meters using both radios and various antenna combinations.

I could hear stations on both bands, but they were mostly down in the mud. I almost managed to work a maritime mobile sailboat. I appreciate why many POTA stations use CW or digital modes (I like CW, but carpal tunnel in both hands makes it difficult). After about 2 hours, I quit and took an earlier ferry home, but before I left, I used a camera tripod and added an antenna

Plastic sandwich bags labeled with the names of the equipment inside them and the DYMO label maker.

mount to adjust the hamsticks. I used some junk wire and made some crude radials.

I encountered some issues, including the poor band conditions, the audio from the low-power radio needed improvement, the headphones I brought didn't do the job well, and I needed to practice my Powerpole technique because I reversed the FT-891 direct current connection.

I learned quite a bit from this adventure. First, do not go to Block Island during the tourist season; it is too crowded. Next, if you drive your vehicle for any activation, you can take as much or as little gear as you want. Finally, no matter what rig you use, practice at home to learn all the functions of the radio. I plan on going back in the off-season to try again.

Second Activation Attempt

When I went back to Block Island, I planned a very different trip. Due to daylight saving time, I left early in the afternoon and arranged to spend the night. I set up my tent and camping gear at the Sandsland Scout Reservation. It is not part of the Block Island National Wildlife Refuge area, but 20 and 10 meters were active all night, and 20 W worked great.

In the morning, I added a 17-foot wire with an alligator clip to the top of the 17-foot whip antenna and threw it over a tree. I was able to check into the WB2JKJ net on 7.238 MHz, and accepted Joe Fairclough's honest 3 × 2 report!

Alan Kline, KB1DJ, with his Jeep setup and radio gear for his second activation.

I told 10 ham radio friends from all over the US to look for me on 10, 20, and 40 meters at various times of the day. On 10 and 20 meters, I worked my old neighbor and tower-climbing mentor, Bill Bithell, N1BB, and my cousin Aaron Fishman, K1BAF. Finally, on 10 and 40 meters, I worked Rick Blumberg, W1HZ, in Phoenix, Arizona, with whom I went to high school. He planted the seed to operate fast-scan television on 432 MHz. So, the second trip was not a bust.

For this follow-up trip, besides taking the extra camping gear, I pared down the equipment to the following:

- A Xiegu transceiver
- A Bioenno battery with the correct direct-current cables
- A ground spike for a 17-foot vertical
- Ground radials
- An MFJ-223 antenna analyzer
- Hamsticks for 20 and 40 meters with short coaxial cable

Both trips were definitely worth it! They were tiring but fun, and I look forward to my next adventure. I plan to try POTA/maritime mobile from my pontoon boat. In the meantime, I need to learn how to log.

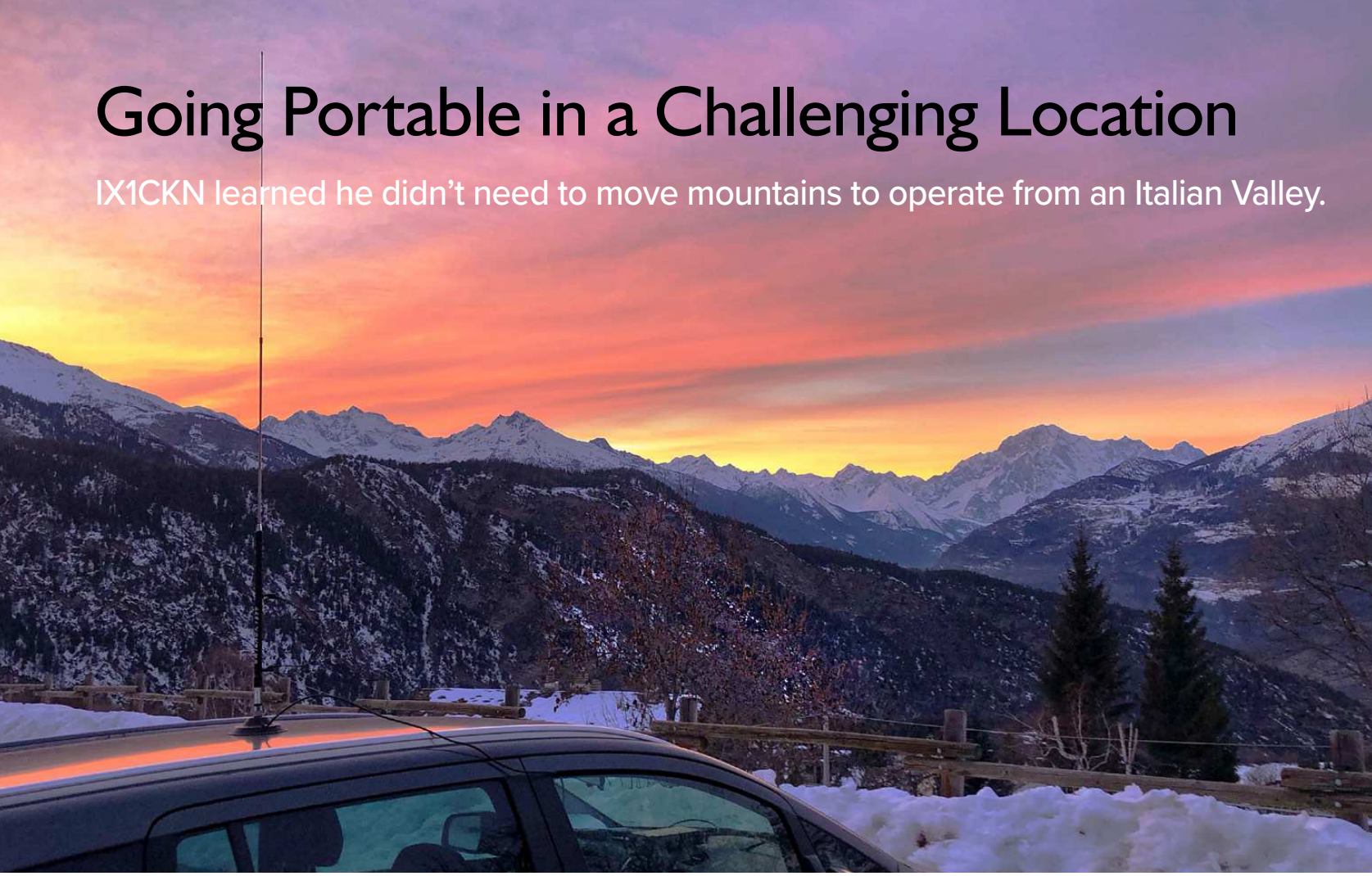
All photos provided by the author.

Alan D. Kline, KB1DJ, was first licensed in the early 1970s as WB1FOD. He now holds an Extra-class license. Alan is an ARRL Life Member and has been involved in Scouting for more than 40 years. He owns Lynn Ladder & Scaffolding Co. He can be reached at **kb1dj@yahoo.com**.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

Going Portable in a Challenging Location

IX1CKN learned he didn't need to move mountains to operate from an Italian Valley.



The author's Falcon Outback 1899 attached to his car in Ozein, a historic village west of Aosta and on the way to the Cogne Valley. To the right, Mont Blanc is partially visible.

Christian Diemoz, IX1CKN

If you ask fellow hams to name the Italian amateur radio prefixes, most will respond with IZ, IK, and IW without hesitation. Those more "in the know" might recognize IU, IT9, and ISØ. If you're not just in the company of ragchewing enthusiasts, you might also hear IV3 and IN3.

Now, raise the bar and ask about IX1. Many are not familiar with this prefix, which corresponds to the autonomous region of Valle d'Aosta. The reason for its relatively low recognition is easily explained — it is the smallest Italian region, a borderland in the far northwest with a population of about 123,000.

A Valley in the Western Alps

The official number of hams in Valle d'Aosta is not straightforward, but there are thought to be fewer than 100 currently. Filter out those who are now inactive or not interested in HF operating, and you'll end up with around 20 IX1 hams.

Four mountains exceeding 4,000 meters above sea level surround the valley: Mont Blanc, Matterhorn, Gran Paradiso, and Monte Rosa (see the map on the next page). The average elevation of the region is more than 2,100 meters above sea level, and only 20% is less than 1,500 meters above sea level.

After years of being a shortwave listener, I became licensed as IX1CKN in July 2011. Unfortunately, the orography of Valle d'Aosta makes operating considerably difficult.

The Gaps in the Log

Despite my location, I was determined to start my DX Century Club (DXCC) journey. My first station was a simple homebrew fishing rod vertical and a Codan 9360 located in Aosta (just under 700 meters in altitude, in grid JN35pr), the region's capital city. I quickly acquired my first 100 entities thanks to digital modes. In those first 6 months of activity, however, I realized that North American stations were largely absent from my contact log (see Table 1) even though solar activity was peaking and I participated in the CQ WPX and CQ World Wide (CQ WW) Contests. The trend continued in subsequent years.

Table 1 — 2011 – 2018 Contact Log

Year	Total Contacts	Total US Contacts	Total Canadian Contacts
2011 (6 months)	672	0	1
2012	>1,000	10	2
2013	>1,000	14	0
2014	>1,000	20	1
2015	471	5	2
2016	250	0	0
2017	150	0	0
2018	393	5	0

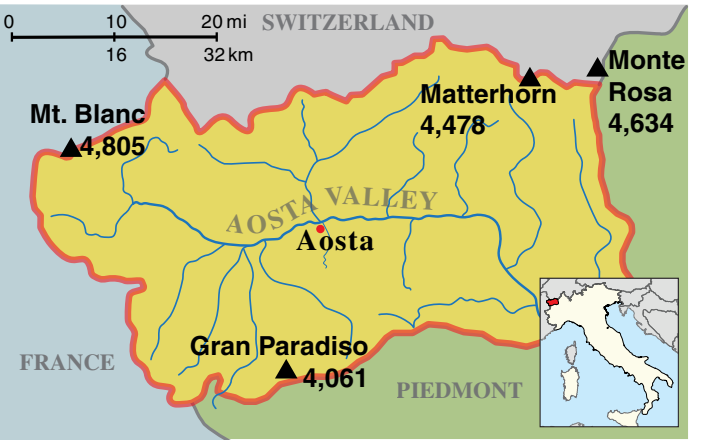
I struggled to accept the situation, especially because it was different toward the opposite side of the world. I had abundant VK and ZL prefixes in my log. On PSK, I even worked ZL7, the entity farthest from my station (almost 19,000 kilometers away). South America was not hard to reach either, as I had numerous contacts with those in call sign regions PY and LU. I discussed my findings with a couple of other hams in my vicinity. They both said they work stations in the US and Canada with no trouble, and that they even use ARRL contests to hunt states for the Worked All States Award.

Finding the Problem, and a Portable Solution

So, why was it different for me? The key factor was that I live on the northern side of the valley floor, at 670 meters above sea level. I am also right beside the slopes of Mont Fallère, a 3,061-meter peak that completely blocks my path to the west and northwest. I had thought that antenna trajectory would be less important for HF operation than for VHF and above, but I was wrong. Even with a high takeoff angle, I couldn't get through to North America.

In 2022, I decided to troubleshoot. If I couldn't get rid of the mountain, I thought I could try to work around it. The main thing I needed was a portable station. I managed to find a used Xiegu G90 at an affordable price, and then I began my search for a favorable spot toward North America. This was not an easy task in a valley with more than 10 converging lateral valleys, the bottoms of which were packed with meters of solid rock. I recalled some previous excursions I had taken for portable FM DXing, and a suitable place came to mind.

I turned my focus west of Aosta and to the heights above Aymavilles, a locality at the entrance of the Cogne Valley. Once, while walking from Ozein, a historic wine-making village, toward Pointe de la Pierre (in grid JN35pp), I had received distinct signals from French transmitters in Lyon. The reason was evident:



A simplified map of Valle d'Aosta.

the route develops on the upper part of the valley ridge and becomes a terrace on the west side of my region. It seemed to be just what I needed. The only thing left to do was try.

Putting It to the Test

On October 9, 2022, I loaded my G90, a 16 Ah battery, and a Falcon Outback 1899 into my car. I drove to Ozein and parked in a lot that was 1,365 meters above sea level. It felt like being on a balcony with a beautiful view of Mont Blanc.

I connected my setup and chose 28 MHz, thinking that I could achieve better results if propagation was on my side. I turned on the transceiver, and I was instantly impressed by the amount of signal curves on the waterfall. The accents of the other operators told me that they were all North American stations. I wasted no time responding to their calls. Several of them heard me, and I was running only 15 W.

I returned home that evening with 14 US contacts in my log. While this was a success, I knew it could have been an episodic opening, and that one operation wasn't enough proof that this new spot was the solution. With the same equipment, I went back on October 30 during the SSB portion of the CQ WW Contest. I operated again on 28 MHz and was met with the same results as during my first attempt. In one afternoon, I made 46 North American contacts; some were as far west as Arizona.

Exploring Options Pays Off

After a bit of investigating, I finally overcame my tough operating location by going portable. In December 2022, I participated in the ARRL 10-meter Contest and made 32 North American contacts. I finished the year with 111 US contacts and 13 Canadian contacts in total — more than I had made in the previous 11

The author's portable setup while activating Riserva Naturale Tzatelet Provincial Park (IT-0120) for POTA.

years combined! In March 2023, I again operated low power on 15 meters to work another 80 US stations during the ARRL International DX Contest. I uploaded a video of that experience at **www.youtube.com/watch?v=xnph3Cn9fK0**. I finished 2023 with 176 US and 16 Canadian contacts. As I write this article in December 2024, I am up to an exceptional 261 US contacts and 26 Canadian contacts. I didn't change my setup much this year, other than adding a ¼-wave vertical with radials that I put on the ground beside my car. I am now close to earning the Worked All States Award — only nine remain.

My newfound interest in portable operating has also gotten me invested in Parks on the Air (POTA®). I often activate various parks around Valle d'Aosta — much to the excitement of overseas park hunters. Around 20% of my 2024 North American contacts were made while I was activating POTA parks, especially Riserva Naturale Tzatelet Provincial Park (IT-0120) and Zona Umida di Les Iles di Saint-Marcel (IT-0395).

It's important to try different approaches before jumping to conclusions in ham radio. An easy solution may be hidden in plain sight. For example, it could be worth rethinking your operating location instead of writing off your equipment or assuming that the bands are dead. Getting on the air from somewhere other than my home station showed me that problem-solving is a big part of the hobby. After years of frustration, learning how to easily contact North America opened new horizons for me, and the sense of accomplishment is amazing.

If I didn't live in the shadow of Fallère, I probably wouldn't have been able to discover these aspects of our incomparable hobby. Think about it next time you hear an IX1 on the radio.

All photos provided by the author.

Christian Diemoz, IX1CKN, has always been interested in radio and was a shortwave listener for much of his life. He first became licensed in 2010, and he holds the call signs IX1CKN, KC2YXI, and HB9EYT. Christian works as an online journalist. When he's not in his home shack, he can be found operating portable at his local POTA parks. You can reach Christian at **ix1ckn@gmail.com**.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

Connecting Youth with Ham Radio in the Classroom

Two Staten Island Technical High School students share how an ARRL ETP School Station Grant helped to enhance the engineering curriculum by immersing them in hands-on radio activities.

Ashley Li and Olivia Wojtczak

SITHS Engineering Teacher Everton Henriques, KD2ZZT (on the right), assists Olivia Wojtczak (on the left) and Ashley Li (in the middle) with building a directional antenna.

Amateur radio initiatives at Staten Island Technical High School (SITHS) began in fall 2022 and wouldn't have been possible without the help of ARRL and the ham radio community. After attending one of ARRL's Teachers Institute on Wireless Technology sessions (**www.arrl.org/teachers-institute-on-wireless-technology**), one of our engineering teachers, Mr. Henriques, KD2ZZT, added concepts to our existing engineering curriculum (see the sidebar "SITHS's Engineering Program Evolution" for more information on how the program began and where it's headed) that support the ham radio license exam training and post-licensure activities. Additionally, our school received an ARRL Education & Technology Program (ETP) School Station Grant (**www.arrl.org/etp-grants**) that brought our experiences with amateur radio to the next level. The ARRL Education and Technology program, which supports the Teachers Institute on Wireless Technology and School Station Grants, is funded entirely by donors to ARRL.

Hands-On Coursework

The main purpose of introducing amateur radio into SITHS was to improve communications and telemetry applications for the school's solar car team — Seagull Solar, WSØLAR — which consists of a group of students and staff from different schools who are building a street-legal solar-powered car to eventually race in the Solar Car Challenge at the Texas Motor Speedway.

Now, we not only have a radio station at our school, but some students were also inspired to start a ham radio club for our school — SITHS Amateur Radio League (SITHS ARL), WS1THS — to further develop their ham radio practice. Currently, our station is set up for the use of student-dedicated communication frequencies and Staten Island's local repeater. Because it's a high-powered system, it allows for communication anywhere in the building. It also serves as an occasional crossband repeater and is mobile for off-grid satellite contacts.

SITHS ARL offers opportunities for students interested in learning about amateur radio applications beyond those offered in class. The radio club is also available for students who are unable to participate in any of the classes offered in the engineering curriculum. We are all enamored with the Geochron, which shows just about every Earth condition in real time on SITHS ARL's 4K station screen, thanks to ARRL's ETP School Station Grant!

So far, we've designed and built directional antennas for foxhunting and contacting the International Space

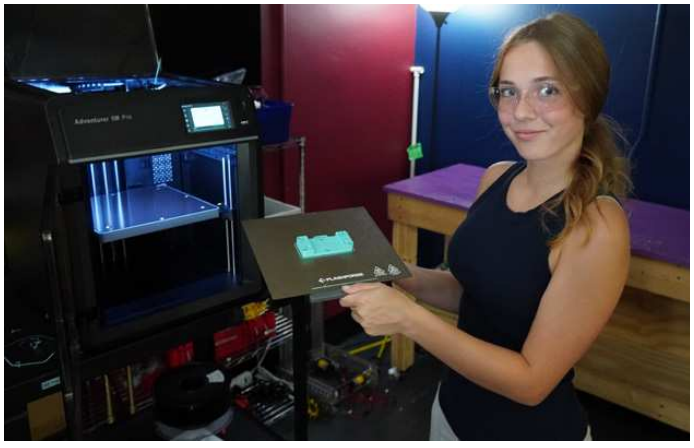
SITHS's Engineering Program Evolution

By SITHS Engineering Teacher Everton Henriques, KD2ZZT

The engineering curriculum at SITHS was originally intended to provide students with practical activities that address the concepts of the FCC licensure exams. After attending ARRL's Teachers Institute on Wireless Technology (TI), I learned additional ways to incorporate ham radio into the curriculum, while still supporting training for the exams, that added post-license activities. TI trained me for the Amateur Extra-class license, and I learned how to effectively promote foxhunting, satellite contacts, and HF applications with students.

The Staten Island Technical High School engineering program has received generous support from the ARRL Education and Technology Program School Station Grant and mentoring from several local hams. Resources like amateur radio equipment are important, but the time that local hams have donated has also been invaluable. Mentoring from local hams provides an opportunity for students to engage in a good amount of discussion about operating skills for young hams. This has helped students grow and has facilitated their abilities to take the lead on specific diverse projects.

I would like to thank Steve Goodgame, K5ATA; Ed Wilson, N2XDD; Wayne Greene, KB4DSF, and the network of teachers I gained from TI for providing me with the resources, training, support, and great ideas that my students now enjoy. If teachers are looking to bring radio and wireless technology into their classrooms, but also need to learn about it themselves, then I highly recommend attending ARRL TI! *Editor's note: For more information on TI, including the program's plans for the future, read "ARRL Teachers Institute: Looking Back, Moving Forward" by Steve Goodgame, K5ATA, in the January 2025 issue.*



Olivia Wojtczak built a part for one of her projects using the 3D printer that SITHS students in the engineering program have access to.

Station (ISS) and participated in skill-based labs applicable to ham radio that include soldering, building electronic terminal connections, learning about standing wave ratio (SWR), learning how to read power measurements, and understanding practical uses for amateur radio. We also engage in radio-related independent studies, including learning about radio programming and participating in simplex, repeater, and local net operations.

While this program is geared toward engaging students with fun projects and activities that introduce amateur radio practices, our understanding of radio extends far beyond the classroom. For example, having a ham radio license and knowledge of electronics and engineering concepts allows us to figure out how to communicate in areas where cell phones don't work or aren't permitted.

Growing Connections with Ham Radio

Ham radio immediately formed a community within our school. Students are excited to broaden their communication skills, acquire a real FCC license, and develop their practical circuit theory. Not only does ham radio create a sense of unity within our school by bringing together students with common interests, it also connects us to radio enthusiasts who are miles away.

Mr. Henriques said:

> We've received a great deal of support from ARRL members and staff, including ARRL Education and Learning Manager Steve Goodgame, K5ATA, and ARRL Hudson Division Director Ed Wilson, N2XDD, who both visited our school and ran the testing for our most recent batch of students. In that single day, they inspired several students to pursue future upgrades. Also, Ed was kind enough to donate an antenna kit to the club for students to explore the world of HF — it's a wonderful community!

What Classmates Are Saying

Amateur radio has opened us up to new opportunities (such as contacting satellites and learning about long-distance communications and wireless data transmissions) that can benefit us in a variety of careers, like those in the mechanical, electrical, and general mechatronic fields. Here's what some of our classmates have to say:

Lori Gallo, KE2CMD

> Getting my ham radio license has been a fun and engaging way to combine physics and engineering principles. While [it] was a part of our curriculum to get licensed, the skills I'm learning through ham radio are equally useful outside the classroom, both for hobby and emergency purposes.

Erica Yu, KE2CMO

I'm now able to join a network of engineers, innovators, and enthusiasts and collaborate with others to change the world!

Aaron Ye, KE2CMN

I'm amazed by the many opportunities that come with ham radio, because radio operations are the fundamental backbone to many existing technologies and communications.

Excitement for the Future

Since the amateur radio initiatives at SITHS began in 2022, 265 students have earned their license, including 228 Technician-class licensees, 27 General-class licensees, and 10 Amateur Extra-class licensees, and these numbers continue to grow.

We're all hoping that SITHS can host an ARISS contact with astronauts on the ISS. It's anticipated that the application process will begin in the spring of 2025.

Whether the knowledge acquired from this curriculum propels us toward our desired career paths or simply provides us with a new hobby, there is no doubt that ham radio offers us a unique experience that can be useful in the future.

The Staten Island Technical High School is now a Model School for the ARRL Education and Technology Program, setting the example for other schools interested in pursuing amateur radio to complement their STEM education program. These results and opportunities are possible due to the generous support of ARRL donors to the Education and Technology Program, which supports the entirely donor-funded ARRL Teacher's Institute on Wireless Technology. In 2024, several donors have stepped up to fully fund a seat for a teacher to attend, and others have donated what they can in smaller amounts. All of these gifts are an investment in the future of amateur radio. Those interested in making a difference in programs like this can contact the ARRL Development Office or give online at **www.arrl.org/GiveToSTEM**.

Watch students Kangxi Yang, KE2DYE, and Shiphi Panicker, AA1SP, talk about ham radio in the digital edition of *QST* (**www.arrl.org/qst**).

Photos provided by Steve Goodgame, K5ATA.

Ashley Li and Olivia Wojtczak are students at SITHS. They initiated the creation of the school's student-run newspaper, *The Tech Times* — Ashley is the editor-in-chief and Olivia is the managing editor. They recruited a team of talented writers to work on the periodical, which is distributed to the student body and staff monthly. Ashley is an aspiring civil engineer and hopes to receive her amateur radio license in the upcoming year.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

Strays

QST Congratulates...

Jim Schmidt, WA4VOC, for receiving the Bullitt Amateur Radio Society's (B.A.R.S.), KY4KY, 2024 Amateur of the Year Award. Jim has provided a complete satellite system for B.A.R.S.'s Field Day operation for numerous years to help the club achieve many first-, second-, and third-category finishes. He has presented at meetings and is always available to answer questions.

Each year, B.A.R.S. selects one of its members as the Amateur of the Year. They look for someone who shares their knowledge, equipment, and time with club members and activities.

Jim Schmidt, WA4VOC, pictured with his 2024 Amateur of the Year Award. [Bud Sohl, KC4WQ, photo]

Celebrating Marconi, Remotely

Four operators on two continents used one station to honor Marconi's contributions to radio.

Rob Noakes, VE3PCP

While amateur radio operators regularly explore new technologies, we cannot forget to celebrate the accomplishments of those who came before us. One such accomplishment happened on December 12, 1901, in Newfoundland, Canada. Guglielmo Marconi raised an antenna with a kite, and this antenna received the first transatlantic signals ever sent via radio waves. The signals came from Marconi's high-powered wireless transmitting station in Cornwall, England, 3,500 kilometers (about 2,100 miles) away.

Rob Noakes', VE3PCP, station used during the event.

On December 12, 2023, the Inverhuron Ham Radio Club conducted an all-day operation using our remote station in Inverhuron, Ontario, Canada, to honor the 122nd anniversary of the event. We operated with our club call sign, VA3XXT. This was our first operation with this call sign.

Our club has an HF and a dual-band VHF/UHF remote station in operation 7 days a week from 4:30 AM until 10 PM. I own and operate the station, so I'm able to have others join and participate in the communications during the day.

I began the operation at 5:45 AM local time on 160 meters. Each hour, we moved up to the next band. We covered nine bands during the day and made contacts on every band except 10 meters, where the propagation wasn't good when we got there.

Special Guests

At 8:20 AM, Raisa "YL Raisa" Skrynnikova, VO1BIG/R1BIG/OH7BG, joined on 40 meters. She operated from her home in Saint Petersburg, Russia. She has a large social media following and was named Amateur Radio Newsline's International Newsmaker of the Year Award winner for 2023. She works tirelessly to promote amateur radio, especially to get more women inspired and involved.

