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DIGITAL EDITION



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ARRL Amateur Radio®

January 2026

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Year of the Club

2026

Amateur Radio

QST Reviews

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RigSelect RigSelect PRO: Radio
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FTM-510DR

(SPU-1 is required for ASP Operation)



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(SPU-1 is required for ASP Operation)



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Year of the Club



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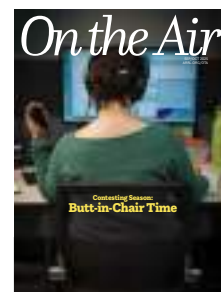
Welcome to 2026, the Year of the Club! Throughout the year, ARRL and QST will be recognizing and celebrating our vibrant community of amateur radio clubs with programs to support club activities and growth, opportunities to recognize clubs on the air, honors for clubs celebrating significant milestones, and more. Read "ARRL Year of the Club" in this issue for more information, and check www.arrl.org/year-of-the-club all year as we roll out more resources and initiatives for clubs.



NCJ, National Contest Journal, is ARRL's bimonthly magazine by and for the ham radio contesting community, presenting information and advice from top contesters, operator profiles, and scores for the North American QSO Party and North American Sprint. www.arrl.org/ncj



QEX, A Forum for Communications Experimenters, is ARRL's bimonthly forum for research, theory, and projects on the cutting edge of RF communications. www.arrl.org/qex



On the Air is ARRL's bimonthly magazine for beginner to intermediate ham radio licensees, presenting jargon-free, easy-to-understand explainers, practical information, and projects. www.arrl.org/ota

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	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
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 150 W CW (up to 2 GHz)
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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				
F23H (3 Section)	144-174 MHz (W/ Cut Chart)	15	350	UHF
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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Second Century

Year of the Club

As we welcome in a new year, ARRL is introducing a year-long effort to shine the spotlight on radio clubs. Clubs are the critical backbone of our community — of our hobby. Clubs routinely serve as the entry point for newcomers to amateur radio. I could fill pages with wonderful memories I have, from Ramapo High School ARC and Fair Lawn ARC, to Field Days with the Ramapo Mountain ARC, to my participation with the Frankford Radio Club. Activities. Friends. Learning. Accomplishment. Great times.

During 2026, we want you to be inspired by all the things that your club is already good at — and take the time to thank and recognize your volunteer leaders for sustaining a wonderful club experience. There are new activities that your club can take on, including the possibility of merging with another local club to ensure that one combined is stronger than the two apart. You'll see us promoting content in different forms related to the MARCONI (Motivating Amateur Radio Clubs to Open New Initiatives) program created by the Meriden ARC of Wallingford, Connecticut.

We will also be looking to expand on our hugely successful ARRL Affiliated Clubs program. Again, we routinely see clubs at the 75- and 100-year marks of affiliation being recognized by the ARRL Board — and sometimes we've been excited to welcome those clubs to ARRL HQ and have pictures taken with them on the steps of W1AW! Affiliation, to me, shows that club members are committed to the success of ARRL's efforts to promote and protect amateur radio, and to develop the next generation of radio-active members.

Coincidentally, 2026 is also the semiquincentennial of our country. As a part of the America250 celebrations, we too will be participating by adding awards for Worked All States (WAS) and WAS Triple Play. Where do clubs fit into the pursuit of these single-year awards? We are working with the Section Managers and club leaders to offer the opportunity to operate as W1AW/portable to get all 50 states on the air in support of the awards. This was a very exciting part of ARRL's Centennial in 2014! I even worked W1AW/portable stations back then using the Hellschreiber mode just to get my count up with two more contacts!

To inspire the competitive nature of members in your club, we have launched two initiatives to spur innovation and creative thinking. Competitions are under

way for the best club newsletters and the best club websites. The intention is to recognize those clubs that excel in these forms of communicating with their members and the community at large, and to offer best practices to those clubs open to learning and “shamelessly stealing” from others! We've seen some fantastic work done on both fronts with efforts that go far beyond simply leveraging social media for their platform(s). Follow all of the ARRL Year of the Club programming at **www.arrrl.org/year-of-the-club**.

What projects or ideas have you had for your club? A kit night, building club co-sponsored projects while others learn from your experience? A tech night where folks drag in their test equipment and toolboxes to diagnose pesky circuit problems? Hilltopping with microwave dishes or lasers to experience the very high end of our spectrum allocations? Doing an antenna expedition to a beach or mountaintop to see how these enhance HF propagation? Don't feel limited or restricted. Ideas are great — but executing them and seeing the results is where the satisfaction and enjoyment are found for you and your club!

During Year of the Club, be radio active! Earn your ARRL America250 WAS awards. Be a connector! Get together with club members and put some of your collective ideas to work! Have a great year, and see you on the air — maybe from some W1AW activations!

David A. Minster, NA2AA
Chief Executive Officer

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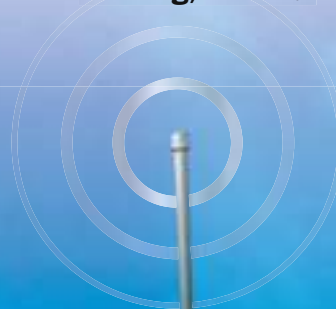
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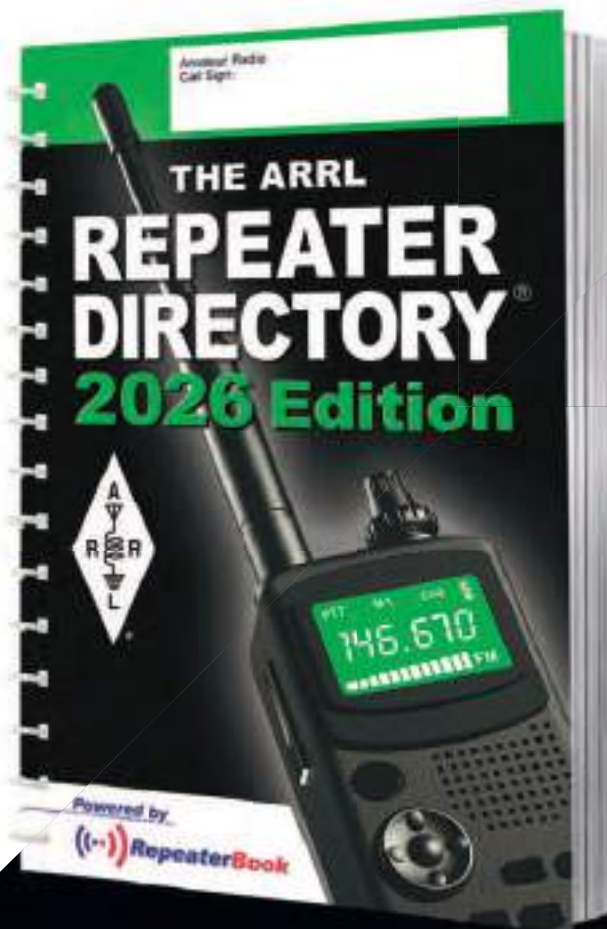
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Club Spotlight



W5QX



The San Angelo Amateur Radio Club

Founded: 1922

Voting Licensed Amateur Members: 25

Members: 35

Section: West Texas

ARRL Affiliation Date: Sept. 27, 1954

Meetings: Monthly

Website: www.w5qx.org

February 11 – 20, 2021

As many as 10 inches of snow accumulated in San Angelo, Texas, causing much of the local power grid to fail. A massive winter storm that would later be called The Great Texas Freeze blanketed almost the entire state with enduring cold, ice, and snow. During the storm, Dave Mulvey, K5DCM, a newish ham in San Angelo, frequented the W5QX repeater. He chatted sometimes with an elderly operator, Denny Mills, KI5MCR, about the power outages and other local news. It would later turn out that Denny lived down the street from Dave. After reading a social media post about the utility shutting down water to his part of the city because of a leaky pipe, Dave put out a QST announcement on W5QX relaying the information, just in case. Denny didn't have a working cell, telephone, computer, or television, so he hadn't heard about the impending shutdown. He filled up his bathtub, flushed his toilets, and laid by enough water to get him through. It was a small thing, important to maybe just one person, but it's indicative of the kind of impact ham radio can have on a community.

"Are we [hams] going to save the world?" Dave asked when I spoke with him about the San Angelo Amateur Radio Club (SAARC), where he is now Vice President. "Probably not. But are we going to be able to help somebody?" The answer to that question depends on how prepared and connected a radio amateur is, and local clubs, like SAARC, play a major role in making sure their members answer with a resounding "Yes." In SAARC's case, it's not because the club's sole focus is on emergency communications or because it sponsors the local National Weather Service Skywarn® repeater for Tom Green County and its backup, K5CMW. Instead, it's because SAARC welcomes members of all skill levels and has done the legwork to integrate within the greater Concho Valley.

A Welcoming Club

Over the last 5 years, the club has worked to welcome anyone interested in radio communications. Dave told me that during meetings they spend as little time as possible on formal business before moving on to introductions, because there

are almost always a few new people. They ask attendees to give their call signs and to tell everyone how long they've been hams, but they spend the most time on the club program for the evening, which in a series of recent meetings focused on repairing a vintage Heathkit receiver and transmitter pair. After each meeting, the executive committee makes sure to hang around and talk with newcomers about what brought them out.

Community Outreach and Service

A big part of SAARC's success depends on the relationships it has built with people and institutions throughout the San Angelo community and the value the club brings to those relationships. The 2024 exhibit "Radio Pioneers of San Angelo" that Dave Mulvey researched and helped curate at ASU's Mayer Museum explored "all facets of the radio industry, including the first generation of radio enthusiasts in San Angelo," according to the Mayer Museum's exhibit description. Around 10,000 people visited during its 6-month run.

SAARC members Christena Parks, KI5WBZ, and Jim Atcheson, KI5WCB, table at gun shows throughout the region under a radio communications banner, license manuals and information spread in front of them. They talk up ham radio with anyone who's interested. The Great Texas Freeze inspired both of them to get licensed, and staying connected during disasters motivates much of the interest in ham radio that they see. As Jim said, "When the cells go down, you can still reach out. It's a tremendous utility."

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South Texas: Stuart Wolfe, KF5NIX, 408 Cedar Grove Rd., Rockdale, TX 76567 512-660-9954; kf5nix@arrrl.org

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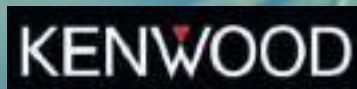
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Up Front

Celebrating a Special Service Club

Roanoke Division Director Dr. James Boehner, N2ZZ (front right), and Vice Director Bill Morine, N2COP (front left), attended a ceremony celebrating the Azalea Coast Amateur Radio Club of Wilmington, North Carolina, being named an ARRL Special Service Club. The club, which maintains radio operations aboard the retired battleship USS *North Carolina*, took this group photo on the deck of the ship to commemorate the occasion.



[Photo courtesy of Bill Morine, N2COP]

A STEALTH Radio Demonstration

Members of the Knox County Amateur Radio Club (KCARC) participated in the Science, Technology, Engineering at Loud Thunder (STEALTH)'s "Science of Flight" Scout event in Illinois City, Illinois, offering Scouts hands-on radio-related demonstrations, including tracking the International Space Station (ISS) using ISS-Above; monitoring aircraft VHF radio and NOAA weather satellite transmissions; Morse code practice, and a 2-meter station to get on the air with hams. KCARC member Don Achelpohl, ACØUH (left), ran the club's ISS demonstration with the help of Eagle Scouts Ray Leon and Max Serre, KD9YQX (right).



[Walt Holling, WA9LT, photo]

World's Best Ham?

Steve Baron, KU9J, spotted this sign over the door of The Honey Baked Ham Company restaurant in Hendersonville, North Carolina, which is one of many franchise locations across the US. While the chain has no links to ham radio, its founder, Harry J. Hoenselaar, is credited with the invention of spiral-cut ham.



[Steve Barron, KU9J, photo]

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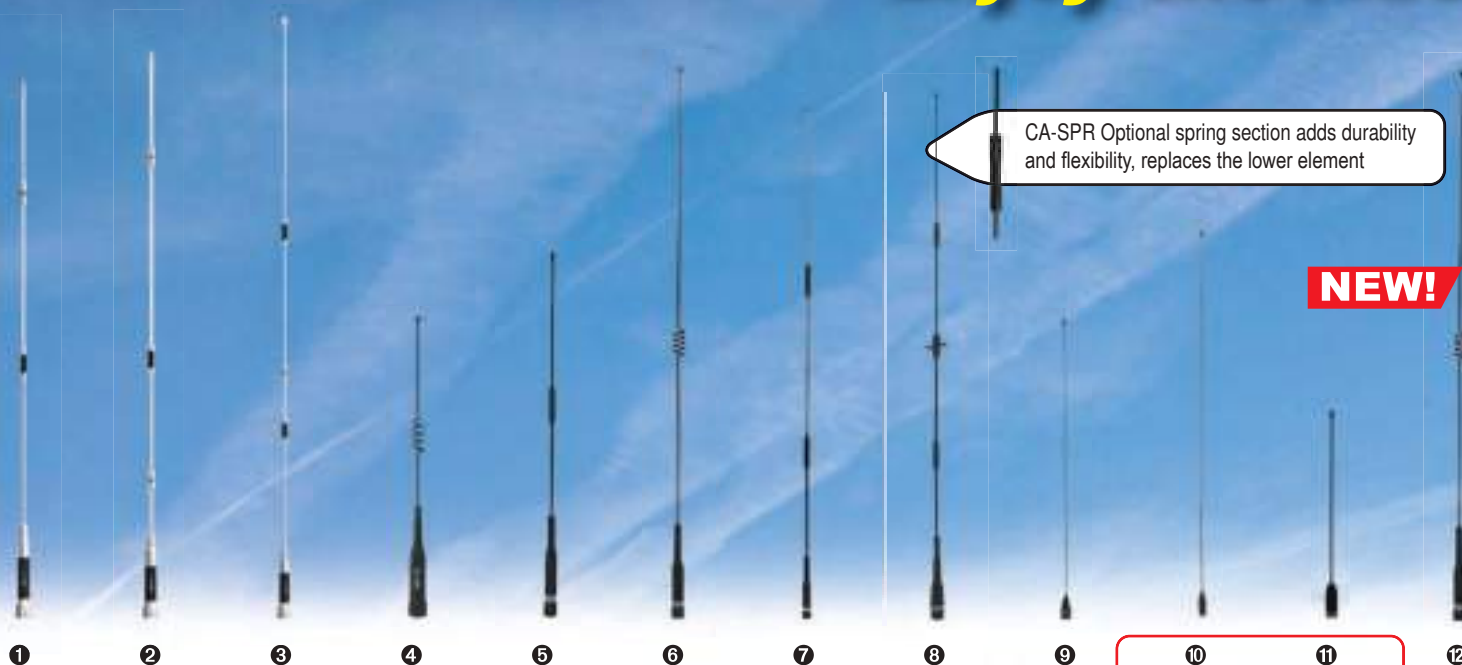


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2 COMET CSB-770 A DUAL-BAND 2M/440MHz w/FOLD-OVER

2M: 5/8 wave center load • 440MHz: 5/8 wave x 2 center load • VSWR: 1.5:1 or less • Length: 51" • Conn: PL-259 • Max Pwr: 150W

3 COMET CSB-790 A DUAL-BAND 2M/440MHz w/FOLD-OVER

2M: 7/8 wave center load • 440MHz: 5/8 wave x 3 center load • VSWR: 1.5:1 or less • Length: 62" • Conn: PL-259 • Max Pwr: 150W

4 COMET B-10/B-10NMO DUAL-BAND 2M/440MHz

2M: 1/4 wave • 440MHz: 1/2 wave • Length: 12" • Conn: B-10 PL-259, B-10NMO - NMO style • Max Pwr: 50W

5 COMET SBB-2/SBB-2NMO DUAL-BAND 2M/440MHz

2M: 1/4 wave • 440MHz: 5/8 wave center load • VSWR: 1.5:1 or less • Length: 18" • Conn: SBB-2 PL-259, SBB-2NMO - MNO style • Max Pwr: 60W

6 COMET SBB-5/SBB-5NMO DUAL-BAND 2M/440MHz w/FOLD-OVER

2M: 1/2 wave • 440MHz: 5/8 wave x 2 • Length: 39" • Conn: SBB-5 PL-259, SBB-5NMO - NMO style • Max Pwr: 120W

7 COMET SBB-7/SBB-7NMO DUAL-BAND 2M/440MHz w/FOLD-OVER

2M: 6/8 wave • 440MHz: 5/8 wave x 3 • Length: 58" • Conn: SBB-7 PL-259, SBB-7NMO - NMO style • Max Pwr: 70W

8 COMET CA-2X4SR/CA-2X4SRNMO WIDE-BAND 140-160MHz 435-465MHz w/FOLD-OVER

2M: 5/8 wave • 440MHz: 5/8 wave x 3 • Length: 40" • Conn: CA-2x4S PL-259, CA-2x4SRNMO NMO style • Max Power: 150W

9 COMET BNC-24 DUAL BAND 2M/440MHz HT ANTENNA

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10 COMET SMA-24, SMA-24J DUAL BAND 2M/440MHz HT ANTENNA

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11 COMET SMA-503, SMA-503J DUAL BAND 2M/440MHz HT ANTENNA

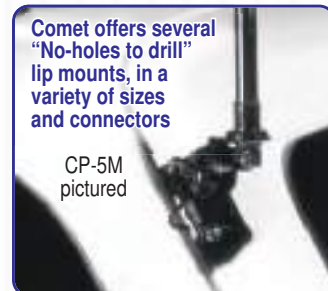
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Correspondence

Letters from Our Members

Digital Mode Discovery

I recently learned about the new digital voice mode, FreeDV Radio Autoencoder (RADE). The clarity is better than any digital voice mode (DMR, System Fusion, D-STAR) I have ever heard — it's like talking on Skype on HF with half the bandwidth of SSB! Because you don't need much power for this mode, it really levels the playing field for folks who have only 100 W radios.

FreeDV RADE is a game changer, and I feel it will bring more hams back to HF ragchewing. It's so much fun, and I'm making so many new friends on HF!

Ken Kerr, W4KDK
Jackson, Tennessee

Youth Inspiration

As part of my 55-year journey to get comfortable using CW, I often listen to K1USN Radio Club's weekly slow speed test (SST) sessions on 40 meters. The SST allows CW newbies (like me) to get some on-air experience. One operator calls "CQ SST" at no faster than 20 WPM, you reply with your call, you have a simple exchange, and it's over.

Recently, I heard a somewhat hesitant "CQ SST KE2AIZ." After our exchange, I checked their QRZ page and was surprised to see the smiling face of a 9-year-old girl named Maggie. I thought, if she could do it, so can I.

The 2025 Dayton Hamvention was a few weeks later. As I was wandering through the flea market, I looked up from a table and saw a man and a young girl approaching from the opposite direction. Something

looked familiar as they passed by — it was Maggie and her dad Andy Flowers, KØSM! We chatted for a few moments, I took a photo with Maggie, and then we went our separate ways.

After getting back home, I contacted Maggie's dad to see if I could have his permission to share our story with QST. He agreed and provided some additional details about Maggie. She had turned 10 years old by Hamvention and was there to participate in the Radio Club of America Youth Forum to share her experiences as a young ham learning CW. Andy also shared that Maggie made her very first CW contact on 10 GHz, and she even made a 10 GHz CW contact using rain scatter — wow!

Mark Munroe, W4ZIP
Boardman, Ohio

QST Article Generates New Connections

This April, I went on a Silver Cloud expedition cruise via the Silversea cruise line to remote locations off the Pacific Ocean. I was fortunate to stop at islands I had only dreamed about from DXpeditions, one of which was Pitcairn Island.

I brought along a copy of the March 2025 article "Vacation on Pitcairn Island" by Mike Collis, WA6SVT/VP6MC, in which he talks about moving there. After asking around for him, I found out he was a docent at the local museum, and we were able to connect. He was gracious enough to invite me to his home to see his station. I was surprised to see how much interference there was from the

town's solar panels, as I was anticipating very quiet listening conditions on the bands. Mike also introduced me to the only other active ham on Pitcairn — Meralda Warren, VP6MW — and I was lucky to see her shack, too.

Pitcairn is a beautiful, mountainous island, and never in my wildest dreams did I think I would visit such a place, let alone meet the author of the QST article printed shortly before my arrival. It was an experience I will never forget!

Howard Bernstein, WB2UZE
Manhasset, New York

CW Offers a Little Something Extra

James Harvey, W7YV, hit the nail on the head with "The Mode that Can Endure All Things" in the October 2025 "Correspondence" column. I agree that CW is still the most efficient and reliable amateur mode available. It's also the easiest transmitter to construct in a pinch. It's no wonder there are so many younger amateurs signing up for code classes at their local clubs. Perhaps now is the time to reinstitute a very modest code requirement — like 5 WPM — for Amateur Extra-class operators only. After all, the Amateur Extra-class license should be something "extra," so why not add a useful, new dimension to the requirements?

Edward Baznik, WB8CFO
Independence, Ohio

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.

CY0S: Sable Island DXpedition 2026 – Breaking the Silence from the Dunes

Paid content from



Andy Mitchell, VA3CW / NA8F

From March 19–31, 2026, a team of seasoned amateur radio operators will activate CY0S, transmitting from the remote and windswept shores of Sable Island, Nova Scotia. Though Sable Island is officially part of Canada, it is recognized as a separate DXCC entity due to its geographic isolation and unique administrative status. This DXpedition is more than just a technical challenge—it's a rare opportunity for the global amateur radio community to connect with one of the more elusive entities on the DXCC list.

A Signal from the Sandbar

Sable Island is a crescent-shaped sandbar located approximately 300 kilometers southeast of Halifax, Nova Scotia, in the North Atlantic Ocean. Measuring just 42 kilometers long and barely 1.5 kilometers wide at its broadest point, the island is famous for its shifting dunes, wild horses, and over 350 recorded shipwrecks. It's also a designated Canadian National Park Reserve, protected for its fragile ecosystem and unique biodiversity.

Access to Sable Island is strictly controlled by Parks Canada, and only a handful of scientific and environmental missions are permitted each

year. For amateur radio operators, this makes CY0 one of the most difficult and desirable DX entities to activate—and to work.

Why CY0 Matters

In the world of DXing, rarity drives demand. CY0 (Sable Island) currently ranks #59 on Club Log's most-wanted list overall, but its scarcity is even more pronounced in regions like Asia and Oceania, where propagation challenges and limited activations make it a top-tier target. In North America, CY0 is less rare but still highly sought after, especially on low bands like 160m and 80m. For European operators, CY0 typically appears in the top 30, and in Asia, it is estimated to be in the top 20 most-wanted.

With multi-band, multi-mode operations planned—including CW, SSB, FT8, RTTY, satellite, and EME—the CY0S team aims to maximize reach and provide opportunities for stations across all continents to log CY0S.

The Challenge of Getting There

Planning a DXpedition to Sable Island is not for the faint of heart. The island has no

permanent residents, no commercial flights, and no harbors. Access is via chartered Britten-Norman Islander aircraft, which has a payload capacity of approximately 1,440 pounds—including the weight of the team members. This significantly restricts the amount of gear that can be brought. To manage this, the team has arranged two flights to the island.

Each operator is limited to just 35 pounds of personal baggage for the entire two-week stay. To save weight, team members will bring freeze-dried meals, a strategy that has proven essential in past activations. Every piece of equipment has been weighed and scrutinized for necessity and versatility. If the final load exceeds the aircraft's limits, some gear may have to be left behind.

View the rest of this article at FlexRadio.



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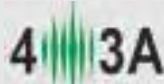
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7 AM-12 ⁴⁵ PM	8 AM-1 ⁴⁵ PM	9 AM-2 ⁴⁵ PM	10 AM-3 ⁴⁵ PM	1500-2045	VISITING OPERATOR TIME				
1 PM	2 PM	3 PM	4 PM	2100	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	2200	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	2300	DIGITAL BULLETIN				
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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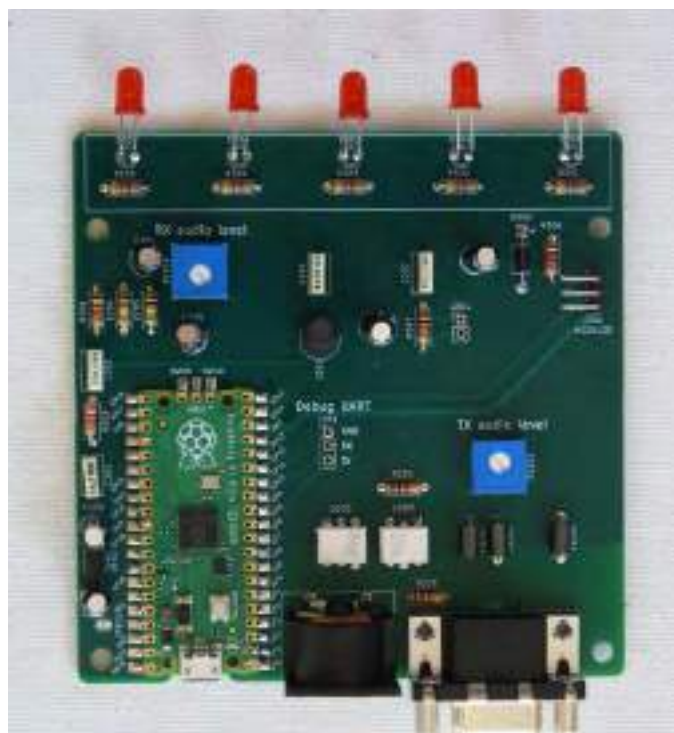
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The OpenTNC: An Open-Source Packet Radio Controller

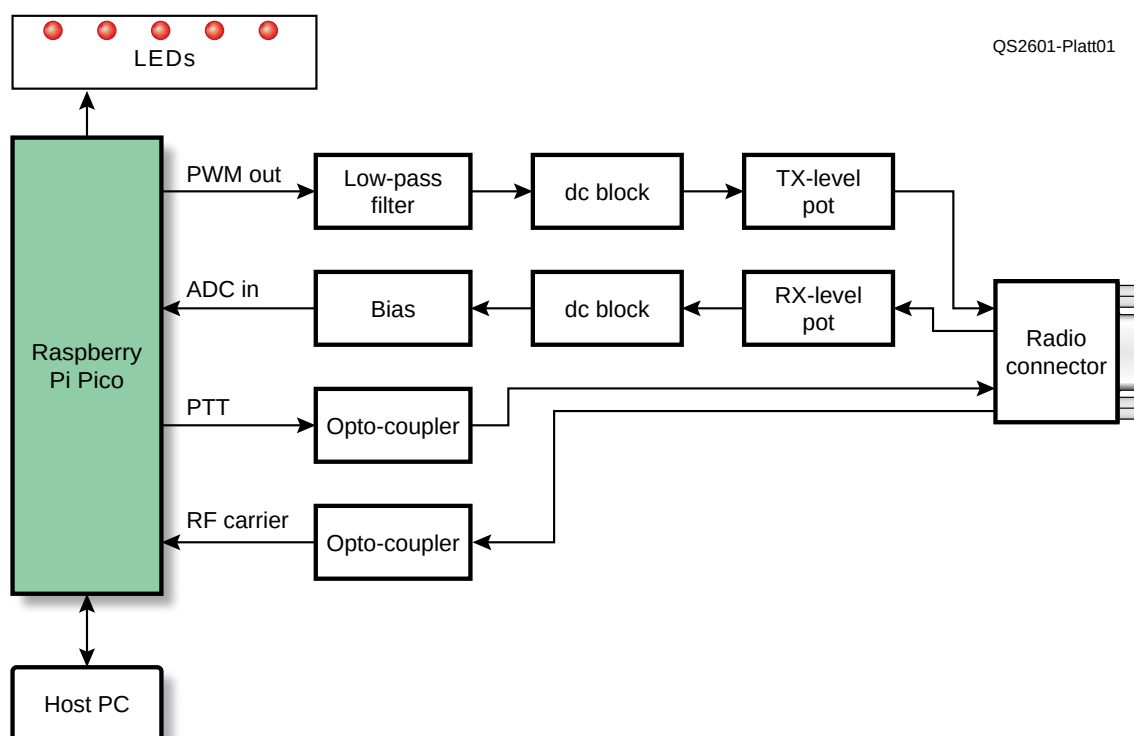
This project provides a low-cost avenue into packet radio without sacrificing features or performance.

David Platt, AE6EO

The Open Terminal Node Controller (OpenTNC; see the lead photo) is a new take on an old idea: a packet radio controller for 1200- and 9600-baud AX.25 digital communication, with capabilities and commands modeled after the classic Tucson Amateur Packet Radio TNC-2 design. Its performance is competitive with commercial TNCs. The design is made with modern components and meant to be homebuilt at a fraction of the cost of a commercial TNC. The OpenTNC supports FX.25 error correction; AX.25 V2.0 and V2.2; Keep It Simple, Stupid mode, and Deflate data compression. It works with any serial port terminal emulator and does not require the installation of specialized AX.25 networking software on the PC. USB connected and USB powered, it appears as a virtual COM port. Current drawn from the computer's USB port is less than 100 mA. Finally, the project source code, KiCAD schematics and board layout, Gerber files, ready-to-flash firmware images, and



The OpenTNC prototype.



QS2601-Platt01

Figure 1 — The OpenTNC block diagram.

documentation are all available on the project website at www.gitlab.com/davidplatt/opentnc.

Basic Design Approach

For those unfamiliar, 1200-baud amateur packet radio is based on the old Bell-202 telephone line modem standard. The sender transmits alternating 1200/2200 Hz tones to send the data bits, and the receiver recovers the data by detecting the data bit transitions. The OpenTNC does almost all of the audio signal processing digitally using an inexpensive Raspberry Pi Pico microcontroller. The required analog circuitry includes only a simple transmitted data low-pass filter and some level-shifting and volume-control circuits. The result is a simple design with few parts and a straightforward printed circuit board (PCB) layout. Figure 1 is a block diagram of the OpenTNC. The complete OpenTNC schematic is shown at www.arrl.org/qst-in-depth, and the required parts are given in Table 1 and in an uploadable spreadsheet file on the project website.

OpenTNC Operational Description

Referring to Figure 1, the received audio signal from the radio connector goes through a volume-adjusting potentiometer, a dc-blocking capacitor, and a voltage-bias network, and it is fed to one of the Pico's analog-to-digital converter (ADC) input pins. The voltage on this pin is sampled by the ADC at regular intervals, and the resulting digital samples flow into the frequency discriminator software. The transmitted audio signal

comes from a digital output pin driven by the Pico's pulse-width modulation hardware. It is fed through a passive low-pass filter, a dc-blocking capacitor, and a volume-adjusting potentiometer, and then out to the radio connector's transmit audio pin. A digital output pin on the Pico drives an opto-isolator, which grounds the radio connector's push-to-talk (PTT) pin in order to transmit. A second opto-isolator, driven by the radio's "RF carrier detected" signal, pulls a Pico input pin to ground whenever the radio's squelch is open — this is an optional feature. Finally, the Pico drives a set of LEDs that show the TNC's status (heartbeat, connected, carrier detected, packet received, PTT active, and transmission underway). The board can have either five traditional single-color LEDs or a strip of five WS2812B NeoPixel RGB LEDs.

Component Choice, Availability, and Installation

The only specialized parts on the board are the Raspberry Pi Pico and the low-dropout linear voltage regulator. The Raspberry Pi company has publicly committed to keeping the Pico in production through 2035. It is possible to build the board without the low-dropout regulator if you re-enable the Pico's onboard switching regulator. All of the other components and connectors are standard through-hole parts. The release package at the OpenTNC project website includes a ZIP archive containing the necessary Gerber photo plot files for creating a PCB. You can simply upload the archive to the website of any PCB

Table 1 — Parts List

Qty	Description	Value	Reference	DigiKey Part	Mouser Part
5	Capacitor	10 μ F	C101, C102, C201, C205, C206	P19445CT-ND	667-ECA-1HHG100I
1	Capacitor	0.001 μ F	C202	399-19343-1-ND	80-R82EC1100SH50J
1	Capacitor	3900 pF	C203	399-R82EC1390AA50J-ND	80-R82EC1390AA50J
1	Capacitor	100 μ F	C301	493-10975-1-ND	667-ECA-0JHG101I
5	Red LED	N/A	D301, D302, D303, D304, D305	754-1266-ND	604-WP7113LID
1	Diode	1N4001	D306	1N4001G-T	625-1N4001E-E3/73
3	Ferrite bead	Mix 43	FB201, FB202, FB203	1934-1416-1-ND	623-2743005112
1	Connector	DB9F	J202	609-5188-ND	649-LD09S13A4GV00LF
1	Connector	DIN5P	J203	CP-2350-ND	490-SDS-50J
1	Inductor	10000 μ H	L201	RLB0812-103KL	652-RLB0812-103KL
5	Resistor	1 k Ω	R201, R206, R208, R209, R306	CF14JT1K00CT-ND	660-CF1/4CT52R102J
1	Resistor	2.2 k Ω	R203	CF14JT2K20CT-ND	660-CF1/4CT52R222J
2	Resistor	100 k Ω	R204, R205	CF14JT100KCT-ND	660-CF1/4CT52R104J
1	Resistor	100 Ω	R210	CF14JT100RCT-ND	708-CF14JT100R
5	Resistor	470 Ω	R301, R302, R303, R304, R305	CF14JT470RCT-ND	660-CF1/4CT52R471J
1	Variable	5 k Ω	RV201	3386F-502LF-ND	652-3386F-1-502LF
1	Variable	5 k Ω	RV202	3266W-502LF-ND	652-3266W-1-502LF
1	Pico	N/A	A101	2648-SC0915CT-ND	358-SC0915
1	Regulator	LP2950-3.3	U102	296-LP2950-33LPRE3CT-ND	595-LP2950-33LPRE3
2	Opto-isolator	4N32	U202, U203	4N32M-ND	512-4N32M

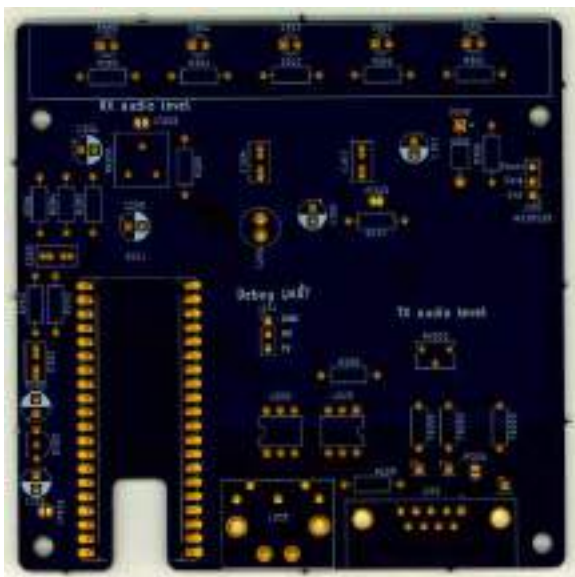


Figure 2 — The current OpenTNC PCB.

company and place your order, and boards will arrive in the mail in a few weeks. The minimum order at most companies is five boards. I have used JLCPCB (www.jlcpb.com) and have been happy with their service, quality, and prices. PCBWay (www.pcbway.com) and ELECROW (www.elecrow.com) are competing manufacturers that accept small-run orders, and there are plenty of others you can investigate. Figure 2 shows the most recent version of the PCB.

The Pico can be connected to the PCB using pin headers and pin sockets, which allows you to replace it if necessary. Or, because the Pico board has crenelated edges, you can hand-solder it directly to the pads on the PCB footprint. To prevent static damage, wear a proper wrist strap with a safe connection to ground, and work on a static-free surface. The lead photo shows the completed OpenTNC prototype. This uses five single-color LEDs, and it has a pin header installed to allow users to test a WS2812B LED strip.

Programming and Use

Once you have built the board, the firmware image must be flashed into the Pico's memory; this is usually a drag-and-drop operation. The firmware image, the instructions for flashing it, and the way to access the OpenTNC virtual COM port can be found on the OpenTNC website. Once you have flashed the firmware and connected to the USB COM port, you will be greeted with a sign-on message and a **CMD:** prompt. Typing **HELP** will display all of the supported commands. At that point, you can connect the OpenTNC to your VHF FM radio and start making connections to packet radio systems. You can also tune your radio to 144.390 MHz, enter the **MONITOR**



Visit <https://youtu.be/wN2WjA5JruE> to watch ARRL Lab Digital RF Engineer John McAuliffe, W1DRF, build the OpenTNC.

ON command, and start observing automatic packet reporting system (APRS) traffic in your area.

OpenTNC Evolution

The current version of the OpenTNC has some limitations compared to commercial TNCs. It has no direct support for APRS (there's no way to connect it to a GPS receiver) and no mailbox capability. While 2400-bit-per-second transmission is currently unavailable, it is also currently under development. New features can be added by anyone because all of the source code is available. Finally, the OpenTNC design is not tied to the Raspberry Pi Pico. Most of the firmware was written to be hardware independent. The OpenTNC is built as an application running on the free open-source Zephyr runtime kernel and libraries, which support many microcontrollers and boards. My hope is that this project — and the code that supports it — will spur additional interest in packet radio systems.

All photos provided by the author.

David Platt, AE6EO, has been interested in radio and electronics since he received a crystal radio kit at age 10. David received his license in 2001 and has been part of his local ARES, RACES, and repeater groups from that point on. David worked as a software engineer for 5 decades at Honeywell, The 3DO Company, TiVo, and Google, and he still programs for fun. You can reach him at dplatt@radagast.org.

See QST in Depth for More!

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

- ✓ The complete OpenTNC schematic

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A Coupled-Resonator Tri-Band Yagi

This design provides convenient coverage on 2 and 6 meters as well as 70 centimeters.

Andrew “Jim” Danielson, AC9EZ

Since its introduction in 1926, the Yagi antenna has been a popular choice among radio amateurs operating on the HF through UHF bands. My station relied on individual Yagis for 6 meters (five elements) and 2 meters (four elements). Using separate Yagis required two separate coaxial feed lines, and I didn’t have a Yagi for 70 centimeters.

In 2024, I set out to design and build a multiband Yagi that would allow me to operate on the 2- and 6-meter and 70-centimeter weak-signal frequencies with a single antenna and only one feed line. In addition, I wanted the antenna to be affordable, have horizontal polarization, be shorter than my present 15-foot boom Yagi for 6 meters, and use parts that were 3D-printable or available from a local home-improvement store.

I found very few horizontally polarized Yagi designs that allowed for dual-band operation on 2 and 6 meters, and no designs that covered those bands and 70 centimeters. However, I came across a duo-band coupled-resonator Yagi design by German amateur Martin Steyer, DK7ZB, that placed the 2-meter and 70-centimeter horizontally polarized elements on the same boom. I highly recommend those interested in DK7ZB’s unique antenna approach to visit www.qsl.net/dk7zb/start1.htm and click on “Duo-/Triband-Yagis” in the left-hand column for more information.



Figure 1 — The first version of the antenna on its mast.

The 2014 edition of *The ARRL Antenna Book* talks about the coupled-resonator method, which involves placing a single driven element near another element cut for a higher frequency. On the lower frequency, the radio feeds only the lower-frequency element; on the higher band, the length and spacing of the higher-frequency element enable the radio to feed the higher band, giving a single antenna dual-band operation. I decided to combine DK7ZB’s coupled-resonator Yagi design with the optimized wideband array design prin-



Figure 2 — Feed-line detail.



Figure 3 — The 3D-printed block.

Table 1 — Element Dimensions

Element	Length (in)	Length (cm)	Spacing (in)	Spacing (cm)	Element Use
1	109.2	277.4	0	0	6-meter reflector
2	36.5	92.7	19	48.3	2-meter reflector
3	12.5	31.8	40	101.6	70-centimeter reflector
4	38.2	97.0	42.2	107.2	2-meter driven element
5	109.2	277.4	44	111.8	6-meter driven element
6	11.5	29.2	45.5	115.6	70-centimeter driven element
7	11	27.9	48.3	122.7	70-centimeter director
8	11.4	29.0	54.8	139.2	70-centimeter director
9	10.5	26.7	64.2	163.1	70-centimeter director

Table 2 — Antenna Gain and SWR

MHz	dBi	SWR
50	5.6	1.7
51	6.6	1.7
52	6.7	2.4
144	7.5	1.8
145	7.3	1.6
148	5.7	2.3
430	8.5	1.9
432.5	8.8	1.5
435	8.8	1.3

ciple to create a tri-band Yagi for 2 and 6 meters and 70 centimeters.

The Design

The core of the antenna is a two-element Yagi for 6 meters that uses a dipole-driven element. I placed the 2- and 6-meter elements on top of the boom, which I made with a 6-foot piece of 1-inch square aluminum tubing. The 6-meter driven element also drives the 2-meter array as a coupled resonator. The 70-centimeter elements are on the underside of the boom, with the 70-centimeter driven element placed directly below the 6-meter driven element.