At 11 AM, Eva Thiemann, VA3QET, joined from her home in Muri, Switzerland, on 15 meters. She is also known by her home call sign, HB9FPM, and is an accomplished Summits on the Air activator with more than 750 peaks to her credit as well as four Mountain Goat Awards. She has organized two week-long special YL events — one under the call sign OL88YL in the Czech Republic in 2019, and the other under the call sign SP88YL in Poland in 2023. She is actively involved in the Union of Swiss Short Wave Amateurs.

At 2 PM, Raisa joined again on 10 meters, but we were unsuccessful with contacts, so we moved to 40 meters and made many contacts there.

At 3:30 PM, our third guest, Callum "Cal" McCormick, MØMCX, joined from his operating station in Honiley, England, a few hours from where Marconi's transmitter was located in 1901. Cal is a well-known amateur who operates as MØXXT, and he livestreams videos for his YouTube channel each week. He is the founder and owner of DX Commander Antennas, a manufacturer offering all-band vertical antennas and related accessories.

Cal brought in a pileup and made contacts on 20 and 40 meters. Many stations that would've had trouble working him from the UK were able to get in the log. He saw 115 SSB contacts from five countries in just over 1 hour. He did a livestream from his shack, and viewers could follow along and make contacts. I have a second computer in my shack that I use to livestream

to my YouTube channel for remote operations. Cal and I streamed simultaneously during his operation time, and the entire day was livestreamed with a few breaks in between. We ended the operation at 4:45 PM local time.

Remote Operation Software

We used *RemoteHams* (**www.remotehams.com**) to make this operation possible. This software (also known as *RCForb*) utilizes a server and a client.

The server resides on my shack's computer and is connected to my station, which includes a Kenwood TS-870S connected to an Ameritron AL-811 amplifier and a modified vertical antenna that covers 10 through 160 meters. There is also a full-size 80-meter delta loop and a triband Yagi that can be used as necessary. For the most part, the vertical performs excellently for the remote station, providing omnidirectional coverage without the need to rotate a directional antenna. However, due to its wider bandwidth, we tend to use the delta loop on 80 meters.

The client resides on the operator's computer, enabling them to connect to the server and radio through the internet. As I'm in the shack, I control all the operation parameters, so the guests only have to hit the push-to-talk (**PTT**) button or the voice-operated switch and make contacts.

RemoteHams is different from many other remote connection software solutions because it allows consecutive users to connect at the same time, so operating as a group is easy. It enables coaching and support for all the connected users. See the "*RemoteHams* History" sidebar for more information.

The modified vertical antenna used during the event.

To further celebrate the day, we put together a QSL card that could be personalized and sent to anyone who contacted us.

Final Results

With an operating time of just under 11 hours, we made 223 contacts overall. Four of the contacts were made via CW on 30 meters. The rest were SSB across eight of the nine bands. We contacted 11 countries. During our contacts, we took the time to interact with hams about the significance of the day and the operation.

More information about the day and a link to all five livestreams can be found on the Inverhuron Ham Radio Club's DX Remote QRZ page at **www.qrz.com/db/VA3XXT**.

I can't help but wonder what Guglielmo Marconi would think about four hams from different continents operating through the same station and how far we have come with radio.

RemoteHams History

Brandon Hansen, KG6YPI, started *RemoteHams* around 2007. At first, *RemoteHams* supported using only *Ham Radio Deluxe* and *SWLog* as an interface and one dedicated Yaesu FT-857 driver. I came across this project in 2012 because a few friends didn't have access to a radio and wanted to help.

At the time, I had an Icom IC-756 Pro III, so I wrote a driver for Icom radios. Pretty quickly, I wrote a FlexRadio *(PowerSDR)* driver and then a few other drivers. Today, we support most newer radios. Brandon and I split the workload. Brandon took care of the main client and server software while I concentrated on developing new drivers to support more radios, antenna switches, and amplifiers. A user wrote the Android app in 2015, which became quite popular. A few users have also supplied a few other drivers over the years.

RemoteHams typically has around 300 remote stations online daily, about 35,600 registered users, and a very active help forum. The software is free to download and use. It has run on donations since the beginning. To get involved, see the "Getting Started with *RemoteHams* Software" guide at **http://beta.remotehams.com/orb/RemoteHams_Getting_Started_K3_20151123.pdf** — RemoteHams *Administrator Roger MacDonald, W8RJ*

All photos provided by the author.

Rob Noakes, VE3PCP, became a licensed radio amateur in 1985 and passed the Advanced-class exam in 1986. He has operated the Inverhuron Ham Radio Club remote station since 2021. Rob has worked as a mechanical designer for 20 years. He can be reached at **ve3pcp@gmail.com**.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

ARRL Awards Recognize Excellence in Ham Radio

It's probably easy to think of someone you know in the hobby who goes above and beyond in service to amateur radio, their club, their fellow hams, or their community. Volunteers are the core of the Amateur Radio Service, and that dedication carries the ARRL Field Organization. Excellence in on-air operations inspires the rest of us to be better, build better, and do better.

ARRL seeks your help in honoring the outstanding work done by hams through the ARRL service awards. There are a host of different awards that are divided into four categories: Education Awards, Public Relations Awards, Distinguished Service Awards, and Technical Awards.

Education Awards

Hiram Percy Maxim Memorial Award

Named for the Founding President of ARRL, this award goes to a licensed radio amateur under age 21 who has made exemplary contributions to amateur radio and the local community. Nominees must be current ARRL members. **Nomination deadline: March 31, 2025.**

ARRL Herb S. Brier Award for Instructors and Teachers

Honoring Herb S. Brier, W9AD (SK), ARRL sponsors this award in conjunction with the Lake County Indiana Amateur Radio Club to recognize the very best in amateur radio instruction and recruitment. The award goes to a licensed radio amateur and ARRL member who is an ARRL-registered volunteer instructor or ARRL-registered professional classroom teacher. **Nomination deadline: March 15, 2025.**

Public Relations Awards

ARRL Philip J. McGan Memorial Silver Antenna Award

Honoring Phil McGan, WA2MBQ (SK), this award recognizes a radio amateur and ARRL member who has demonstrated leadership in successfully promoting amateur radio to the public. **Nomination deadline: March 31, 2025.**

ARRL Bill Leonard Award

Honoring Bill Leonard, W2SKE (SK), three annual awards are given to professional journalists or journalistic teams whose outstanding coverage highlights the enjoyment, importance, and public service contribution of the Amateur Radio Service. The award is given in three media categories: audio, visual, and print. **Nomination deadline: March 31, 2025.**

Distinguished Service Awards

Knight Distinguished Service Award

Honoring Joe T. Knight, W5PDY (SK), the award recognizes exceptional contributions by a Section Manager to the health and vitality of ARRL. **Nomination deadline: March 31, 2025** (for consideration during the July ARRL Board meeting).

George Hart Distinguished Service Award

Honoring George Hart, W1NJM (SK), the award recognizes an ARRL member's lifetime of activities within the ARRL Field Organization, including the National Traffic System and the Amateur Radio Emergency Service®. **Nomination deadline: November 1, 2025.**

The 2024 Hiram Percy Maxim Memorial Award Recipient

Kees Van Oosbree, WØAAE, received the 2024 Hiram Percy Maxim Memorial Award. He is an active member of the radio community in Minnesota and at Iowa State University, where he is treasurer of the university's amateur radio club. He is also active in the Minnesota Wireless Association and is regularly on the air via SSB, CW, RTTY, and other digital modes.

Kees Van Oosbree, WØAAE, receiving the 2024 Hiram Percy Maxim Memorial Award. From left to right: ARRL Minnesota Section Manager Bill Mitchell, AEØEE; Kees Van Oosbree, WØAAE, and ARRL Dakota Division Director Bill Lippert, ACØW. [Chuck Stroud, KA8HDE, photo]

Technical Awards

ARRL Microwave Development Award

This award recognizes a radio amateur or group of radio amateurs who contribute to the development of the amateur radio microwave bands. **Nomination deadline: March 31, 2025.**

ARRL Technical Service Award

This award recognizes a radio amateur or group of radio amateurs who provide amateur radio technical assistance or training to others. **Nomination deadline: March 31, 2025.**

ARRL Technical Innovation Award

This award recognizes a radio amateur or group of radio amateurs who develop and apply new technical ideas or techniques in amateur radio. **Nomination deadline: March 31, 2025.**

The 2024 ARRL Technical Service Award Recipient

Ed Menasian, N8LPQ, of Toledo, Ohio, received the 2024 ARRL Technical Service Award. This award is given annually to one or more licensed radio amateurs whose service to the amateur community or society at large is of the most exemplary nature within the framework of amateur radio technical activities.

The award motion certificate presented to Menasian noted that he exemplifies the spirit of the award by creating ways to learn and share technical information, including his weekly breakfast meetings and licensing classes that train prospective and current hams.

Ed Menasian, N8LPQ, pictured with his plaque and award motion certificate. [Great Lakes Division Director Scott Yonally, N8SY, photo]

This Month in QEX

QEX magazine is a forum for the free exchange of ideas among communications experimenters. All ARRL members can access the digital edition of *QEX* as a member benefit (**www.arrl.org/magazines**). Print subscriptions are available and sold separately; see **www.arrl.org/qex**.

Coming up in the January/February 2025 issue of *QEX*:

- Valentino Barbi, I4BBO, presents a tracking generator to complement the tinySA spectrum analyzer.
- Michelle Thompson, W5NYV, explains the design and implementation of SFBC for an amateur radio application called Neptune.
- Patrick Van Torre, ON4CAZ, describes an analog transceiver based on crystal oscillators and crystal filters.
- Mark C. Noe, KE1IU, and Palmer G. Noe, KC1LXO, show an inexpensive monitoring system using *openHAB* that can be accessed from any PC or mobile device.
- In his essay series, Eric Nichols, KL7AJ, explains the function of the vacuum tube.

Would you like to write for *QEX*? We pay $50 per published page for full articles and *QEX* Technical Notes. Get more information and an Author Guide at **www.arrl.org/qex-author-guide**.

Sierra Harrop, W5DX, sharrop@arrl.org

Happenings

$41,000+ Raised by Donors, YouTubers, for ARRL Teachers Institute

A YouTube telethon to raise money for the ARRL Teachers Institute on Wireless Technology (TI) was a resounding success. More than $21,000 was contributed during the livestream, which unlocked another $20,000 that donors had set as a challenge gift. ARRL Director of Development Kevin Beal, K8EAL, said that upped the ante. "It's quite clear that even with the generosity of the donors in attendance, the challenge gift really pushed everyone until the end to meet that goal." There were more than 430 gifts made, and the amount gifted most frequently was $20.

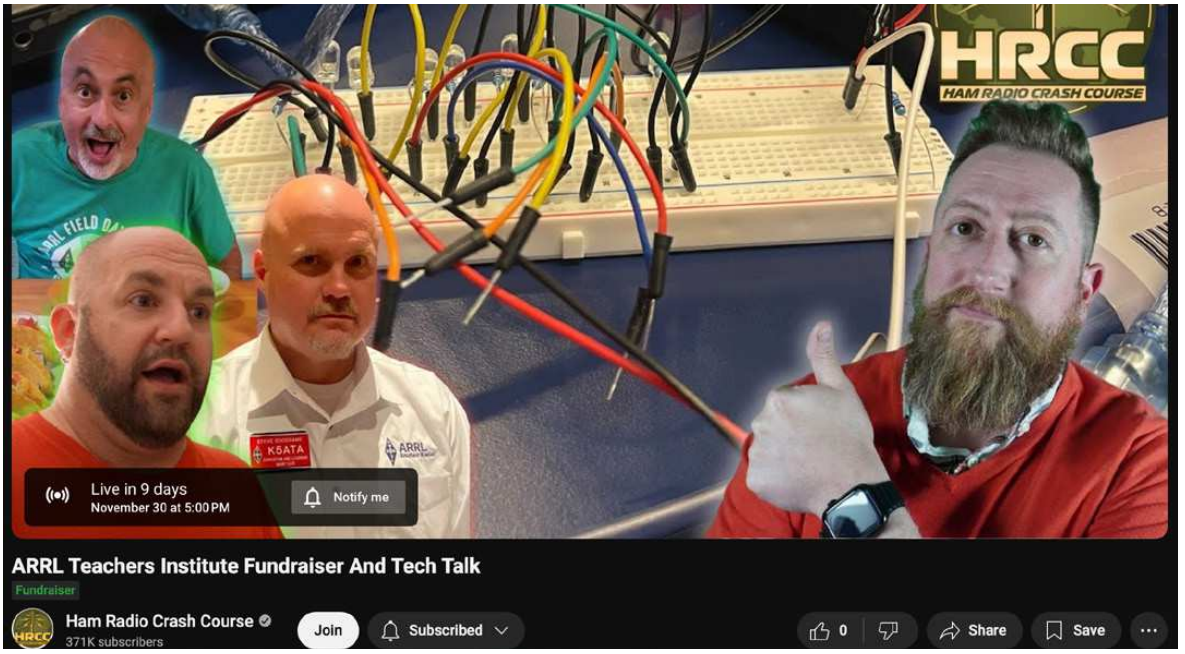
The event, hosted by YouTuber Josh Nass, KI6NAZ, on his popular Ham Radio Crash Course channel, drew thousands of views. On the stream, several teachers and students who have benefited from TI shared their stories of success. "We were glad that teachers Everton Henriques, KD2ZZT, and Drew Mortenson joined us on the stream. Two of Everton's students attended and were inspirational and impressive. They're the whole reason why we're doing this," said Beal.

A face familiar to longtime ARRL members also paid a visit via video. Former ARRL President Kay Craigie, N3KN, shared her memories of the origins of the ARRL TI, which she pioneered. "People have stepped up in just the most wonderful ways over the years. Large donations, small donations — whatever people are able to do — have made it possible to continue this program," she told Beal in a video call.

Craigie attributed the program's success to its flexibility, and how it can evolve to meet the changing needs of educators. ARRL Education and Learning Manager Steve Goodgame, K5ATA, hopes to innovate further in 2025. "We're taking it on the road. Historically, we've flown teachers into ARRL Headquarters (in Newington, Connecticut), but we want to go meet some of them where they are," said Goodgame.

The program has lofty goals for expansion next year. In 2024, there were seven cohorts — next year will have 16. "We're grateful to everyone who participated in the livestream, whether they watched it, shared it, or donated to it," said Goodgame. "They are enabling us to continue this growth."

A replay of the live telethon can be seen at **www.youtube.com/watch?v=XCo5ajQadRk**. If you'd like to contribute to the future of the ARRL TI, visit **www.arrl.org/GiveToSTEM**.



The YouTube telethon to raise money for the ARRL Teachers Institute on Wireless Technology raised more than $41,000.

2025 Youth on the Air Camp Application Period Open

Applications are now being accepted for campers interested in attending the 2025 Youth on the Air Camp. Licensed amateur radio operators, ages 15 – 25, who want to attend are encouraged to apply online at **www.youthontheair.org**. The camp is scheduled to take place on June 15 – 20, 2025, in Thornton (Denver), Colorado, and the Denver Radio Club, an ARRL Affiliated Club, is the local host.

The current application period is for the fifth camp for young amateur radio operators in North, Central, and South America. For the best chance at being selected, applications should have been submitted by 2359Z on January 15, 2025. Those campers will have been selected by the working group and notified of their acceptance by February 1.

To encourage attendance from across the Americas, allocations for campers are being held open for various areas of North, Central, and South America. If countries do not use their allocation, or should someone within an allocation decline acceptance, those positions will be filled from the remaining pool of applicants. As this will be an ongoing process, everyone will not receive notifications of acceptance at the same time. Preference will be given to first-time attendees.

Applications will continue to be accepted through May 1, and up to 50 campers will be accepted.

The application process is free, but a $100 USD deposit is required upon acceptance. Should a potential camper be unable to pay the $100 deposit, they may apply for a scholarship or waiver. Campers are responsible for their own arrival and departure transportation to and from the camp location. Travel assistance may also be available, especially for those traveling from outside of the US and Canada. Travel during camp events is provided.

For more details about the camp, visit the camp website at **www.youthontheair.org** or email Camp Director Neil Rapp, WB9VPG, at **director@youthontheair.org**.

Lipscomb University Receives $25,000 Scholarship Check

The Raymond B. Jones College of Engineering at Lipscomb University in Nashville, Tennessee, has received a check for $25,000 from Friends of Wireless (FOW) to establish an endowed scholarship for electrical engineering students. FOW, based in Nashville, is a nonprofit organization that provides grants to area organizations to further amateur radio in Williamson County and the surrounding area.

Over the past several years, FOW has provided grants in excess of $10,000 to the Williamson County Emergency Management Agency, in addition to deeding a repeater site and all of the corresponding equipment.

FOW Treasurer Hilton Dean, W4GHD, and FOW President Ed Hudgens, WB4RHQ, presented the check to Raymond B. Jones College of Engineering Dean Dr. David Elrod, WA4MRH. Hudgens is also Vice Director of the ARRL Delta Division.

"There are 55 electrical engineering students, all from different demographics and environments, who would qualify for the scholarship," said Dr. Elrod. He added that several students are already licensed amateur radio operators, and they use the equipment at the Lipscomb Engineering Amateur Radio Club, K4LRC.

From left to right: Hilton Dean, W4GHD; Dr. David Elrod, WA4MRH, and Ed Hudgens, WB4RHQ. [Hilton Dean, W4GHD, photo]

Fall 2024 Section Manager Election Results

On November 19, 2024, ballots were counted at ARRL Headquarters for the Section Manager election that was conducted in fall 2024.

ARRL members in South Carolina have elected incumbent Matthew Crook, W1MRC, to continue as their Section Manager, with a new term of office that started on January 1, 2025. Crook received 296 votes, and his opponent, Billy Irwin, K9OH, of Anderson, received 223 votes.

Crook, of Lexington, has been Section Manager since July 1, 2024, when he was appointed to fulfill the term of office when then-Section Manager John Gendron, NJ4Z, moved out of the Section to accept a new job.

Southern New Jersey welcomed a new Section Manager in the New

Year. Ron Fish, KX1W, of Galloway, ran unopposed after Tom Preiser, N2XW, decided not to run for a new term of office. Preiser has been Section Manager of the Southern New Jersey Section since January 2019.

The following incumbent Section Managers were unopposed, and they began new 2-year terms of office on January 1, 2025: Jon McCombie, N1ILZ (Eastern Massachusetts); Cecil Higgins, ACØHA (Missouri); Matthew Anderson, KAØBOJ (Nebraska); Jim Mezey, W2KFV (New York City-Long Island); Rocco Conte, WU2M (Northern New York); Joe Shupienis, W3BC (Western Pennsylvania), and Michael Douglas, W4MDD (West Central Florida).

California Councilwoman Earns Technician-Class License

Richmond, California Councilwoman and head of the city's Public Safety Committee Soheila Bana, KO6GTV, passed her amateur radio license test and is now a Technician-class operator. On November 9, 2024, the Brickyard Landing Homeowners Association hosted a 1-day Technician license class and Volunteer Examiner (VE) test session. The HOA has an active amateur radio/Community Emergency Response Team presence and supports "reasonable" antenna requests to further that objective. They are also looking at creating a club station in their common area facility for their licensed members. Bana is working to bring VE test sessions to the city's community center so that more people can discover amateur radio and be better prepared to respond in the event of a city-wide emergency. In addition to Bana, there were 18 newly licensed hams from Richmond, Berkeley, San Francisco, Oregon, and South Dakota who attended the VE session.

From left to right: Councilwoman Soheila Bana, KO6GTV; ARRL Pacific Division Vice Director John Litz, NZ6Q, and Rocky Saunders, KM6NKV, who helped organize the Brickyard Landing Homeowners Association 1-day Technician license class and VE test session. [Annie Lewis, N6ACL, photo]

ARRL 2023 Annual Report Now Available

ARRL has published its 2023 Annual Report, which includes a summary of the year's program activities, along with the 2023 and 2022 financial statements and an independent auditor's report.

ARRL marked 2023 as the Year of the Volunteers, recognizing the nearly 57,000 volunteers who contribute to supporting the organization and the wider amateur radio community. "The future of amateur radio rests on the shoulders of volunteers, and every one of us can be a volunteer," said ARRL President Rick Roderick, K5UR, in his message in the annual report. The report highlights the involvement of volunteers across program areas, including ARRL Volunteer Examiners and Amateur Radio Emergency Service® (ARES®) volunteers.

"It seems right for an organization like ours, which is fueled by volunteers, to take a moment to recognize the countless individuals who share their time, talent, and treasure with ARRL to advance the hobby we all love," said ARRL Chief Executive Officer David A. Minster, NA2AA, in his included report. Minster also noted the celebration of the ARRL Foundation's 50-year anniversary in 2023. Its work has benefited the charitable, educational, and scientific efforts of the amateur radio community. Minster recognized the generous contributions from Amateur Radio Digital Communications, which renewed commitments amounting to more than $2.1 million to support club grants, education programs, and scholarships. "This represents the largest single commitment ever for our organizations," said Minster.

Also included in the annual report is ARRL's Report to America, which references the involvement of amateur radio operators during natural disasters that occurred in 2023, in addition to formal partnership agreements with served agencies, including the Federal Emergency Management Agency (FEMA) and the FCC. In May 2023, ARRL entered into an updated Memorandum of Agreement with FEMA to enhance cooperation between ARES and FEMA in

providing disaster communications — When All Else Fails®.

The ARRL 2023 Annual Report is available for download at **www.arrl.org/annual-reports**.

2024 ARRL Field Day Results Published

Results are published, and the numbers are in. They paint a picture of a very active 2024 ARRL Field Day. Nearly 1.3 million contacts were reported during the 24-hour event; that is up from 1.25 million contacts in 2023. That's likely indicative of the continued rise of Solar Cycle 25 leading up to the event, but more people also participated in 2024.

Entries were received from all 85 ARRL and Radio Amateurs of Canada Sections, as well as from 27 different countries outside the US and Canada. "It is encouraging to see a rise in participation from year to year," said ARRL Contest Program Manager Paul Bourque, N1SFE. "ARRL Field Day is amateur radio's premier event, and the hams turned out for it."

Field Day is whatever you make it. For some participants, it's a contest; for others, it's a social gathering and club activity. Other groups use Field Day to showcase to the public what amateur radio is all about. Some groups use Field Day as an opportunity to introduce youth to amateur radio.

Class A, B, and C scores are included in the 2024 *QST* results article. The scores for Class D, E, and F stations and club aggregate scores are listed on the ARRL Field Day website at **https://field-day.arrl.org/fdresults.php** and in the digital edition of the December 2024 issue of *QST*.

Section Manager Nomination Notice

To all ARRL members in Maryland/DC, Nevada, New Hampshire, Northern New Jersey, Rhode Island, San Joaquin Valley, Utah, and West Texas. You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the Sections concerned. It is advisable to have a few more than five signatures on each petition. A sample nomination form is available on the ARRL website at **www.arrl.org/section-terms-nomination-information**. Nominating petitions may be made by facsimile or electronic transmission of images, provided that upon request by the Field Services Manager, the original documents are received by the manager within 7 days of the request. It is acceptable to submit signatures that have been sent via email or mail under the following guidelines: The petition copies must be made from the original form supplied by ARRL or downloaded from the ARRL website. The form must be exactly the same on both sides (i.e., autobiographical information should appear exactly the same on all copies). All forms/copies must be submitted together.

Candidates may use any of the available electronic signature platforms such as DocuSign, Dropbox Sign, and Signed PDF. Candidates who use an electronic signature platform to be nominated, as described above, do not have to send in original paper copies of the nominating documents. The packet that is sent to ARRL Headquarters must be complete. Multiple files or emails for a single petition will not be accepted.

We suggest the following format:

(Place and Date)

Field Services Manager, ARRL

225 Main St.

Newington, CT 06111

We, the undersigned full members of the _____ ARRL Section of the _____ Division, hereby nominate _____ as candidate for Section Manager of this Section for the next 2-year term of office.

(Signature _____ Call Sign _____ City _____ ZIP _____)

Any candidate for the office of Section Manager must be a resident of the Section, an amateur radio licensee of Technician class or higher, and a full member of ARRL for a continuous term of at least 2 years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4:00 PM Eastern Time on March 7, 2025. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters no later than April 1, 2025, to full members of record as of March 7, 2025, which is the closing date for nominations. Returns will be counted May 20, 2025. Section Managers elected as a result of the above procedure will take office July 1, 2025.

If only one valid petition is received from a Section, that nominee shall be declared elected without opposition for a 2-year term beginning July 1, 2025. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the July issue of *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. A Section Manager vacancy occurring between elections is filled through appointment by the Field Services Manager. — *Mike Walters, W8ZY, Field Services Manager*

Rick Palm, K1CE, k1ce@arrl.net

Public Service

The Power of Positivity in the Public Service Sector

Positive thinking is sometimes overlooked in the public service arena, where the demand for services in an emergency or disaster situation can often put overwhelming pressure on volunteers and professionals alike — but it's mandatory when it comes to having efficient and effective teamwork and responses. One of the goals for Amateur Radio Emergency Service® (ARES®) and other amateur radio public service group operators (especially the group leaders) is to emphasize having an optimistic attitude. Techniques to achieve this usually involve affirmations of positive work products and outlooks.

American psychologist B. F. Skinner defined the behavioral theory of learning as involving the technique of presenting a pleasant stimulus after a behavior to increase the likelihood of that behavior happening again. In the context of amateur radio public service, that means providing rewards and other positive feedback every time an operator conducts themselves professionally and invents or develops a new efficient technique for EmComm work will increase the likelihood of an operator's particular behavior happening again.