This version of the antenna is shown in Figures 1 – 3. It has continued to hold up to the elements after more than 6 months of use. The only mechanical failure I've had since its creation and installation was with one of the 3D-printed brackets splitting. There is also a slight sag on the driven element, but I haven't detected any other problems. The antenna has withstood snow, rain, and heavy winds. This original version of the antenna is described more fully on the *QST* in Depth web page (www.arrl.org/qst-in-depth).

John Stanley, K4ERO, helped me improve the design, which now consists of two-element 2- and 6-meter Yagis (a reflector and driven element) and a five-element 70-centimeter Yagi. The driven elements for 2 meters and 70 centimeters are still fed from the 6-meter driven element, but now, all the elements are mounted above the boom (see Figure 4). I found that putting the 70-centimeter elements below the boom tilted the main lobe downward on that band, and the 2-meter director caused the 70-centimeter main lobe to split. The new design reduces 2-meter gain a bit, but it has a much better pattern on 70 centimeters (see *QST* in Depth for more details).

Element Dimensions

The measurements of the improved antenna are included in Table 1 and Figure 4. The dimensions are measured from the 6-meter reflector. The tubing diameter is not critical; I used whatever aluminum tubing was available at a low cost. I determined the antenna dimensions experimentally by running multiple simulations on *4NEC2* and manually adjusting the length and spacing of each element, starting on 6 meters and working up to 70 centimeters. I suggest making the driven elements adjustable so you can center the SWR minimum where you want with a real antenna.

Gain and SWR

The calculated *4NEC2* gain and SWR for the improved version of the antenna are shown in Table 2. These values are for free space. The azimuth and elevation patterns are shown in Figure 5.

Materials

Thanks to the generosity of some local ham friends, I was able to source thin-diameter aluminum

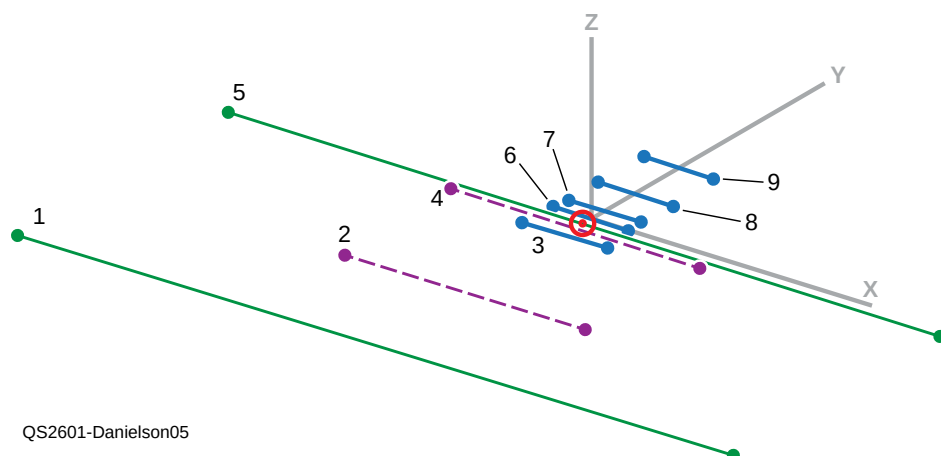


Figure 4 — The improved version (with element numbers) as modeled in *NEC*.

Figure 5A

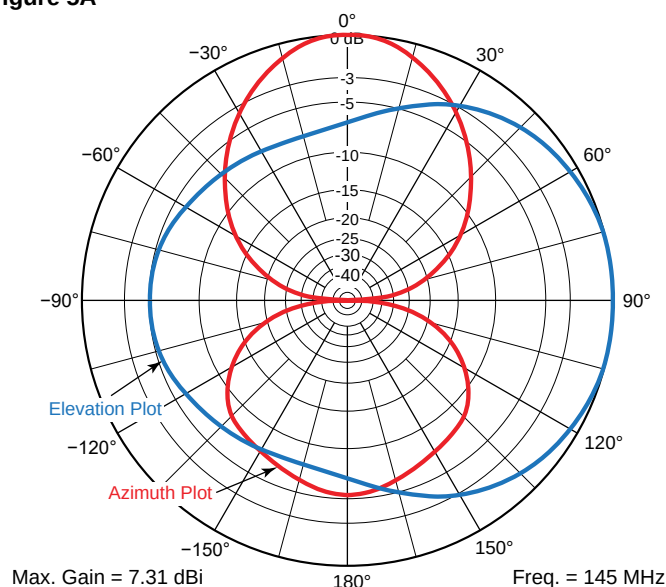


Figure 5B

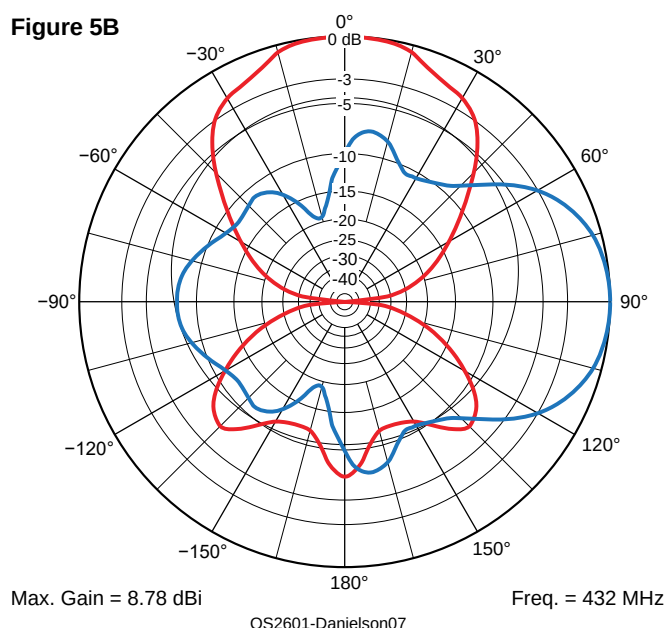


Figure 5 — Elevation (blue lines) and azimuthal (red lines) free-space patterns for 145 and 432 MHz. The patterns on 50 and 145 MHz are similar.

tubing for the elements. I purchased 6-foot-long square aluminum tubing from my local home-improvement store for roughly \$30. I built the brackets that mount the elements to the boom using a 3D printer, and based them on a design that I helped create for a Purdue University Fort Wayne research project I undertook a few years ago. One of my university mentors, Dr. Jordan Marshall, NM9L, printed the 3D brackets from polyethylene terephthalate. Due to the varying dimensions of aluminum tubing, the .stl files on *QST in Depth* serve as a basis for other radio amateurs building this style of Yagi.

My friend Steve Nardin, W9SAN, drilled the mounting holes on the boom, and I drilled the mounting holes in the elements using a hand drill. The coaxial cable that feeds the antenna is split and fed directly to the 6-meter driven element.

Results

This antenna met my design expectations and has provided me with easy access to three popular bands on a conveniently sized boom. The design is simple and allows any amateur with basic hand tools the ability to build it. This tri-band Yagi provides conve-

nient coverage of three popular VHF and UHF bands with horizontal polarization, all at minimal cost to the budget-conscious amateur.

See *QST* in Depth for More!

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

- ✓ NEC files for both versions of the antenna
- ✓ More details on the first version, with dimensions
- ✓ Dimensions for both antenna versions in metric units
- ✓ Files for the 3D-printed brackets

All photos provided by the author.

Andrew “Jim” Danielson, AC9EZ, is a senior at Purdue University Fort Wayne (PFW), where he majors in music and an outside field and minors in journalism. His research at PFW includes historical performance practice of early music and wildlife telemetry. Jim is an Amateur Extra-class operator and has received DXCC, WAS, and WAC. He enjoys building antennas, chasing DX, contesting, activating/chasing POTA, and operating QRP/CW. Besides amateur radio, Jim enjoys photography, tinkering with electronics, and reading books, as well as playing the pipe organ, piano, violin, and harpsichord. He can be reached at dfile13@hotmail.com.

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An Introduction to THz (Optical) Communications

Send audio over a light beam with simple hardware.



The completed transmitter and receiver, built with perforated breadboard material and wooden boards.

Irwin Math, WA2NDM

As amateur radio operators, we are certainly all familiar with the HF spectrum, VHF, UHF, and even microwaves. But there are other frequencies not commonly used for routine communications (except by a few experimenters) that can be explored. Communication via optical signals was recently demonstrated by NASA's Psyche spacecraft, which sent signals over 140 million miles to Earth. These signals are truly electromagnetic in nature, but they lie in the terahertz (THz) region, well beyond microwaves. Hopefully, building this transmitter and receiver assembly (see the lead photo) for THz communications will motivate those who like to consider unusual ideas to experiment with this mode.

Once frequencies rise into the 1000 MHz or more (gigahertz) region, wavelengths drop to millimeters and nanometers, which is why they're described as microwaves. With even higher frequencies, electromagnetic waves become visible colors that can be seen by the human eye. These wavelengths have a frequency of hundreds of THz. Visible light begins at a wavelength

of around 700 nanometers (red, or around 426 THz) and ends at a wavelength of around 400 nanometers (blue, or around 743 THz). While this is quite high, it's still electromagnetic in nature. Although it doesn't end there, we'll keep this THz investigation in this range by using visible light as our choice.

Getting Started

One of the easiest and most inexpensive ways for someone to get started operating on THz wavelengths is to locate a suitable transmission source that can be modulated. The two most common visual THz sources are light-emitting diodes (LEDs) and laser diodes. LEDs require an optical system to concentrate their diverging output, while laser diodes are easier



Figure 1 — The laser diode.

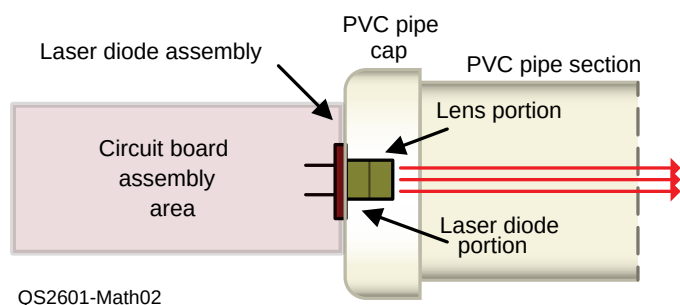


Figure 2 — Laser diode optical transmitting assembly.

to work with because an additional lens system isn't usually required.

I used a surplus 660-nanometer 5 mW visible red laser diode (see Figure 1). It operates at a wavelength of around 660 nanometers or about 460 THz and is designed to operate at 5 V dc (maximum). The laser is also usually provided in a brass housing with an integral lens to produce a very bright collimated red light with an output level directly related to the current passing through it. The cost for such a laser diode is usually around \$5.

Once you have your laser diode, the first thing you need to do is check its operation. (Keep in mind that any time you turn on a laser diode, you must be very careful not to view the output beam directly, as the power level of some lasers can be high enough to damage your eyes; only look at the laser output on a non-reflective surface to be absolutely safe, which is good to do with any type of laser.) Simply connect a 3 V source (two AA batteries in series) to the laser assembly; the red wire from the laser connects to the positive ends of the batteries, and the blue wire connects to the negative ends. The reflection of the laser output beam should appear to be a point or round dot of red light when viewed on a white background at about 10 to 20 feet away. If it's not round (or close to it),

adjust the lens by holding the rear part of the housing and slowly turning the front part a fraction of a turn until the beam becomes a small round spot.

Building the Transmitter

Now you're ready to build the transmitter. Figure 2 shows a suggested holder for the laser diode and companion circuit board using common PVC plumbing components. The diagram also shows the location of the finished laser transmitter circuit board, which can be epoxied to the rear of the laser assembly. Figure 3 is a schematic diagram of a simple driving circuit using this laser diode that will produce a visible red THz output with an AM audio signal. The first stage is a basic transistor audio amplifier that can be driven by an electret microphone or simple external audio source. The audio from this stage then drives a second transistor that controls the current through the laser. This stage is biased to generate some light output with no audio signal to produce an unmodulated carrier. With the audio signal from the first stage, the laser varies its brightness in step with the audio level — the result is an AM 460 THz signal. You'll be able to see the laser output blink in step with the audio; however, the output beam of the laser won't diverge or spread out at short distances. No additional optical system is needed for initial experimentation.

Figure 4 shows a suggested circuit for the optical receiving assembly, which uses a common solar cell as a detector. Unlike a photo diode, which is normally used for optical-based instrumentation and light-controlled devices, a solar cell produces an electrical output directly from incoming light without the need for additional circuitry and is ideal for this application.

Numerous sources for single solar cells or arrays can be found online at a low cost. I chose a small round single cell that's about 1¼ inches in diameter (see Figure 5). It has a fairly large light-sensitive area and responds to a wide range of optical inputs including the 660-nanometer output of the laser. It produces a few millivolts or more, depending on the strength of the input optical signal. The one you choose can be mounted in an assembly like that of the transmitter, with the exception that the laser diode has been replaced with the solar cell and a large-diameter convex lens. The purpose of the lens is to collect as much light as possible from the laser (especially at a

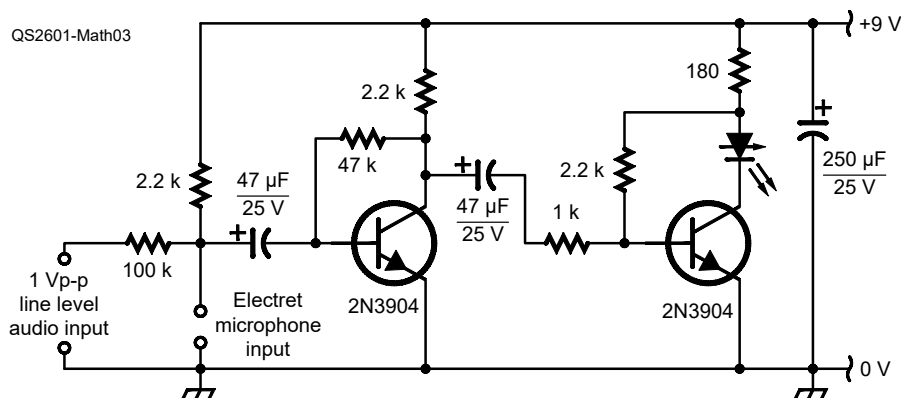


Figure 3 — A simple 454.5 THz transmitter.

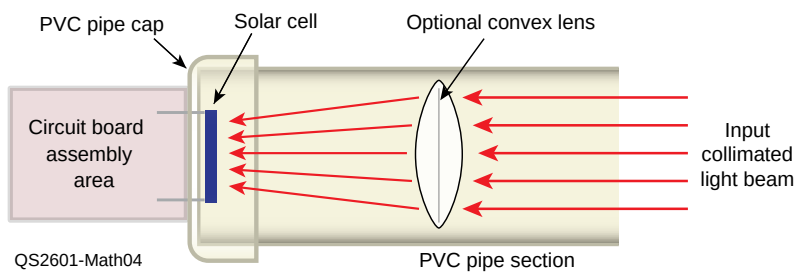


Figure 4 — Solar cell receiving optical assembly.

distance where the beam has diverged to some extent) and direct it onto the light-sensitive portion of the solar battery cell. For short-distance (up to 100 feet) experiments, the lens is not necessary. It only helps if the beam divergence is greater than the size of the solar cell or array. A lens the diameter of the diverged spot with a 3- to 6-inch focal length is ideal and can be obtained for about \$3 on the internet as a simple 3X plastic magnifier lens. To determine the proper spacing of the lens, use a table lamp that's 5 or more feet from the lens, and place the lens in front of a white surface to get a clear image of the light bulb; this is the same distance you'll place the lens in front of the solar cell. Using the PVC-pipe section is still recommended. In daylight, it'll serve as a shield against overloading from sunlight, and at night, it will reject artificial light sources that might carry 120 Hz modulation.

The circuit shown in Figure 6 uses a common audio-amplifier integrated circuit. This amplifies the demodulated audio from the received amplitude-modulated THz signal from the solar cell enough to drive a small speaker. The LM386 used for this purpose is not critical, and almost any similar audio amplifier can be used. A volume control is provided at this stage to adjust the recovered audio to the desired level. The dotted lines in Figure 6 connect the two optional components between pins 1 and 8 of the LM386. With nothing connected here, the gain will be 20; with the resistor and capacitor connected, the gain will be 50, and with the capacitor alone, the gain will be 200. It's best to start with a gain setting of 20, then modify if needed.

Testing and Modifications

To test everything, locate the optical assemblies pointing toward each other at about 5 – 10 feet apart, set the volume control on the receiver to minimum, and turn on the transmitting assembly. Now, very carefully, adjust the position of the transmitting and receiving assemblies so that the beam of light from the laser falls as accurately as possible over the center of the solar cell, and secure everything in place. Adjust the volume control on the receiver to hear the undistorted

sound of your voice or another audio source you're using from the speaker, and experiment to see just how far you can actually transmit with this system. With the simple components described here, I achieved around 300 feet between the transmitter and receiver, but it required a great deal of patience and careful alignment, which I did outdoors in an open field as it was getting dark so the red beam could easily be seen.

The signal was clear, and the 300-foot limit was just due to the available space I had. It seemed that much greater distances could be achieved with a little more effort and patience.

Both circuits require 9 V, which can be provided by common 9 V batteries. You could make a basic THz transceiver with the addition of a common single-pole double-throw switch and build a second transceiver for two-way communications over short distances.

This is not intended to be a finished effort, as the transmission range achieved with this simple arrangement will be relatively small, considering the size and output power of the laser diode emitter and the limitations of the simple optical system. Many variations are possible, and some amateur radio experimenters with much more elaborate systems have obtained point-to-point transmission distances of miles. There are even commercially manufactured systems for optical or free-space communications using similar techniques, but they're not necessarily intended for amateur radio applications. Those like the previously mentioned deep-space system used by NASA to cover extraordinary distances are obviously much more complex. Regardless, you will at least have an idea of a THz transmission system, as well as a hands-on practical working example.



Figure 5 — The solar cell.

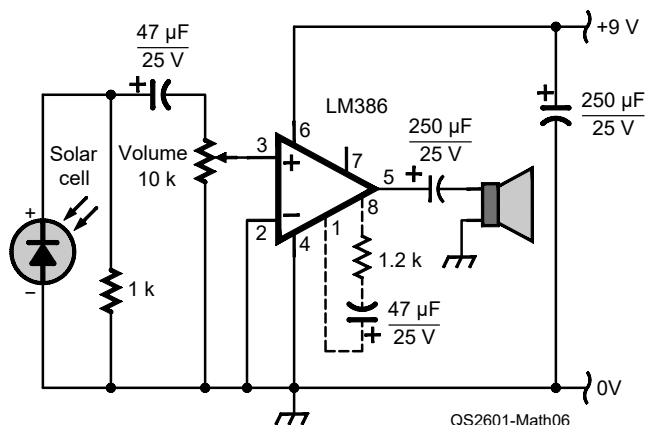


Figure 6 — Simple wideband THz audio receiver.

If you wish to continue experimenting with THz transmissions, then I suggest finding a higher-powered laser diode. Such a device might even require an external lens to help produce a narrow output beam. You'll still need a lens or lens system in the receiver section to collect as much light as possible, but the choice and size of this lens could be much larger or more exotic than stated. You could even modify an inexpensive astronomical telescope or design a unique novel antenna as part of the transmitter, receiver, or transceiver for your system. Regardless, you'll need a lot of patience to align the system.

Another choice would be to modulate an analog or digital oscillator in the transmitter as the carrier, then use a frequency-sensitive detector in the receiver. The visible red laser used in this article was specifically chosen so the beam could be easily seen. Other wavelengths, which may or may not be visible, could also be used, so don't limit yourself. Many laser diodes, larger solar cells or arrays, or actual photo diodes might also help. *Regardless of what you choose, always be very careful with your eyes.*

Parting Thoughts

In conclusion, there are many possibilities, and you don't need exotic or expensive test equipment or techniques to find out what operating in the THz region is all about. Who knows what you may come up with?

All photos provided by the author.

Irwin Math, WA2NDM, has been the author of CQ magazine's popular "Math's Notes" column for more than 50 years. He is also the author of *Understanding Basic Electricity*, which is specifically intended for non-technical people to gain some understanding of what electricity is all about. Irwin currently holds an Amateur Extra-class license and is a Life Member of ARRL and IEEE. He can be reached at im@liteway.com.

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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 October 2025 activity report of the VM Program.