Columbia County, Florida, ARES team members Marcus Perry, KN4DCJ (in the foreground), and Dalton Weatherford, KK4KSM, providing radiocommunications for a public service event. [Photo courtesy of Brad Swartz, N5CBP]

Positive Reinforcement Shaped My Public Service Journey

When I was a new ham, a friend suggested I try repeater operating because it's fun and social, and it offers a lot of public service opportunities including responding to emergencies and major disasters; I was intrigued. This was in 1976, before the era of modern synthesized radios, and I had a Drake TR-33C: a crystal-controlled portable 2-meter transceiver that was powered by batteries. (Operators of this radio had to install pairs of crystals for each frequency pair of local repeaters.) It had a short, rubber duck antenna (which I thought was cool), and I couldn't wait to try it out.

At the time, I worked in the dusty, dark stacks of the Lexington, Massachusetts, public library's basement. I had a tiny office below ground level where I would take my breaks. One day, I brought my TR-33C to work to try to make my first repeater contact during a break. The closest repeater was on top of a hill in the next town over.

After listening for a little bit, I finally heard another station. I pressed the push-to-talk button and announced, "This is WA1." Because I was nervous, I had inadvertently left off the suffix of my call sign. I quickly heard the reply, "Hey, what happened to the rest of your call sign?" followed by laughter. Not one to give up easily, I tried a more distant repeater, calling, "WA1YIU, listening." A station immediately answered, "You're barely making it into the repeater, OM. What are you running for an antenna?" I replied that I was in the basement of the library using the rubber duck antenna that came with my TR-33C. Their response: "So let me get this straight — you're in a basement, below ground, with a rubber duck and a 1 W radio 20 miles from the

repeater?" I was humiliated. I turned off my radio and contemplated ending my foray into local repeater operating and public service all together.

Two years later, the Blizzard of '78 hit Boston and the surrounding areas; it was the city's second greatest snowstorm on record, with 27.1 inches of snow. Across the northeast, the American Red Cross reported 99 deaths and 4,587 injuries and illnesses attributable to the storm. The library was closed, but the director asked me to clear the parking lot, sidewalks, and doorways of snow.

During my breaks from shoveling, I climbed to the attic of the uninhabited library and called in reports of conditions over the aforementioned repeater on the top of the hill. I used my TR-33C with higher gain, a whip antenna, and more height above the average terrain, and my reports were welcomed by the repeater net control station. I had been accepted by the local repeater and EmComm community and found self-actualization through true public service.

Thanks to the positive affirmations of other hams during the Blizzard of '78, I kept moving forward on my public service journey. During the fall of that same year, a call went out over the repeater requesting the help of ham operators in a massive search for a missing 6-year-old boy in Webster, Massachusetts. I skipped school and spent several days providing radiocommunication for the search teams — I had found my calling in public service through amateur radio. You can read more about that search and its amateur radio communications effort in the July 2012 *QST* "Public Service" article, "ARES®, EmComm and Mental Health Risks."

Public Service Sector Benefits

From my humble beginnings, I ended up providing daily traffic handling for New England's local, Section-level, and regional National Traffic System (NTS) nets. I later found a home in northern Florida's Columbia County ARES program, where I found more opportunities for public service such as providing emergency and disaster communications for the Emergency Operations Center and area shelters during hurricane situations, and that's where I remain today.

The Radio Amateur's Code states that hams must be considerate, loyal, progressive, friendly, balanced, and patriotic (**www.arrl.org/amateur-code**). Following the code means giving positive feedback (especially to new hams) and avoiding negativity that undermines their efforts and results in the loss of potential volunteers — harvest new friendships and volunteers for your public service team members, efforts, and organizations. As a result, the public service sector as a whole benefits from positive ham-to-ham feedback through good morale, happier volunteers, and a more effective and efficient work product. See the sidebar "Get Involved with ARES and NTS" for details on how to grow your public service efforts.

Get Involved with ARES and NTS

The National Traffic System (NTS) is an integral part of ARRL's public service efforts and has seen a resurgence in activity throughout the past couple of years. ARRL members can subscribe to *The NTS Letter* and the *ARES Letter* — monthly public service newsletters — free of charge. To subscribe, visit your membership profile on the ARRL website at **www.arrl.org**.

Contact your Section Manager (see the "ARRL Section Managers" list on page 16 of *QST* for their contact information) or consult the ARRL Net Directory (**www.arrl.org/arrl-net-directory**) for information on traffic nets in your Section, region, and area. New friends, camaraderie, fun, and public service opportunities await you!

Rus Healy, K2UA, k2ua@arrl.org

2024 ARRL 10 GHz and Up Contest Results

The 2024 ARRL 10 GHz and Up Contest weekends took place August 17 – 19 and September 21 – 23.

The 2024 ARRL 10 GHz and Up Contest grew, with log submissions up from 141 to 156! Of these, 96 are in the 10 GHz category, and 60 fall into the 10 GHz and Up category. That's an increase of 12 logs in the 10 GHz and Up category from 2023. Entries were distributed across all regions, with more than 20 entries each in the W6, W2, and W1 call areas, followed by more than 10 entries each in the W8, WØ, VE, and W5 areas.

Entrants from the upper Midwest dominated the top ten scores for the 10 GHz category, but the winner, Hugh Duff, VA3TO, hails from the Toronto area. Hugh's 274 contacts on 10 GHz were the highest single-band QSO count of any entrant in any category.

In the 10 GHz and Up category, Peter Prabucki, VA3ELE, climbed to the top of the standings with an astounding 325 contacts and a score of more than 76,000. Kevin Hobbs, VE3KH, came in second place from his home station with 276 contacts and 99 unique call signs. Both are remarkable achievements from any home station. In third place, Neil Macklem, VE3SST, was the only other operator whose score broke 70,000, and he completed a sweep for Canadian stations in the 10 GHz and Up category.

It took about 100 QSOs to make the top ten QSOs list in the 10 GHz category, while it took 200 QSOs to make the top ten QSOs list in the 10 GHz and Up category. These numbers speak to the growth in activity across the bands. Unique call sign leaders were closely aligned for the top ten scores lists. For the first time, in this year's contest, four operators broke the 100 unique call sign barrier, with each operator obtaining 101 to 105 unique call signs. This speaks to the number of available stations on the higher bands.

Logs Received by Call Area

Call Area	Entries
WØ	15
W1	21
W2	22
W3	8
W4	4
W5	13
W6	25
W7	8
W8	18
W9	8
VE	14
Total	156

Entries by Year

2024		**2013**	
10 GHz	96	10 GHz	73
10 GHz and Up	60	10 GHz and Up	27
2023		**2012**	
10 GHz	93	10 GHz	78
10 GHz and Up	48	10 GHz and Up	37
2022		**2011**	
10 GHz	98	10 GHz	87
10 GHz and Up	56	10 GHz and Up	29
2021		**2010**	
10 GHz	91	10 GHz	88
10 GHz and Up	45	10 GHz and Up	31
Checklog	1	**2009**	
2020		10 GHz	77
10 GHz	76	10 GHz and Up	31
10 GHz and Up	46	**2008**	
2019		10 GHz	77
10 GHz	110	10 GHz and Up	27
10 GHz and Up	34	**2007**	
2018		10 GHz	77
10 GHz	98	10 GHz and Up	38
10 GHz and Up	45	**2006**	
2017		10 GHz	76
10 GHz	85	10 GHz and Up	39
10 GHz and Up	42	**2005**	
2016		10 GHz	95
10 GHz	89	10 GHz and Up	36
10 GHz and Up	42	**2004**	
2015		10 GHz	94
10 GHz	85	10 GHz and Up	42
10 GHz and Up	37	**2003**	
2014		10 GHz	105
10 GHz	86	10 GHz and Up	37
10 GHz and Up	26	**2002**	
		10 GHz	106
		10 GHz and Up	32

Top Ten Scores

10 GHz Only		10 GHz and Up	
Call	**Score**	**Call**	**Score**
VA3TO	63,507	VA3ELE	76,058
WBØLJC	50,395	VE3KH	75,786
WA9TT	41,641	VE3SST	70,015
NØUK	39,760	K8ZR	63,278
KØHAC	34,736	K9PW	60,984
WA6CDR	33,897	K1RZ	60,954
KA9VVQ	32,285	K2UA	60,776
W9FZ	31,804	K2DH	60,587
N2WK	30,752	W2FU	58,263
NØKP	27,376	N2MG	54,946

Top Ten Unique Call Sign Leaders

10 GHz Only		10 GHz and Up	
Call	**Unique Calls**	**Call**	**Unique Calls**
VA3TO	61	K2UA	105
VE3DS	45	K2DH	104
N2WK	42	K8ZR	101
W6DL	40	N2MG	101
WA6CDR	39	VE3KH	99
N5BF	39	VA3ELE	91
KB8U	38	VE3SST	87
N2JMH	38	K1RZ	87
N7DA	36	AF1T	84
N6VHF	35	W1MKY	83

Top Ten QSO Leaders

10 GHz Only		10 GHz and Up	
Call	**Total QSOs**	**Call**	**Total QSOs**
VA3TO	274	VA3ELE	325
WBØLJC	184	VE3SST	300
WA9TT	153	VE3KH	276
N2WK	148	K9PW	245
NØUK	131	K8ZR	236
KØHAC	116	K2DH	228
VE3DS	115	K2UA	228
WA6CDR	109	W2FU	227
VA3ECO	102	N2MG	210
KA9VVQ	96	VE3SMA	200
WA2VOI	96		

Best DX by Band in Kilometers

Call	Best DX	Call	Best DX
10 GHz		**75 GHz**	
AF1T	711	VA3ELE	57
K1RZ	711	VE3SST	57
W1GHZ	711	VE2UG	57
W1MKY	711	K8ZR	57
K3WHC	711	K1OR	44
VE3KH	711	AA9IL	20
N6CA	698	WB8TGY	20
K1OR	694	K2DH	5
WB5ZDP	691	K2UA	5
W5LUA	683	N2MG	5
24 GHz		**123 GHz**	
K6MG	259	AF1T	8
KB6BA	259	K1RZ	8
KØSM	248	W1MKY	8
KE2AIZ	248	K3WHC	8
VA3ELE	248	AA9IL	5
W2FU	235	K2DH	5
WA2TMC	225	K2UA	5
N9JIM	213	K9PW	5
W6QIW	213	N2MG	5
AA9IL	187	WB8TGY	5
47 GHz		**300+ GHz**	
K6MG	259	AF1T	8
KB6BA	259	K1RZ	8
W6QIW	182	W1MKY	8
K6ML	174	K3WHC	8
VA3ELE	117		
VE3KH	117		
AA6PZ	116		
VE3SST	103		
K9PW	99		
VE2UG	99		

Mark Scola, VA3HES, set up his equipment at the end of his driveway for his first attempt operating in a microwave contest. To his surprise, he completed 20 contacts in the contest, including a 200-kilometer contact with Steve Gocala, KB8VAO. [Mark Scola, VA3HES, photo]

Call Area Leaders

10 GHz Only

Call	Score	Call	Score
Area 0		**Area 6**	
WBØLJC	50,395	N5BF	20,368
NØUK	39,760	N7DA	17,235
KØHAC	34,736	W6DL	16,356
NØKP	27,376	N6VHF	15,079
WØZQ	26,986	AG6KG	8,134
WA2VOI	26,890	N6MI	6,358
NOØX	17,480	K6WCI	6,132
VA3ECO	17,219	N6MX	4,482
KØAWU	14,880	K1CT	4,355
KØSHF	13,436	N6OQ	4,059
Area 1		**Area 7**	
W1FKF	10,056	WA6CDR	33,897
KA1NKD	8,764	W7GLF	1,587
WZ1V	6,520	K7MDL	1,189
K1MAP	4,454	AG6QV	817
K1KG	3,829	KGØD	772
K1ZE	3,049	KD7UO	516
WB2VVV	911	NØCYT	105
Area 2		**Area 8**	
N2WK	30,752	KB8U	23,491
N2JMH	17,975	K8DP	5,993
N2ZN	16,554	K8CLP	5,435
N2OA	14,641	VE3ADQ/W8	5,242
K2CS	13,604	W8RU	5,234
WW2Y	11,418	KB8YHF	2,344
W9KXI	8,874	WF8Z	2,216
N3RG	6,052	**Area 9**	
WB2RVX	4,441	WA9TT	41,641
W3TI	3,146	KA9VVQ	32,285
Area 3		W9FZ	31,804
NG3W	17,560	KØKFC	26,964
WG3K	8,419	K9JK	24,201
W3SZ	5,412	W8BYA	23,936
WA3GFZ	3,680	WØAUS	1,499
N3FL	2,722	**Area 15 (Canada)**	
W3HMS	1,628	VA3TO	63,507
Area 4		VE3DS	24,207
W8BRY	389	VE4SA	16,730
N8KH	101	VE3EG	12,082
Area 5		VE3FN	10,101
WB5ZDP	8,818	VE3JGL	6,503
W5VY	6,368	VA3HES	2,784
WA5WCP	3,389	VA7SC	849
N6CA	2,661		
WQ5S	1,670		
AD5JK	1,194		
K5TRA	651		

10 GHz and Up

Call	Score	Call	Score
Area 0		**Area 6**	
No Entries		W6QIW	41,937
Area 1		K6MG	32,444
AF1T	45,067	K6ML	29,453
W1MKY	43,044	W6BY	20,516
W1GHZ	34,261	KB6BA	19,578
K1OR	25,257	N9JIM	18,995
K1FMS	19,364	N6TEB	5,712
KCØIYT	16,934	AA6PZ	4,390
K1CA	15,799	**Area 7**	
K1ZZ	10,886	K6VHF	20,684
AA1I	8,701	**Area 8**	
KA1ZD	7,440	K8ZR	63,278
Area 2		KB8VAO	24,079
K2UA	60,776	K2YAZ	20,042
K2DH	60,587	WB8TGY	19,532
W2FU	58,263	AA9IL	13,722
N2MG	54,946	NN9X	13,585
KØSM	46,044	WA8VPD	12,704
K2TER	39,736	W8ISS	12,303
WA2TMC	39,411	K9TMS	11,082
KE2AIZ	34,896	KD9GGZ	8,858
NR2C	12,310	**Area 9**	
Area 3		K9PW	60,984
K1RZ	60,954	**Area 15 (Canada)**	
K3WHC	26,504	VA3ELE	76,058
Area 4		VE3KH	75,786
N9ZL	15,258	VE3SST	70,015
K9AGL	105	VE2UG	35,907
Area 5		VE3SMA	34,713
W5LUA	10,731	VE3HPC	12,723
KM5PO	9,755		
KI5EMN	8,017		
AA5AM	6,799		
AA5C	4,981		
W5ZCA	2,643		

Full Results Online

You can read the full results of the contest online at **https://contests.arrl.org**. You'll find detailed analysis and more play-by-play, along with the full line scores. Improve your results by studying your log-checking report, too.

The next ARRL 10 GHz and Up Contests will be held August 16 – 18 and September 20 – 22, 2025.

Paul Bourque, N1SFE, n1sfe@arrl.org

2024 ARRL 222 MHz and Up Distance Contest Results

The most recent ARRL 222 MHz and Up Distance Contest was held August 3 – 4, 2024.

The 222 MHz and Up Distance Contest is a distance-scored event, with points earned for the distance in kilometers between the center of the six Maidenhead grid square locators for each station. In 2024, 128 entries were received for the ARRL 222 MHz and Up Distance Contest, with 3,431 total contacts reported. While this number of entries is low compared to other years, it is still higher than those received in 2022. However, several active stations did not submit their logs. Participants should be sure to submit their logs regardless of the number of contacts they made. Not only does this assist with our log-checking efforts, but you might also be pleasantly surprised by how you did in the contest.

As the "Contacts Reported per Band" table shows, most of the activity was clustered on the bands from 222 MHz through 10 GHz, with 222 and 432 MHz being the most popular bands this year. They were also the most popular bands last year. Contacts were reported on 24, 47, and 123 GHz as well.

While no new DX records were set this year, notable DX contacts include a 1,442-kilometer contact on 222 MHz between the Suwannee Amateur Radio Club station, N4SVC, located in Maidenhead grid square EM80mi, and Brad Fuller, WQ5S, in EM13ci. On 432 MHz, Jim Howard, N2JMH, located in FN12bw in western New York, reported a 1,007-kilometer contact with Bob Davis, AA9MY, in EN50fm. Jim also shared the best DX on 2.3 and 5.7 GHz with a pair of 407-kilometer contacts with David Petke, K1RZ, who was in FM19jh in Maryland. Check out a full report of the best DX contacts by band in the "Best DX Contacts by Band" table.

Next year, make a point to get on the air during the weekend of the contest, and be sure to submit all of your logs and post your photos and stories on the ARRL contest soapbox.

Best DX Contacts by Band

222 MHz	
N4SVC	1,442 kilometers
WQ5S	1,442 kilometers
432 MHz	
N2JMH	1,007 kilometers
902 MHz	
W0GHZ	621 kilometers
1.2 GHz	
N4SVC	568 kilometers
2.3 GHz	
N2JMH	407 kilometers
K1RZ	407 kilometers
3.4 GHz	
K1RZ	202 kilometers
WB2RVX	202 kilometers
5.7 GHz	
K1RZ	407 kilometers
N2JMH	407 kilometers
10 GHz	
W0GHZ	621 kilometers
24 GHz	
K6MI	1 kilometer
WB6HYD	1 kilometer
47 GHz	
K6MI	1 kilometer
WB6HYD	1 kilometer
123 GHz	
K6MI	1 kilometer
WB6HYD	1 kilometer

Contacts Reported per Band

Band	Contacts
222 MHz	1,245
432 MHz	1,410
902 MHz	213
1.2 GHz	379
2.3 GHz	58
3.4 GHz	22
5.7 GHz	34
10 GHz	64
24 GHz	2
47 GHz	2
75 GHz	0
123 GHz	2
Total	3,431

Entries by Year

Year	Number of Entries
2024	128
2023	145
2022	118
2021	141
2020	171
2019	157
2018	147
2017	199

The next ARRL 222 MHz and Up Distance Contest will be held August 2 – 3, 2025.

Regional Winners

Regions are defined in the contest rules (**www.arrl.org/222-mhz-and-up-distance-contest**). Category key: R — Unlimited Rover; S — Single Operator, Fixed, and M — Multioperator, Fixed.

Region	Category	Call	Score
1	R	KA7RRA/R	2,119
	S	VA7SC	7,292
2	R	N7OOS/R	259
	S	KJ7BJS	960
	M	AI7ID	3,007
3	R	N6ZE/R	3,183
	S	K6WIS	2,715
5	S	WO1S	334
	M	KC5MVZ	641
6	S	WB0ULX	2,038
7	S	WQ0P	6,209
8	R	W5VY/R	38,358
	S	AA5AM	14,899
9	R	N9GH/R	121
	S	K2DRH	49,513
	M	WD9EXD	33,031
10	R	N0HZO/R	26,162
		KC0P/R	26,162 (tie)
	S	W0GHZ	29,914
11	S	N2JMH	67,022
	M	WW2Y	31,101
12	S	AJ6T	17,559
13	R	NV4B/R	41,771
	S	KY4G	12,755
	M	N4SVC	37,230
14	S	K1RZ	76,578
15	R	WB2SIH/R	7,390
	S	WB2RVX	34,134
	M	W2SZ	24,448
16	R	W1RGA/R	31,250
	S	AF1T	63,286
	M	N1SOH	2,108

Affiliated Club Competition

Club	Score	Entries
Medium		
North East Weak Signal Group	284,121	13
Mt. Airy VHF Radio Club	194,444	11
Northern Lights Radio Soc.	149,837	11
Rochester VHF Group	82,739	3
Society of Midwest Contesters	69,910	5
Ontario VHF Assn.	51,060	3
North Texas Microwave Soc.	28,287	3
Pacific Northwest VHF Soc.	22,724	7
Fourlanders Contest Team	18,638	3
Yankee Clipper Contest Club	16,913	3
Local		
Chippewa Valley VHF Contesters	6,375	3

Top Ten Scores

Rover	
NV4B/R	41,771
W5VY/R	38,358
W1RGA/R	31,250
KC0P/R	26,162
N0HZO/R	26,162
WB2SIH/R	7,390
AA2SD/R	6,927
N6ZE/R	3,183
KA7RRA/R	2,119
N1SFE/R	1,496
Single Operator	
K1RZ	76,578
N2JMH	67,022
AF1T	63,286
K2DRH	49,513
K1WHS	48,431
WZ1V	43,351
WB2RVX	34,134
W0GHZ	29,914
K0AWU	29,153
VE3ZV	25,705
Multioperator	
N4SVC	37,230
WD9EXD	33,031
WW2Y	31,101
W2SZ	24,448
N2SLN	11,472
AI7ID	3,007
N1SOH	2,108
KC5MVZ	641

Full Results Online

You can read the full results of the contest online at **https://contests.arrl.org**. You'll find detailed analysis and more play-by-play, along with the full line scores. Improve your results by studying your log-checking report, too.

Dave Olean, K1WHS, performs pre-contest maintenance on his 222 MHz antenna array in preparation for the 2024 ARRL 222 MHz and Up Distance Contest. The antenna array consists of four 22-element antennas at 106 feet with azimuth and elevation rotation capability. [Dave Olean, K1WHS, photo]

Steve Ford, WB8IMY, wb8imy@arrl.net

Amateur Radio World

Radio Club Uruguayo Celebrates Heritage Day

October 6, 2024, was Heritage Day in Uruguay, and Radio Club Uruguayo used the occasion to promote amateur radio. They set up a special event station at the Military Aeronautics School near the city of Pando. The celebration featured plenty of aircraft — both vintage and modern — and it attracted a substantial crowd.

The station call sign was CW1EMA. If you happened to work the station, an electronic QSL is available at **www.cx1aa.org**.

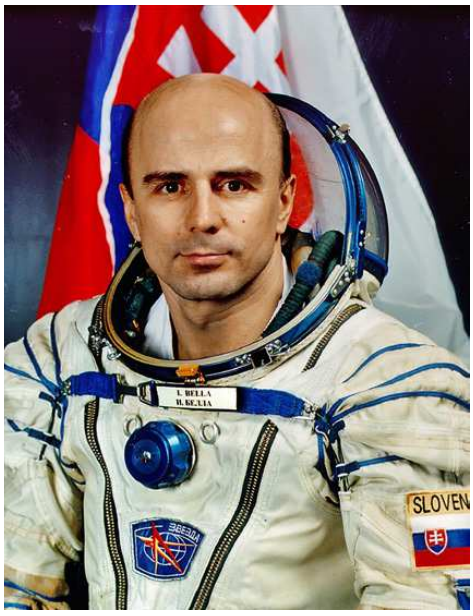
Diego Filgueira, CX3ADR, operating Radio Club Uruguayo station CW1EMA at the Military Aeronautics School during Heritage Day. [Radio Club Uruguayo photo]

The IARU Region 3 conference was held at The Emerald Hotel in Bangkok, Thailand. [The Emerald Hotel photo]

Radio Amateur Society of Thailand Hosts IARU Conference

In November 2024, the Radio Amateur Society of Thailand hosted the 19th conference of International Amateur Radio Union (IARU) Region 3 at The Emerald Hotel in Bangkok. International Telecommunication Union Radiocommunication Bureau Director Mario Maniewicz and IARU President Tim Ellam, VE6SH, spoke during the opening ceremony.

Along with special event station CW1EMA, flight demonstrations were a main attraction at the Military Aeronautics School during Heritage Day. [Radio Club Uruguayo photo]



Slovak cosmonaut Ivan Bella. The Slovak Association of Radio Amateurs started a year-long special event operation to celebrate the 25th anniversary of his flight to the International Space Station. [Slovak Air Force photo]

The new Icom ID-RP4010V repeater installation in San Marino. [Amateur Radio Association of the Republic of San Marino photo]

In addition to the main conference, a member-societies/representatives meeting took place, along with a meeting of IARU Region 3 directors. Special event station HS19IARU was on the air throughout the conference.

Slovak Association of Radio Amateurs Special Event

In October 2024, the Slovak Amateur Radio Association inaugurated a special event operation. It honors the 25th anniversary of Slovak cosmonaut Ivan Bella's flight to the International Space Station. Stations throughout Slovakia will be using the call sign OM25ISS until October 1, 2025, on all bands and modes. Electronic certificates are available. For more information, visit **www.qrz.com/db/OM25ISS**.

A Repeater Upgrade for San Marino

The Amateur Radio Association of the Republic of San Marino (ARRSM) has installed a new Icom ID-RP4010V repeater, replacing the previous RP4000V system. This upgrade represents a crucial step forward to enhance services offered by ARRSM for San Marino and surrounding areas.

The Icom ID-RP4010V repeater operates in the 144, 430, and 1200 MHz bands and supports both D-STAR and analog FM modes. One of the most innovative features of the new repeater is the optional UX-262 LTE module, which allows a wireless IP connection. In addition, the new system was compatible with ARRSM's existing ID-RP2C repeater controller, making the upgrade process much easier.

Hokkaido Amateur Radio Seminar

The Hokkaido Amateur Radio Seminar, sponsored by the Hokkaido Regional Headquarters of the Japan Amateur Radio League (JARL), was held September 22, 2024. The theme of the seminar was "fusing computers and amateur radio." The event attracted more than 150 amateurs from throughout the area.

The Hokkaido Amateur Radio Seminar normally alternates every other year with the Hokkaido Ham Fair, but due to the COVID-19 pandemic, this was the first time it had been held in several years.

Seminar lectures included presentations by JARL president Morita Koji, JA5SUD; Hiroshi Hamada, JG1MOU, the creator of *Turbo HAMLOG*; and Mark Wohlschlegel, WC3W, who gave an online presentation from the US. In addition to lectures, related organizations and manufacturers set up several exhibition booths.

Contest Corral February 2025

Check for updates and a downloadable PDF version online at **www.arrl.org/contest-calendar**.
Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.