◆ Technician operators in Connecticut, Washington, Kansas, New York, California, and Arizona were issued advisories concerning 20-meter FT8 operation, a band on which Technicians have no privileges. A Technician operator in New York was issued an advisory for 17-meter FT8 operation, a band on which Technicians have no privileges.

◆ A club station in California was issued an advisory for operation with an expired license.

◆ Two operators in Florida were issued advisories concerning identification of their stations on 40 meters. Section 97.119(a) requires amateur stations to transmit the assigned call sign at the end of each communication and at least every 10 minutes during a communication.

◆ An operator in Utah received a notice of violation from the FCC for operation on 173.767 MHz, a frequency not authorized to the amateur service.

An operator in Florida received a notice of violation from the FCC for broadcasting, prohibited by Section 97.113(b) of Commission rules; and for refusal to allow an inspection, in violation of Section 97.103(c). Both operators were directed to respond to the notices within 30 days with sworn statements, under penalty of perjury.

◆ Interference to amateur satellite operations was informally resolved through the VM program. Persistent interference to 3.868 MHz was determined to be from a foreign transmitter.

◆ There was one virtual club presentation about the VM Program given to the Oro Valley Amateur Radio Club in Tucson, Arizona.

◆ The FCC requested assistance in two cases: a public safety case near McAllen, Texas, and a case involving unlicensed operation in California.

The totals for September 2025 monitoring were 1,235 hours on HF frequencies, and 2,003 hours on VHF frequencies and above, for a total of 3,238 hours.

— Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH

Product Review

Wouxun KG-Q10H Quad-Band Handheld

Reviewed by John Leonardelli, VE3IPS

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With the current Cycle 25 propagation shifts on HF, my experiments have drifted above 30 MHz. Programming my HF radios for 6-meter FM simplex, along with both local and distant repeaters, has opened up new opportunities for making contacts. Pairing my Wouxun KG-UV9D handheld (for 2 and 1.25 meters) with the KG-Q10H (for 2 meters and 70 centimeters) gave me a “little pistol” contest setup that’s ideal for portable use — just add antennas — but it lacks the 6-meter band. A true quad-band handheld would be the perfect addition to my kit and simplify my life with a smaller load to pack.

Enter the Wouxun KG-Q10H — a radio that makes you double-check the spec sheet. This is true quad-band capability: 2 meters, 70 centimeters, 1.25 meters (220 MHz), and the “magic” 6-meter band, all packed into one solid handheld. The extended receiver coverage even pulls in the aircraft AM band, opening up new listening opportunities. When 6 meters comes alive, with a better antenna, this handheld becomes a capable little DX chaser.

Having access to the 220 MHz band gives me more local repeater options while enjoying a band that’s quieter and far less prone to commercial two-way interference.

Another feature that’s become increasingly important is the USB-C charging port. With multiple handhelds and brands in my shack, being able to charge in the field — or during a power outage — without hunting for a brand-specific charger is a big deal. Having a common charging interface is now as essential to me as the Anderson Powerpole. I think this is becoming a best practice for resilient field operations and an important shift toward standardization and interoperability in the field. Hopefully, more manufacturers will pay attention to this.

Bottom Line

The Wouxun KG-Q10H provides genuine quad-band coverage with extended receiver coverage (aircraft AM) and supports USB-C charging, which is convenient in the field.

The radio comes with a Li-ion battery pack, short 2-meter/70-centimeter antenna, long 6/1.25-meter antenna, belt clip, wrist strap, drop-in charger, and owner’s manual. Remember, you need to order the programming cable.

Description

This quad-band handheld can transmit FM from 3 to 6 W depending on the band. It offers wideband receiver coverage, 50 – 54 MHz, 108 – 174 MHz, 222 – 225 MHz, 320 – 480 MHz, and 714 – 999 MHz; AM air band, FM broadcast, and NOAA weather are included. It offers a full-color dual-channel screen with simultaneous VHF/UHF monitoring, 999 channels, PC programming via Wouxun customer programming software (CPS) and *CHIRP*, and a built-in GPS with Q-series location sharing and a mini map. It is IP67-rated waterproof/dustproof, and the included battery is 3000 mAh at 7.6 V with a USB-C and desktop charger. There is no USB-C cable included.

The antenna connector is SMA male for the radio and SMA female for the antenna. For full specifications, see Table 1.

Another interesting feature is that it supports cross-band repeat with two modes available (more on this later).



Table 1 — Wouxun KG-Q10H Transceiver S/N W09MB0131

Manufacturer's Specifications

Frequency coverage: Receive, 50 – 54 MHz, 108 – 174 MHz, 222 – 225 MHz, 320 – 480 MHz, 895 – 999 MHz.

Transmit, 50 – 54 MHz, 144 – 148 MHz, 222 – 225 MHz, 420 – 450 MHz.

Power requirements: 7.4 V dc.

Modes of operation: F2D, F3E.

Receiver

AM sensitivity (10 dB S+N/N): Not specified.

FM sensitivity: Signal-to-noise: $\leq 45/40$ dB (wide/narrow band).

FM adjacent channel rejection:

Selectivity $\leq 70/60$ dB (wide/narrow band).

FM two-tone third-order intermodulation distortion (IMD) dynamic range: IMD $\leq 65/60$ dB (wide/narrow band).

FM two-tone second-order IMD dynamic range: Not specified.

Squelch sensitivity: Not specified.

Audio output: ≤ 500 mW, $\leq 5\%$ THD.

Transmitter

Power output: 6 W max, except 3 W max 222 – 225 MHz.

Spurious signal and harmonic suppression: ≤ -60 dBm.

Transmit-receive turnaround time: Not specified.

Receive-transmit turnaround time: Not specified.

Size (height, width, depth, including protrusions): 5.3 × 2.5 × 1.5 inches.

Weight: 0.65 pound.

¹ Noise limited at the value shown.

Measured in the ARRL Lab

Receive and transmit as specified.

Receive current, 350/420 mA (one/two channels, max backlight and volume), 335 mA (one channel, backlight off); standby, 90/57 mA (power save off/on); standby with GPS on, 67 mA. Transmit current (backlight default, high power), 52 MHz, 1.0 A, 146 MHz, 1.1 A; 223 MHz, 1.0 A, 440 MHz, 1.1 A.

Transmit, FM. Receive, FM and AM.

Receiver Dynamic Testing

All measurements taken at 500 Hz bandwidth, unless otherwise specified.

120 MHz	–114.9/0.40 dBm/μV			
12 dB SINAD:				
	<i>Band A (dBm/μV)</i>		<i>Band B (dBm/μV)</i>	
	Wide	Narrow	Wide	Narrow
53 MHz	N/A		–122/0.18	–122/0.18
146 MHz	–125/0.13	–125/0.13	–123/0.16	–123/0.16
162.4 MHz	–124/0.14		–122/0.17	
223 MHz	N/A		–122/0.18	–122/0.18
440 MHz	–125/0.13	–125/0.13	–122/0.17	–123/0.16
100 MHz	N/A		–100/2.13	

Rejection, 20 kHz spacing:

(All measurements are noise limited at the value shown.)

	<i>Band A (dB)</i>		<i>Band B (dB)</i>	
	Wide	Narrow	Wide	Narrow
53 MHz	N/A		68	60
146 MHz	63	61	63	59
223 MHz	N/A		60	56
440 MHz	48	47	54	51

Dynamic range, 20 kHz/10 MHz spacing:

	<i>Band A (dB)</i>		<i>Band B (dB)</i>	
	Wide	Narrow	Wide	Narrow
53 MHz	N/A		54/98	55/98
146 MHz	63 ¹ /79	61 ¹ /80	63/71	59 ¹ /71
223 MHz	N/A		60 ¹ /86	56 ¹ /86
440 MHz	48 ¹ /74	47 ¹ /74	54 ¹ /73	51 ¹ /71

	<i>Band A (dB)</i>		<i>Band B (dB)</i>	
146 MHz	105		104	
440 MHz	80		74	

	<i>Min (1) (dBm/μV)</i>		<i>Max (9) (dBm/μV)</i>	
146 MHz	–127/0.10		–111/0.66	
223 MHz	–126/0.11		–110/0.73	
440 MHz	–127/0.10		–111/0.64	

450 mW into 8 Ω @ 1.4% THD.

Transmitter Dynamic Testing

5 W typical, except 2 W on 220 MHz (Ultra Hi setting).

Typically, > 60 dB; worst case, 53.9 MHz, 48 dB. Complies with FCC requirements.

PTT release to 50% of full audio output, squelch off, S9 signal: 282 ms typical.

PTT close to 50% of full RF output, high power: 485 ms typical, except 53 MHz, 505 ms.

Build Quality

The KG-Q10H feels rugged, like it's meant to live in a go-bag or clip onto the MOLLE webbing of my backpack without a second thought. It holds up well in the rain, too, thanks to its IP67 rating. There's a waterproof panel on the right side that protects the Kenwood-style microphone and headphone jack, and the USB-C charging port is sealed with a gasket to keep out dust and moisture. The Wouxun SMO-008 is a waterproof speaker microphone completing its outdoor capability.

Wouxun has stepped up their game compared to earlier models. Spurious emissions are much tighter now and fully FCC-compliant. Plus, the included 3000 mAh high-capacity battery gives you all-day usage without the need to scramble for a charger. I cannot believe how the USB-C power port has become important in my portable radios. I can use my USB power banks to charge these radios and not worry about needing an ac outlet nearby.

Antenna Notes

The antenna situation requires some attention. To get the most out of the 6- and 1.25-meter bands, you'll want to swap antennas based on the band in use. The radio includes two multiband antennas (labeled on the inside ring of the SMA-F connector). I've left the long 6- and 1.25-meter antenna on by default, but band-specific antennas will make a noticeable difference in performance. I tried various $\frac{1}{4}$ -wave antennas for each band with the expected results. I found an unbranded triband antenna that covers the three high bands in my antenna box, and it works better than the stock antenna. I have added that to the radio go-bag.

My initial intention was to enjoy the radio on 2 meters and 70 centimeters to get a sense of audio and transmit capabilities compared to other radios, and then swap the antenna for the other bands. Like most of the manufacturer-supplied antennas, they can always use some improvement. Although it's ideal for short range, it struggled on some of my local repeaters. I found adding longer antennas improved the signal dramatically but also made the radio more cumbersome to use. On 6 meters, the supplied antenna is too short, and a 4-foot base-loaded telescopic whip provided better results. Due to the higher power output on 2 meters and 70 centimeters, the performance was as expected, but on the other two bands I expected 6 W maximum of power and got less than that, which was disappointing. However, for my operating needs, having the extra coverage is useful, as are some of its standout features.

Using a 6-meter ground plane or a 1.25-meter J-pole antenna added more range and provided better signals,

as expected. For portable operations and hilltop contesting, I tried various mono- and dual-band Yagis that give the handheld some punch and will increase your QRP class scores.

The KG-Q10H makes for an easy way to add new band capabilities in your home shack while having portable flexibility when you're outside.

Field Performance

Where this radio really shines is its field performance. The radio has some heft and feels solid in your hand. The display is bright and sharp, and using the keys to navigate the menus becomes intuitive over time. Audio quality is crisp and clear, with a speaker that doesn't sound like it's coming out of a tin can, and the receive sensitivity is better than you'd expect. The RF front end seems tighter than other brands, which makes it less susceptible to splatter and interference. The dual push-to-talk (PTT) setup makes transmitting on two bands easy once you get used to it, and the battery life is respectable.

It's nice to be able to charge it in my car using a USB-C cigarette lighter plug.

You do need to remember that the term *area* means VFO to Wouxun engineers.

GPS location tracking, NOAA weather alerts, and cross-band repeat, which is invaluable for emergency communications, POTA, and public service events, are standard features.

The flashlight has come in handy when I've tried to log contacts on a notepad or tried to find misplaced car keys at dusk while in a park. The keys are backlit as well, making for improved operation in low-light conditions.

I found I was using the dual receive capability a lot more with the local 220 MHz repeater and a 6-meter simplex channel set up. Listening in on aircraft or Marine 16 transmissions while walking the dog down by the lake has been enjoyable.

Programming

I dove into the Wouxun CPS software and immediately ran into issues trying to write to the radio. I got a pop-up stating "800M(A) Current freq out of range warning." I don't know if it was a bug or a firmware issue, but at first I thought it may be a cable mismatch. The lack of a supplied cable is annoying, but I was able to test with the Wouxun PCO-001 and the RT Systems USB-K4Y(B) cables on Windows 11.

I finally found a way to fix the error: Tab over to VFO settings in the CPS, and change the frequency in the 800M(A) entry from 795.025 to 895.000. Reading and writing to the radio are very fast.

Like with most Wouxun gear, there's a learning curve with programming — the CPS menu layout isn't what I'd call intuitive. *CHIRP* provides support with a beta release that brings Baofeng-style plug-and-play simplicity, but I did not try it. It's not a deal breaker, and the CPS does everything I need for entering 25 channels and setting up my configuration settings. I will definitely use the import and export feature to populate a few hundred channels. The Wouxun CPS doesn't allow cut-and-paste across spreadsheets, stock configurations, and advanced editing options, so I strongly urge you to plan your programming in advance. With 999 memories available, there is a lot of key entry work to do.

The programmable top and side keys allow you to quickly engage monitor, weather, flashlight, and scan modes without digging into the menu.

The included printed manual is well written and has more than 100 pages. The advanced operations section offers a wealth of information for uncommon radio features that are common in commercial radios.

This radio is able to receive the FRS/GMRS frequencies, but it does not transmit.

Feature Caveats

There are a ton of features available, like stopwatch, brightness levels, scan modes, 14 display colors, and more to keep you busy, but these are the ones I found useful.

Squelch: A short press of the green menu key will bring up squelch, power, step, CTCSS, etc. The radio does not have a squelch knob; it's set by this menu prompt.

Dual display and PTT: The dual display function allows you to monitor two channels at the same time. The top display is primary area A, and the bottom refers to secondary area B. Use the TDR/mode key to toggle between a single and dual display. The dual PTT took some time to get used to, as PTT 1 is the bottom side button that controls the primary area frequency displayed on the top line.

Work mode: This allows the display area to show channel name, frequency, or number. It helps me quickly see what the repeater frequency is when repeaters on different bands use the same call sign.

AM modulation mode: The radio can receive AM but not on all bands. You must turn the mode on in the programming software for the specific channel. This is an odd quirk, but having local airport channels programmed for plane spotting is another benefit of this radio.

Battery level: You can show an icon, but my preferred method is to show the battery voltage in the top right corner.

GPS mapping: Another powerful feature is GPS location data display. When enabled, the KG-Q10H can display the location of other Q-series radios that are transmitting their GPS location data. I did not try this, but please understand it is not a radio with GPS-provided map viewing. It simply allows Q-series radios to Q-series radios to send and receive GPS data. This could be an interesting feature for emergency communications. The last time I saw a feature like this was for a Garmin GPS/FRS radio. The display shows a simple map with up to eight radio IDs displayed. The feature works from radio to radio in simplex mode and on the same band and channel. Further experimentation is required to better understand the benefits of location tracking. Although it does have GPS capability, it uses a proprietary position reporting system that is not compatible with the APRS network. So, you cannot use it for traditional APRS messaging or tracking on APRS.fi.

Cross-band repeater: This allows the radio to act as a mini repeater offering two modes: directional and two-way.

The *directional mode* configures both the primary and secondary frequency as receivers. If any one of those frequencies receives a signal, it will broadcast it on the other frequency.

The *two-way mode* operates as a traditional cross-band repeater with the primary area as the receiving frequency and the secondary area as the transmit frequency.

NOAA alerts: I find it easiest to assign this mode to a programmable key. Seven channels are available in area A. Set up your notification types in menu 6 after turning on the alert in menu 5.

On-the-Air Use Cases

General

A quad-band radio opens doors to more VHF/UHF options. The 6-meter band sometimes punches through when 2 meters is blocked, while 1.25 meters is a quieter band for "tribal" repeater groups during commute hours. Net enthusiasts will enjoy hopping onto a wider variety

of nets across multiple bands. This radio has opened up new opportunities for making contacts on the less-used bands.

POTA/SOTA

Six-meter POTA contacts can be an award goal on their own, and FM simplex activations on higher bands are just plain fun. Summit activators will love the versatility — imagine working all four bands during events like the Colorado 14er Challenge. Deploy a small Yagi 16 feet up with an “Armstrong rotator” (manual rotation), and you can make long-distance FM contacts with a few watts.

During one POTA outing 2 years ago, I was chatting with Yury, VA3GKX, on a park-to-park contact on the 6-meter FM calling channel when a Florida station broke in with 10 W into a vertical whip. The next 45 minutes were a flurry of contacts, including Puerto Rico — all at low power. I'd love to repeat that experience with just the handheld and a telescopic whip or small Yagi at a park.

One Saturday afternoon, several portable operators hit the field for some range testing, POTA, and a few contacts in the ARRL June VHF Contest. I was happy with the results using the radio with a 2- and 1.25-meter amplifier and barefoot for the rest. Handheld to handheld provided signals where line of sight was available, as expected, with distances out to about 7 miles due to the terrain. I worked VE3WY on 223.500 MHz who was 50 miles away using a Yagi; he commented on the excellent audio and wanted to know what radio I had. One of the operators had a quad-band radio, but the 1.25- and 6-meter performance was very poor. He was curious to know what radio I was using because it seemed I was doing very well in the testing, and he was not. These testing events are valuable in providing real-world results and then sharing over coffee afterward.

Contests

Quad-band capability means more contacts and higher scores, especially for portable and rover ops. Multiple antennas — think compact Yagis and antenna switches — will help you squeeze the most out of this radio. Simple hilltop activations offer a chance to make contacts and add band multipliers. Check the ARRL contest calendar for event dates.

Travel Radio

I'm starting to see this handheld radio as an ideal travel companion. Besides ham bands, its ability to tune FM broadcast stations is handy for weather, traffic updates, or even a quick dose of classical music on the road. Its wideband reception will allow public service and safety channels to be monitored as well. The extended receive

coverage is also useful. Leave the drop-in charger at home, and use your USB-C power bank instead. I am sure I can load up a lot of cities with 999 memories available.

6-Meter DX Fun

Cycle 25 is making 6 meters interesting again. Apartment and condo dwellers can easily hide a 6-meter mobile whip on a balcony and make contacts and collect grid squares.

EmComm/ARES

This would be a top pick for its rugged build, true quad-band capability, and convenient USB-C charging. The inclusion of NOAA weather alerts, FM broadcast, and built-in aircraft AM band reception enhances situational awareness for aviation and emergency coordination scenarios.

Cross-banding is especially useful for extending coverage around obstacles and hilly terrain. While the radio can get noticeably warm during operation in this mode, it remains a low-cost and highly effective solution for punching through RF “holes” or terrain-related signal dropouts. By connecting an external antenna, you can expand your primary and secondary frequency options to take full advantage of the radio's capabilities.

Improvements

A proper and longer quad-band antenna would improve the radio performance and add another Wouxun item to the shopping cart. A longer dual-band 1.25- and 6-meter antenna that is a $\frac{1}{4}$ wave on 220 MHz and a coil loaded on 52 MHz will be most welcome.

Wouxun dropped the ball by not including a programming cable. The number-one issue is always a defective or fake programming cable that will frustrate a new owner as they attempt to program their radio.

I would love 6 W available on all bands but found, in practice, being short a few watts isn't problematic if a good antenna is used.

The first thing I am going to lose is the microphone/speaker cover plate, so having an extra one in the box would be awesome.

Conclusion

The Wouxun KG-Q10H is a rugged, high-performance quad-band handheld from a brand that's earned a solid reputation. If you want a single handheld offering wide coverage, durability, and the flexibility to experiment above 30 MHz, this one is tough to beat. The dual receive feature gets plenty of use, and while you'll spend some time getting to know its quirks and finding

the right antennas, it's a no-nonsense analog rig with serious RF chops — and USB-C charging to boot. If you're considering adding a new radio to your shack, the KG-Q10H delivers features you won't find elsewhere and rewards you with extra capability.

Manufacturer: Wouxun, www.wouxun.com. *Price:* \$220. Offered in four different colors. Available in the US from select online retailers.

RigSelect PRO: Radio Switch and SO2R+ Controller

Reviewed by Charles Fulp, K3WW
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As the name suggests, the RigSelect PRO is a premium station accessory designed to connect up to four radios to a single set of headphones, paddle, microphone, and PTT switch, ideal for advanced SO2R+ contesting. With three pairs of headphones and multiple keys cluttering my desk over decades, this feature was very appealing. Beyond basic radio selection, its genuine WinKeyer 3.1 and support for Open Two Radio Switching Protocol (OTRSP), a standard for controlling multiple radios via software, elevate it to a sophisticated single operator two radio (SO2R) controller for serious operators.