Start - Finish Date-Time		Date-Time		Bands	Contest Name	Mode	Exchange	Sponsor's Website
1	0000	2	2059	3.5-28	LABRE-RS Digi Contest	Dig	4-char grid square	**labre-rs.org.br**
1	0000	2	2359	1.8-28,VHF/UHF	Vermont QSO Party	CW Ph Dig	RS(T), VT county or SPC	**www.ranv.org/vtqso.html**
1	0001	2	2359	28	10-10 Int'l Winter Contest, SSB	Ph	Name, mbr or "0," SPC	**www.ten-ten.org**
1	1200	2	1200	1.8-28	European Union DX Contest	CW Ph	RS(T), EU union region or ITU zone	**www.eudx-contest.com**
1	1200	2	1200	3.5-28,144	F9AA Cup, CW	CW	RST, serial	**www.site.urc.asso.fr**
1	1200	2	2359	3.5-28	Mexico RTTY International Contest	Dig	RST, XE state or serial	**rtty.fmre.mx**
1	1400	2	2359	1.8-28	Minnesota QSO Party	CW Ph Dig	Name, MN county or SPC	**www.w0aa.org/mnqp-rules**
1	1400	2	2359	1.8-28	FYBO Winter QRP Sprint	CW Ph Dig	RS(T), SPC, name, power, temperature	**azscqrpions.org**
1	1600	2	1900	3.5	AGCW Straight Key Party	CW	RST, serial, class, name, age	**www.agcw.de**
1	1600	2	2359	1.8-28	British Columbia QSO Party	CW Ph	RS(T), BC district or SPC	**www.orcadxcc.org**
2	0000	2	0359	3.5-14	North American Sprint, CW	CW	Other's call, your call, serial, name, SPC	**ncjweb.com/Sprint-Rules.pdf**
3	2000	3	2130	3.5	RSGB 80m Club Championship, SSB	Ph	RS, serial	**www.rsgbcc.org**
4	0100	4	0300	3.5-28	ARS Spartan Sprint	CW	RST, SPC, power	**ars-qrp.com**
5	2000	5	2100	3.5	UKEICC 80m Contest	Ph	6-char grid square	**www.ukeicc.com**
6	0000	7	0300	7	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or pwr	**qrpcontest.com/pigwalk40**
6	1800	6	2200	28	NRAU 10m Activity Contest	CW Ph Dig	RS(T), 6-char grid square	**nrau.net**
6	2000	6	2200	1.8-28,50	SKCC Sprint Europe	CW	RST, SPC, name, mbr or "none"	**www.skccgroup.com**
8	0000	9	2359	3.5-28	CQ WW RTTY WPX Contest	Dig	RST, serial	**www.cqwpxrtty.com**
8	1100	8	1300	7,14	Asia-Pacific Spring Sprint, CW	CW	RST, serial	**jsfc.org/apsprint/aprule.txt**
8	1200	9	1200	1.8	KCJ Topband Contest	CW	RST, JA prefecture or district code	**www.kcj-cw.com**
8	1200	9	1200	1.8-28	Dutch PACC Contest	CW Ph	RS(T), PA province or serial	**pacc.veron.nl**
8	1200	9	2359	1.8-28,50	SKCC Weekend Sprintathon	CW	RST, SPC, name, mbr or "none"	**www.skccgroup.com**
8	1500	9	1500	1.8-28	OMISS QSO Party	Ph	RS, SPC, mbr (if any)	**www.omiss.net**
8	1900	8	2359	1.8	WAB 1.8 MHz Phone	CW Ph	RS, serial or country	**wab.intermip.net/Top Band Phone.php**
8	2000	8	2300	1.8	RSGB 1.8 MHz Contest	CW	RST, serial, UK district code (if UK)	**www.rsgbcc.org**
9	1300	9	1700	3.5,7	Balkan HF Contest	CW Ph	RS(T), serial	**www.bfra.bg**
10	0100	10	0300	1.8-28	4 States QRP Group Second Sunday Sprint	CW Ph	RS(T), SPC, mbr or power	**www.4sqrp.com**
10	1300	14	2359	All, no WARC	ARRL School Club Roundup	CW Ph Dig	RS(T), class (I/C/S), SPC	**www.arrl.org/school-club-roundup**
11	1900	11	2029	3.5	DARC FT4 Contest	Dig	RST, 4-char grid square	**www.darc.de**
12	0130	12	0330	1.8	NAQCC CW Sprint	CW	RST, SPC, mbr or pwr	**naqcc.info/sprint_rules.html**
12	2000	12	2130	3.5	RSGB 80m Club Championship, Data	Dig	RST, serial	**www.rsgbcc.org**
14	0000	14	2359	1.8-7	PODXS 070 Club Valentine Sprint	Dig	Name, OM or YL, SPC	**www.podxs070.com**
15	0000	16	2359	1.8-28	ARRL International DX Contest, CW	CW	RST, SP or power	**www.arrl.org/arrl-dx**
15	0000	16	2359	All, no WARC	YLRL YL-OM Contest	CW Ph Dig	Serial, RS(T), SPC	**ylrl.org**
15	1200	16	1159	1.8-28	Russian PSK WW Contest	Dig	RST, 2-letter oblast or serial	**www.rdrclub.ru**
15	1900	15	2059	1.8-28	Feld Hell Sprint	Dig	See rules	**sites.google.com/site/feldhellclub**
16	2300	17	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or power	**qrpcontest.com/pigrun**
19	1900	19	2030	3.5,7	AGCW Semi-Automatic Key Evening	CW	RST, serial, 2-digit year first used a bug	**www.agcw.de**
20	0000	21	0300	14	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or pwr	**qrpcontest.com/pigwalk20**
20	1900	20	2000	3.5-14	NTC QSO Party	CW	Max 25 WPM; RST, mbr or "NM"	**pi4ntc.nl/ntcqp**
20	2000	20	2130	3.5	RSGB 80m Club Championship, CW	CW	RST, serial	**www.rsgbcc.org**
21	2200	23	2200	1.8	CQ 160-Meter Contest, SSB	Ph	RS, SP or CQ zone	**www.cq160.com**
22	0600	23	1800	3.5-28	REF Contest, SSB	Ph	RS, French department or serial	**concours.r-e-f.org**
22	1300	23	1300	3.5-28	UBA DX Contest, CW	CW	RST, ON section or serial	**www.uba.be**
22	1500	23	0159	1.8-28,50	South Carolina QSO Party	CW Ph Dig	RS(T), SC county or SPC	**scqso.com**
22	1800	23	0559	3.5-28	North American QSO Party, RTTY	Dig	Name, SPC+DC	**www.ncjweb.com/NAQP-Rules.pdf**
22	1800	23	0559	3.5-28	NA Collegiate Championship, RTTY	Dig	Name, SPC+DC	**www.w9smc.com**
23	0000	23	2359	3.5-28	World Wide Patagonia DX Contest	CW Ph	RS(T), 4-char grid square	**wwpatagonia-arg-dx.com.ar**
23	1400	23	1700	3.5-28	High Speed Club CW Contest	CW	RST, mbr or "NM"	**www.highspeedclub.org**
23	1500	24	0100	3.5-28,50,144	North Carolina QSO Party	CW Ph Dig	NC county or SPC	**ncqsoparty.org/rules**
24	2000	24	2200	3.5-28	RSGB FT4 Contest	Dig	Signal report	**www.rsgbcc.org**
26	0000	26	0200	1.8-28,50	SKCC Sprint	CW	RST, SPC, name, mbr or "none"	**www.skccgroup.com**
26	2000	26	2100	3.5	UKEICC 80m Contest	CW	6-char grid square	**www.ukeicc.com**

There are a number of weekly contests not included in the table above. For more info, visit: **www.qrpfoxhunt.org**, **www.ncccsprint.com**, and **www.cwops.org**. All dates and times refer to UTC and may be different from calendar dates in North America. Contests are not conducted on the 60-, 30-, 17-, or 12-meter bands. Mbr = Membership number. Serial = Sequential number of the contact. SPC = State, Province, DXCC Entity. XE = Mexican state. Listings in blue indicate contests sponsored by ARRL or *NCJ*. The latest time to make a valid contest QSO is the minute listed in the "Finish Time" column. *Data for Contest Corral is maintained on the WA7BNM Contest Calendar at* **www.contestcalendar.com** *and is extracted for publication in* QST *2 months prior to the month of the contest. ARRL gratefully acknowledges the support of Bruce Horn, WA7BNM, in providing this service.*

Certificate of Code Proficiency Recipients

Sponsored by

www.i2rtf.com

This month, ARRL recognizes merit and progress in Morse code proficiency on the part of the following individuals, who have achieved proficiency at the following rates, in words per minute.

May 2024

Tom J. Zajdel, AA3TZ	10
Tom J. Zajdel, AA3TZ	15
John H. Orkney, KA1LHJ	20
Tom J. Zajdel, AA3TZ	20
Daryl I. Hammond, WØBZ	25

June 2024

Robin L. Zinsmaster, N6PHP	25

July 2024

Theodore J. Jacobson, N6ZO	10
Jerry K. Nobles, N5MES	10
Charlene K. Lewis, K8XCO	15
David R. Koberstein, N9DK	20

August 2024

Thomas H. Busch, WB8WOR	10
Jeanne Martin, KC1SPX	10
Thomas S. Wright, ND9Z	10
Richard McCleaf, K3EYJ	15
Stephen C. Brandt, N7VS	30
George I. Levy, NC2M	30
Stephen C. Brandt, N7VS	35

September 2024

Tony Levenson, W4FRV	10
David E. McNeill, N7WMN	10
David W. Risik, WA3HSC	10
Sherrick A. Slattery, KA6NZB	10
Mark C. Guenther, WB7TLK	20
Robert Harrington, VE3OU	20

October 2024

Daniel L. Schaible, KD8UZS	10
John S. Hickman, WW3B	20
David R. Koberstein, N9DK	25

November 2024

Edward K. Metzler, KN9V	10
Paul B. Walp, WB6PIO	10

Congratulations to all of the recipients.

February 2025 W1AW Qualifying Runs

W1AW, the Hiram Percy Maxim Memorial Station at ARRL Headquarters in Newington, Connecticut, transmits Morse code Qualifying Runs to assist ham radio operators in increasing and perfecting their proficiency in Morse code. Amateur radio operators can earn a Certificate of Code Proficiency or endorsements by listening to W1AW Qualifying Runs.

February Qualifying Runs will be transmitted by W1AW in Newington, Connecticut, at the times shown on 1.8025, 3.5815, 7.0475, 14.0475, 18.0775, 21.0675, 28.0675, 50.350, and 147.555 MHz. The West Coast Qualifying Runs will be transmitted by K6KPH on Saturday, February 22, at 2 PM PST (2200 UTC) on 3581.5, 7047.5, 14047.5, 18077.5, and 21067.5 kHz. Unless indicated otherwise, sending speeds are from 10 to 35 WPM.

Amateur radio operators who participate in Qualifying Runs may submit proof of 1 minute of the highest speed they have copied in the hope of qualifying for the Certificate of Code Proficiency, or an endorsement to their existing certificate.

Legibly copy at least 1 minute of text by hand, and mail the sheet to: W1AW Qualifying Runs, 225 Main St., Newington, CT USA 06111.

Include $10 (check or money order) if this is a submission for your initial Code Proficiency certificate; $7.50 if you are applying for an endorsement (available for speeds up to 40 WPM). Your text will be checked against the actual transmissions to determine if you have qualified.

Members of the North Fulton (Georgia) Amateur Radio League (**https://nfarl.org**) are offering to subsidize the total cost of a Code Proficiency certificate or endorsement submission for any individual age 21 years and younger, and who reside in either the US or Canada. Participants who wish to make use of this offer should indicate on their Qualifying Run submissions they are age 21 or younger, and certify as such via their signature. Eligible participants are not required to send any fee with their Code Proficiency submissions.

For more information about Qualifying Runs, please visit **www.arrl.org/qualifying-run-schedule**.

For information about how to qualify for the Certificate of Code Proficiency, please visit **www.arrl.org/code-proficiency-certificate.**

W1AW Qualifying Runs — February 2025
(All times are in Eastern Standard Time.)

Monday	Tuesday	Wednesday	Thursday	Friday
		2/5 4 PM – 2100Z 10 – 35 WPM	**2/6** 10 PM – 0300Z **(2/7 – UTC)** 10 – 40 WPM	**2/7** 9 AM – 1400Z 10 – 35 WPM
2/10 4 PM – 2100Z 10 – 35 WPM	**2/11** 7 PM – 0000Z **(2/12 – UTC)** 10 – 40 WPM		**2/13** 9 AM – 1400Z 35 – 10 WPM	
Presidents' Day	**2/18** 10 PM – 0300Z **(2/19 – UTC)** 35 – 10 WPM	**2/19** 9 AM – 1400Z 10 – 35 WPM	**2/20** 7 PM – 0000Z **(2/21 – UTC)** 10 – 35 WPM	**2/21** 4 PM – 2100Z 10 – 40 WPM
2/24 7 PM – 0000Z **(2/25 – UTC)** 10 – 35 WPM	**2/25** 10 PM – 0300Z **(2/26 – UTC)** 10 – 40 WPM		**2/27** 4 PM – 2100Z 35 – 10 WPM	

Mike Walters, W8ZY, w8zy@arrl.org

Club Station

Increase Funding for Club Events with Annual Fundraisers

Activities are perhaps the most important aspect of an amateur radio club's uniqueness and appeal to its members — they get members engaged, allow members to learn from each other, and provide a sense of community. In this month's column, Southeastern Connecticut Amateur Radio Society (SECARS), W1QV, President Mark Noe, KE1IU, shares how SECARS holds annual auctions to help fund their activities.

SECARS is a very active club. We give back to our community by providing communication support for local marathons and road races; hosting several training, educational, and emergency service nets on our repeater system; organizing foxhunts, and more. Of course, all this activity requires funding. While annual dues and donations provide substantial support, approximately ⅓ of our yearly revenue comes from our biannual live-auction fundraisers.

We're not restrictive with what we accept for sale, which results in having some interesting items at the auction hall! Everyone always has fun, and occasional bidding wars break out for collectibles. Each event brings between 55 and 90 people, and we auction off 100 to 300 items over the course of several hours, bringing in more than $1,000 to our treasury.

Planning and Organization

Running an event of this magnitude requires planning. We form a committee (appointed by the club president) to organize the event and provide support the day of. We also discuss the logistics at our monthly executive committee meeting to ensure resources are available.

The first task is scheduling the event 6 months ahead of when we want to have it. This lead time allows us to secure the venue and advertise the auction. We make sure not to schedule the event at the same time as other major hamfests to maximize our attendance. We also hold a club meeting for SECARS's membership to approve the event date.

Next, we secure the venue. We like to serve refreshments, so small kitchen facilities are required. We've used senior centers, fire stations, and church halls, but have found church halls to be best suited for us because they're large, scheduling is flexible, and they typically require only a small donation to secure the space.

Finally, we determine the terms of the event: what we'll charge for admission and what's included with that fee; what the terms of sales are and what guarantees the club will offer on purchased equipment (we

The audience bidding on a popular item. A lively group makes for an exciting event. [Mark Noe, KE1IU, photo]

usually make all sales final, and the buyer assumes the risk associated with their purchase); what items we'll accept for sale; who's responsible for removing items that don't sell; if there will be a raffle, and if so, what prizes to offer and what the ticket price should be, and how much the club can spend to secure refreshments. Because SECARS runs on majority votes by members, these terms are proposed by our executive committee and then brought before the membership for review and ratification at a club meeting.

Getting the Word Out

Because our auctions are open to the public, we market it to the whole ham community. We submit an application for our event to be sanctioned by the ARRL New England Division (**www.arrl.org/hamfest-convention-application**). The auction is typically approved within a couple weeks, and information is then published in an upcoming issue of *QST*.

We also list the event (and its terms) at **https://secars.org/secars-auction-information**, and we include the URL in all of our advertisements.

To reach even more hams, we visit **www.arrl.org/find-a-club** to get email addresses for clubs in the commutable tri-state area, then email them an invitation 1 month prior to the event. We also send a print advertisement to our local newspapers.

Preparation

About 2 months before the event, things start to come together. We make sure we have support at the check-in table; people to record auction sales, help in the kitchen, and bring sound equipment and the talk-in station; auctioneers to conduct the event, and a crew to set up the facilities and clean up afterward.

It's important to consider each role that's needed and provide volunteers with clear descriptions of responsibilities and the times for which they're expected to fulfill them. Because volunteers don't always respond quickly, several emails showing what roles are filled (and by whom) can inspire action from those on the fence about helping.

It's always good to plan for extra help, as issues come up that may make one or more volunteers unavailable at the last minute. We discuss this last crucial step at our monthly executive committee and club meetings, so everyone is prepared.

One week before the event, we conduct practice runs to make sure everything works as it should, but occasionally things go wrong, despite our best efforts to prepare. For example, we record our sales in a custom-made computer database, but sometimes we have network issues, data-entry errors, or software glitches, so we record all sales on paper as well to have a backup copy. Sometimes we run out of food, so we look for local pizza shops ahead of time, just in case. Creative problem-solving and improvisation can fix most issues, as long as crucial matters are covered with a contingency plan.

After the Event

We've been conducting auctions for many years, and we're always learning more about how we can improve the event — SECARS often solicits opinions from auction attendees to help with this. Taking photos and writing a brief post-event narrative to go in the club newsletter and/or on our website remind us what was done in previous years and keep members who couldn't attend informed. Most importantly, we thank all our volunteers during and after the event — they're what make it successful.

SECARS also presents an after-action report at the executive committee and club meetings, where we discuss what went well and what could be improved.

Adding fundraisers to your club's offerings can be fun, build different skills among your members, and add to the camaraderie and vibrancy of your organization!

ARRL Special Service Clubs

ARRL offers the Special Service Club (SSC) program for clubs that demonstrate that they're working to improve the amateur radio community by completing special projects, holding license classes, and working with local groups on events, among other activities. Visit **www.arrl.org/ssc-application** for more information about this program. Below is a list of new and renewing SSCs as of December 10, 2024.

Renewing SSCs

Toledo Mobile Radio Association, W8HHF	Toledo, OH
Zephyrhills Area ARC, W1PB	Zephyrhills, FL
Great South Bay ARC, W2GSB	West Babylon, NY
Radio Amateurs of the Gorge, W7RAG	Hood River, OR

New SSCs

Hill Country ARC, W3XO	Kerrville, TX

Sign Up for ARRL Club News

Read the monthly *ARRL Club News* e-newsletter to find out more about what clubs are doing to advance amateur radio in their communities and within the hobby. To opt in to monthly email delivery of *ARRL Club News*, log in to **www.arrl.org** and select "E-Newsletters and Notifications" on your account web page.

Steve Goodgame, K5ATA, sgoodgame@arrl.org

Ham Media Playlist

Wintertime Operations

Winter is here, and with it comes a different way to operate in the great outdoors. For decades, hams have enjoyed portable outdoor operations via Summits on the Air (SOTA), Parks on the Air (POTA), World Wide Flora and Fauna (WWFF), and other activities. One must meticulously prepare for such operations to be successful, but winter weather poses a unique set of challenges.

KL7EC Outdoors

While many YouTube channels focus on outdoor operations, relatively few focus predominantly on winter activations. One such channel is KL7EC Outdoors (**https://youtube.com/@KL7ECoutdoors**). Jeramy, KL7EC, lives in Alaska and regularly operates in the great outdoors. A quick scan of his videos makes it clear that not only does Jeramy love portable winter operating, but he loves being outside in general.

Jeramy's videos range from quick POTA activations to more exhilarating operations. In his video titled "Flying to Denali: Frozen Lake Landing for POTA Activation" (**https://tinyurl.com/KL7EC-Denali**), Jeramy does exactly what the title states. With his friend Doug, KL7DUG, Jeramy flies in a 1961 Piper PA-18 Super Cub to Denali National Park (US-0022) for an activation many hams only dream of. Operating from the tail of the plane, Doug and Jeramy successfully activated the park, tying the proverbial bow on an epic ham radio adventure.

Jeramy, KL7EC, and Doug, KL7DUG, activate Denali National Park (US-0022), operating from the horizontal stabilizer of a Piper Super Cub.

Jeramy, KL7EC, gives viewers a glimpse of the beauty of Alaska as he makes his way to US-7222.

In another video, "Surviving -1°F: Winter POTA Activation With Temporary Shelter" (**https://tinyurl.com/KL7EC-Winter**), Jeramy demonstrates how he gets on the air at below 0°F using his portable gear. His balance of temporary shelter and equipment, along with a few creature comforts like his propane heater, gives him the perfect combination for an evening of ham radio fun while activating Rocky Lake State Recreation Site (US-7222) in several inches of snow. If you are looking for a channel to inspire you to get outside regardless of the weather, KL7EC Outdoors may be the one for you.

Off-Grid Ham Radio OH8STN

If you are interested in operating portable ham radio in severe winter weather, check out Off-Grid Ham Radio OH8STN (**https://youtube.com/@OH8STN**). Julian, OH8STN, is well-known for portable operations in snowy and extremely cold conditions. In his video titled "Winter Ham Radio Tips OH8STN" (**https://tinyurl.com/oh8stn-winter**), Julian showcases several pieces of gear that are essential to effective operations in the field. He explains his reasoning for using different types of shelters for different conditions and heat sources, and the importance of a simplified radio setup. Julian makes sure not to lose

One of Julian's, OH8STN, setups in frigid temperatures.

focus on the importance of safety, warning viewers that heat sources may require ventilation, etc.

Mike N2MAK

If you are looking for a lighter setup for winter activities, check out a video by Mike, N2MAK, titled "POTA activation to test the mAT-705 Plus antenna tuner and some new gear" (**https://tinyurl.com/n2mak-pota**). Mike shows a rather lightweight setup using a sled, an ice hut, an Icom IC-705, and a simple antenna. Putting his kit to more of a test in his video titled "Winter SOTA POTA Adventure" (**https://tinyurl.com/n2mak-sota**), he drags his gear in the sled to Bare Hill (US-5098, W2/WE-098) in New York. This video is a bit different from many winter portable operations videos because, while there is snow on the ground, it takes place during mild winter weather.

With an elevation of just under 1,600 feet, Mike makes the trek with the sled with no issues. He then steps viewers through his setup and explains what equipment he is using for the activation. With a light equipment load-out and relatively mild winter conditions, the ice hut and small Buddy heater prove to be adequate to keep him comfortable for the entire activation. Mike manages to activate as both a SOTA summit and a POTA park.

Mike, N2MAK, shows viewers his setup for winter operations.

Philip, N1UNH, participates in Winter Field Day in the woods of New Hampshire.

Donovan Outdoors

No discussion of winter portable operations would be complete without talking about Winter Field Day (**www.winterfieldday.org**), which is an operating event every January during which hams everywhere get on the air. Some hams go to extremes to make sure they live up to the "winter" part of the day.

Philip Donovan, N1UNH, has a minimal setup for his Winter Field Day operation. His channel, Donovan Outdoors (**https://youtube.com/@Donovanoutdoors**), is not a ham radio-specific channel, but rather focuses more on the general outdoors. In his video titled "Winter Field Day 2019--Amateur Radio and Lunch in The Snow" (**https://tinyurl.com/N1UNH-wfd**), Philip presents a view of Winter Field Day that is relaxed and enjoyable to him. Taking the time to admire the wilderness in which he chooses to operate, he carries a tarp, some basic supplies, and modest radio gear. Philip's Winter Field Day video is a good reminder that while contesting and making as many contacts as possible are one way to have fun operating, we should take the time to operate in a way that we truly enjoy.

With winter upon us, if you are able, take the time to get outside and enjoy a little time on the air. I know I will.

Bernie McClenny, W3UR, w3ur@arrl.org

How's DX?

Marshall Islands On the Air in February

We are no doubt at the peak of Solar Cycle 25; conditions on the higher bands have been excellent. There has been plenty of good DX, and DXpeditions have been frequent. Yours truly has been concentrating on 6 meters, the Magic Band. I hope you can take part in the fun while it lasts.

V7 — The Marshall Islands

The Next Generation DX team has scheduled their upcoming V7 DXpedition to the Marshall Islands for February 11 – 23, 2025. The same team recently conducted the 8R7X DXpedition to Guyana. V7 is not very rare, as it ranks number 97 for mixed mode worldwide on Club Log's DXCC Most Wanted List. It's also number 74 on digital, 81 on phone, and — hard to believe — number 152 on CW. By continent, it ranks 52 in Europe, 132 in North America, 104 in South America, 203 in Asia, 183 in Oceania, and 81 in Africa.

The last big activation on the islands was in fall 2015, when the German V73D DXpedition netted almost 65,000 contacts. Not bad for a DXpedition held prior to the introduction of FT8! Currently, there are two hams on the Marshall Islands. They are Lisa, V73ML/KJ6GHN, who has been working on Kwajalein Atoll since October 2023, and more recently, Don, V73KW/KW7R, who has been there since mid-October 2024.

Four of the 8R7X DXpedition team members who will be part of the V7X DXpedition to the Marshall Islands. Pictured from left to right are Jamie Williams, MØSDV; Sven Lovric, DJ4MX; Philipp Springer, DK6SP, and Tomi Varro, HA8RT. [Philipp Springer, DK6SP, photo]

The V7X team members will include Philipp, DK6SP; Sven, DJ4MX; Tomi, HA8RT; Jamie, MØSDV; Yannick, DK1YH, and Braco, E77DX, the senior member of the team. The operators are between 21 and 27 years old except for Braco, who is 50. All six members are well trained in CW, SSB, and digital operations. They plan to be active on all modes on 1.8 – 50 MHz. For more details about this DXpedition, visit their website at **www.next-generation-dx.com**.

Vince Chinn, W6EE, SK

In the October 2022 "How's DX?" column, Glenn Johnson, WØGJ, wrote about the Northern California DX Foundation's (NCDXF's) Golden Anniversary. This month, we learn about the sad passing of the last founding member of NCDXF. Ed Fong, WB6IQN, reported:

> Vincent "Vince" Chinn, W6EE, a founding member of the well-known NCDXF, passed away on September [21], 2024. He was 87 years old.
>
> Vince Chinn was the architect of NCDXF in [1972]. With fellow hams Lee Shaklee, W6BH (SK); Jack Troster, W6ISQ (SK); and Don Schliesser, K6RV (SK), began the support of DXpeditions. He was the last surviving member of the elite group.
>
> [NCDXF] was formed by Vince to create an educational and scientific foundation that would qualify as a tax-exempt entity under IRS rules. After all, Vince was a Certified Public Accountant (CPA). Contributions were then fully tax deductible and thus would give [donors] incentive to give larger amounts to support DXpeditions. Over the years, the foundation contributed millions of dollars to DXpeditions throughout the world.
>
> They supported more than 500 DXpeditions, including to the Khmer Republic (now Cambodia), Antarctica, the famous Kingman Reef, Palmyra Island, and Christmas Island, to name a few.
>
> He served as the past president of the Cathay Amateur Radio Club and was its treasurer for more than 30 years. By profession, Vince was a CPA and gave tax advice to local ham clubs. In his spare time, he organized [Volunteer Examiner] test sessions and encouraged young folks in local high schools to [learn about] ham radio and emergency communications in the San Francisco Bay Area. When the students passed the exam, he would gift them a Baofeng

Chris Hannagan, ZL7DX, making some repairs to his station on the Chatham Islands. He can now be heard on all bands on 1.8 – 50 MHz. [Todd, ZL2SP, photo]

UV-5R programmed to work the local repeaters. He financed and was the trustee of several repeaters.

He was an avid DXer, working more than 200 countries, and [he] had a love for Collins equipment. Vince is survived by his wife, Shirley; his children, Larry, Kathy, and Lisa, and several grandchildren.

DX News from Around the World

JD1/M — Minami Torishima

Take, JG8NQJ, is back on Minami Torishima until early March 2025. He is there for a work assignment, so he will be active only in his spare time as JG8NQJ/JD1. Typically, he is active in the mornings on weekdays before he heads into the office. Take is occasionally active on the weekends. During this trip, he will be mainly on CW, with some FT8 on 17 and 15 meters. There is a slight chance for activity on 160, 20, 12, and 6 meters. Take is aware that the entity is needed by North American DXers; unfortunately, the best times to contact North America are while he's at work. JD1/M is currently ranked number 32 on Club Log's DXCC Most Wanted List. QSL via the bureau or direct to JA8CJY. Other options are Logbook of The World® and eQSL.

KH9 — Wake Island

Wake Island ranks number 27 on Club Log's DXCC Most Wanted List. The last DXpedition to Wake Island was K9W in 2013. Since then, a few hams (including KH9/WA2YUN, KH9/N7NVK, and KH9/NL7RR) have had work assignments there and were occasionally on the air. In November 2024, Allen Le Vie, KH7AL, accepted a job as an electronics technician for the island. His schedule will alternate between 3 months on Wake, and then 1 month off, at least through the next year. He should be on the island until late February 2025 before leaving for a month and then returning for the next 3 months. His days off are Mondays. It should be noted that Wake Island is 12 hours ahead of UTC, meaning he should be active on Sundays. Allen said he'll "most likely be on the air [in the] early mornings or late afternoons to avoid the peak heat of the day." His rig is a barefoot Yaesu FT-891, and he is using multiple dipoles for 40, 30, 20, 17, 15, and 10 meters. Currently, he is not active on digital modes, but he is on CW. "I'm not sure that my CW skills are up for running [pileups]," he said. In February 2025, Tom, NL7RR, is expected to be back on Wake for a few weeks. Allen noted there are a few other Wake islanders who are interested in getting licensed.

ZL7 — The Chatham Islands

In May 2017, husband-and-wife team Chris Hannagan, ZL2DX, and Catherine Hannagan, ZL2QT, moved back to the Chatham Islands and have been operating as ZL7DX and ZL7QT, respectively. This past fall, Holger, ZL3IO, and his daughter Xenia, ZL4YL, stayed at the Hannagans' location for the CW portion of the CQ World Wide DX Contest. They operated as ZL7YL in the Multi-Two category. Holger was there in October 2024, and again in November 2024 to help Chris make improvements to the ZL7DX and ZL7QT stations. The Hannagans can now cover all of the HF bands and 6 meters with ease. Their antennas include a top-loaded 18-meter vertical with elevated radials on top band, a 15-meter vertical with an extensive ground on 80 meters, and a ¼-wave vertical on their roof for 40 meters. On the high bands is a six-band hexbeam elevated 10 meters. The 6-meter antenna is a seven-element loop-fed array at 14 meters above the ground, which Chris uses for both terrestrial and Earth-moon-Earth. Chris and Catherine have multiple rigs, an Elecraft KPA500, and a currently broken OM Power OM2000 amplifier.

Wrap-Up

That's it for this month, with thanks to KH7AL/KH9, WB6IQN, ZL7DX, and The Daily DX for helping to make this month's column possible. Don't forget to send your DX news, photos, and club newsletters to **bernie@dailydx.com**. Until next month, see you in the pileups!
— *Bernie, W3UR*

Jon Jones, NØJK, n0jk@arrl.org

The World Above 50 MHz

6-Meter F2 Starts Strong, Fades, and Then Rallies on Black Friday

Strong F2 openings took place on 6 meters during the first week of November 2024. Rich Zwirko, K1HTV (FM18), started the month working VU3WEW at 1601Z. He also copied 4S7AB but was unable to make a contact. Steve, NN4X, worked two VU stations. I, NØJK, copied SV1DH and LZ1YE, and I worked EA1DR. KFØM (EM17) noted TA1M. Greg, WQØP (EM19), worked XT2MD. Bruce Frahm, KØBJ (DM99), logged 13 European stations, including those with SV and 9H prefixes. Randy, NØLD (EM15), worked EA1DR. Clark, W8TN (EM98), logged 4S7AB. That afternoon, there was a strong opening from Alaska to the lower 48 states. I, NØJK, logged five Alaskan stations and noted that KL7SB was on 50.150 MHz SSB. KL2R said, "I ran the lower 48 US stations for more than 3 ½ hours. This was the biggest [6-meter-to-lower-48-states] opening in more than 20 years." Several stations completed their Worked All States (WAS) Awards on 6 meters that afternoon, including David, WA9DU, and Tom, N4TL. Tom reflected:

> I was first licensed in 1965 and worked only on the HF bands for about 13 years. In 1978, Harvey Crane, WD4IYF, loaned me a Kenwood 6-meter radio, and I was on 6 meters for the first time. Over the next few years, I was able to work 48 states.
>
> In 1982, I worked KH6IAA in Hawaii, and that gave me 49 confirmed [states]. In 1995, I moved from South Florida to Raleigh, North Carolina, and I had to start over for WAS on 6 meters. In 2020, I worked KH6CJJ in Hawaii, which gave me 49 states confirmed from Raleigh.
>
> And then, on November 1, 2024, near the peak of Solar Cycle 25, I finally worked Alaska on 6 meters. I was able to complete a contact with Les, KL7J. Les does real-time uploads to Logbook of The World®, so the contact was confirmed right away.

Timothy Goodrich, K6TW, operated from DM23 on November 10 and 11, 2024, with the above setup.

F2 Continues

On November 2, K1HTV made 32 European FT8 contacts, and then he switched to FT4 and worked 51 more stations. Ken, WB2AMU, worked 15 European stations on SSB and CW. K1HTV copied KG6DX in Guam at 2213Z. Dan, K7SMA; Steve, NN4X, and John, KFØM, worked KG6DX. KHØ/KCØW was active and had "the whole US calling," according to NN4X. PSK flags showed that KG6DX was received from coast to coast. On November 3, Europe was again open to the Midwest. W8TN (EM98) also worked three VU stations and received them for more than 45 minutes! Clark's .all file showed VU2DCC sending RR73 to W5ADD and W5TRL. I copied K5CM (EM25) sending a report to VU3WEW. AA5C (EM13) worked VU3WEW and decoded VU2MSA and VU2DCC. This opening may have had some help from sporadic E, as E_s was noted from the Midwest to northeast states at the same time. That afternoon, WB2AMU noted a massive transcontinental F2 opening to the US West Coast. On November 4, FK8HA worked many European stations.

On November 5, Tim Havens, WW1L (FN55), worked ET3AA. Jay, W9RM (DM58), reported a loud signal from 9M6NA on 50.323 MHz. KMØT (EN13) had one decode of 9M6NA. VK3OT noted an opening from Europe to Australia at around 1000Z. KØBJ left his radio on while attending church on November 6. When he returned home, he saw that he had copied XT2MD for 45 minutes. K1HTV worked 3B8HK for 6-meter DX Century Club (DXCC) Award #180.

A Super South Pacific Opening

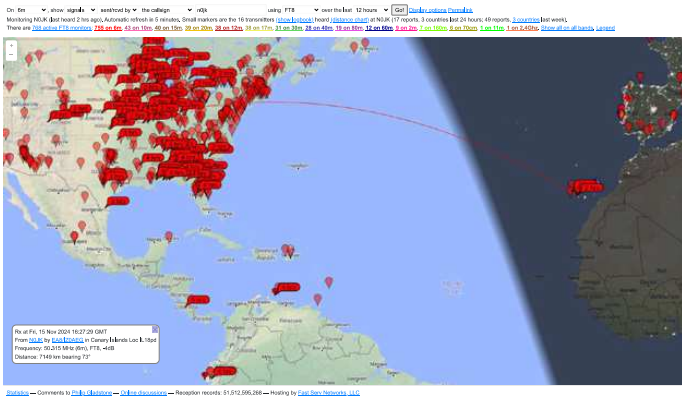
During the afternoon of November 9, strong signals from Hawaiian stations suddenly appeared on 6 meters for the Midwest. I counted at least six, with KH6TU being the strongest. The opening extended

farther west, and I copied 5W1SA, VK4CH, FK8HA, and Rémi, FK8CP. Rémi was up to +26 dB, and I logged him at 2142Z. Hasan, NØAN, worked FK8HA and VK9DX. Larry, WØPR (EN34), picked up KHØ/KCØW, E51BQ, and VK9DX. Trey Garlough, N5KO (CM97), worked 5W1SA, KG6DX, KG6JDX, and KHØ/KCØW. The Hawaiian stations seemed overwhelmed with the QRM on 50.313 MHz. I saw KH6TU trying *MSHV* on FT8. N9TF (EM66) said Hawaii was in for 45 minutes. Hawaii would have been his last state for 6-meter WAS. He observed that KH6HI in Oahu and KH6TU in Maui would alternate in signal strength. They are about 115 miles apart.

N5KO logged 9M6NA on November 10. The next day, Jim, AAØMZ (EM29), briefly copied 3B8FA. K1HTV worked 4U1ITU. At 1429Z on November 14, WW1L worked the VK9CV Cocos (Keeling) DXpedition. EA8AQV also logged VK9CV. On November 15, EA8/IZØAEG called me, NØJK, at 1627Z. We were unable to complete the contact. K1HTV and KFØM noted a strong opening to Brazil that evening. This may have been the result of E_s linking to transequatorial propagation. N5KO had a strong opening to Japan. On November 16, Fred, NO5Z (DM62), and Rich, K1HTV, worked Mwabi, 7Q2MM, in the morning. Mwabi is 17 years old. That afternoon, Gary, NØKQY (DM98), worked VK9DX. He said he called VK9DX many times and gave up, but then VK9DX called him. On November 19, K1HTV noted transcontinental F2, and on November 22, Rich worked VU3SNA and VU2DCC! His son Andy, K1RA, pulled a 6-meter Yagi into a tree and was also able to work VU2DCC.

On the Bands

50 MHz. K6TW operated from grid DM23 on November 10 and 11, but he made only four contacts. Sporadic E appeared for several days in late November. Ron, K3FR (FM18), noted E_s to call sign regions VE1, VE2, and WØ on November 22. From Kansas, I noted signals from the W1 region, including K1TOL (FN44), VE3, W2, and W3. I noticed no E_s links. More E_s appeared the next day to W1, W2, W3, VE2, and VE3. WA2GFN (FN20) turned 78 years old that day, and he was able to celebrate with the E skip. He worked 10 stations on SSB, including N9RUH, who said WA2GFN was his first 6-meter contact. Alaska was back via F2 on November 25 for AD1C (DM79), KFØM, WGØG, and K9KU. WGØG logged four, and Larry, K9KU (EN65), worked five Alaskan stations. WA2GFN and WB2AMU reported transcontinental F2 on November 26 to W6, W7, and VE7SL on SSB.



A PSK Reporter screenshot showing that EA8/IZØAEG was able to call Jon Jones, NØJK, on November 15, 2024. Unfortunately, they could not complete the contact. [**www.pskreporter.info/pskmap**]

I, NØJK, had E_s to AI9L (DM35). N7BAV (CN95) worked C5T, and he noted that W7MEM and N7ZO also worked C5T. NN4X worked VE8CK (DP22). On November 28, NN4X worked HZ1SK.

A Black Friday F2 special took place on November 29. Midwest stations WQØP, KFØM, and KØBJ worked Europe. KØBJ also picked up a signal from 9L5A. KD2CYU (FN20) logged 9L5A and HD8FG in the Galápagos for all-time new ones.

144 MHz. There was a strong tropospheric opening across the southeast states on November 16. Paul, AA4ZZ (EM96), worked ZF1EJ from a distance of 1,886 kilometers at 2114Z. He also worked K5SW west to Oklahoma on CW and those in Texas grids EM13 and EL09. He logged Yuri, UT1FG/MM, in EL74. Paul later worked W5LUA and WQ5S (both EM13) on 222 MHz. Stan, KA1ZE, who was operating W3XTT (FN01), worked W5EME (EM32), K5SW (EM25), K6FX (EL09), and XE2KK (DL96) from a distance of 2,697 kilometers. This qualifies as a new 2-meter tropospheric record!

Here and There

Per Spaceweather.com, here is some advice on how to catch aurora openings: sometimes, despite a high planetary K index, there is no aurora. Other times, the K index is not high, but aurora appears. Pay attention to sustained negative Bz. When magnetic fields in solar wind turn south (i.e., negative Bz), auroras can appear at mid-latitudes, even without a geomagnetic storm. Watching Bz is therefore the best way to prepare for auroras.

Mike White, K7ULS, qualified for the Fred Fish Memorial Award number 59.

Convention and Hamfest Calendar

A = AUCTION
D = DEALERS / VENDORS
F = FLEA MARKET
H = HANDICAP ACCESS
Q = FIELD CHECKING OF QSL CARDS
R = REFRESHMENTS
S = SEMINARS / PRESENTATIONS
T = TAILGATING
V = VE SESSIONS

Abbreviations

Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

ARRL ALABAMA SECTION CONVENTION

February 28 – March 1, Trussville, Alabama
D F H Q R S T V
Fri. 4 PM – 8 PM, Sat. 8:30 AM – 4 PM. *Spr:* Birmingham ARC. Trussville Civic Center, 5381 Trussville Clay Rd. *TI:* 146.88 (88.5 Hz). *Adm:* $10. **www.birminghamfest.org**

Arizona (Green Valley) — Mar. 8 F H R T
8 AM – noon. *Spr:* Green Valley ARC. Valley Presbyterian Church, 2800 S. Camino Del Sol. *TI:* 146.29. *Adm:* Free. **www.gvarc.us**

Arizona (Sun City West) — Feb. 8 D F H R T
6 AM – noon. *Spr:* West Valley ARC. Lord of Life Lutheran Church S. parking lot, Meeker and RH Johnson Blvds. *TI:* 147.30 (162.2 Hz). *Adm:* Free. **www.westvalleyarc.com**

ARRL SOUTHWESTERN DIVISION CONVENTION

February 14 – 15, Yuma, Arizona
D H Q R S T V
Fri. noon – Sat. 9 PM. *Spr:* Yuma Amateur Radio Hamfest Organization. Yuma Co. Fairgrounds, 2520 E. 32nd St. *TI:* 146.84 (88.5 Hz), 145.55. *Adm:* $15. **www.yumahamfest.com**

Colorado (Brighton) — Feb. 16 D F H R V
9 AM – 1 PM. *Spr:* Rocky Mountain Ham Radio, Inc. Adams Co. Fairgrounds, 9755 Henderson Rd. *TI:* RMHAM DMR Talk Group 720. *Adm:* $6. **www.rmham.org**

Florida (Brooksville) — Feb. 15 D H Q R T V
8 AM – 3 PM. *Spr:* Hernando Co. ARA. Sand Hill Scout Camp, 11210 Cortez Blvd. *TI:* 146.715. *Adm:* $6. **www.hcara.org**

Florida (Sebring) — Feb. 15 F H R T
8 AM – 1 PM. *Spr:* Highlands Co. ARC. First Baptist Church of Lake Josephine, 111 Lake Josephine Dr. *TI:* 147.045 (100 Hz). *Adm:* $5. Email: **rbg695@hotmail.com**

Georgia (Dalton) — Feb. 22 D F H R T V
8 AM – 2 PM. *Spr:* Dalton ARC. North Georgia Fairgrounds, 500 Legion Dr. *TI:* 145.230 (141.3 Hz). *Adm:* $5. **www.qrz.com/db/w4drc**

Indiana (Dugger) — Feb. 22 D H V
8 AM – noon. *Spr:* Dugger ARC. Dugger Community Building, 840 Hicum St. *TI:* 146.775 (136.5 Hz). *Adm:* $5. Email: **boscoguns@yahoo.com**

Iowa (Perry) — Feb. 22 D F H Q R S V
8 AM. *Spr:* Hiawatha ARC. Perry National Guard Armory, 2930 Willis Ave. *TI:* 145.190 (118.8 Hz). *Adm:* $15. **www.harciowa.org**

Massachusetts (Chicopee) — Mar. 1 D F H R V
8:30 AM – noon. *Spr:* Mt. Tom Amateur Repeater Association. Castle of Knights, 1599 Memorial Dr. *TI:* 146.94 (127.3 Hz). *Adm:* $10. **www.mtara.org**

Massachusetts (Marlborough) — Feb. 15 F H R V
9 AM – noon. *Spr:* Algonquin ARC. 1LT Charles W. Whitcomb Middle School, 25 Union St. *TI:* 446.675 (88.5 Hz). *Adm:* $5. **www.n1em.org**

Michigan (Northville) — Feb. 22 D F H R
8 AM – noon. *Spr:* Livonia ARC. Ward Church Knox Hall, 40000 Six Mile Rd. *TI:* 145.35 (100 Hz). *Adm:* $5. Email: **k8uns@arrl.net**

Michigan (Traverse City) — Feb. 8 D F H R V
8 AM – noon. *Spr:* Cherryland ARC. VFW Hall, 3400 Veterans Dr. *TI:* 146.86 (114.8 Hz). *Adm:* $5. **www.cherrylandarc.com**

Minnesota (St. Cloud) — Feb. 15 D H Q R S V
9 AM – 1 PM. *Spr:* St. Cloud ARC. St. Cloud National Guard Armory, 1710 Veterans Dr. *TI:* 146.94 (100 Hz). *Adm:* $10. **www.w0sv.club**

New Jersey (Clinton [Annandale]) — Mar. 8 D F H R V
8 AM. *Spr:* Cherryville Repeater Association II. North Hunterdon High School, 1445 Rte. 31. S. *TI:* 147.375 (151.4 Hz). *Adm:* $7. **www.w2cra.org**

New York (Hicksville) — Feb. 23 D H Q R S V
8:45 AM. *Spr:* Long Island Mobile ARC. Levittown Hall, 201 Levittown Pkwy. *TI:* 146.85 (135.6 Hz). *Adm:* $8. Email: **richierec@gmail.com**

New York (Troy) — Feb. 1 F H S
8 AM – 2 PM. *Spr:* W2SZ RPI ARC. Rensselaer Union McNeil Room (2nd-floor lobby), 1761 15th St. *TI:* 146.82 simplex. *Adm:* $6; free to current students. **www.w2sz.org**

North Carolina (Concord) — Mar. 7 – 8 D F Q R S
Fri. 3 PM – 7 PM, Sat. 8:30 AM – 4 PM. *Spr:* Mecklenburg ARS. Cabarrus Arena & Events Center, 4751 Hwy. 49 N. *TI:* 146.655. *Adm:* $12 Advance, $15 door. **www.charlottehamfest.org**

Oklahoma (Sayre) — Mar. 1 F H R V
8 AM. *Spr:* West Central Oklahoma ARC. Beckham Co. Activity Building, 300 E. Main St. *TI:* 146.76 (88.5 Hz). *Adm:* $5. **http://sites.google.com/view/wcoarc**

Oregon (Rickreall) — Feb. 15 D F H R V
9 AM – 3 PM. *Spr:* Salem Repeater Association. Polk Co. Fairgrounds, 520 S. Pacific Hwy. W. *Adm:* $10. **www.w7sra.com**

Pennsylvania (Youngsville) — Mar. 8 F H Q R V
7 AM – noon. *Spr:* BSA Venturing Crew 73. Youngsville Free Methodist Church, 179 Davis St. *TI:* 145.11 (186.2 Hz). *Adm:* $5. **https://sites.google.com/site/kb3bsa/warren-county-hamfest?authuser=0**

Tennessee (Tullahoma) — Mar. 7 – 8 D F H R S T V
Fri. 4:30 PM – 8 PM, Sat. 8 AM – 2 PM. *Spr:* Middle Tennessee ARS. First United Methodist Church, 208 W. Lauderdale St. *TI:* 146.70 (114.8 Hz). *Adm:* $10. **www.qsl.net/mtars**

Texas (Harlingen) — Feb. 8 D F H R V
7:30 AM – noon. *Spr:* Rio ARC. Sunshine RV Resort, 1900 Grace Ave. *TI:* 147.14 (114.8 Hz). *Adm:* Free. **www.rioarc.arc**

Texas (Irving) — Mar. 1 F H R V
8 AM – 2 PM. *Spr:* Irving ARC. Betcha Bingo Hall, 2420 W. Irving Blvd. *TI:* 146.72 (110.3 Hz). *Adm:* $5. **www.irvingarc.org/hamfest**

Texas (Orange) — Feb. 21 – 22 D F H R S T V
Fri. 1 PM – 6:30 PM, Sat. 7:30 AM – 2 PM. *Spr:* Orange ARC, Jefferson Co. ARC. Orange Co. Convention & Expo Center, 11475 FM 1442. *Tl:* 147.18 (103.5 Hz). *Adm:* $10. **www.qsl.net/w5nd/index_files/HAMFEST%20INFO/hamfest%20info.htm**

UTAH DIGITAL COMMUNICATIONS CONFERENCE

February 22, Sandy, Utah
H S
7:30 AM – 2 PM. *Spr:* Utah VHF Society. Conference Center at Miller Campus, 9750 S. 300 W. *Tl:* 146.62. *Adm:* $15 Advance, $20 door. **https://utah-dcc.square.site**

ARRL VERMONT STATE CONVENTION

February 22, Colchester, Vermont
D F H Q S V
8 AM – 1 PM. *Spr:* Radio Amateurs of Northern Vermont. Hampton Inn Convention Center, 42 Lower Mountain View Dr. *Tl:* 145.15 (100 Hz). *Adm:* $7 Advance, $12 door. **www.ham-con.org**

Virginia (Gloucester) — Feb. 1 D F H R T
9 AM – 4 PM. *Spr:* Middle Peninsula ARC. Gloucester Moose Lodge #886, 6565 Moose Dr. *Tl:* 145.37 (100 Hz). *Adm:* $10. **www.mparchamfest.com**

Washington (Puyallup) — Mar. 8 D F H R V
9 AM – 3 PM. *Spr:* Mike & Key ARC. Washington State Fairgrounds Pavilion, 110 9th Ave. SW. *Tl:* 146.82 (103.5 Hz). *Adm:* $12. **www.mikeandkey.org**

West Virginia (Charleston) — Mar. 1 D F H R S V
9 AM – 1 PM. *Spr:* Charleston Area Hamfest & Computer Show, Inc. Beni Kedem Temple, 100 Quarrier St. *Tl:* 145.35 (91.5 Hz). *Adm:* $10. **www.qsl.net/w8gk**

West Virginia (Glenville) — Feb. 22 D F H R V
8 AM – 2 PM. *Spr:* Pioneer ARA. Gilmer Co. Recreation Center, 1365 Sycamore Run Rd. *Tl:* 145.29 (915 Hz). *Adm:* $5; kids under 12, free. Email: **jlarrybarton@gmail.com**

To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests-and-conventions-calendar**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/hamfest-convention-application** for an online registration form. Dates may be recorded up to 2 years in advance.

Events that are sanctioned by ARRL receive special benefits, including an announcement in these listings and online. Sanctioned conventions are also listed in *The ARRL Letter*. In addition, events receive donated ARRL prize certificates. Once the form has been submitted, your ARRL Director will decide whether to approve the date and provide ARRL sanction.

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **March 1** to be listed in the **May** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's website for possible late changes, driving directions, and other event details. Please note that postal regulations prohibit mention in *QST* of games of chance, such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and ARRL web banner advertising. Call ARRL's toll-free number at 1-800-243-7768, or email **ads@arrl.org**.

Field Organization Reports — November 2024

Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program can be found at: **www.arrl.org/public-service-honor-roll**.