Description

The RigSelect PRO measures $2.875 \times 7.75 \times 6.75$ inches ($7.2 \times 19.6 \times 17.0$ centimeters) and weighs approximately 2.75 pounds (1.25 kilograms). Its rear panel features 20 standard 3.5-millimeter stereo (TRS) phone jacks, two USB-C ports (USB RUN and USB APP), and a 5.5-millimeter-OD $\times$ 2.1-millimeter-ID power plug requiring +6 V to +15 V dc at a maximum of 350 mA. The front panel (see the lead photo) includes four pushbuttons (**RIG 1–4**), responsive to single/double taps, with a long press on **RIG 1** accessing the menu system via a color thin-film transistor (TFT) display (see Figure 1). A WinKeyer speed control (**CW SPEED**), **ON/OFF** button, and LED indicators for CW PTT and PWR complete the design.

Bottom Line

The RigSelect PRO elegantly consolidates multiple radios into a sophisticated SO2R controller, offering complex audio routing and WinKeyer precision for competitive contesters.



At its core is an Arduino Mega 2560 Mini microcontroller with C++ firmware, storing configurations in EEPROM (non-volatile memory) for automatic power-up loading (see Figure 2 for the inside of the RigSelect PRO). Audio circuits for headphones or amplified speakers are isolated via transformers, with separate grounds by default (connectable to chassis ground via a jumper for RF grounding). Audio switching uses solid-state relays, while microphone signals and grounds employ telecom-quality latching relays. PTT can be routed from your favorite manual or foot switch.

On the rear panel (see Figure 3) there are two USB connections, **USB RUN** and **USB APP**. Connecting **USB RUN** to your computer will generate two COM ports, one for WinKeyer commands and one for OTRSP commands. If you want to use the free, highly recommended RigSelect Windows application, you must run a cable from the USB APP connector to your computer. This generates a third COM port, which is used to give the application access to the menu system and more in a GUI format.

The App

I find the RigSelect Windows app (version 7.51) far quicker and easier than button-driven menus (see Figure 4). Hovering over options triggers pop-up explanations, like the Split-Stereo PLUS ToolTip (see



Figure 1 — The TFT display. Shown here is the SO2R menu, one of many you can select from the front panel.

Figure 5), which is invaluable given the extensive features. The app allows macro programming within buttons, reprogramming front-panel shortcuts (see Figure 6), and advanced audio routing via the Advanced window (see Figure 7). The Tools and WinKeyer window (see Figure 8) supports setup if

logging software lacks WinKeyer integration, and test tools for SO2R validation. Control commands can originate from front-panel buttons, app buttons, or external software, enhancing flexibility.

Features

Select any two of four radios for SO2R, with RIG 1 and RIG 2 as defaults. All connections use 3.5-millimeter stereo jacks, supporting adapters for various radio brands and simplifying swaps. Advanced operation enables custom audio routing (e.g., RIG 1 to left ear, RIG 3 to right) and macros for monitoring a third radio. Pass-through mode bypasses the WinKeyer for radios with internal keyers, though setup varies (e.g., the Icom IC-7300 requires menu adjustments, while the Elecraft K4 uses separate inputs). Audio isolation ensures no RFI issues, as confirmed in my testing.

Flexibility

The RigSelect PRO integrates with most logging software (e.g., *N1MM*) and radio types. SO2R toggles via



Figure 2 — The RigSelect PRO circuit board.



Figure 3 — The RigSelect PRO rear panel.

WinKeyer, software PTT, or a PTT switch. There are options to use things like Key Out from many radios to trigger SO2R functions if none of the PTT choices are desired. The keying circuit supports most modern transceivers; however, use caution with older radios with more than 30 V on their key lines.

SO2R

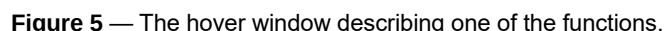
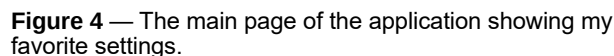
SO2R techniques vary, but the RigSelect PRO streamlines the process. I followed the quick start guide and *N1MM* application notes, using the RigSelect app to manage the setup from my computer screen. Updating the firmware via the app was quick and straightforward. After minor setup tweaks, I resumed SO2R after a 17-month break and found the RigSelect PRO as reliable as any controller I've used since the 1980s. My preferred mode, Split-Stereo PLUS (see Figure 8), routes RIG 1 to my left ear and RIG 2 to my right until I transmit, then feeds the non-transmitting radio to both ears with a reduced sidetone remaining in the transmitting radio ear. This helped me copy calls easier and still stay oriented during busy contests like the IARU HF World Championship. I am starting to disable the sidetone for clearer audio when both bands are crowded. The Blank/Blend mode keeps RIG 1 in the left ear and RIG 2 in the right at all times, with optional sidetone blending. When Blend is off, the transmitting ear goes silent, aiding focus but limiting binaural hearing. These modes suit most SO2R testers, from beginners to veterans.

SO3R and Beyond

Using the Advanced window in the app, you can inject audio from other radios into either ear. There is a large array of macros available, which should let the adventurous toggle in their favorite settings. For the non-contester, monitoring other radios while operating might also be desirable. If you like to do complex switching, there are eight transformer isolated inputs (four stereo lines in) that can be combined in 16 different ways. Using the advanced features, one should be able to switch in audio from one or two more radios to quickly check other bands. You could swap or overlay the audio from the additional radios with your main radios.

Things to Keep in Mind

You must use stereo cables except on the mic input where a mono 3.5-millimeter plug will work safely. There is a built-in speaker to provide monitoring of the WinKeyer. It can be set to zero or completely disconnected; however, the maximum volume is barely above what I can still hear (my wife assures me that it is plenty loud) and is at the relatively high pitch. Please note that the sidetone pitch can be configured; the default setting is about 600 Hz.



My station includes two transceivers (often remote) and a PC, all connected to the RigSelect PRO. I examined the basic setup, connected the audio from my handheld to one position, and monitored both HF radios while audio from our local repeater could pop into my left ear when there was activity. I use the fourth position for computer audio in and out. I can now use my favorite boom mic headphones for the two radios, monitoring repeaters and Zoom meetings on the computer with the pushbuttons selecting my choice. I have been very active since returning to SO2R operations, testing many of the RigSelect PRO features. I am on the CWops Tests (CWT) activities every Wednesday, usually performing at a relatively high level. I also was on the IARU HF World Championship, the North American QSO Party, and the Worked All Europe DX Contest CW with competitive results and no issues with the RigSelect PRO.

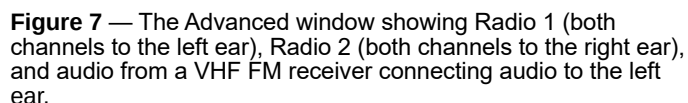
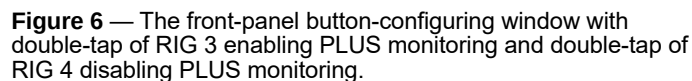




Figure 8 — The Tools and WinKeyer window can be used to set up the WinKeyer if your logging software does not provide that functionality. The tools permit testing your SO2R setup.

Where to Learn More

The manufacturer's website (www.rigselect.com) has downloads of the extensive documentation, including the current 60-page manual, a quick start guide to get you going, the RigSelect application, the firmware

update, and release notes. You will also find application notes that include setup information for use with the popular *N1MM* software.

There is also a user group at <https://groups.io/g/RigSelect-Pro> where you can browse the archives and see familiar SO2R operators. I posted a question to the group as well as contacted some well-known users. My question led to a firmware update with a new feature rather quickly. Both the developer and the community can be very helpful.

Conclusions

The RigSelect PRO is a sophisticated switching system suitable for those who have numerous radios and a need to interact at various levels of complexity. It provides the ability to use any combination of up to four radios for SO2R operations. I have decided to purchase the unit that I have been evaluating. It has worked well for numerous events. The price and Windows-only app may deter some potential users.

Manufacturer: KD6X Designs, www.rigselect.com. Available from DX Engineering. Price: \$859.99.

DIEX DXM60 60-Meter Dipole

Reviewed by Ward Silver, NØAX
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I have not been very active on 60 meters in recent years, but the DXM60 from DIEX is a small, rotatable antenna that looked like a good opportunity to get back on the band. The DXM family of antennas is available for 80 through 20 meters.

The DXM60 is an inductively loaded dipole. Inserting inductance allows a significant reduction in size from a full-size antenna. A full-size half-wave dipole for 5.35 MHz is 143/5.35 MHz (26.7 meters or 2670 centimeters long). This is 87.5 feet and fairly unwieldy for small lots or portable stations.

The DXM60 is slightly longer than 28 feet. Loaded dipoles, if well designed, can be competitive with full-size wire antennas. There is only a modest reduction in gain until the loaded antenna drops below $\frac{1}{4}$ of full size. I am used to QRP operating, so a compromise antenna would not be a problem. In addition, the DXM



is rotatable, so I could turn it to optimize what signal strength it could muster.

Workmanship and Materials

The antenna is constructed of eight telescoping aluminum tubing segments on each side, approximately 60 centimeters (23 inches) long, plus a loading coil on a solid plastic form (see Figure 9). Each element half is 430 centimeters (14.1 feet) long. The

Bottom Line

The DIEX DXM60 performed very well for its cost and size. It presents a few assembly shortcomings, but fortunately they are easily remedied.



Figure 9 — The DXM60 parts including the aluminum element segments, loading coils, and center angle bracket with mast clamp.

segments are attached to each other with sheet-metal screws, except for the adjustable outer section elements that are held in place with a hose clamp.

Component quality and packaging are good. Tubing cuts are clean, and all holes deburred. All parts are bagged or bundled and labeled individually or as a set of hardware. Unfortunately, the manual labels did not match the supplied labels on bags or parts, though I was able to figure out what parts to use during assembly. The manual or packing list should include a complete parts list, including tubing diameter and length. Note that the parts are all metric, including screws and nuts. The antenna ships in a short box that avoids excess length charges.

The telescoping tubing fit is pretty loose compared to US tubing sizes. This will result in the antenna segment joints moving in the wind. The sheet-metal screws holding the antenna together will then loosen, holes will elongate, etc., and the pieces will fall apart. In addition, water will get into the joint. The segments should instead be joined by machine screws and locking hardware.

If you use the sheet-metal screws as supplied, some of the pre-drilled holes are quite tight — add a bit of anti-oxidant compound as a lubricant. Cover the screw and joint with Scotch 33+ or equivalent tape.

Toothed lock washers are not included, but I consider them a must for all assembly screws joining metal pieces. Stainless-steel, external tooth lock washers should be added at all of the segment joints and to the feed-point attachment screws.

The stainless-steel hose clamps supplied for clamping the adjustable slotted segment are too big and would not tighten fully to a full-circumference grip. I substituted US $\frac{1}{4}$ - to $\frac{5}{8}$ -inch clamps, which provided a better grip.

Each segment has a paper label to guide assembly, but it won't come off without solvent. The labels can be left on and will weather off.

The mast clamp is galvanized — a good choice that is much better than plated — and the saddle is aluminum.

No anti-oxidation compound is provided or discussed. Whenever assembling antennas with tubing-to-tubing joints, a compound such as SS-30 or Penetrox/Noalox should be used. Because the tubing segments fit together loosely, a more generous coating than that used on tight-tolerance assemblies should be used. Once the segments are attached, wrapping the joint with high-quality tape will also help keep water from building up in the joint. The element tips are open, so any excess water that gets in will drain out.

The manual states that, once attached to the aluminum tubing segments, the coil should be covered with heat-shrink tubing or self-vulcanizing tape. This should be provided with the antenna. Large-diameter heat-shrink tubing is not a common hardware store item, and the manufacturer should ensure that the right material (tubing or tape) is used by including it with the antenna.

Manual and Build

The manual is provided as an online download at www.diexantennas.com/en-US/product/DXM60.

Overall, the manual is too sparse. Descriptions of assembly steps are quite limited. There are no final dimensions to check whether the assembly was done correctly. The manual would benefit from having more photos and drawings and a native English speaker edit the manual text. It took several reads for me to clearly understand the translated Italian, and there is only one dense paragraph describing the assembly of the tubing segments.

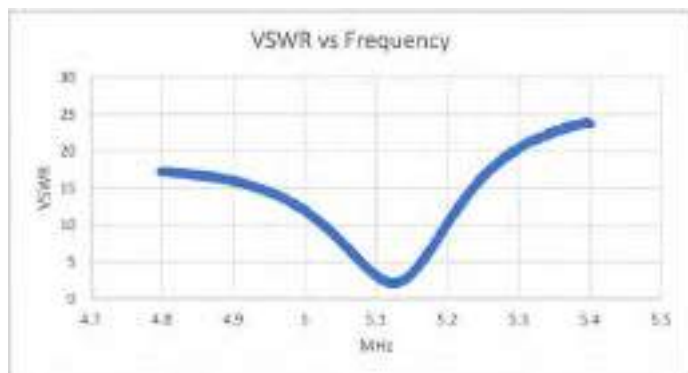


Figure 10 — SWR versus frequency with the DXM60 temporarily installed 18 feet above ground.

Experienced builders will have no trouble because this is not a complicated assembly, and it can be figured out with some experimentation. The tubing segments will only go together with the coil in one orientation, as shown in the manual drawing. Less-experienced buyers should step through the full process once, before beginning the final assembly.

Assembly

No special tools are required, although metric nut drivers or wrenches would be best. A combination metric/imperial tape measure is very useful.

Insert the inner element segments (1A and 1B) into the insulator blocks *before* attaching the insulator blocks to the center angle bracket.

There are two extra unexplained narrow-spaced holes in the center angle bracket next to the holes for the mast clamp. The clamp only fits in the wide-spaced set of holes.

Be sure to orient the center angle bracket with the angle away from the feed point. This is counterintuitive but provides an additional support point with the clamp saddle.

Tubing labels for segments 5A and 6A were reversed from the order given in the manual. Do a test assembly first to be sure the element segments are in the right order. Hopefully, the manufacturer will correct this production error.

The length of the coax pigtails at the feed point makes up the center portion of the element. Do not make the pigtails longer than necessary for the feed point to span 10 centimeters.

Installing and Tuning

The initial assembly was RF-tested at about 18 feet above ground on a metal pole. Minimum SWR was

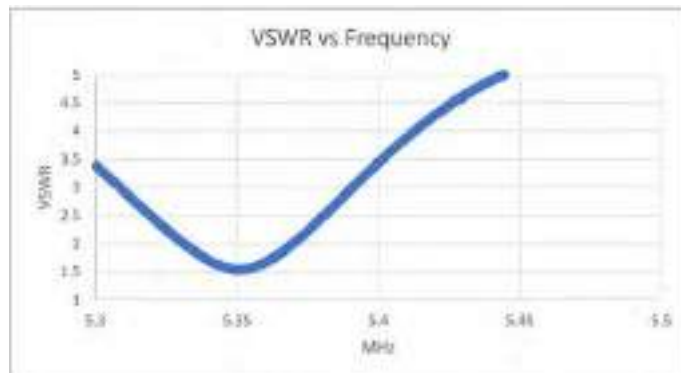


Figure 11 — SWR versus frequency of the DXM60 after the final installation, as seen in the station through the antenna system feed line.

about 2.0:1 around 5.125 MHz with manual lengths for tip segments 7A and 8A (see Figure 10). This is expected behavior. Loaded antennas are inherently more narrow-band than full-size antennas and are very sensitive to nearby conductors or ground. Expect to perform adjustments with the antenna in its final mounting place.

The DXM60 was then mounted on one leg of Rohn 25 at 45 feet above ground (see the lead photo). The antenna was centered between two sets of metal guy lines. A two-element 40-meter beam was above the DXM60 at 65 feet and a two-element 30-meter beam at 60 feet. Both a 40-meter Extended Double Zepp and an 80-meter dipole were attached to the tower at 60 feet. I did not notice any significant interaction with those antennas caused by the DXM60.

Once in place, the initial minimum SWR frequency moved up to 5.15 MHz, about 200 kHz below my desired setting of 5.35 MHz (see Figure 11). Tuning was awkward because the tips, not an inner segment, must be adjusted, so I removed the entire element beyond segment 1 for each adjustment. Alternately, the entire antenna can be tipped and lifted for access to the adjustable sections. I found that a change in element length of 1 centimeter resulted in an approximately 14 kHz shift in frequency of minimum SWR. (The manual specifies 20 kHz per centimeter change in length.)

A feed-line choke was necessary to prevent interaction that appeared as a dip in the SWR curve at about 5.000 MHz. I added six mix-31 snap-on ferrite cores at the antenna feed point, and that eliminated the effects from common-mode current coupled onto the feed line.

In the station (through about 80 feet of RG-213 and 200 feet of ½-inch hardline), the antenna exhibited the SWR curve in Figure 11. The 2:1 SWR bandwidth

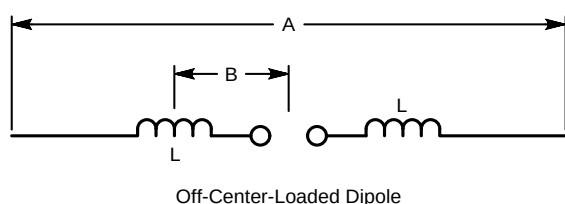


Figure 12 — A dipole antenna with off-center loading coils. A represents the entire dipole length as a fraction of the full-size dipole. B represents the fraction of total length at which the loading coil is placed. As B increases, L must be greater to maintain resonance.

was from 5.330 to 5.370 kHz (40 kHz) with a minimum value of 1.54:1 at 5.352 MHz. (All SWR data was obtained with a SARK-110 vector antenna analyzer.)

I did not attempt to adjust the value of the minimum SWR. Doing so would have had an insignificant effect on my signal strength, and I could not eliminate the effects of ground and nearby conductors. If I had managed to reduce the minimum SWR, the SWR bandwidth would likely increase somewhat. The behavior of the loaded dipole was reasonable in these circumstances, and the minimum SWR of 1.5:1 was completely acceptable.

On the Air

I compared the DXM60 to a reference antenna — a 160-meter base-fed tower vertical with an SWR of 1.53:1 at 5358 kHz. The tower is 150 feet from the tower on which the DXM60 is mounted.

Over a few days in the late afternoon and through the evening, I made numerous comparisons using FT8 and the PSKReporter network for a convenient signal-to-noise ratio (SNR) reference. In almost all cases of domestic and DX reception, the DXM60 SNR was equal to or stronger than the 160-meter vertical by 0 to 6 dB (1 S-unit). At $\frac{3}{4}$ wavelength long, the reference antenna's main elevation angle is greater than 30 degrees, and it was occasionally stronger on stations around the Midwest (my station is in Missouri). I felt that my received reports were comparable to those for other stations. Modeling suggests that the DXM60 would be approximately 1 dB below a full-size dipole, and that agrees with the specified gain value of 1 dBi, which is -1.15 dBd.

Running the DXM60's maximum rated power of 100 W, I was able to work domestic stations in the US and Canada easily. The SWR showed no change after extended periods of 50% duty cycle FT8 operation so that amount of power was not overheating the loading coils. Mixed in with the domestic QSOs were some

DX contacts in Europe, the Caribbean, and South America, including getting through to the OG0C expedition.

DXM Design

The design of loaded dipoles is discussed in the 25th edition of *The ARRL Antenna Book* (see sections 11.1.8 [Inductively Loaded Dipoles] and 21.1.2 [Inductive Loading]). Figure 12 shows the basic dimensions, and these are the DXM60 values:

$A = 860 \text{ centimeters} / 2760 \text{ centimeters} = 32.2\% \text{ full length}$

$B = 75\% \text{ of element length (approximate)}$

$X_L = \text{approximately } 2100 \Omega$, which requires 62.5 μH at 5.35 MHz

Using the online ON4AA inductance calculator (<https://hamwaves.com/coil/en/index.html>) and estimated coil dimensions, the coil's Q (the ratio of reactance to resistance) is approximately 350, corresponding to a loss resistance of $2100 \Omega / 350 = 6 \Omega$. This Q is fairly good for a long, thin coil. A coil wound with larger-diameter wire or tubing and having a larger inside diameter would have a higher Q (lower loss) but with an increased wind load and higher weight, especially if covered. According to *The ARRL Antenna Book* discussion of center-loaded mobile whips, which are very similar to loaded dipoles, this design complies with guidelines for good performance. The exact values chosen by DIEX must also consider available materials and cost.