615
AD8CM

475
N9VC

300
W7EES

280
AC8NP

270
W9FE

265
W9EEU

261
WD8USA

255
KT2D

230
N3KRX

229
W7PAT

220
NI2W
N2LC

215
WM5N

205
KB3YRU

200
W9RY

196
KD2LPM

191
KC8YVF

190
KC9FXE
N4CNX

186
KO4KUS

185
W9GRG

182
KD2NMG

180
KD8UUB

168
KD2QAR

164
KC8T

161
KA9IKK

160
K9LGU
N8SY

155
N1ILZ

150
WB9QPM
KR4PI
WB8YYS
WO2H

146
WV5Q

140
WA0QLW
KK3F
WB9WKO
KD8ZCM
KW1U

139
W8IM
WM2C

135
AG9G

130
AC0KQ
K3JL
K8MDA
KC8PBU
WK4WC
N2JBA
KV2J
N1UMJ
WZ0C

127
W3YVQ

125
W2PAX
KY2MMM

124
KB5PGY

120
WC4FSU
AD4DO
KE4RS
WA4VGZ
W2AH
KY2D
KA0HHN
AB9ZA

119
K1YBO

115
N0JAR

114
AI9F

112
K3EAM

111
W5WMC

110
KM4WHO
AD3J
KO4OL
WB9EDL
W4CMH
KE4ANW
N2DW
WB8TQZ
N1IQI
W1RVY
N1LAH
KC1KVY

108
KC1HHO

105
K7OED
W8MAL

103
K5OB
WA3EZN

100
WB4RJW
NX9K
N8MRS
KB8GUN
WB8SIQ
W4EDN
K2MTG
K3YAK
KA2HZP
KB2QO
WB2VUF
W1KX
AE5MI
W1TCD

98
W4TTO
W9BGJ

95
W4NHO
KF8ATJ

93
WW3S

92
W2OOD

90
KT5SR
KC9UC
W8GSR
KL7RF
K8KRA
N8OD
KN4AAG
W2ARP
W4KX
KT4WX
K8ED
KB8PGW
WX2DX
N1CVO

89
WA3QPX
NT1N

86
KV8Z

85
K4NWX
KF7GC
KB4OLY
WB8RGE

84
AC8AL

83
KB3MXK
KT5EM

82
WB4ZDU

81
KM4WXX

80
KG5AOP
KR4ST
KA8BJA

AE2EY
K2MJR
KE8DON

79
KB1NAL
N8RWF
K8RDN

78
KE8HKA

77
NJ5R

75
WB3FTQ
N2TSO
W2QMI

74
KM4BRQ

73
AF7SC
W5XX
N0ET

72
K1CJV
N4NOA
K2PHD
K4DH

70
K6RAU

The following stations qualified for PSHR in October 2024, but have not been recognized in this column yet: W9EEU 161, KA9QWC 120, AB9ZA 120, W9BGJ 76.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AR, AZ, CO, CT, DE, EMA, ENY, EPA, GA, IL, IN, KY, LA, MDC, ME, MI, MO, MS, NC, ND, NE, NFL, NLI, NM, NNJ, NNY, OH, OR, RI, SD, SFL, SJV, SNJ, STX, TN, WCF, WI, WMA, WPA, WY.

Brass Pounders League

The BPL is open to all amateurs in the US, Canada, and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on amateur radio frequencies within 48 hours of receipt in standard ARRL radiogram format. Call signs of qualifiers and their monthly BPL total points follow.

KY2D 2,472, NX9K 1,888, W2AH 1,298, WB9WKO 814, W8MAL 778, KW1U 746, KK3F 664, WA3QLW 653, N9CK 584, KB9GO 571, AG9G 500.

Special Events Stations

Working special event stations is an enjoyable way to help commemorate history. Many provide a special QSL card or certificate!

Jan. 11 – Jan. 12, 1500Z – 0300Z, KB4RK/W4CEC, Blairsville, GA. Boy Scouts of America. **Scouters Winter Camp Out SWC2025**. 7.257 14.057 14.257 21.257 PSK. QSL. Russ Keller, KB4RK, 1129 Hidden Hills Dr., Wake Forest, NC 27587. **www.swcbsa.org**

Feb. 15 – Feb. 16, 1500Z – 1600Z, K4US, Alexandria, VA. Mount Vernon Amateur Radio Club. **George Washington's Birthday at Mount Vernon**. 7.042 7.242 14.042 14.242. QSL. MVARC, P.O. Box 7234, Alexandria, VA 22307. **www.mvarc.org** or **k4us@mvarc.org**

Feb. 15 – Feb. 17, 1600Z – 2300Z, WØJH, Stillwater, MN. Stillwater Amateur Radio Association. **Ice Station WØJH — Frozen Minnesota Lake Portable**. 3.860 7.260 14.260 21.360. E-certificate. Send QSL information to **w0jhrequest@gmail.com**. *WØJH will operate portable from a frozen lake in Washington County, Minnesota; grid square EN34*. **www.radioham.org**

Feb. 15 – Feb. 23, 0000Z – 1259Z, W7P, Flagstaff, AZ. Northern Arizona DX Association. **Pluto Discovery Anniversary Special Event**. 7.290 14.090 14.290 21.290; all bands, all modes. Certificate & QSL. W7P c/o NADXA, 6315 Townsend-Winona Rd., Flagstaff, AZ 86004-1493. *Operating from the Lowell Observatory and club member's home QTHs*. **www.qrz.com/db/w7p** or **www.nadxa.com**

Feb. 16 – Feb. 18, 0000Z – 0000Z, WØH, Jackson, OH. White House Communications Agency Amateur Radio Club. **The White House Communications Agency Amateur Radio Club Presidents Day 2025 Commemoration**. 3.875 7.275 14.250 28.550. Certificate. Lowell Yates, 6809 Four Mile Rd., Jackson, OH 45640. **www.whitehousecomms-arc.org**

Feb. 17 – Feb. 21, 1700Z – 1900Z, WØCXX, Cedar Rapids, IA. Collins Amateur Radio Club. **Celebrating Engineers Week at Collins Aerospace**. 14.263. QSL. Brice Anton-Jensen, 1110 Lyndhurst Dr., Hiawatha, IA 52233. *Club members may operate outside of the specified time; some may operate on Sunday, Feb. 16 or Saturday, Feb. 22*. **www.qrz.com/db/w0cxx**

Feb. 19 – Feb. 24, 0000Z – 0000Z, NV7AL, Las Vegas, NV. American Legion Paradise Post 149 and 40&8 Voiture 306. **Merci Train Boxcar Anniversary**. 7.074 7.250 14.074 14.250. QSL. Robert Bencsko, 2548 Fort Lauderdale Dr., Las Vegas, NV 89156. *Watch for us on DX Summit.* **www.qrz.com/db/nv7al**

Feb. 21 – Feb. 23, 1700Z – 2100Z, WS7G, George, WA. Columbia Basin DX Club. **George Washington's Birthday**. 7.222 7.260 14.255 14.322. Certificate & QSL. Brian Nielson, 11650 Road 1 SE, Moses Lake, WA 98837. **www.homestead.com/ws7g.html**

Feb. 22, 1400Z – 2200Z, WØEBB, Leavenworth, KS. Kickapoo QRP Amateur Radio Club. **21st Annual Freeze Your Keys Winter Operating Event**. 7.035 7.240 14.058 14.325. QSL. Gary Auchard, 34058 167th St., Leavenworth, KS 66048. **w0mna74@gmail.com**

Feb. 22, 1600Z – 2000Z, K3CAL, Prince Frederick, MD. Calvert Amateur Radio Association. **Calvert High School STEM Expo**. 14.220 14.270 14.305 14.330. QSL. Calvert Amateur Radio Association, P.O. Box 306, Huntingtown, MD 20639. **www.k3cal.club**

Feb. 22 – Feb. 23, 0000Z – 2359Z, NJ2KC, Bridgeton, NJ. New Jersey Knights of Columbus Amateur Radio Club. **Knights of Columbus 125th Anniversary of the Fourth Degree**. 7.2125 14.3125 18.1125 21.4125. Certificate & QSL. NJ2KC c/o Thomas M. Perrotti, 785 Vineland Ave., Bridgeton, NJ 08302. **www.nj2kc.org**

Feb. 28, 0000Z – 0130Z, W3SGJ, Beaver, PA. Beaver Valley Amateur Radio Association. **Beaver Valley ARA CW Roundup**. 28.040. Certificate. Rich Soltesz, K3SOM, 115 Brooks Dr., Beaver Falls, PA 15010. *This event is to allow all classes of amateur radio operators, both new and old, to participate and to encourage operators to get on the air for one evening to make CW contacts*. **www.qrz.com/db/w3sgj**

Feb. 28, 0000Z – 2359Z, N4R, Sparta, TN. KR4EE. **2025 Rare Disease Day SES**. 14.074. QSL. Jill Dybka, 7737 Sparta Hwy., Sparta, TN 38583. *PSK, FT4, FT8; other modes are possible*. **www.qrz.com/db/kr4ee**

Certificates and QSL cards: To obtain a certificate from any of the special event stations offering them, send your QSO information along with a 9 × 12-inch self-addressed, stamped envelope (3 units of postage) to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form at **www.arrl.org/special-events-application**, or email information to **events@arrl.org.**

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **May** *QST* would have to be received by **March 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Event page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us. ARRL reserves the right to exclude events of a commercial or political nature.

Volunteer Monitor Program Report

The Volunteer Monitor (VM) Program is a joint initiative between ARRL and the FCC to enhance compliance in the Amateur Radio Service. This is the November 2024 activity report of the VM Program.

♦ Commendations were issued to amateurs in Sequim, Moses Lake, Richland, Bothell, Morton, and Soap Lake, Washington; Placerville, California, and Bend, Oregon, for exemplary operation as net control operators of the Columbia Basin Net operating on 3.960 MHz.

♦ An amateur radio operator in Maryland received a commendation for exemplary AM operation and for explaining proper AM operating procedures and transmitter settings to those participating in AM communications.

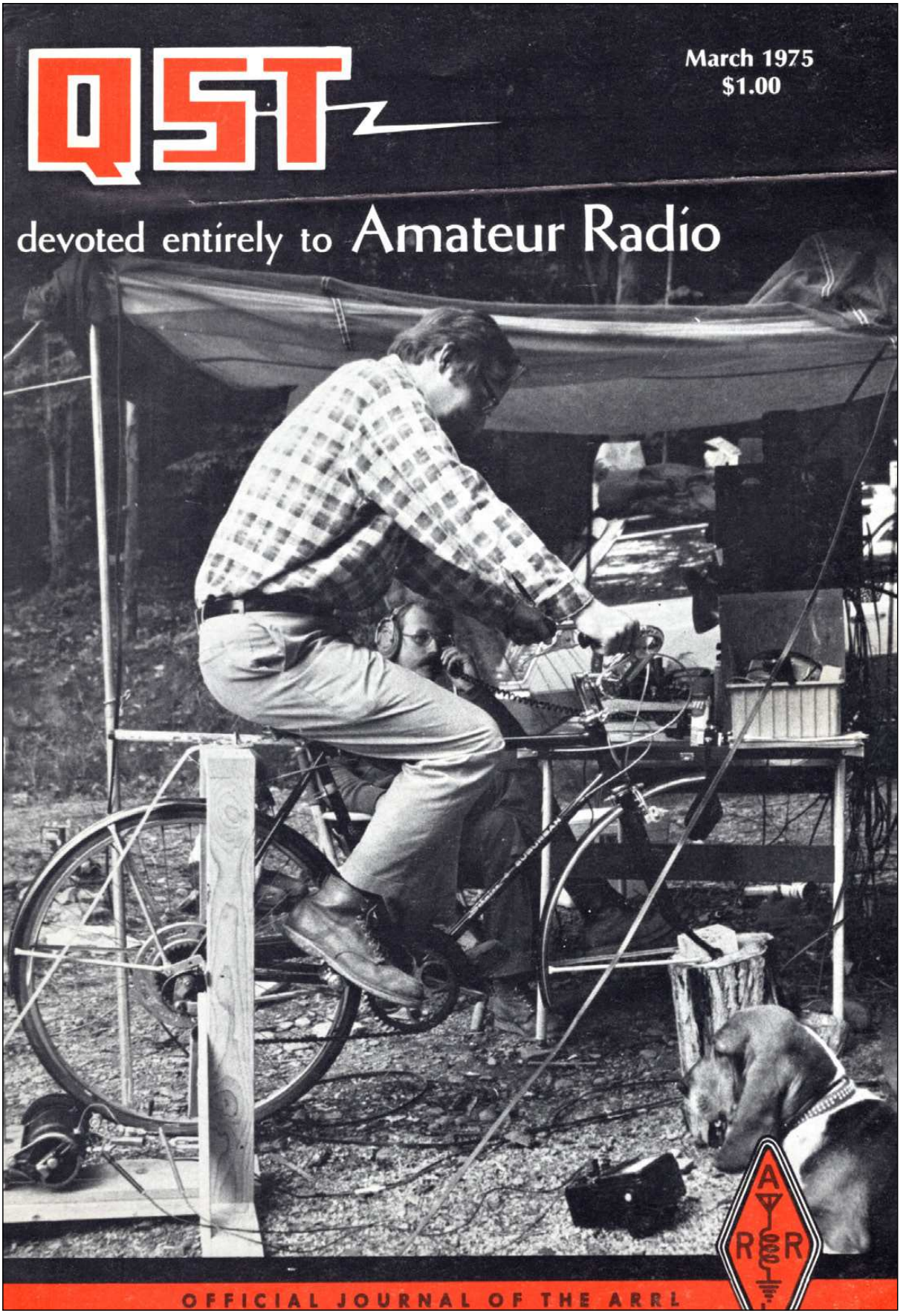
♦ Operators in Louisiana and Arizona received advisories for operation with expired licenses.

♦ A Technician-class operator in Florida received an advisory for FT8 operation on 40 meters. Technicians can only use CW on 40 meters. A Technician-class operator in Utah received an advisory concerning FT8 operation on 30 meters. Technicians have no operating privileges on 30 meters.

♦ An operator in Florida received an advisory for unattended robotic FT8 operation on 14.074 MHz. Under FCC Rule 97.221(b), an unattended station may be auto-controlled only while transmitting on RTTY or data on the subbands of 14.0950 – 14.0995 or 14.1005 – 14.112 MHz. Such stations may not call CQ and can only respond to being polled.

The totals for October 2024 monitoring were 1,562 hours on HF frequencies, and 2,215 hours on VHF frequencies and above, for a total of 3,777 hours. — *Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH*

A Look Back


QST
March 1975
$1.00
devoted entirely to Amateur Radio
OFFICIAL JOURNAL OF THE ARRL

Hints and Kinks For the Experimenter

HANDY HOMEMADE ADAPTERS

The two adapters shown in the accompanying photograph are simple to assemble and useful for hams using their 2-meter rigs for both base and mobile operation. The adapter at the top is for connecting one chassis jack to another. Two male phono plugs (RCA type) and a 2-inch piece of No. 16 wire are all that are necessary. Place the plugs back to back. Run the piece of wire through both male plugs, and solder the wire to plug tips. Be sure the backs are touching one another, then solder them together.

For the other adapter, drill out the hole in the reducing adapter (UG-175) to a 0.242-inch diameter, using a letter "C" size drill. Remove the nut and washers from the chassis jack. Solder one end of a 3-inch long, No. 16 wire to the center terminal of the chassis jack. Grip the outer ring of the chassis jack and the reducing adapter with a pair of pliers and thread the jack all the way into the 0.242-inch diameter hole.

Some resistance will be encountered because the steel chassis jack is cutting its own threads into the brass adapter. The reason for assembling these two pieces in this manner is that the chassis jack has a 1/4-32 thread and a tap for this thread is not readily available to the average ham. Solder the other end of the No. 16 wire to the center terminal of the PL-259 and trim off the excess wire. – *Wayne L. Jung, WB9IQC*

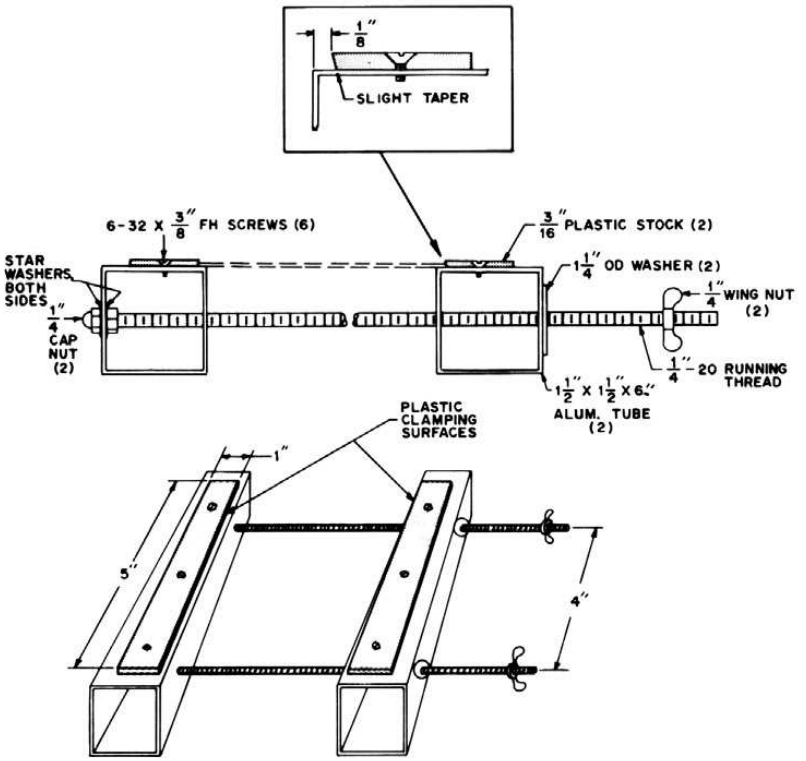


Fig. 1 — Printed-circuit-board rig. Wooden blocks can be used instead of aluminum tubing.

CIRCUIT-BOARD HOLDER

After only a brief exposure to working with circuit boards and the problems of supporting these unwieldly lightweights, it became obvious that some holding device was an absolute must. The commercially available clamps are beautiful, but they are expensive, and who needs all those universal joints?

The device I use was built from parts readily available and simple enough for a one-evening project. My unit has a width capacity of 6 inches, but this can be increased by using longer threaded rods (Fig. 1). For the ham with limited working space, this clamp has the advantage of being stored easily when not in use, freeing the operating position or kitchen table for other uses.

The 1-1/2 × 1-1/2 × 6-inch aluminum tubing used as a base for the clamp is available – usually as scrap – from any aluminum-awning fabricator. The material I found had a wall thickness heavy enough to be tapped for the No. 6-32 screws that hold the plastic jaws. Wooden blocks could be substituted for the aluminum tubing at some sacrifice in weight and appearance.

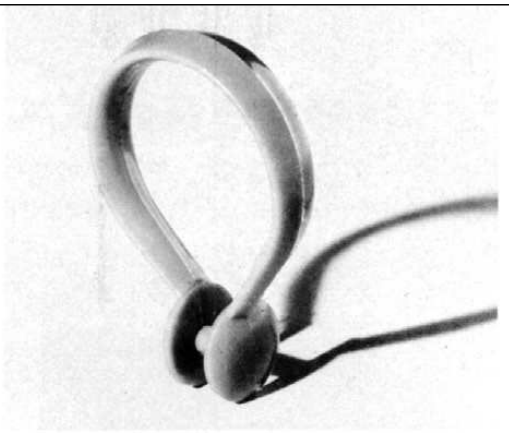
The screws, nuts, washers, and threaded rod are available at any hardware store. The 1/4-inch rod comes in 36-inch lengths at about 60¢ per length, so your total investment should not be more than a couple of dollars. The plastic jaws were cut from 3/16-inch sheet stock (2 pieces 1 × 5 inches). However, there is nothing sacred about these dimensions. The tapered clamping edge should be worked with care to obtain a true straightedge and a uniform taper from end to end. This is not as difficult as it sounds. Place a sheet of sandpaper on a perfectly flat surface and hand lap the edge while checking at intervals with a known straightedge.

The holes in the aluminum tubing to pass the 1/4-inch rods should be drilled for minimum clearance. This will permit smooth adjustment while avoiding sloppy action at the jaws. With a little effort and minimum expense you can roll your own circuit-board clamp for near-perfect working conditions on that next solid-state project. – *Dave Adams, W6DRM*

LOW-COST CABLE HANGERS

There is a frequent need for bringing coaxial cables and assorted control wires into the ham shack, or from one equipment rack to another in the same room. A neat installation will help to keep the numerous conductors from creating an octopus of disarray.

This writer recently purchased 12 plastic shower-curtain hooks for 79 cents at a nearby discount store, hoping to solve a problem the OM was having. It seems that he was trying to bring three coaxial cables, a rotator control line, and a shielded pair for controlling a remote tower-mounted antenna switch into the shack from outdoors. The cables were hanging in disorderly fashion between the tower and the entrance panel on the rear wall of the house. It was suggested that the lines be dressed neatly under the overhang of the house, approximately six feet above ground.

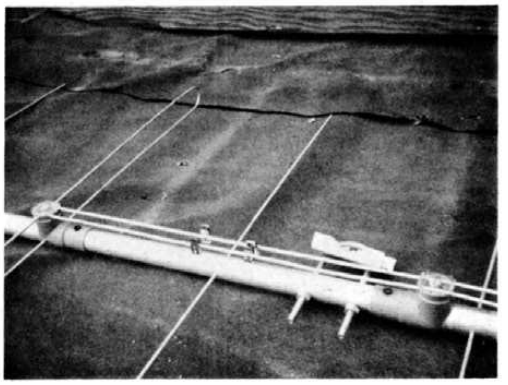


The shower-curtain hooks (see photo) turned out to be ideal for the application. A piece of heavy-duty guy line was stretched between the lower tower section and a support member for the sun porch, anchored in place, and equipped with six of the shower-curtain hooks. The cables were then run through the hooks to the point where they could be dropped down to the entry panel leading to the shack.

The style of hooks shown here are of the snap-together variety, thereby permitting them to be opened easily when it is necessary to add or delete a cable. One thing for sure, it beats holding bundles of wire together with vinyl-plastic electrical tape. The latter creates a sticky, disgusting mess after being exposed to the sun in warm weather. – *W1CKK*

ALUMINUM WIRE CONNECTIONS

When using aluminum wire for elements and matching stubs on a 220-MHz Yagi, I needed a way to make easily adjustable connections to the Twin-Lead and to the shorting stub. The solution was to use large Fahnestock clips, slipped over the ends of the wire before the array was assembled. A pair of clips were soldered together to make the shorting stub. Incidentally, the insulators shown were made of plastic pipe fittings, drilled to fit over the 7/8-inch boom, and slotted with a saw to take the stub wires. – *Donn G. Shankland, W8WVS*



Celebrating Our Legacy

A Ham in New York City

Around 1972, I started listening to the New York Rangers hockey games, Jean Shepherd (who was a ham — K2ORS), and Wolfman Jack on a transistor radio. One late night, I tuned around and heard a Blackhawks hockey game from Chicago. I told my best friend Peter, who said he heard the same thing on his transistor radio. He said we could listen to stations even farther away if we had a radio with a shortwave band and the AM band.

Within a few months, Peter, my other friend Randy, and I bought shortwave radios. We could listen all over the world but needed a long wire antenna, preferably outside. I lived on the first floor of a two-family house, so I ran a wire across the attic and down to my bedroom. It was exciting to discover we could listen to a shortwave station in New Zealand, and if we sent them a letter, they would send us back a postcard with a picture and the station's call letters. So, we competed to see who got the most and best QSL cards.

One evening, we were at Randy's house listening to his Lafayette shortwave radio, and the signal was suddenly interrupted. Somehow, Randy figured out it was Morse code. Randy eventually discovered a gentleman named Bob, who was a ham, in the apartment building next door. Randy got us invited to his shack, and I remember his primary radio was one of the first from Yaesu: an FT-100. From that day on, we were hooked. Bob became our mentor and gave us our Novice exam. Eventually, we passed the General exam, and later, I passed the Advanced-class exam.

Forty-Fifth Street and Canal Street were the two key radio supply locations at the time. Canal Street was more fun because the stores sold mostly used parts, and many of the people who managed or owned the shops moved from the original Radio Row.

Our perfect jaunt was taking the train to Canal Street and picking up a few circuit boards and parts before hitting Barry's Electronics. It was one of the few family-owned amateur radio-only stores at that time. After lunch, we'd stop at Forty-Fifth Street for more looks at Arrow Electronics, Lafayette Electronics, and HeathKit. Most of these stores sold magazines such as *QST*, *CQ*, *Ham Radio, Popular Electronics*, and *Popular Mechanics,* and we often picked up copies.

Currently, I live in Yonkers, New York, in a neighborhood called "Morsemere" with a rich history of radio. A few blocks away is the former site of Edwin Armstrong's home and laboratory. Armstrong is considered the father of FM radio, and his Alpine Radio Tower is still visible directly across the Hudson River in Alpine, New Jersey. Just North of Yonkers in Ardsley, New York, was the home of Cyrus Field, co-creator of the Atlantic Telegraph Company. Field met with Samuel Morse to plan laying the first transatlantic telegraph cable in the 1860s.

Mark Samis, KD2XS
Yonkers, New York

A Morse Code Convert

The Morse code requirement to become a ham kept me away from the hobby until the early 1990s when they added the Technician no-code license. When I heard the Morse code requirement was dropped, I quickly started studying for the test. I was content with being a no-code Technician and enjoyed the benefits of 2-meter FM and a little segment of 10-meter phone.

A few months after receiving my amateur radio license, I was invited to my uncle Al's, K9XR, house, where a bunch of hams crowded around equipment. The smell of warm electronics and the sharp tones of Morse code filled the room. It was a CW contest — the first I had ever experienced.

I didn't know how to decipher the dits and dahs jumping out of the speaker, and was intrigued by the fact that these folks were communicating with a whole other language! After watching the intensity of the operation, I was suddenly motivated to join in the action! So, over the next 20 months, I passed my 5, 13, and then 20 WPM tests and have enjoyed CW ever since. I owe it all to my uncle for exposing me to this aspect of the hobby, and I have had some of the most enjoyable experiences with CW.

Thomas Johnson, K9KJ
Munster, Indiana
Life Member

Send reminiscences of your early days in radio to **celebrate@arrl.org**. Submissions selected for publication will be edited for space and clarity. Material published in "Celebrating Our Legacy" may also appear in other ARRL media. The publishers of *QST* assume no responsibility for statements made in this column.