Summary

The DXM60 surprised me with better-than-expected performance for its cost and size. Its assembly shortcomings are easily remedied, hopefully by the manufacturer in the future, or for now by the purchaser. I will be making the recommended fastener changes to the antenna, fully weatherproofing the feed point, and installing it between the 40- and 30-meter beams. As Solar Cycle 25 progresses, the 60-meter band should provide some excellent propagation as solar activity drops. The FCC may also change our allocation or power limits, so it will be important to have an effective antenna that can be tuned to different frequencies and with a movable pattern. The DXM60 satisfies those requirements.

Manufacturer: DIEX Antennas, www.diexantennas.com. Available in the US from DX Engineering. Price: \$237.99.

Ask Dave

Get more information from the “QST: Ask Dave” YouTube playlist at <https://bit.ly/3z2MBMI>.

Propagation, Radials, and Coax

The Grayline Propagation Phenomenon

Q Ernie Martin, WØAUU, asked, regarding grayline propagation: I see these screens with the world map on it, and it will have a top half of a sine wave-looking area in the middle that is light and to the right and left is dark. Is that light area the grayline? Should I point my beam at countries in the light area? Is that how it works?

A The map you're describing is a Mercator projection, one of many ways to depict a spherical Earth on a flat sheet of paper, as shown in Figure 1A. This projection depicts the areas around the equator with relative accuracy, but the closer you get to the poles, the larger the distortion.

In reality, the earth is nearly spherical (an oblate spheroid) and is constantly rotating, with a full rotation every day. The sun shines on half of the earth, and the other half is in darkness, as illustrated in Figure 1B. We call the boundary between night and day “twilight.” A band of twilight circles the earth at any given time, and you experience twilight twice a day, at sunrise and sunset. In Figure 1B, the light portion of the map is daytime, the dark part is nighttime, and the gray area — the grayline — is twilight.

As the earth turns, twilight circles the planet, but the parts of Earth being swept by twilight vary with the seasons due to the planet's axial tilt. During twilight, the ionosphere changes from daylight to nighttime conditions, or vice versa. Unusual propagation can

sometimes occur between ham stations that are both in twilight, even if they're on the other side of the earth. To contact a station with grayline propagation, wait until twilight and point your antenna toward a station that is within the grayline at the same time. The parts of the globe that are in twilight at the same time as you change with the seasons. So, if you have an area you wish to contact, prediction tools like DX Atlas (<https://dxatlas.com>) can determine what time of year is best for your DX attempts.

There are actually three different subcategories of twilight. Civil twilight, from sundown to when the sun is 6 degrees below the horizon, is still bright enough to read a newspaper outside. Nautical twilight is when the sun is between 6 and 12 degrees below the horizon; you probably can't read in the low light, and some brighter stars appear. During nautical twilight, the horizon is still visible at sea, making nautical measurements and navigation easier. Astronomical twilight puts the sun between 12 and 18 degrees below the horizon. During astronomical twilight, stars are visible, but sunlight is not completely gone. Once the sun is 18 degrees below the horizon, astronomical night is in full swing. All this is reversed for morning twilight.

Note that grayline propagation is a possibility, not a given. That said, if you're interested in contacting a very distant DX station, grayline propagation may offer what you're looking for.



Figure 1 — Maps of Earth from DX Atlas (<https://dxatlas.com>). The first map (A) is a Mercator projection showing daylight, nighttime, and twilight. The map is distorted, particularly as you move toward the poles. On this map, twilight is depicted as a gray band, known as the “grayline.” The second map (B) shows a spherical Earth as seen from space. Note that you can set DX Atlas to display civil twilight alone, both civil and nautical twilight, or civil, nautical, and astronomical twilight.

Sloping Ground vs Radials

Q Tom Gauvin, KC1PVO, asks: I am putting up a ground-mounted multiband vertical antenna at the edge of a level part of my yard — it slopes down from there. About half of the radials will be on level ground, but the other half will be on the 45-degree slope. How will this affect the antenna's input impedance and radiation pattern?

A A resonant ground-mounted vertical antenna with radials has about a 30 Ω input impedance. As a result, no matter how carefully you tune it, you will not get much better than a 1.6:1 standing wave ratio; however, most HF radios these days have antenna tuners that can handle this. The radials that slope down actually cause the impedance to rise, making your antenna tuner's job easier. Note that most VHF vertical antennas have built-in radials that slope down about 45 degrees, which tends to raise the input impedance closer to 50 Ω . Your downward-sloping radials will do the same thing. There is nothing wrong with this configuration.

The radiation pattern will change a bit to favor a down-slope pattern, but this effect will not be pronounced.

Selecting Coax

Q Joel Chaney, K8SHB, asks: How do I pick the right coaxial cable to use between my transceiver and antenna?

A The radio and antenna are connected via a transmission line. There are two types of transmission line: parallel wires and coaxial cable. Coax is constructed with a center conductor placed inside a hollow or insulation-filled tube in such a way that the two can't short together (see Figure 2). This cable type dates back to the first transatlantic telegraph cable in 1858, years before it was finally satisfactorily explained mathematically by Oliver Heaviside in 1880.

Each type of coax has a characteristic impedance, or the ratio of the voltage to the current when the cable is carrying RF energy. In amateur radio, we generally use coax with 50 Ω impedance. Each end of a coax line has one of three types of plug: PL-259 — so-called "UHF" cable, matched to an SO-239 receptacle — BNC, or SMA. In the US, PL-259 connectors are usually used for 100 W radios and antennas; in Europe and other regions, so-called "N-connectors" are commonly used.

Common coaxial cables used in amateur radio include RG-8U, a thick cable that can handle high power; RG-8X, a thinner cable that can easily handle 100 W



Figure 2 — Cutaway view of a Times Microwave LMR-400 coaxial cable. [Dave Casler, KE0OG, photo]

radios; RG-213, a flexible cable the size of RG-8U with a stranded center conductor; LMR-240, a Times Microwave cable similar to RG-8X but with a double outer conductor, and LMR-400, a Times Microwave cable similar to RG-8U but much better shielded. I suggest buying your cable from a reputable source, as there's a lot of low-quality cable sold at online marketplaces. But even the best cable does not last forever — water ingress and faults in the plastic outer sheath are common reasons for coax degeneration.

All cables exhibit a frequency-dependent RF signal loss per foot. At HF, all the cables mentioned above are fine, but at VHF and above, including 2 meters and 70 centimeters, you'll want to go with a lower-loss cable, such as RG-213 or LMR-400, to connect your station to a rooftop antenna.

Coaxial cable is not cheap, typically running more than a dollar per foot for RG-8X (my favorite cable) and even more for the thicker varieties. Coax is available from nearly all ham radio dealers. On your QRZ page, you say that you run about 600 W. At this power level, Belden RG-213 with PL-239 connectors on each end is a good choice. You can purchase this with the connectors already mounted. Don't forget to include lightning arrestors in your cable runs. If you want to go for something more deluxe, use Times Microwave LMR-400. Times Microwave sells PL-259 crimp connectors, but you will need their specialized connector mounting tools. It would be less effort to get the cable with connectors already attached.

Send your questions to askdave@arri.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.

Hints & Hacks

Taming Power Supply Noise; A CW Key from Reused Parts; New Life for a CB Antenna

Fix VLF and HF Noise from a Power Supply

RFI, buzz, and noise from computer power supplies in ham shacks can be a real problem on the HF and VLF bands. RFI often sounds like a cacophony of buzzing or swishing sounds across the entire spectrum, or a repetitive gurgling peak across the band, obscuring the station you're trying to hear.

My all-in-one shack computer is powered by a typical laptop external power supply brick (see Figure 1). The power supply generates an annoying wideband swishing noise on the HF bands, with strong gurgling or rumbling noises peaking every 20 or 30 KHz. I started listening in the VLF ham band at 630 meters and discovered an S-9 noise level. While the HF band

interference was just annoying, the VLF noise made the band unusable. I knew it was time to fix it or at least attenuate it.

First, I moved the computer power supply away from the radio and all cables — this was easier said than done. I rerouted all RF and antenna cabling away from the brick and ended up with at least

12 inches of separation between them. The VLF noise completely disappeared from that simple change, but I could still hear the wideband swishing and gurgling on HF. I suspected the noise was being radiated from the power supply cables.

To choke potential radiated cable noise, I wrapped both the ac input cord and dc output cord around large mix-31 ferrite cores (see Figure 2). I used a 2.4-inch-diameter core so the ac plug could pass through the middle for winding. I wound eight turns of ac cord around the core. I also used the same size core for the dc output cable and was able to squeeze 12 turns of cable around it. The cables should be in close contact with the ferrite core, and the input and output ends should be kept away from each other. To prevent the cable windings from moving around, and to keep the beginning and ending windings from coming in contact with each other, I secured the wire to the core with black electrical tape. I wound the ferrite cores as close as possible to the power supply housing and then secured them. To have more cable available for winding and less cable available to radiate, I placed the



Figure 2 — The power supply brick with input and output cables wrapped around ferrite cores. [Scott Freeberg, WA9WFA, photo]



Figure 1 — The power supply brick mounted to the wall and away from any coaxial, audio, or control cables. [Scott Freeberg, WA9WFA, photo]



Figure 3 — The single-paddle key pictured with the Elecraft KX2. [Hiroki Kato, AH6CY, photo]

power supply brick as close to the ac wall receptacle as possible. Finally, I mounted the power supply brick to the wall using Velcro® to help keep it away from any cables running along the floor.

It worked! The addition of ferrite cores and physical separation eliminated the terrible VLF RFI noise, as well as the annoying HF-band swishing and gurgling. — 73, Scott Freeberg, WA9WFA, wa9wfa@arrrl.net

Make a Single-Paddle Key from Assorted Parts

We often find old toggle switches at swap meets or in our junk boxes — I happen to own a few. I took one apart, and by rearranging the components, I fashioned a single-paddle key specifically for my Elecraft KX2 transceiver (see Figure 3).

The 3.5-millimeter stereo plug is repurposed from earbuds (the kind that airlines and tour buses give out free for in-flight/onboard video/audio programs). The support/base is an old Erector Set piece. — 73, Hiroki Kato, AH6CY, ah6cy@arrrl.net

Repurpose a CB Antenna for 10 and 12 Meters

A repurposed CB antenna, which operates on 11 meters, is an inexpensive way to access 10 and 12 meters (see Figure 4).

A CB antenna requires a good counterpoise, which is typically provided by the metal in the vehicle body. Recreating this counterpoise may be your biggest installation challenge. Where you plan to install the antenna will dictate how you solve this.

Most CB antennas have some way of tuning them to minimize the standing wave ratio at the desired frequency. Because they were originally designed for



Figure 4 — The CB antenna repurposed for 10 and 12 meters [Steve Kubis, KDØWUQ, photo]

11 meters, you may need to shorten yours for 10-meter use. Many CB antennas can simply be adjusted by cutting off a small length from the end of the rod. Think carefully before you make any cuts, as there is no going back!

If the antenna has a loading coil, you may find that one end of the coil has an adjustment screw that you can loosen, and you can slide the antenna rod to lengthen or shorten the top element. If you adjust the antenna to be shorter, the excess moves down into the loading coil. This extra material in the coil can generate a surprising amount of heat when transmitting at higher power, potentially damaging the coil. To avoid this, cut off the excess so it doesn't extend too far into the coil.

Avoid making major adjustments until you have it where you intend to use it. The antenna's location can significantly influence how the antenna behaves, so use an antenna analyzer to make the adjustment process easier.

CB radios are limited to 4 W of output on AM, so CB antennas don't need to handle a lot of power. If you know the specifications of yours, you can look up the maximum power. I wouldn't recommend going above the 100 W of peak envelope power that most standard HF transceivers can output. Mode also matters; you can get away with higher power levels for the low-duty cycle modes, like SSB. For 100 percent duty cycle modes, like FT8 and RTTY, you might need to reduce the output power. — 73, Steve Kubis, KDØWUQ, steve.kubis@outlook.com

"Hints and Hacks" items have not been tested by QST or ARRL unless otherwise stated. QST invites you to share your hints with fellow hams. Send them to hh@arrrl.org. Please include your name, call sign, complete mailing address, daytime telephone number, and email address on all correspondence. Whether you are praising or criticizing an item, please send the author(s) a copy of your comments.

Microwavelengths

Travel Antennas for Microwaves

Have you ever been on vacation and found yourself thinking that your location would be good for microwave operation? I have on numerous occasions. The challenge is figuring out how to bring equipment along; air travel has severe baggage limitations, and car travel offers little extra space once essentials are packed.

The biggest problem for microwaves is the size of the dish and tripod — transverters can be reasonably small if we forego high power, and portable intermediate frequency transceivers are compact. HF operators may manage with a dipole and low-power rig, but successful microwave operation needs some antenna gain. Is a big dish really necessary, or can we make contacts with a smaller compromise antenna?

Smaller Antennas

One way to decrease antenna size is to shrink the dish. Frank Kelly, WB6CWN, was able to fold an offset

dish into a flat package by adding a hinge for the feed arm. A small transverter and battery pack attached to the feed arm completed the package, ready for quick handheld contacts. While this approach saves space, a large suitcase would still be needed for air travel.

Pointing a handheld dish with a sharp beam is tricky. A lower-gain antenna with a wider beam is more forgiving, especially in an unfamiliar location with uncertain headings. One possibility is a flat-panel antenna. These are common for 2.4 and 5.8 GHz Wi-Fi, and some will work at the ham calling frequencies. Similar options can be found for other microwave bands; I have one for 10 GHz rated at 25 dBi gain, only a few dB less than a small dish.

Michael Aust, WB6DJI, built a very compact 10 GHz rig for contests and Summits on the Air. His rig, which is small enough for backpacking with a small patch antenna, consists of an FX-4CR transceiver by BG2FX, an MKU10G5 transverter by DB6NT, and an internal 6 Ah LiPo battery. The patch antenna, from F4HWK, has a reported gain of 18 dBi. Michael regularly makes 150-mile contacts from hills and mountaintops with this rig (see Figure 1).

Horn antennas come in all sizes, are easy to make, and have predictable performance. A 6-inch horn with a 4-inch square aperture will have close to 20 dBi gain. It isn't as compact as the patch antenna, but you could pack your socks inside the horn to save space. I made one from sheet copper for a simple homebrew 10 GHz transverter — an early version of my simple transverter design (https://w1ghz.org/xvtr/Simple_and_Cheap_Transverter_for_10GHz-2024_update.pdf) — that I would loan to hams who wanted to try 10 GHz. It has been used for many successful contacts.

Smaller antennas have wider beamwidth than a dish, so precise aiming is not needed, and they can be used for handheld operation. An omnidirectional antenna would eliminate the aiming problem. Doug Allen, K4LY, uses a waveguide slot antenna on his car for portable operation from high elevations with good success, as shown in Figure 2. This is an option for sites where there may be restrictions on setting up a bigger operation, or for operating from a car packed for vacation. The compromise is that omnidirectional antennas have lower gain — perhaps only 12 dBi — so any real DX

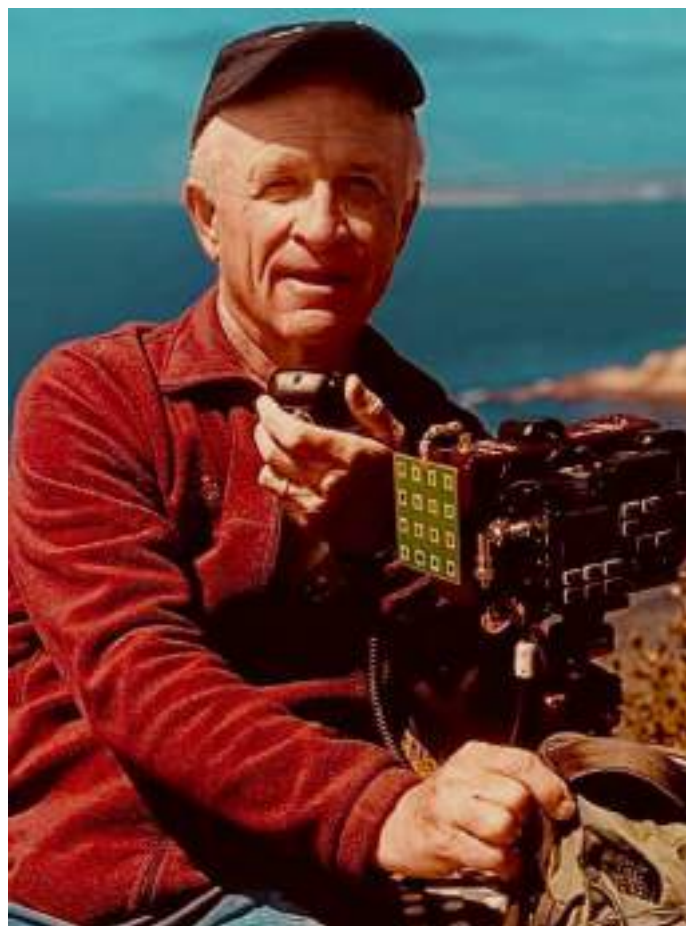


Figure 1 — Michael Aust, WB6DJI, operating his portable 10 GHz rig after backpacking to a mountaintop. [Michael Aust, WB6DJI, photo]



Figure 2 — Doug Allen, K4LY, operates 10 GHz portable using a waveguide slot antenna on his vehicle for quick contacts. The slot antenna is inside a PVC pipe for weatherization. [Doug Allen, K4LY, photo]

might require a well-equipped station at the other end, or exceptional propagation conditions.

Antenna Amplifiers

Years ago, when we were getting started on 10 GHz in New England, we were using simple WBFM Gunnplexer transceivers with small horn antennas. We soon approached the maximum range for these 10 GHz transceivers (around 150 kilometers), even with clear line-of-sight paths between mountaintops. Because the Gunnplexers were not easily compatible with a dish antenna, we investigated other ways to increase gain. Matt Reilly, KB1VC, and I experimented with metal lens antennas, while Dale Clement, AF1T, tried adding an extension to the horn. Both approaches added some gain.

For a travel antenna, using a small horn antenna with an optional extension might work. I thought about ways to make a horn extension that could fold up and determined that sheet-metal or copper-clad printed circuit board material held together with conductive copper tape would work. Then I thought about what materials are available at almost any location: cardboard, aluminum foil, and duct tape. I found a cardboard box in the firewood bin, marked waveguide dimensions in the center of each side at one end, and made cuts from the marks to the corners at the far end. Removing the corner pieces left the sides of a pyramid. I left the end flaps and folded them down for support, then taped the outside to form a horn antenna shape.



Figure 3 — A 10 GHz small WR-90 horn antenna with cardboard extender for more gain. The inside, lined with aluminum foil and copper tape, is on the left; the outside, showing duct tape and zip-tie construction, is on the right. [Paul Wade, W1GHZ, photo]

To make it into an antenna, I lined the inside with aluminum foil and slid a small horn into the narrow end. The flare angles of the small horn didn't match the cardboard one, so I made the electrical connection by covering the joint with copper tape, sold in various widths as guitar tape. A few more joints in the foil were covered with bits of copper tape.

The complete horn with extension is shown in Figure 3. I tested it on a distant beacon: VE2TWO/b in grid square FN25uk, 195 kilometers over the Green Mountains from my grid square, FN34uj. To provide a reference, the beacon signal during this test was about 20 to 25 dB above the noise using an 18-inch Sony dish, strong enough for an SSB contact. Using the home-made horn with the extension, the signal was about 10 to 15 dB above the noise, enough for easy CW copy. Finally, using just the small horn alone, with about 11 dBi gain, it received barely audible signals. Three to 6 dB above the noise is not enough for CW copy. Building a homemade horn plus an extension with available materials and somewhat arbitrary dimensions added enough gain to make a difference on a marginal signal; using properly calculated horn dimensions might add a few dB more.

Summary

Small, simple antennas and equipment suitable for travel can make good microwave contacts from remote locations and add more fun to a vacation. Some ingenuity using available materials can improve results — it doesn't have to be fancy or perfect to work. Just remember to bring some guitar tape and a Swiss Army knife when you're roving!

POTA in Liguria: CQing Between the Olive Trees

Exploring the scenic coast of Italy, one park activation at a time.

Christian Diemoz, IX1CKN

Every year, I travel to the western part of Liguria, Italy. As a longtime lover of routine, I've spent the last 17 years vacationing in the same spot — the Loano waterfront — without much inclination to explore beyond my familiar surroundings. In 2024, however, I decided to spice up my getaway by bringing an HF setup and operating Parks on the Air® (POTA®).

Armed with the lightweight uSDR+ QRP transceiver (nicknamed “red corners” because of its distinctive red casing), which runs with an internal battery, and two portable antennas — a quarter-wavelength vertical and an end-fed — I went on my way to activate four parks classified as Natura 2000 reserves (a Europe-wide network of protected areas, including the protection of any threatened species living among them) in the province of Savona. They were all easily reachable by car, which optimized operating times and avoided interfering with my family's holiday schedule.



Christian Diemoz's, IX1CKN, setup near Santa Libera Church for POTA reference IT-1025.

Success After a Bumpy Start

My first stop on September 16 was POTA reference IT-1025, which covers Monte Ravinet and Rocca Barbena. I set up near the Santa Libera Church (Maidenhead grid square JN44cd), perched on a hill covered in olive trees with a stunning view of the sea. Excited, I turned on my radio only to be greeted by a harsh, pulsing noise that drowned out most signals. Despite the setback, I managed to make 11 contacts — eight on SSB and three on FT8 with the iFTx mobile app to achieve activation validity (though it was far from smooth sailing).

In the afternoon, I headed to Monte Acuto, Poggio Grande, and Rio Torsero (POTA reference IT-1055). After a short hike, I found a scenic spot along the road where the Sanctuary of Monte Croce is, overlooking the valley and sea (Maidenhead grid square JN44bc). At 670 meters above sea level, it was the perfect place to set up my gear. This time, conditions were noise-free and ideal for making contacts. I made 24 contacts in 80 minutes, including five valuable park-to-park contacts



Activating Monte Carmo (POTA reference IT-1047) from the car.

with other POTA operators across Europe, as well as a DX contact with Indonesia while operating FT4 on 10 meters.

Despite the rough start in the morning, the afternoon rekindled my enthusiasm, reinforcing the adage by 19th-century American philosopher Ralph Waldo Emerson: "It's not about the destination, it's about the journey."

Operating from Monte Carmo and a Loano Beach

On September 19, I explored Monte Carmo (POTA reference IT-1047), which is part of Monte Settepani. After a bumpy ride, I reached a parking spot at 596 meters above sea level in Maidenhead grid square JN44ce and started operating from the driver's seat, as it looked like it was going to rain. Solar conditions weren't favorable due to the aftermath of a minor (G1)



Christian Diemoz, IX1CKN, activating IT-1107 from Le Manie plateau.



A towel and a QRP transceiver are all you need to operate from a beach!

geomagnetic storm, but my perseverance paid off. I made 22 contacts, mostly with Spain and the UK, in 100 minutes. I had hoped to make DX contacts from this location, but you can't always get what you want.

That afternoon, I decided to attempt my first-ever operation on the beach. I set up on a Loano beach (Maidenhead grid square JN44dc) with my quarter-wavelength vertical antenna placed in the sand, just a few meters from the sea. I called "CQ QRP" on 20 meters and quickly secured eight contacts, followed by five more on FT4. The highlight of the day was contacting Jan Botha, ZS4JAN, in South Africa, proving that salt water has the power to enhance portable low-power operations.

A Satisfying Finale

For my final activation on September 20, I activated POTA reference IT-1107 in Finale Ligure. I set up at Le Manie plateau (Maidenhead grid square JN44ee) on a grassy area perfect for radio operations at 308 meters (though there was no view of the sea here). Propagation favored northern Europe, and within 2 hours I secured 40 contacts, including six with other parks. It was the perfect conclusion to my Ligurian POTA journey.

Thoughts About My Experience

I logged 121 contacts, divided among four POTA activations and a beach session, all in a week. Beyond the figures, what struck me was the versatility and capability of the uSDR+, proving that even a lightweight setup can deliver satisfying results and fun for hours.

Portable operations offer a unique blend of challenges (even preparing for the activation by checking maps and previous reports by other hams isn't trivial when it comes to places you've never been before) and pure enjoyment, deepening my appreciation for amateur radio as a way to connect with nature and operators throughout the world.

All photos provided by the author.

Christian Diemoz, IX1CKN, earned his license in 2010. He has had a love for radio his entire life and now holds three call signs: IX1CKN, KC2YXI, and HB9EYT. When Christian is not operating from his home shack, he's either working as an online journalist or operating POTA. He can be reached at ix1ckn@gmail.com.

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



A Homemade 6.4-Meter EME Dish

A Polish microwave enthusiast leveraged his radio experience and advice from fellow hams to build his dream moonbounce station.

Henryk Kotowski, SMØJHF

I still remember the words of wisdom I was told in the early 1960s: If you have spare time, build a better antenna — it's the best signal booster money can buy.

Only a small percentage of active shortwave enthusiasts build their own antennas due to the heaps of commercially made, optimized radiators available on the market. The microwave sector of amateur radio, on the other hand, is relatively limited and involves a considerable number of experimenters. This is where the spirit of amateur radio is apparent — testing new technologies, learning techniques, and exploring the spectrum. Many of these experimenters are professionals who have vital knowledge and essential equipment through their line of work.

Dreams of an EME Station

Rafael Grygorowicz, SP9VFD, is a very successful, skilled, and self-taught amateur microwave constructor in the south of Poland. He lives in a small village in the foothills of the Tatra Mountains, near the border between Poland and Slovakia, and he earned his amateur radio license in 1991, when he was 15 years old. He is an international member of ARRL.

Rafael has passed all levels and stages of amateur radio, starting with 80-meter local chats from a club station. Later, he built an HF station of his own, worked on dozens of different factory-made transceivers, and refurbished scrapped military amplifiers before concluding that the short-wave bands were no challenge.

Rafael had read about moonbounce communication, or Earth-moon-Earth (EME), back in the 90s, but it wasn't until 2007 that he was able to try it himself. Feeding an array of four nine-element Yagi antennas with 50 W of RF power, he managed a two-way contact with KB8RQ on 144 MHz using JT65B emission. The next step was to upgrade to 432 MHz, and being capable of EME contacts on CW enlivened his pursuit. This was the turning point. Rafael had a house, a family, and a good job — all that was missing was a large dish reflector pointed at the moon.

Assembling a 6.4-Meter Dish

In the early summer of 2020, Rafael kicked off the construction of a meshed 6.4-meter paraboloid antenna system in his garage, to be completed on the lawn (see Figure 1). Being a bona fide amateur, he had



Figure 1 — Rafael's, SP9VFD, assembled 6.4-meter paraboloid dish antenna, ready to bounce signals off the moon.



Figure 2 — Rafael fixes the last pieces of reflective metal mesh to the dish's aluminum frame.

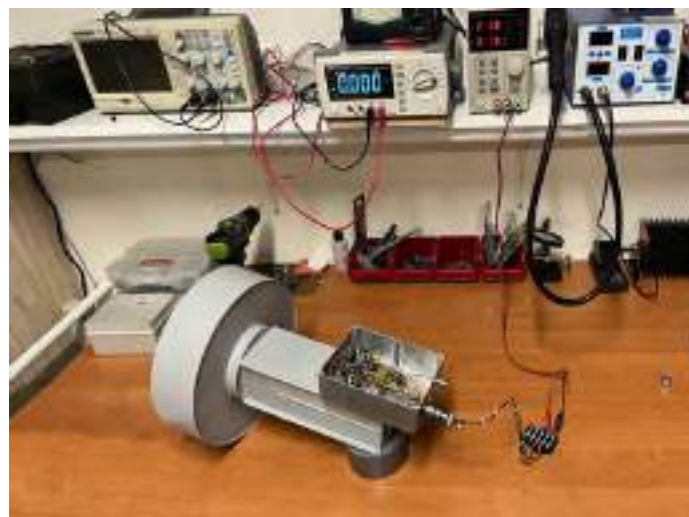


Figure 3 — Rafael's 2.3 GHz feed unit being tested on the workbench.

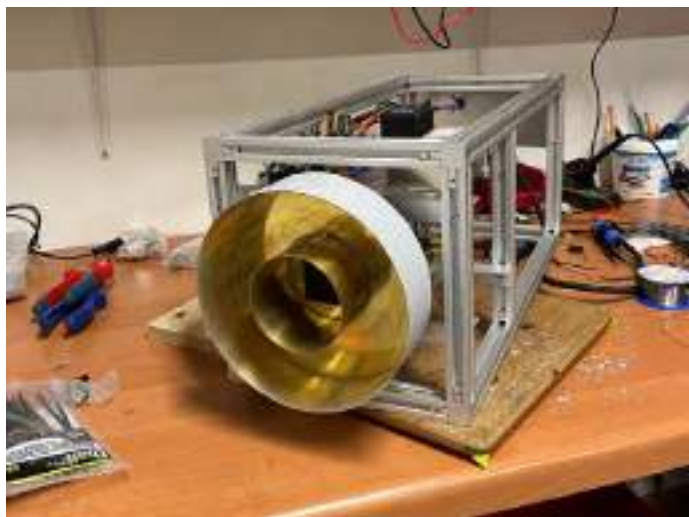


Figure 4 — The framed 3.4 GHz septum feed unit, with ample space for a solid-state power amplifier, a power supply, relays, a transverter, and a receive low-noise amplifier.

to do a lot of research, reading, and consulting. A few auxiliary instruments and gadgets were constructed in the garage, and certain components were outsourced, but most of the hardware — including the welded lattice tower supporting the finished dish — was hand-crafted using relatively simple tools and methods.

Homebrew antennas are quite common among EME operators and vary widely in size, shape, material, and strength. One reason that serious EME operators take on the task of building these antennas from scratch is that commercially available large surplus dish antennas are difficult to dismantle, relocate, and assemble anew. Smaller, commercial paraboloid reflectors are, on the other hand, very popular among microwave amateurs — Rafael, for example, recently acquired a 10-foot solid dish for his 10 GHz and 8.4 GHz (Deep Space Network) projects.

This story is not intended to offer data and formulas on a particular dish design and construction; you can find detailed scientific descriptions of such designs in print and on the web. The intention is to show that, though not easy, it is possible to assemble a state-of-the-art amateur EME station.

To start, Rafael assembled 24 ribs from aluminum angle to support the dish's reflective mesh. These ribs would later be fastened to a set of aluminum plates — one 40 inches in diameter, the other 25 inches — that would serve as the backbone of the paraboloid

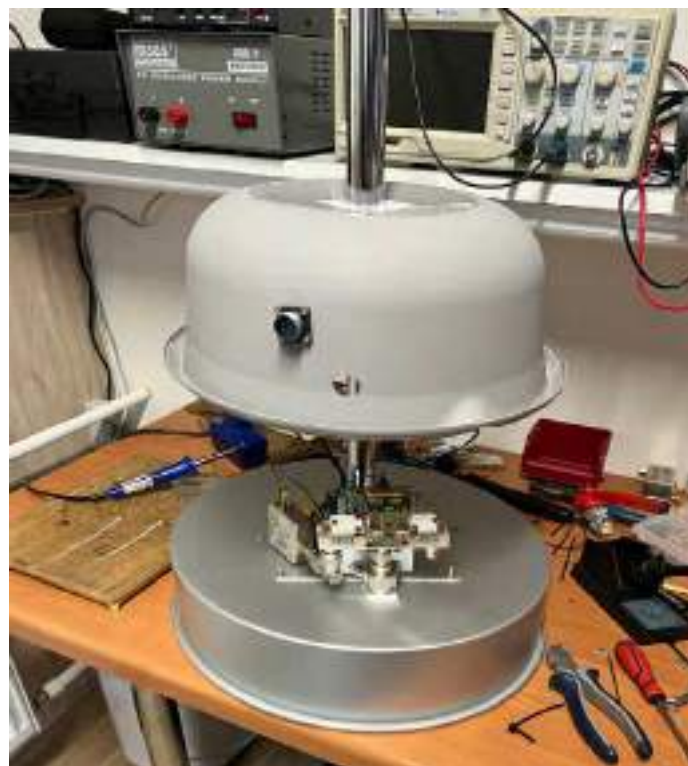


Figure 5 — Rafael's homebrew 432 MHz loop feed unit, adapted for the paraboloid dish antenna.



Figure 6 — Rafael with his completed dish antenna, ready and waiting for the moon to show up.

reflector. Finally, he stretched reflective metal mesh across the frame and mounted the construction on a welded lattice tower (see Figure 2).

To bring his station to life, Rafael assembled feed units for his desired microwave bands: a 1.2 GHz feed unit containing a W6PQL 600 W pallet amplifier and home-made G4DDK low-noise amplifier (LNA); a 2.3 GHz septum feed unit fitted with a WA6PY LNA and 150 W solid-state power amplifier (SSPA; see Figure 3); and a 3.4 GHz septum feed unit, designed by RA3AQ, fitted with a modified Toshiba UM2683B SSPA, an MKU 34 G3 432 MHz transverter, and a DGØVE receive LNA. The 3.4 GHz feed unit's lightweight frame is made of flexible aluminum-alloy profiles, which allows for easy adaptation for other configurations in the future (see Figure 4).

Next, Rafael assembled an SSPA for 432 MHz, basing his design on salvaged 450 MHz modules used for analog cellular telephony. The output is more than 400 W, powered by 28 V at 40 A. He also put together a homebrew loop feed unit for 432 MHz. Rotating the loop changes the polarization of the signals, a key factor when operating 432 MHz due to Faraday rotation in the path that deteriorates the arriving wave (see Figure 5).

With the completed dish antenna assembled in the yard, Rafael calculated the counterweight using buckets of water tied to the back of the dish, which he could later replace with equivalent metal loads.

5 Years Later

Rafael's location in a valley is not favorable for radio — the hills prevent low-angle radiation on HF, and

the moon isn't visible until it reaches higher elevation, leading to a shorter EME window. However, the valley also protects the antennas from strong mountain winds, and there is relatively little RF pollution.

Despite geographic limitations, as of November 2025 Rafael's EME installation is bouncing CW, SSB, and digital signals off the moon on 432 MHz, 1.3 GHz, 2.3 GHz, and 3.4 GHz, as well as 5.7 GHz, which he added in 2024 (see Figure 6). Rafael is particularly fond of the ARRL International EME Contest; in fact, he used his new dish antenna to earn second place in the 2023 contest in the Single Operator, CW Only, All Band category. He is also performing very well in the European DUBUS EME events, which are CW and SSB only.

More details regarding the construction of Rafael's EME dish antenna can be found at https://ok2kkw.com/eme/Trenton/papers/SP9VFD-How_to_Start_on_Microwave_EME_Using_Homebrew_Equipment.pdf.

All photos provided by Rafael Grygorowicz, SP9VFD.

Henryk Kotowski, SMØJHF, was born in Poland, where he got his first amateur radio license in 1960. At 30, he moved to Sweden and had to wait a few years before he could apply for a license. In 1992, while in Florida, he earned his Extra-class license with the call sign K6JHF, which he uses when visiting California. Henryk can be reached at sm0jhf@gmail.com.

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Strays

QST Congratulates...

Ben Lloyd, GW4BML, on the publication of his book *Summit of Dreams*, which details his family's journey activating rare Summits on the Air (SOTA) on remote islands in the UK. A celebration of both the technical and emotional sides of SOTA, *Summit of Dreams* blends the spirit of amateur radio with the joy of family exploration. The book is available on Amazon.



A Minimalist DXpedition to Monaco

One ham's quest overseas to give an all-time new one to as many North American DXers as possible.

Jim Peterson, K6EI

When I was getting started in ham radio, QST's "How's DX?" column inspired me to dream about packing my gear and heading out to experience a remote radio adventure of my own someday. Of course, the DXpeditions that get the most attention are major multi-operator events from difficult-to-reach destinations, but I wanted to try a small-scale expedition of my own to a less arduous location.

Deciding on a Destination

A few years ago, I assembled a highly portable Elecraft KX3 HF transceiver, and the concept of going on a mini-DXpedition went from hypothetical to feasible. My wife and I talked about taking an overseas vacation, and I realized that if I packed the KX3 in my luggage, I might be able to sneak in a few hours of radio time during our travels.

We needed to go somewhere that would be fun for both of us. My wife wanted to go someplace that wasn't

too cold or too remote that had comfortable accommodations and scenic and historic local sights. My list was shorter — I wanted to go to a location with easy licensing requirements that was also at least a semi-rare DXCC prefix for North American hams.

Southern European destinations certainly met my wife's requirements. But I didn't know where I could go in Europe that would be sufficiently rare. While reviewing my log, the Principality of Monaco stood out as a DXCC location I had never contacted.

A quick review of Club Log's DXCC Most Wanted List (<https://clublog.org/mostwanted.php>) showed that Monaco (prefix 3A) was ranked #25 (now #30) by DXers in western North America. Monaco has a reciprocal license agreement with the US and is relatively easy to get to, but based on its ranking, this prefix was clearly in high demand!

Monaco's rarity is due to its topography and size. It hugs a steep, narrow stretch of Mediterranean coast near the French and Italian border, with a tall ridge of mountains along its northern border blocking low-angle propagation toward North America. At just under 1 square mile, it is one of the world's smallest sovereign states (and the smallest member of the United Nations). Its footprint is smaller than New York City's Central Park, and it has fewer than 40,000 residents. In addition to being topographically challenged, Monaco tops the list of the world's most expensive places to live, with a small apartment typically renting for around \$150,000 per year — yikes! Hence, there aren't any local hams with towers (no wonder stateside contacts with Monaco are so difficult).

My quest became clear — give an all-time new one to as many North American DXers as possible and/or fill a band with Monaco contacts.

Planning and Preparation

My first thought was to find a place to stay across the border in France or Italy, and do a few short portable radio operations from a park or beach inside Monaco. I emailed Franco Lucioni, 3A2MW, the most active ham in Monaco, for more information.

Franco explained that although Monaco has a bilateral reciprocal agreement in place, the principality has



The loop antenna.



Installing the telescoping 10- and 12-meter whip antenna on the balcony.

additional radio-related restrictions, which include an upper power limit of 100 W, and radio operations aren't allowed in any public or outdoor location. He said that a small antenna at your personal residence was tolerated, as long as it was discreet (he uses a tunable whip antenna on his 13th-floor, south-facing balcony).

With portable operations not allowed, a short-term rental became my best option. Fortunately, our planned visit was during the slow season (a few months before the Monaco Grand Prix motor race event and the summer tourist season). I found Google Street View, a Google Maps feature, to be incredibly useful for seeing which rental locations offered the best unobstructed propagation toward North America.

After monitoring the short-stay rental listings for several weeks, serendipity struck — I found a fifth-floor apartment with a north-facing balcony that overlooked Monaco's harbor, which was optimal for contacting North America. While it wasn't cheap, it was manageable given that we'd be there for only a few days.

My antenna needed to be light and compact to qualify as a carry-on for the flight, as well as be easy to install, efficient, and low profile. The space on my rental apartment's balcony was limited, so I opted for a Chameleon Antenna CHA F-LOOP as my primary HF antenna and a simple extendable whip as backup.

The mountain range on Monaco's border blocked low-elevation-angle propagation toward North America, and the fact that I would be running QRP with limited-space antennas wasn't going to help me reach my goal. So, despite being an enthusiastic CW operator at

home, FT8 was the logical choice, as it provides more than 20 dB of processing gain. After all, I was going to need every spare decibel I could find!

The final step on my preparation list was notifying the ARRL DX department and a couple other DX news sites of my upcoming adventure. Once word got out, I received several eager emails from stateside hams asking for details about my station's schedule so they could add Monaco to their completed DXCC list. I made sure to pack my FCC-issued amateur license, along with a copy of the International Amateur Radio Union reciprocal agreement, and I was ready to go.

Radio-Active on the Riviera

When we arrived in Monaco, my wife and I were immediately struck by our temporary home. The harbor was full of immense yachts, and speedway bleachers and barriers were already being installed along the waterfront in preparation for the next motor race.

As expected, the northern mountain range along the border with France blocked the possibility of any propagation at elevation angles below 30 degrees, but the good news was that there weren't any significant RF noise issues. And, having our balcony above the salt-water harbor certainly wasn't going to hurt my signal strength.

Setting up my antenna on the balcony went quickly. I didn't want to irritate the neighbors, so I placed the loop antenna beside a large potted plant, and I deployed my telescoping whip for 10 and 12 meters only when it would be in use. I also tuned my two antennas with my NanoVNA without a hitch.

During our 5-day stay in Monaco, we settled into an enjoyable routine. I got on the air around daybreak,



Jim Peterson's, K6EI, view of Monaco from the rental. The mountains blocked low-angle propagation toward North America.