George J. Misic, KE8RN, ke8rn@comcast.net

Classic Radio

A Shift from Three-Band to Five-Band Transceivers

In the 1960s, Galaxy, National Radio Company, Swan Electronics, and Collins Radio shifted their products from three-band radios to five-band transceivers covering 80/75, 40, 20, 15, and 10 meters.

Collins Radio Was the First to Develop Triband and Five-Band Radios

Collins Radio, the definitive leader in amateur radio equipment from the 1940s to the 1960s, went from making the very first SSB/CW transceiver in 1957 to making the first five-band SSB/CW transceiver in 1959, well before anyone brought a five-band transceiver to the market (and 1 year before Gonset marketed the G-76 — an AM/CW transceiver — in 1960). Collins Radio's three-band KWM-1 transceiver was mostly aimed at the mobile market and was unique because it was the only product that covered 20, 15, and 10 meters, as opposed to 80/75 or 75, 40, and 20 meters like many other triband transceivers did.

The KWM-1 was a historic item, as it was the first SSB/CW transceiver ever made. The advanced and upscale KWM-2 covered 80/75, 40, 20, 15, and 10 meters in 200 kHz bits; 80/75 to 15 meters were fully covered, and the base model of the KWM-2 came with 28.5 to 28.7 kHz, with room for two more 200 kHz-wide bits of 10 meters. The KWM-1 was on Collins Radio dealers' shelves in 1957, and the KWM-2 followed suit 2 years later, in 1959.

Swan Electronics, Hallicrafters, and R. L. Drake Introduced Five-Band Transceivers

Swan Electronics was first to upgrade from a traditional triband radio to a five-band product. In 1963, the company went from manufacturing the SW-240 tribander, which followed their 75-, 40-, and 20-meter SSB transceivers, to putting the Swan 400 — with a separate variable frequency oscillator and five bands — on the ham radio market.

Also in 1963, Drake premiered their TR-3 five-band transceiver (and were still offering triband radios). Hallicrafters also released a five-band SSB/CW transceiver in 1963 — the SR-150 — along with their triband product, the SR-160. It was quite an active year for new designs in amateur radio.

The Collins Radio KWM-1 was the first SSB/CW transceiver ever made. [Photo courtesy of **www.rigreference.com**]

National Made a Mechanical Work of Art in 1964

In 1962, National Radio Company started making SSB transceivers with their NCX-3 SSB/CW/AM transceiver and ac and dc power supplies. National's advanced NCX-5 SSB/CW/AM transceiver, with accurate mechanical digital frequency readout, entered the ham radio market in 1964. The NCX-5 was a mechanical and electrical work of art, and it was pleasing to the eye in its cosmic blue cabinet. The NCX-3 and NCX-5 had receiving and transmitting accommodations for AM that very few SSB/CW transceivers had.

Galaxy Made a Second Tribander Designed like a Five-Band Radio

Galaxy's first transceiver was the Galaxy 300 in 1963, and it covered 80/75, 40, and 20 meters. The company then developed a better tribander (in fact, it was better than all the tribanders on the market at that time, except the KWM-1), with their Galaxy III. Shortly after that, they came out with the Galaxy V five-band radio. The Galaxy radios were hybrids made with vacuum tubes and transistor components.

National's NCX-5, an advanced SSB/CW/AM transceiver, entered the ham radio market in 1964. [Photo courtesy of **www.rigpix.com**]

Sideband Engineers Deserves a Note for Their Four-Band Rig

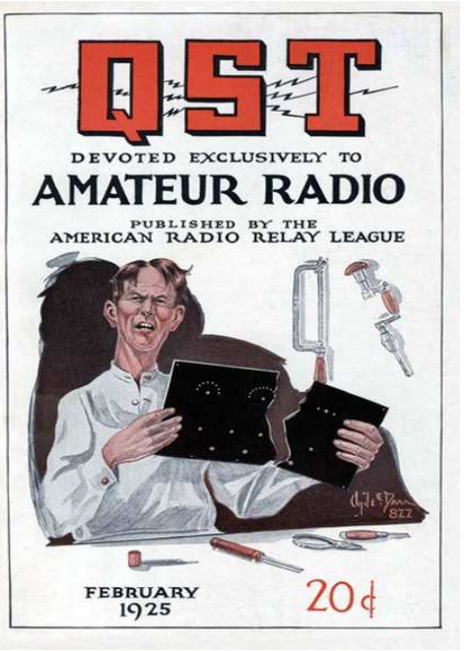
Sideband Engineers (SBE) never made a three-band radio and marketed only two five-band radios in the 1970s (the SB-35 and SB-36). However, when the other manufacturers listed in this article were beginning to sell five-band transceivers, SBE announced the SB-33 — a mostly solid-state radio with a built-in power supply and four bands, including 15 meters. The SB-33 used only three tubes in the transmitter: a 12DQ7 driver and two black and white TV horizontal sweep tubes. It had a very clever circuitry to get selectable sideband without a shift in carrier frequency and to allow all interstage circuits to be used on transmit and receive. It also used a Geneva mechanism, which was when the combined bandswitch and preselector/driver tuning control were joined so that a single knob could serve both purposes. The whole transceiver was a study in clever and compact design.

The Galaxy V was advertised in the March 1966 issue of *QST*.

100, 50, and 25 Years Ago

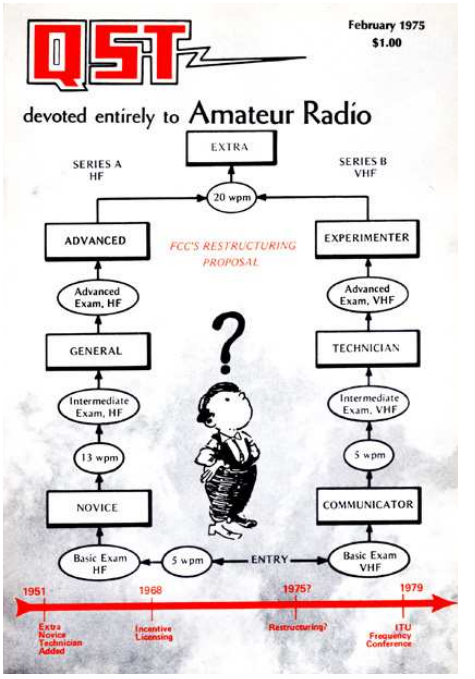
February 1925

- The cover shows an unhappy ham holding a Bakelite front panel that has broken into two pieces, just after having finished drilling the holes.
- "Editorials: The Hoover Bill" reports on a bill proposed by Secretary of Commerce Hoover that discusses the perceived changes to the conditions surrounding radio that temporarily sidetrack the White Bill.
- The first installment of "The McCaa Anti-Static Devices," a method of combating static and power leaks, presents the theory behind one of the devices that is suited to both telephony and code work. The second installment outlines construction details and other devices.
- "The Month's International DX: An International Chess Match," by K.B. Warner, 1BHW, reports a record for consistent amateur communication during a 5-and-a-half-hour chess match that was played via amateur radio between Haverford (PA) College and Oxford University.
- A cautionary tale of the Wouff-Hong is related in "The Great Discovery" by James Walter Harte.
- Charles E. Blalack, 6GG, shares some cures for interference problems he has experienced in "A Few Kinks on Reception."



February 1975

- A new look in amateur licensing? The cover shows a flowchart of the FCC's restructuring proposal.
- "It Seems to Us…The FCC Proposal" examines a few details of the FCC's proposal on license structure, privileges, and examination requirements. The full proposal appears in "Happenings of the Month: FCC's Restructuring Plan."
- Three watts PEP will do it on 6! An attractive way to get into the QRP game on 6 meters is detailed in "A State-of-the-Art QRP Transceiver for 50 MHz" by Peter J. Bertini, K1ZJH.
- Willi Richartz, HB9ADQ, shares a description of his multiband stacked vertical antenna in "A Stacked Multiband Vertical for 80 – 10 Meters."
- Some precautions to take when determining the internal resistance of a meter are explained in "Gimmicks and Gadgets: Measuring Meter Resistance" by Zeb William Rike, III, K5BBN.
- A lighthearted look at the emotional experiences of contesting is shared in "Contesting" by Albert Kahn, K4FW.
- Louise Ramsey Moreau, W3WRE, gives an update on the number of YL hams in Canada, beginning with the 1922 experimental station 3QT, in "YL News and Views: VE YL Clubs."



February 2000

- The cover shows a photo of the Collins 75A-4 receiver. The accompanying story of how a Collins Radio employee built the receiver one part at a time is presented in "A 75A-4 One Piece at a Time" by Joel Thurtell, K8PSV.
- In "It Seems to Us…Reasonable Accommodation," David Sumner, K1ZZ, shares the need for some clarification and fine-tuning of the FCC's preemption policy concerning PRB-1.
- Two three-element Yagi designs for 6-meter fun are detailed in "2×3=6" by L. B. Cebik, W4RNL.
- "A Repeater Controller Accessory: The RCA," by Dwayne Kincaid, WD8OYG, was initially designed for use with repeaters, but this flexible controller can be adapted to many other applications.
- Herbert F. Slade, AA2BF, shows how, by learning to safely climb your "antenna trees," you'll likely improve your antenna's performance and make life a little easier for your "natural skyhooks" in "A Beginner's Guide to Scaling Natural Skyhooks."
- The FCC's *Report and Order* in the 1998 Biennial Regulatory Review of Part 97 — license restructuring — was released on December 30, 1999. Rick Lindquist, N1RL, outlines the details in "Restructuring is Here: Three License Classes, One Code Speed."

Silent Keys

It is with deep regret that we record the passing of these radio amateurs:

K1DSW **Milne**, John, Jr., Braintree, MA
vKB1IBW **McKinnon**, John F., Saco, ME
K1JZ **Miller**, John D., Falmouth, MA
vN1MHC **Sirois**, Albert C., East Boothbay, ME
•K1MRH **Rice**, Barbara A., Bridgewater, MA
KC1ROE **Green**, Milton G., Stoneham, MA
♦W1UF **Shapiro**, L. Dennis, Los Angeles, CA
WT1X **Capezzano**, Richard, Westerly, RI
KB1YXN **Leonard**, Robert E., Middleboro, MA
v•W2EER **Stone**, Edward W., Fayetteville, NY
N2EYH **Bodin**, Richard, Pleasant Valley, NY
K2HYT **Bolden**, George H., Bronx, NY
v♦•WA2IJK **Siafakas**, Thomas R., Kill Buck, NY
v•N2JXD **Thomas**, Alfred F., Vauxhall, NJ
K2JYV **Boyne**, Gary J., Kenmore, NY
WA2KQR **Psaras**, Gus P., New Milford, CT
KB2MXD **Zimmerman**, Theodore, West Caldwell, NJ
vKD2NE **Ahrens**, Oscar F., Jr., Kingston, NY
N2NFI **Scheibel**, William F., Jr., Wading River, NY
vKA2NTB **Carroll**, William T., Jr., Woodbury, NJ
vW2NTE **Bartkowiak**, Gerald M., Medina, OH
vKC2PCK **Haus**, Paul Z., Jr., Teaneck, NJ
KC2PHD **Holmes**, Mitchell, Lexington, SC
N2RDA **Arms**, Robert D., Wayne, NJ
vW2SXK **Walsh**, Stephen J., Hudson, NY
vKC2UXL **Meyer**, Robert H., Jr., Afton, NY
N2WG **Wetherill**, William G., Jr., Wilmington, NC
vN3BTH **Gerber**, Carl A., Cleona, PA
K3CXW **Jerardi**, Thomas W., Columbia, MD
vN3DLS **Serkleski**, Donald L., Shinglehouse, PA
W3DSX **Light**, Randall G., Hamburg, PA
♦WA3HQK **Chuprinko**, Carl A., Morgantown, WV
KB3LCG **Sobeck**, Michael S., Manheim, PA
NB3M **Ialongo**, Ronald J., New Castle, PA
vW3MJZ **Zabko**, Michael J., Mechanicsville, MD
WA3MVQ **Schroeter**, Glade Glenn, Bethlehem, PA
KC3NMO **Stewart**, David P., Uniontown, PA
vKC3NND **Mitchell**, Joseph J., Pittsburgh, PA
vW3PSU **Books**, Harry M., Jr., Etters, PA
KT4AB **Metcalf**, Delbert, Memphis, TN
•WA4AGD **Perry**, Gerald F., Peachtree Corners, GA
vK4AIH **Foust**, James M., Murphy, NC
•KI4AUB **Haddock**, Linda T., Washington, NC
v•N4BCM **McDaniel**, Billy C., Jefferson, AR
AG4BL **Young**, Kenneth Z., Lindale, GA
N4BVT **Tenn**, Barbara V., Palm Bay, FL
N4DEF **Helton**, Tommie E., Griffin, GA
•N4ELU **Amos**, William N., Houston, TX
v•KC4EQM **O'Neal**, Steven D., Winter Haven, FL
N4FB **Cavanna**, Robert E., New Smyrna Beach, FL
W4FLA **Leifer**, Sherman, Boynton Beach, FL
N4FUW **Dewitt**, Ernest W., III, St. Simons Island, GA
•K4GAP **Thomas**, Gary L., Stanford, KY
AB4IQ **Pflueger**, Ed, Paducah, KY
KG4JQQ **Allen**, Joseph G., Shelby, NC
WD4JVV **Stamey**, Henry G., Nolensville, TN
♦AA4JX **Keown**, William F., Belton, SC
vWD4KOA **Keating**, E. C., Bartlett, TN
KE4KUN **Alleman**, Donald S., Jr., Cleveland, TN
KK4LAV **Vest**, Dennis W., Sparta, TN
WB4NSA **Tracy**, William F., Salem, KY
vWB4NXS **Raper**, Mallie C., Elm City, NC
KM4TKF **Bessey**, Gerald D., Hampstead, NC
vWB4TKX **Wilkes**, Carroll E., Albany, GA
vKM4UCK **Dunn**, Joseph R., Satellite Beach, FL
v♦WA4UMR **Morton**, John V., Louisville, KY
vAE4W **Carlson**, Gunnar C., Jr., Las Cruces, NM
vKD4WIA **Dideum**, Dennis C., Virginia Beach, VA
KD4YJV **Cassara**, Gerard J., Chapel Hill, NC
•K4ZHK **Messimer**, Alva W., Johnson City, TN
vAA4ZK **Kirkland**, Samuel N., Jr., North Dinwiddie, VA
vWD5ABK **Mosteller**, Ray G., Albuquerque, NM
•KA5EJX **Huckabay**, Rod, Lubbock, TX
♦WB5FWI **Kenworthey**, Charles W., Jr., San Antonio, TX
vKG5HLB **Smith**, Paul M., Baton Rouge, LA
N5IXA **Hunter**, Randall K., Oklahoma City, OK
KD5JET **Allen**, Wendell D., Iowa Park, TX
W5MDZ **Krause**, Earl E., Pasadena, TX
vNJ5O **Osborne**, James R., Castle Rock, CO
vKB5POZ **Stains**, Francis A., San Antonio, TX
vKE5RNE **Jassmann**, Kenneth, Questa, NM
AE5TP **Landesman**, Russell, Slidell, LA
WB5VRY **Graham**, Gary L., Orange Grove, TX
vKH6DM **Kolb**, Tim, Windsor, CO
♦♦W6FA **Bridges**, William B., Nevada City, CA
v•K6KSG **Singer**, Richard H., Howard, CO
♦N6NR **Olsen**, Richard Kenneth, Tieton, WA
v♦K6OSM **Schaefer**, Robert S., Gardnerville, NV
v♦AD6P **Yowell**, Cleyon O., Hutchinson, KS
N6RGY **Giannini**, Scott L., Sonora, CA
KH6RQ **Souza**, Eugene V., Kaneohe, HI
KI6UGB **Kraybill**, David M., Sebastopol, CA
vKC6WGH **Kinder**, Lane Ernest, Salem, OR
vK7DTB **Bly**, David T., Sierra Vista, AZ
vN7EKY **Clay**, Sherman P., Onalaska, WI
AE7GP **Pierce**, Gary Ray, Tucson, AZ
♦AC7JT **Tingey**, Jeffrey Coy, Logan, UT
vW7JY **Lillie**, Gerald L., Eugene, OR
KW7K **Reichard**, Stephen Scott, Brigham City, UT
•N7KUB **Post**, Roberta "Anne," Meridian, ID
v•N7KUC **Post**, Bob, Meridian, ID
vKK7MAJ **Tissaw**, Richard W., Joseph City, AZ
vKC7SMB **Ruby**, Ronald I., Bend, OR
N7SSD **Kinder**, Sharon M., Olympia, WA
KD7SXH **Zimmerli**, Robert E., Camp Verde, AZ
vWB7ULY **Chambers**, Doris M., Scottsdale, AZ
vKE7VNW **Hogg**, Donald W., Winnemucca, NV
vK7WTG **Hedberg**, Peter E., Redmond, WA
K8AOG **Sellers**, James D., Willard, OH
•KA8CFC **Buchwald**, Robert T., Independence, OH
K8DOL **Norcross**, Kay E., Dublin, OH
vWD8ECC **Elliott**, Kenwood D., Jackson, MI
KD8FIX **Derbisz**, Ronald A., Sr., Escanaba, MI
N8FMJ **Gundlach**, Thomas L., Sandusky, OH
N8GMD **Pengov**, Brian, Mentor, OH
KE8HCQ **Sonye**, Paul A., Avon Lake, OH
K8JBR **Barnhart**, Gary, Millersburg, OH
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♦K8JWG **Voigt**, Wesleyan K., Troy, MI
AA8K **Naruta**, Michael A., Port Huron, MI
WD8KEM **Rogers**, Evelyne J., Warren, OH
WA8KJJ **Clinger**, Frederick S., Yorktown, VA
v•K8OMS **Wilcox**, Robert Leon, Owosso, MI
W8QCI **Zarobila**, Charles M., Cleveland, OH
vK8SAM **Jackson**, Samuel H., III, Walkersville, MD
vW8TRC **Cuthbertson**, Thomas, Ira, MI
v•KA8VMJ **Van Alstine**, Leland C., Jackson, MI
K8WVG **Jendro**, James L., Dracut, MA
KE9AWM **Miller**, David M., Marion, IN
K9BDN **Fering**, Jim, Eau Claire, WI
KC9BUF **Gratchner**, Joseph R., Lake Zurich, IL
WA9CQU **Allmandinger**, Vernon V., Roanoke, IN
vW9DOQ **Reynolds**, Richard, Frankfort, IL
vKK9DX **Topala**, Corneliu M., Waynesboro, TN
W9EEP **Wilkinson**, Randall Joseph, Danville, IL
v•K9EOH **Baughn**, James B., Spencer, IN
•WA9FJQ **Knoblich**, Elliott R., Rockaway Beach, MO
W9LDP **Perkins**, Lyman D., Jr., La Porte, IN
KC9LKW **Pickett**, Roy A., English, IN
v♦W9NGA **Bergmark**, Don G., Green Valley, AZ
WA9OWY **Rice**, Roger D., Charleston, IL
KB9PDF **Albright**, Linda L., Centerville, IN
WA9PDV **Edwards**, Harold V., Champaign, IL
vWB9UJS **Haskell**, Mark B., Valrico, FL
N9VFP **McAllister**, Gaylon Dean, Eagarville, IL
W9VMP **Harber**, William J., Fairland, IN
WB9WAJ **Shipp**, Francis Alden, Quincy, IL
•N9WBS **Mallek**, Albin F., Cottage Grove, WI
K9YB **Solman**, Fred J., Lincoln, MA
•N9ZCH **Batchelor**, Rosalie J., Campbellsburg, IN
vKAØADO **Kafer**, Larry Dean, Waverly, IA
NØAOF **Koehn**, Chad J., Clarkson, NE
vWØAWH **O'Connell**, Mark T., Cameron, MO
NØAZF **Gagne**, Mitchel H., Omaha, NE
•KBØBU **Wright**, Ronald D., Danbury, WI
♦WDØGOQ **Carter**, Charles R., III, Topeka, KS
vKØHH **Pietzschke**, Edgar R., Jonesburg, MO
♦KKØM **McQueen**, David A., Livermore, CA
NØMQP **Hallenbeck**, Charles E., Lawrence, KS
vKBØOWX **Ninas**, Harlan J., Atkinson, NE
•WAØPWS **Andrea**, Daniel J., Leavenworth, KS
KAØRDE **Ware**, Michael J., Bedford, IA
KØRGR **Osler**, William F., Rochester, MN
v•NØUKN **Conley**, Gary M., Dubuque, IA
WBØVET **Wolever**, Lois I., Merino, CO

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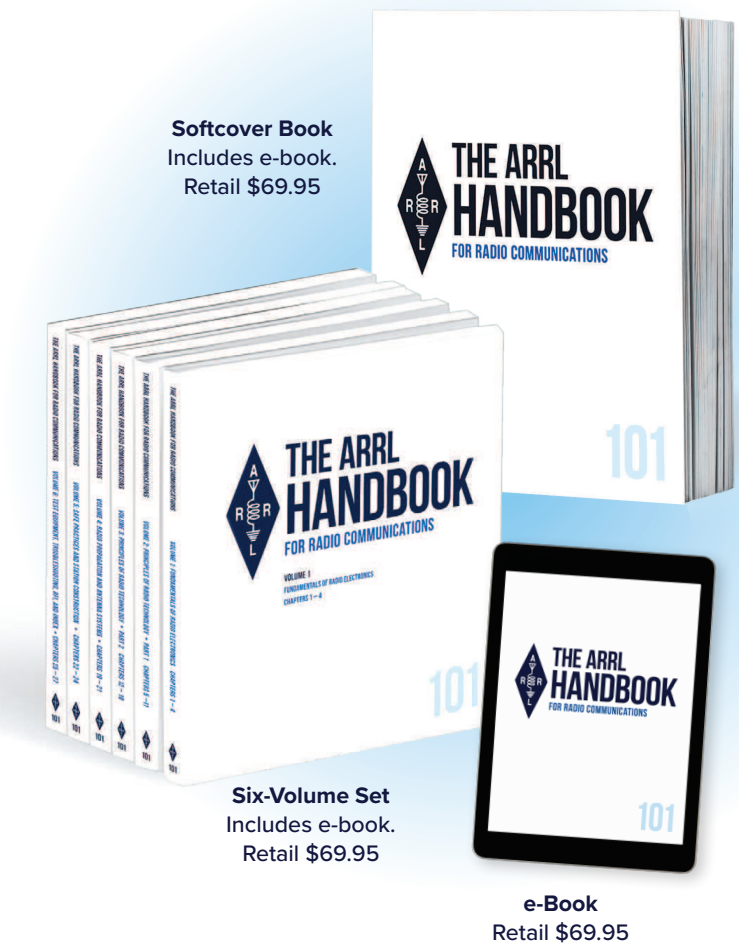

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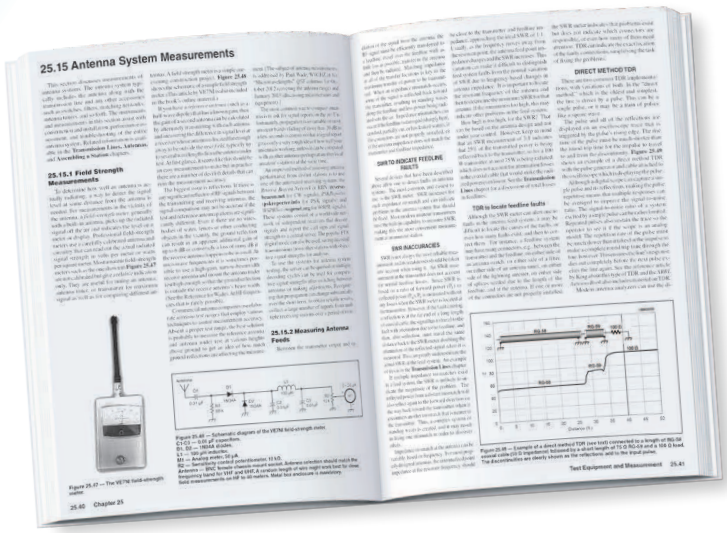
- NEC4 and antenna modeling software.
- SWR meters and related tests.
- RF safety and compliance with FCC exposure regulations.



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	CN-501H	CN-501H2	CN-501V/N
Frequency	1.8~150MHz	1.8~150MHz	140~525MHz
Power Range: Forward	15/150/1.5KW	20/200/2KW	20W/200W
Power Rating	1.5KW (1.8~60MHz) 1KW (144MHz)	2KW (1.8~60MHz) 1KW (144MHz)	200W (140~525MHz)
Tolerance	±10% at Full Scale	±10% at Full Scale	±10% at Full Scale
SWR Measurement	1:1~1:∞	1:1~1:∞	1:1~1:∞
SWR Detection Sensitivity	4W MIN	4W MIN	4W MIN
Input/Output Impedance	50 ohms	50 ohms	50 ohms
Input/Output Connectors	SO-239	SO-239	SO-239 or N-Type

CN-501
Economy Series

Compact HF/VHF AVG reading SWR/Power Meter Cross needle technology displays:

▪ ***FORWARD POWER*** ▪ ***REFLECTED POWER*** ▪ ***SWR*** - *Simultaneously!*

	CN-901HP	CN-901HP3	CN-901V/N	CN-901G
Frequency	1.8~200MHz	1.8~200MHz	140~525MHz	900~1300MHz
Power Range: Forward	20/200/2KW	30/300/3KW	20/200W	2/20W
Tolerance	±10% at Full Scale	±10% at Full Scale	±10% at Full Scale	±10% at Full Scale
SWR Measurement	1:1~1:∞	1:1~1:∞	1:1~1:∞	1:1~1:∞
SWR Detection Sensitivity	5W MIN	5W MIN	5W MIN	0.4W
Input/Output Impedance	50 ohms	50 ohms	50 ohms	50 ohms
Input/Output Connectors	SO-239	SO-239	SO-239 or N-Type	N-Type

CN-901
Professional Series

AVG & True PEP power meter .5 second PEP delay to dampen the needle movement with on/off switch:

▪ ***FORWARD POWER*** ▪ ***REFLECTED POWER*** ▪ ***SWR*** - *Simultaneously!*

CS-201

Frequency Range (up to): 600MHz
Power Rating: 2.5 kW PEP1 kW CW
VSWR: Below 1.2:1
Insertion Loss: Less than 0.2 dB
Isolation: 60 dB 600 MHz
Connector: SO 239
Output Port: 2

CS-201GII

Frequency Range (up to): 2 GHz
Power Rating:
1.5 kW CW (up to 30 MHz)
250 W CW (up to 1 GHz)
150 W CW (up to 2 GHz)
VSWR: Below 1:1.3 at 1.3 GHz
Insertion Loss: Less than 1.2 dB at 1.2 GHz
Isolation: 50 dB 1 GHz
Connector: Gold Plated N-Type
Output Port: 2

NCG company

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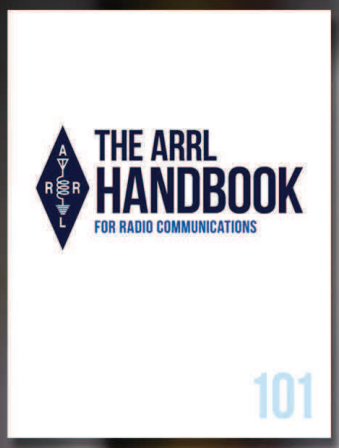
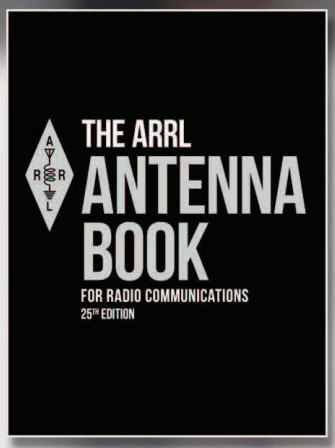
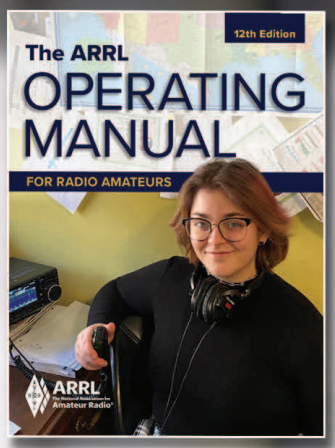
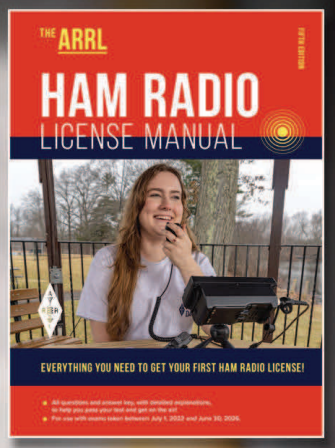


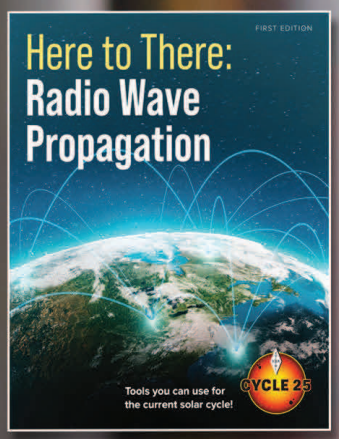


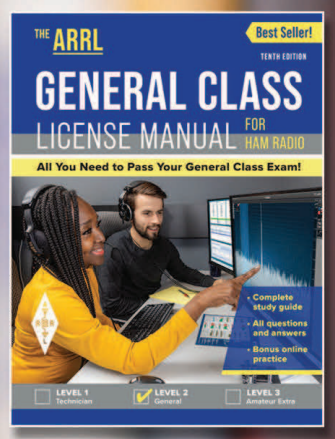




Stay in the Know

ARRL Publications and Journals





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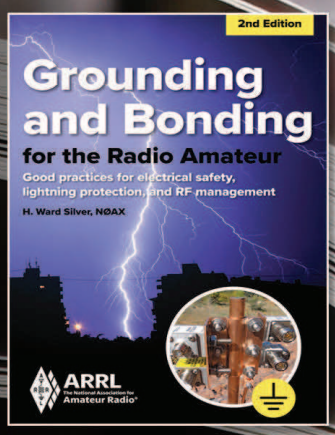

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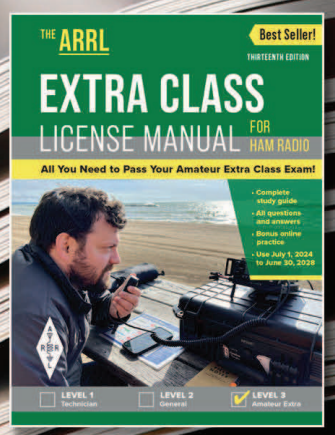

YAGI URBAN BEAM

The distinctive shape and small footprint of the UrbanBeam makes it excellent for use in high density population areas or properties with small lot sizes, where a full-sized Yagi may not be an option. The outstanding performance of this antenna truly outpaces it's size – that's why the UrbanBeam / OptimizIR 2.0 combo is our number one selling antenna package.

$350 OFF

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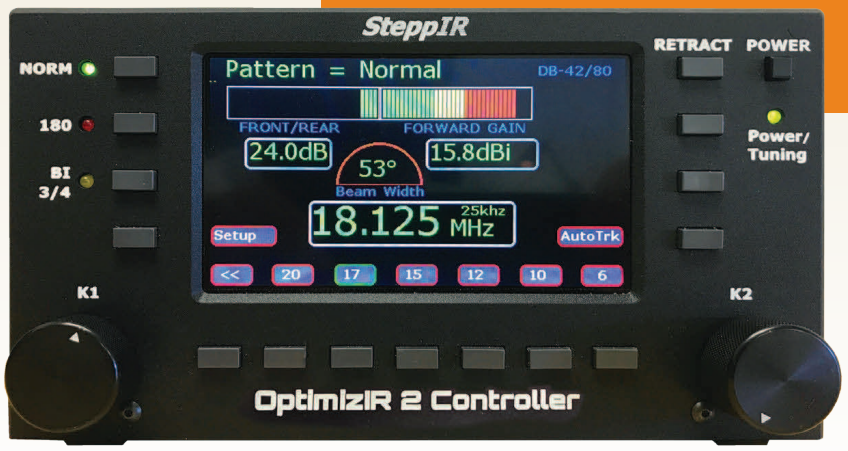

steppIR COMMUNICATION SYSTEMS

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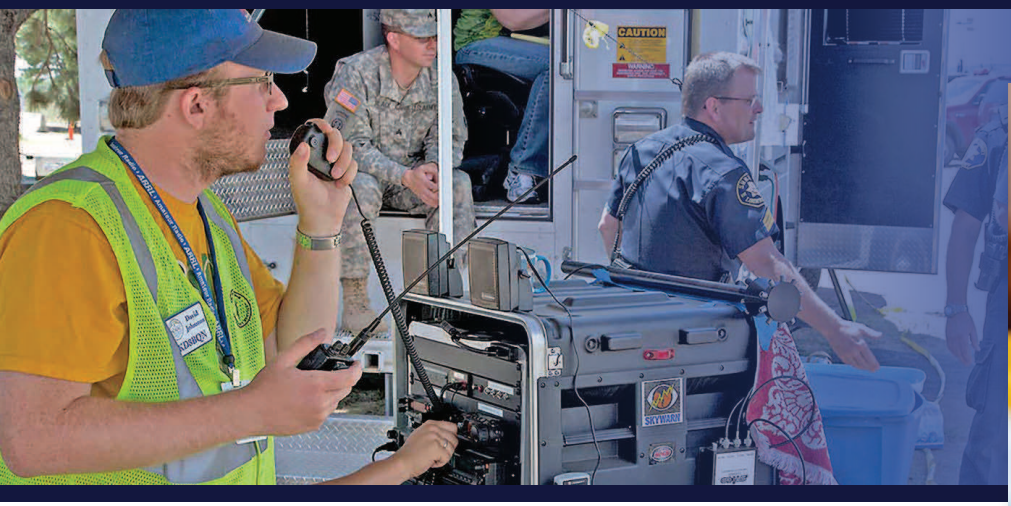
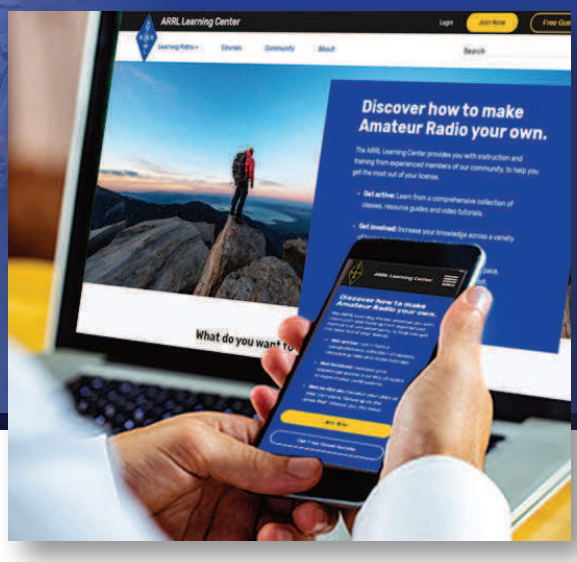
ARRL Learning Center





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WITH THE ARRL DUAL-BAND MOMOBEAM

This dual-band beam antenna is an easy-to-use antenna with a small footprint and a big reach. The beam features a 10-meter Moxon (28 MHz) and 6-meter Yagi (50 MHz). It's perfect for new hams and beginners to be able to work DX, portable operators, university club stations, and even big stations looking for a lightweight yet robust antenna. Put this antenna on the air and operate 10 and 6 meters with a single feed line. A great 'first' beam antenna for every ham!

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Amateur Radio Emergency Service® (ARES®)

The Amateur Radio Emergency Service (ARES)

Amateur Radio Operators use their training, skills, and equipment to provide communications during emergencies When All Else Fails®. The ARRL Amateur Radio Emergency Service (ARES) consists of radio amateurs who have voluntarily registered their qualifications and equipment, with their local ARES leadership, for communications duty in the public service when disaster strikes.

ARES volunteers provide communications for:

- Government agencies
- Disaster relief organizations
- Public service events
- Emergencies or disasters
- Training exercises

ARES radio operators receive training in:

- Message handling
- Communication technology
- Administrative procedures
- Disaster preparedness

ARRL's volunteer amateur radio operators help their communities in good times and bad through community events, disaster response, and various programs.

Get Involved in ARES

- Ask local hams about involvement
- Contact your Section Manager or Section Emergency Coordinator, **www.arrl.org/sections**
- Join local radio clubs, **www.arrl.org/clubs**
- Be "radio active" — Get on the air as often as possible
- Attend SKYWARN® training, **weather.gov/SKYWARN**
- Learn more about ARES, **www.arrl.org/ares**
- Reach out to ARRL for assistance, email **ares@arrl.org**

Contact Your Local ARES Group or ARRL Affiliated Club

Join ARES® Today!

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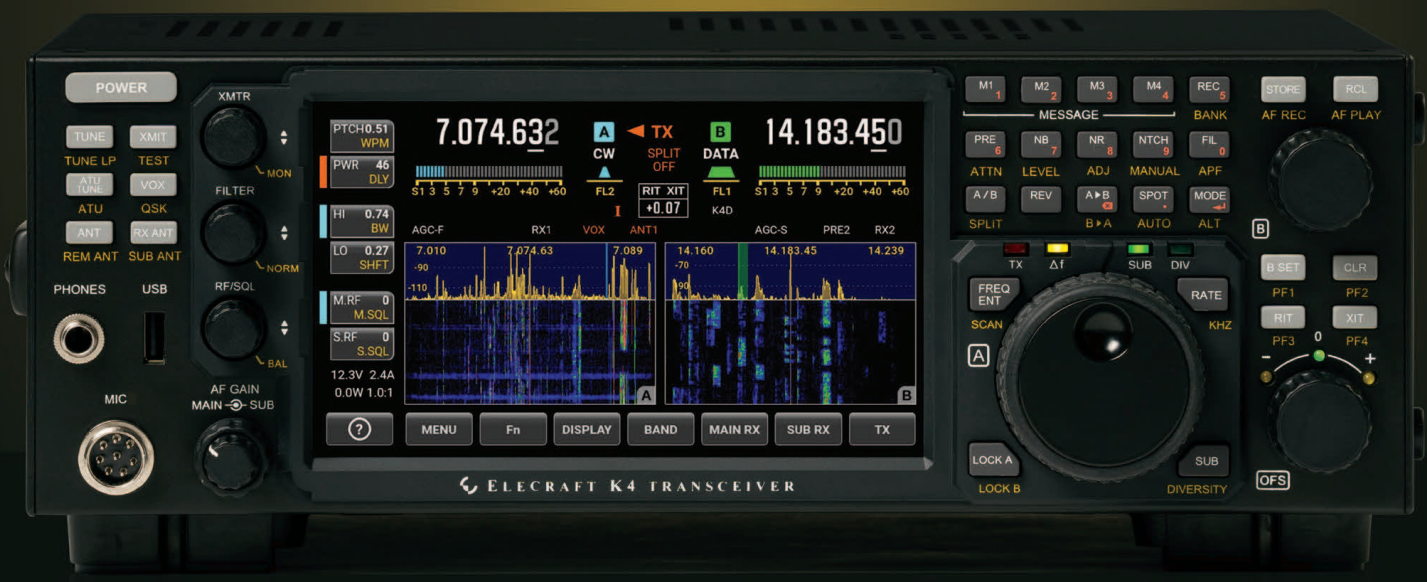
Learn more at: **www.arrl.org/public-service**

ELECRAFT K4

High-Performance Direct-Sampling SDR



A direct-sampling SDR you'll love to use

Our new K4 transceiver harnesses advanced signal processing while retaining the best aspects of the K3S and P3. It features a 7" touch display, plus a rich set of dedicated controls. Per-VFO transmit metering makes split mode foolproof. Band-stacking registers and per-receiver settings are versatile and intuitive. Control usage information is just one tap away thanks to a built-in help system.

Modular, hybrid architecture adapts to your needs

The basic K4 covers 160-6 m, with dual receive on the same or different bands. The K4D adds diversity receive, with a full set of band-pass filters for the second receiver. (Thanks to direct RF sampling, there's no need for crystal filters in either the K4 or K4D.) The K4HD adds a dual superhet module for extreme-signal environments. Any K4 model can be upgraded to the next level, and future enhancements–such as a planned internal VHF/UHF module–can be added as needed.

Single or dual panadapter, plus a high-resolution tuning aid

The main panadapter can be set up as single or dual. Separate from the main panadapter is our per-receiver *mini-pan* tuning aid, with a resampled bandwidth as narrow as +/- 1 kHz. You can turn it on by tapping either receiver's S-meter or by tapping on a signal of interest, then easily auto-spot or fine tune to the signal.

Comprehensive I/O, plus full remote control

The K4's rear panel includes all the analog and digital I/O you'll ever need. All K-line accessories are supported, including amps, ATUs, and our K-Pod controller. The USB display output supports its own user-specified format. Via Ethernet, the K4 can be 100% remote controlled from a PC, notebook, tablet, or even another K4, with panadapter data included in all remote displays. Work the world from anywhere–in style!

K4 KEY FEATURES

- Optimized for ease of use
- Modular, upgradeable design
- 7" color screen with touch and mouse control
- ATU with 10:1+ range, 3 antenna jacks
- Up to 5 receive antenna sources
- Full remote control via Ethernet

The K4 interfaces seamlessly with the KPA500 and KPA1500 amplifiers

'The performance of their products is only eclipsed by their service and support. Truly amazing!' **Joe - W1GO**

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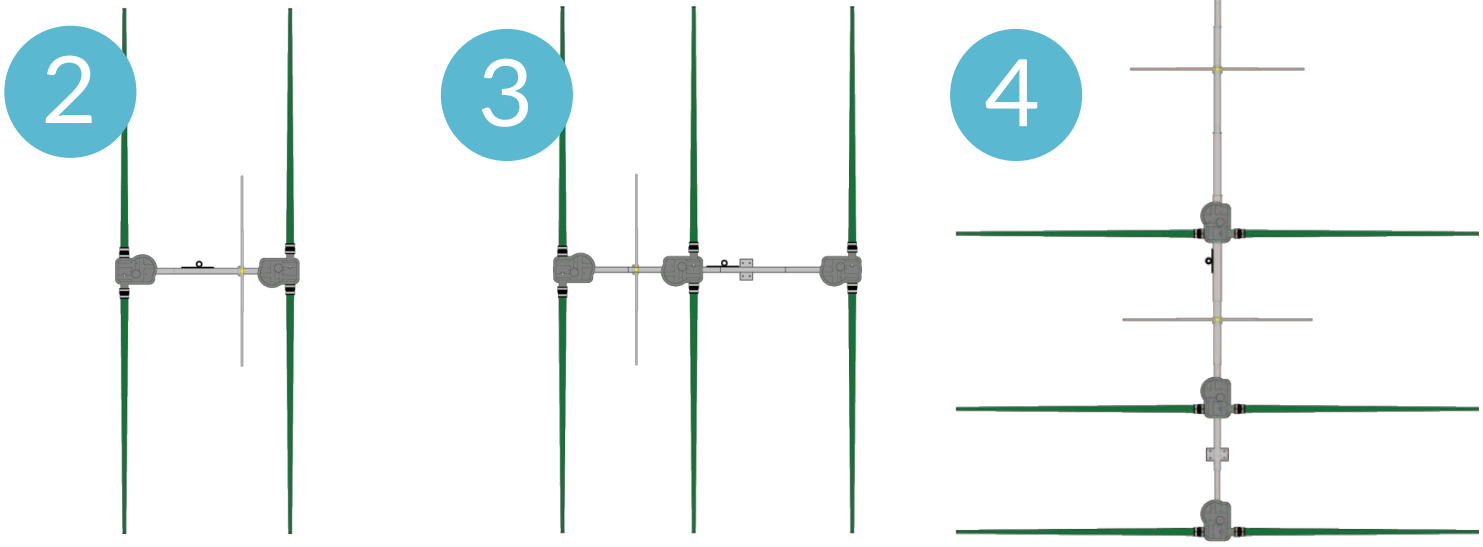
INTRODUCING

SteppIR Value Series Yagis

Now you can save money, and still optimize your performance on 20m, 17m, 15m, 12m, 10m, 6m bands – and everything in between! Simple to assemble and highly portable, with standard features such as 180 degree, Bi-Directional and Retract modes.

Prices have been reduced from the 2024 price 20%



2 Element Base Package Price:	3 Element Base Package Price:	4 Element Base Package Price:
$2819	$3473	$4621

All value series Yagi packages include the SDA 100 electronic controller. An upgrade to the full-color screen OptimizIR 2.0 is available.

steppIR COMMUNICATION SYSTEMS

*Value series Yagis are not eligible for standalone 40/30 loop upgrade.

*OptimizIR 2.0 is an upgrade to standard SDA 100 controller.

PRODUCT INFORMATION / TECH SUPPORT / ORDERING

www.steppir.com 425-453-1910

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www.arrl.org/magazines

Members can access all four ARRL magazines and archives from a web browser or dedicated mobile apps (print subscriptions are sold separately):

QST, ARRL's monthly membership journal.

On the Air, a bimonthly magazine for beginner-to-intermediate hams.

QEX, A Forum for Communications Experimenters (bimonthly).

NCJ, National Contest Journal (bimonthly), covering competitive radiosport.

Advocacy

No organization does more than ARRL to **promote** and **protect** amateur radio, and to **inspire youth**:

- Spectrum defense and regulatory advocacy
- ARRL Teachers Institute on Wireless Technology
- Free Student Membership
- National relationships with FEMA, National Weather Service, SAFECOM, and Scouting America

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- Use with separate passive speakers or headphones
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- DSP noise canceling versions EQ20-DSP, EQ20B-DSP (with added Bluetooth on input)

QST Dec 2019 review *"easy-to-use device that improves the audio clarity of amateur signals"*

In-Line Module

In-Line Module connections

5W amplified DSP noise canceling In-Line module - 8 filter levels 8 to 40dB - Use in-line with a loudspeaker - Audio bypass feature - 3.5mm mono inputs and outputs - Headphone socket - Audio input overload feature - Use with an extension speaker - Supplied with a fused DC power lead, 3.5mm mono jack plug lead and user manual

Dual In-Line

Fully featured flexible dual channel amplified DSP noise canceling unit
- 8 Filter levels 9 to 40dB
- 3.5mm mono or stereo inputs
- Line level input/output
- 7 watts mono speaker output
- Headphone socket
- Easy to use controls

Compact In-Line

- Portable DSP noise canceling unit
- Simple controls
- Use in-line with headphones or powered speakers
- Line/speaker level inputs
- Use with AA batteries or 12V DC supply

NEDSP1962-KBD 5W amplified DSP noise canceling extension speaker retrofit pcb module Easy to install!

DESKTOP MKII

10W amplified DSP noise canceling speaker
- Simple controls
- 8 filter levels
- Separate line level and speaker level audio inputs
- 12V DC power
- Suitable for all radios incl' SDR, Elecraft and FlexRadio products

NES10-2MK4

- 5W DSP Noise Canceling Speaker - 8 filter levels
- Compact speaker for mobile or base station
- Three position switch for all functions
- Headphone socket
- Adjustable metal bracket

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Before considering a ham ad please read.

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3. Closing date for Ham-Ads is the 15th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received December 16th throughJanuary 15th will appear in March QST. If the 15thfalls on a weekend or holiday, the Ham-Ad deadline is the previous working day. Please contactthe Advertising Department at 860-594-0255 or hamads@arrl.org for further information or to submit your ad.

4. No Ham-Ad may use more than 200 words. No advertiser may use more than three ads in one issue. Mention of lotteries, prize drawings, games of chance etc is notpermitted in QST advertising.

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AN IMPORTANT NOTICE TO ALL HAM AD POSTERS AND RESPONDERS, FROM THE ARRL ADVERTISING DEPARTMENT Greetings from ARRL HQ! Please note that we have received reports from many ARRL members who have placed classified ads in these listings, and have received responses from individuals proposing "creative" payment schemes. These particular instances involved offers of overpayments for goods by bank check, followed by instructions to deduct the cost of your item from the overpayment, and to transfer the overage back or to another individual. This is a well-known scam. Unfortunately, we have no control over this and other scams of this type. Once your email address is posted, you are vulnerable to those individuals seeking to provide you with questionable information.

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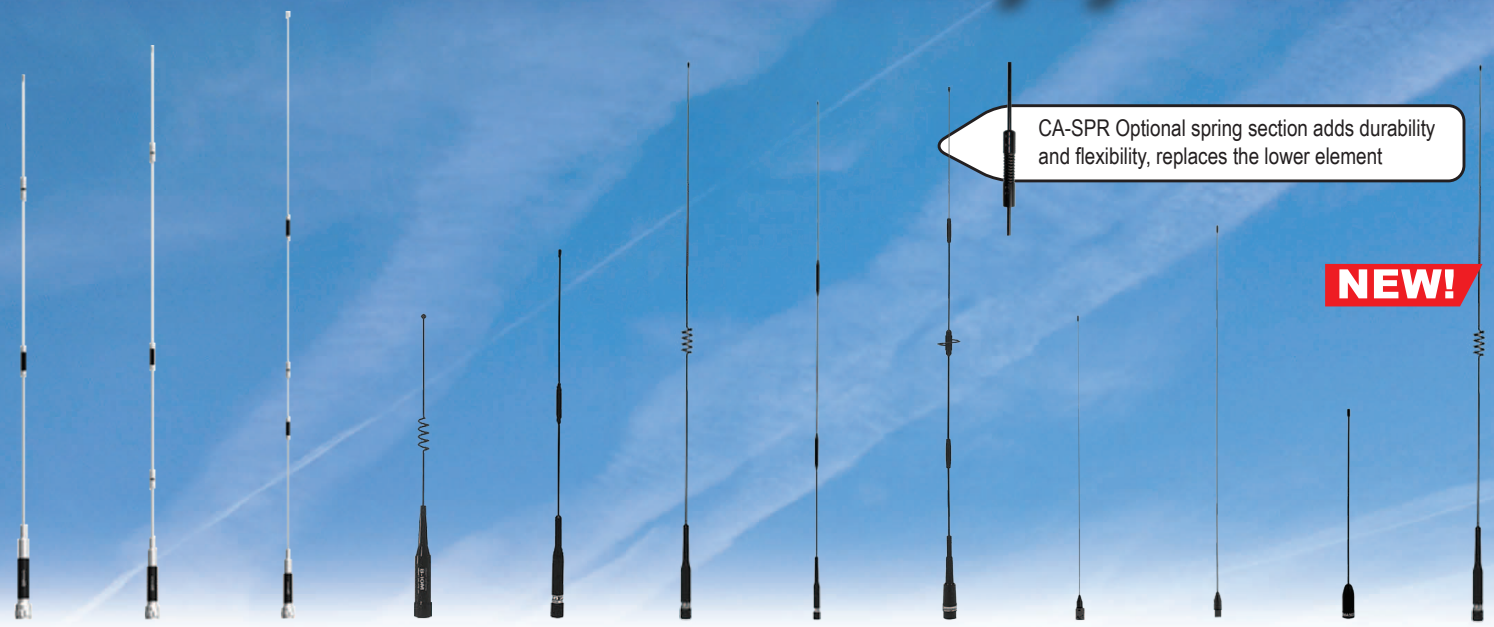

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