Jim Peterson's, K6EI, QSL card for his DXpedition to Monaco.

starting on 30 meters and stepping up through each of the bands, along with the maximum usable frequency. My wife and I then spent a few hours exploring the local sites until the afternoon. I devoted the late afternoon through late evening to making contacts, but during this time, I started on 10 meters and worked my way down through each band until it closed.

Contacting western, central, and eastern European stations was easy, and I experienced some amazing pileups on 10 and 12 meters with Asian countries. Franco was just across the harbor and provided me with helpful signal reports during my stay.

As expected, North American contacts were far more challenging. The optimal window for making stateside contacts tended to be in the afternoon local time on 20 meters and during the early evening on 15 and 17 meters. I also made a few North American contacts on 30 meters around sunrise.

Final Thoughts

Before I knew it, it was time to pack up and move on. Running 3A/K6EI had been a real hoot. I made about 890 contacts in total, including about 50 with US and Canadian stations (many of those with signal reports around -20 dB). Upon my return home, I was gratified to receive several emails from stateside hams who said that after decades of trying, I was their first-ever contact with Monaco — very cool!

All photos provided by the author.

Jim Peterson, K6EI, has been a licensed radio amateur for more than half a century and enjoys operating CW, RTTY, and portable; contesting, and designing and building antennas. He considers ARRL Field Day the high point of the year. Jim holds a BSEE from University of California in Davis, and an MSEE from The Ohio State University. He retired in 2019, after 38 years at Northrop Grumman. Jim is Vice President of the West Valley Amateur Radio Association and a member of the Northern California Contest Club. He can be reached at k6ei@arrrl.net.

For updates to this article, see the **QST Feedback** page at www.arrrl.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 manuscript with images to qst@arrrl.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.arrrl.org/qst-author-guide.

The Centennial of the ARRL Field Organization



Here's a look back at its origins and development.

Steve Ewald, WV1X ARRL Field Organization Supervisor

ARRL Sections were formally established in 1926 by the Board of Directors. The article "The Board Meets" in the April 1926 issue of *QST* introduced this chapter of ARRL history, noting that the Board's annual meeting was held in Hartford, Connecticut, on February 26 and 27, with all Directors present in person for the first time ever. At that meeting, the name of what was then called the Traffic Department was changed to the Communications Department, which the article describes as "a much better title for the department that handles so many other operating activities besides message traffic." The title of Traffic Manager was changed to Communications Manager.

The Birth of the ARRL Sections

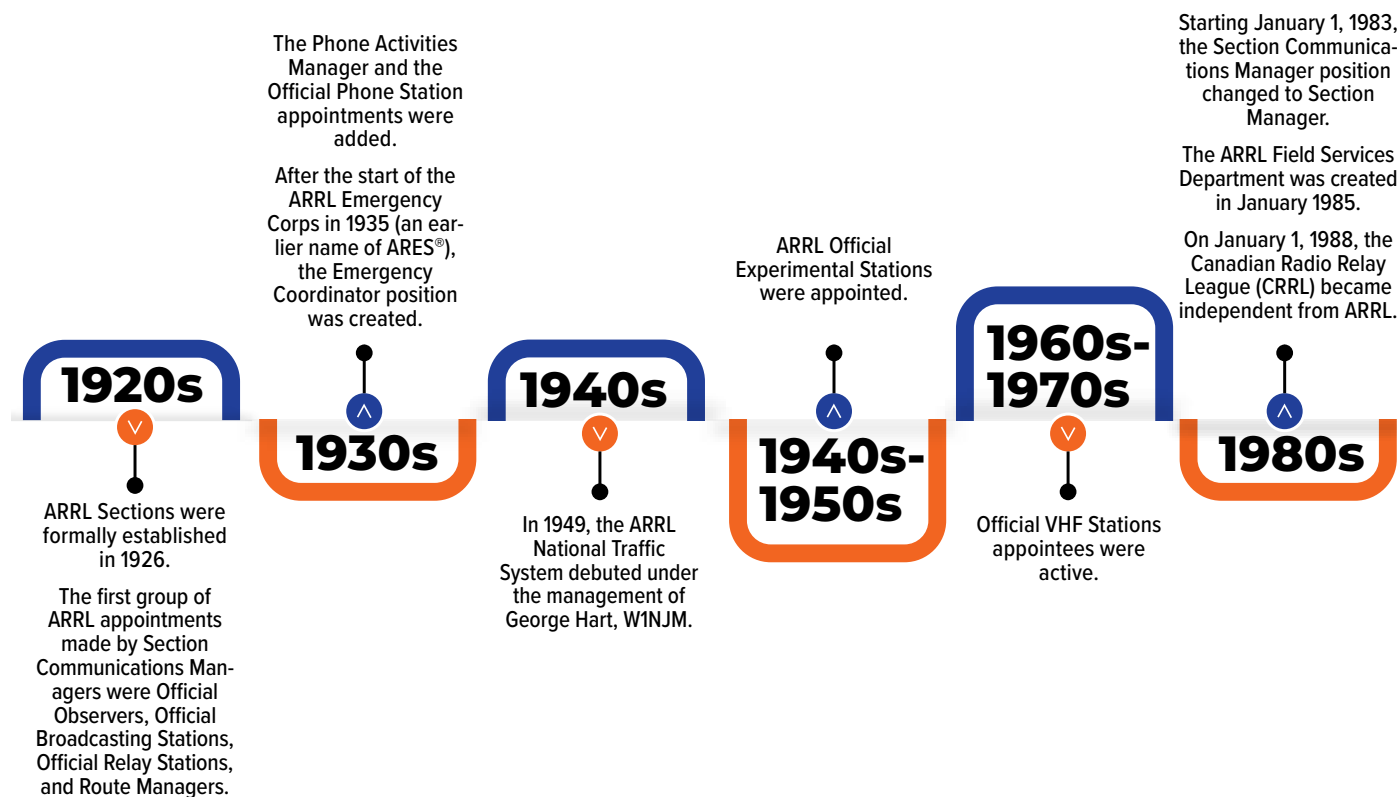
At that same meeting, the existing Division-Manager system gave way to a new plan. As the April 1926 *QST* article stated, "The new plan contemplates a larger number of operating regions, to be known as Sections,

each in charge of a Section Communications Manager who will work [directly] with the Communications Manager (or, in Canada, with the Canadian General Manager). This new plan will greatly reduce the delays in correspondence, reports and bulletins, will enable the publication of more up-to-the-minute field news in *QST*, and will reduce the maximum work required of any field official."

The by-laws were amended, and the operating territory of ARRL would be further divided into Sections. The ARRL members within each Section would elect a Section Communications Manager (SCM) for a 2-year term of office and would have the authority over the Communications Department within that Section.

The April 1926 *QST* article also announced the first Section elections, and it solicited nominating petitions for the SCM position in 64 of the already-established Sections that were within nine of the 14 ARRL Divisions that existed at that time. The first round of Section elections were conducted in May and June of

A timeline of select noteworthy events in the history of the ARRL Field Organization.



1926, and the July 1926 issue of *QST* announced the successfully elected candidates. The task of creating ARRL Sections — or “sectionalizing of territory” — within the ARRL Divisions was given to F. E. Handy, W1BDI, the first Communications Manager, in consultation with the respective Division Director as well as input received from ARRL members in those Divisions. Sections were formed based on state boundaries in the US, province boundaries in Canada, US territory boundaries, geographical considerations, and the number of ARRL members within a given area. (The ARRL Southwestern Division was added in January 1936, and the ARRL Great Lakes Division was added in January 1947.)

Purpose and Principles of the ARRL Communications Department

The following excerpts from Chapter VI of the first edition of *The Radio Amateur's Handbook*, published by ARRL in 1926, highlighted the purpose and principles of ARRL's Communications Department. Written a century ago, these principles still have relevance for amateur radio operators today and especially for ARRL members who are directly involved in the present-day ARRL Field Organization.

“The Communications Department is concerned with the practical operation of the stations of League members. The work of the department includes arranging amateur operating activities, establishing standard operating procedure, encouraging good operating, improving message relaying, and conducting tests to these ends.”

“The Communications Department constantly tries to make our communication system just as efficient as a non-commercial message-handling organization can be made. Compliance with government regulations, orderly operating, and co-operation with each other and with outside interests for the advancement of the art, are a part of the policies of the Communications Department. The first duty of the department to member-stations is to supervise operating work so well that the amateur will continue to justify his existence in the eyes of his Government. Then he will be allowed a continuance of the privileges which he has received as his due in the past.”

The policies of the Communications Department set a standard for all licensed amateur radio operators to take responsibility and strive to ensure our stations are technically set up properly, and that our on-the-air operating conduct is in compliance with rules, regulations, and good operating practice. Field Organization

members have been and continue to be leaders and representatives of ARRL at local and Section levels.

Section and Station Appointments, ARES, and NTS

In 1926, the first group of ARRL appointments made by SCMs were Official Observers, Official Broadcasting Stations, Official Relay Stations, and Route Managers who served as principal traffic stations and arranged schedules while supervising traffic handling at the local and Section levels.

In the mid-1930s, the Phone Activities Manager and the Official Phone Station appointments were added. Phone Activities Managers helped to build up the ARRL Section and national organization and conducted station inspections and/or radio operating tests of candidates for Official Phone Station appointments. Official Phone Stations took “pride in the manner of signal he puts on the air, and must endeavor to live up to the Amateur's Code of good fraternalism and operating equality.”

After the start of the ARRL Emergency Corps in 1935 (an earlier name of the Amateur Radio Emergency Service®), the Emergency Coordinator position was created. Several other ARES-related appointments were added as the program developed. (See “ARES®: 75 and Counting” in the September 2010 issue of *QST*.)

In 1949, the ARRL National Traffic System debuted under the management of George Hart, W1NJM, who designed and organized this formal system of nets to handle traffic. Hart was a longtime ARRL Headquarters staff member and leader. (See “Golden Anniversary: A Look at Fifty Years of the National Traffic System” in the September 1999 issue of *QST*.)

From the 1940s through the late 1950s, ARRL Official Experimental Stations were appointed. Official VHF Station appointees were active in the 1960s and the 1970s. Holders of these appointments promoted good operating practice and the study of propagation on amateur radio frequencies above 50 MHz.

Organizational Changes in the 1980s

In 1982, after 3 years of work, recommendations by the ARRL Long Range Planning Committee were accepted by the ARRL Board to improve upon the ARRL organizational structure in several areas including at the Section level. During a 2-year transition starting January 1, 1983, and depending on the Section election cycle, the Section Communications Manager position changed to Section Manager.

The Section Manager's scope of supervision increased to eight Section-level assistants who focused on these responsibilities: emergency communications, message traffic handling, official observers, official bulletin stations, public information, state government liaison, technical activities, and affiliated clubs. In addition, Section Managers handled administrative duties and maintained communication with ARRL members as they continue to do today.

Section-level assistants were assigned to supervise station-level appointees in their respective areas of responsibility. ARRL members were encouraged to join the ARRL Field Organization. As a result of these changes in the early 1980s, the Field Services Department at ARRL Headquarters was created in January 1985 to provide dedicated administrative support and guidance to the ARRL Field Organization.

On January 1, 1988, the Canadian Radio Relay League (CRRL) — along with its Sections — became independent from ARRL. A close working relationship between ARRL and CRRL (now the Radio Amateurs of Canada) has always existed.

Field Appointment Changes and New Appointments

In 1990, the Local Government Liaison position was created to monitor local government dockets, and to offer local, organized support quickly when necessary.

Public Information Assistants were named Public Information Officers at the local level, and the Public Information Officers at the Section level changed titles to Public Information Coordinators.

In 1991, Assistant Technical Coordinators were renamed as Technical Specialists.

Starting in 2003, new Bulletin Managers and Official Bulletin Stations would not be appointed any longer.

In 2014, the Section Youth Coordinator appointment was created to promote active youth amateur radio operators in the Section, including those involved within clubs, Scouting, and other youth organizations and schools.

In the 2010s, Assistant Section Emergency Coordinator, Assistant District Emergency Coordinator, and Assistant Section Traffic Manager appointments were created.

In 2019, Official Observers and Official Observer Coordinators concluded their service, and they were invited to apply to be a part of the new ARRL Volunteer Monitor Program.

An Organization that Stands the Test of Time

The ARRL Field Organization serves as a framework for ARRL members to contribute their time, effort, and talent according to their interests and abilities. Over the years, many Field Organization appointees and/or Section leaders have risen through the ranks to serve on the Board of Directors, and some have become leaders of the International Amateur Radio Union.

Presently, with 71 ARRL Sections and more than 6,200 appointees in the roles of 21 different appointments, the Field Organization stands ready to serve the amateur radio community and the public. It's poised to adapt to changes and to help address future challenges.

Thank you to all who have served and to all who are serving as a Section leader or as a member-volunteer of the ARRL Field Organization.

If you would like to join the Field Organization or explore these opportunities, go to **www.arrl.org/field-organization** and/or contact your ARRL Section Manager (as noted on page 16).

Prior to 1926

"The ARRL Communications Department is as old as the League itself. The very first League publication, predating *QST*, was a list of 'relay stations,' Forerunners of today's Official Relay Stations, their operators agreed to observe high standards in their operating and message handling. In 1916, the League organized Trunk Lines, under the direction of volunteer Trunk Line managers, so messages could be relayed rapidly from coast to coast. The Trunk Line managers were superseded by Division Managers in 1917, but the ink was hardly dry on the *QST* announcement of the change before war put all amateurs off the air. When *QST* resumed publishing in 1919 it announced the formation of an ARRL Operating Department, but there was little activity to report until year end because [of] the government's hesitance to lift the wartime transmitting ban. The Operating Department grew quickly, was renamed the Traffic Department in 1924 and reorganized as the Communications Department in 1926. Although countless changes were made as the Communications Department evolved over the years, many of the features of the CD of that time are discernible in today's organization."

— Excerpt from "Your Place in Your League," by David Sumner, K1ZZ, in the November 1981 issue of *QST*

Future-Proofing ARES

Starlink Roam for Support of Deployments



Consider adding this compact, inexpensive satellite-broadband option to your go-kit.

Bob Famiglio, K3RF
ARRL Atlantic Division Director

As the nature of emergencies — and the technologies that support response efforts — continues to evolve, one way to keep up with the demands of public service and modern public safety support missions is by using Starlink, an exciting new option that can increase our usefulness as emergency communications volunteers.

A Tool for Rapid Deployment

Starlink offers a compact, inexpensive satellite-broadband option that allows a portable internet backhaul for rapid deployment of ARES® teams in the field. Starlink's Roam service plans are designed for on-the-go use and offer pay-as-you-go activation, Standby Mode for reduced billing when idle, and in-motion support that aligns with vehicle-mounted operations.

Roam provides a low-latency wide-area-network path that's suited to Winlink backhaul, National Traffic System traffic delivery, situational awareness maps, and Automatic Packet Reporting System-Internet Service bridging. Using Roam as an additional tool preserves amateur radio frequencies for tactical voice coordination while moving digital traffic (team logs, resource requests, and incident reports) off-net via a resilient internet path. To be clear, Roam is a supplement, not a replacement, for HF/VHF/UHF nets specifically for tactical voice operations.

The Starlink Mini Roam is built for portability with a 26 W max power draw. It's shipped with a 120 V ac adapter; however, 12 V dc adapters for battery use are also available. It has an integrated Wi-Fi router for quick on-scene networking.

Starlink Mini Roam Integration

The Mini Roam requires an unobstructed view of the sky. Size battery packs or mobile power stations to cover your expected mission durations.

Integrating Roam into ARES standard operating procedures is straightforward; it can be used wher-

ever deployment would benefit by sending written traffic off amateur radio nets to outside of the affected disaster areas. A Starlink Mini Roam costs \$299, with high-speed access (more than 200 Mb/s throughput) costing \$50/month for up to 50 GB of data, which can be paused monthly. The Roam service allows for switching indefinitely to standby service for \$5/month, but the service remains available at that price with speeds limited to about 500 Kb/s and with unlimited use. Tests have confirmed that such reduced speed is sufficient for hams to inject messages in radiogram- or IC-213-type formats. Even Wi-Fi voice calling with some cell carriers works very well and becomes an affordable satellite phone when access to the public switched telephone network outside the affected area is needed and cell service is disrupted, as is frequent in disasters.

In Summary

Starlink Mini Roam is a compact, field-friendly tool that materially extends ARES digital capabilities and usefulness to the public. Adding Roam to a go-kit increases our value, while keeping our on-air radios as the mission-critical primary layer.



The Starlink Mini Roam in Bob Famiglio's, K3RF, go-kit.

ARRL Year of the Club

We're celebrating the 100th anniversary of ARRL's Field Organization by focusing on clubs throughout 2026.



Mike Walters, W8ZY ARRL Field Services Manager

It's been 100 years since ARRL's Field Organization was developed. This is a major milestone for the volunteer-based administrative and operational structure of the League, which allows ARRL programs and activities to be managed at local levels throughout the US and its territories. One of the major contributors to this local-level management is the ham radio club. That's why we're celebrating this landmark year by declaring it the Year of the Club.

Honoring Community Contributions

ARRL Affiliated Clubs (www.arrl.org/affiliated-club-resources) have been a major part of the growth and development of ARRL and its Field Organization over the years, with the oldest Affiliated Club — Dallas Amateur Radio Club, W5FC — being affiliated since 1919. It leads the list of more than 2,800 ARRL Affiliated Clubs across the country, with more joining each month.

Local clubs are holding licensing classes, performing Volunteer Examiner sessions, supporting community events like races and fairs, and providing emergency communications on a regular basis. They also frequently work with schools to give young students the opportunity to talk with astronauts aboard the International Space Station or to launch a pico balloon that can be tracked across the country or around the globe. Radio clubs are often the first introduction to the hobby

that a new ham receives, and they're the face of ham radio for the public, community officials, and emergency agencies.

In addition to recognizing community contributions, the Year of the Club honors club diversity — contest clubs get together and operate on-air contests, repeater clubs operate and maintain local repeaters, some clubs are formed to bring together DX operators as they strive to get elusive contacts, EmComm clubs work with local emergency services in times of need, school clubs allow students and teachers to learn about the many aspects of STEM through wireless communication, and general interest clubs may represent many aspects of the hobby.

It's important to note that clubs, like the rest of the ARRL Field Organization, are made up of volunteers who give their time, experience, and often money to make a club successful. These clubs and the many ham radio volunteers (without whom we would not have the diverse hobby that we have today) deserve to be celebrated. No matter their size, all clubs share the same vital fundamentals — they care about ham radio and their communities, and they want to see the hobby continue to grow.

Ongoing Celebrations

As a part of the Year of the Club festivities, we've initiated contests for club newsletters (www.arrl.org/news/arrl-year-of-the-club-newsletter-contest-call-for-submissions) and club websites (www.arrl.org/news/arrl-year-of-the-club-website-contest-call-for-submissions) and will be holding on-air club-focused events. Also, a new Worked All States award is available for 2026 — W1AW will travel to all 50 United States, and you'll be able to hear "W1AW/" from a different location on the air nearly every week of the year!

Follow the activities on the Year of the Club website at www.arrl.org/year-of-the-club. As more information and activities are announced, links will be posted there. Be on the lookout for related stories in *ARRL Club News* (www.arrl.org/club-news) and *The ARRL Letter* (www.arrl.org/arrlletter), as well as on the ARRL website at www.arrl.org.



Members of the Providence Radio Association, W1OP, visited W1AW on December 9, 2021, to celebrate 100 years of ARRL affiliation. [Mike Walters, W8ZY, photo]



FCC Announces Intent to Delete Minor Part 97 Provisions

As part of a much larger overhaul focused on deleting almost 400 obsolete wireless regulations (www.arrl.org/news/fcc-initiates-broad-inquiry-on-rules-to-delete-or-amend?utm_source=Informz&utm_medium=Email&utm_campaign=ARRL&zs=SQvQm&_zl=a3kV3), the FCC has announced plans to delete or modify four minor provisions of Part 97.

ARRL's Washington Counsel has reviewed the proposal and agrees that the deletions are to obsolete rules and will have no impact on today's modern Amateur Radio Service. One of the deletions was suggested by ARRL as part of an earlier FCC request for public input on rules ripe for deletion. The proposed regulatory changes are to:

1. Delete § 97.27. This provision relates to the FCC's right to modify station licenses. The FCC rationale for deletion is that it duplicates Section 316 of the Communications Act. Its deletion will result in no substantive change to the right of the FCC to modify a station license.

2. Delete § 97.29. This provision specified the procedure to replace paper licenses. The FCC stopped producing paper licenses at the end of 2020, having implemented the web-accessible Universal Licensing System (ULS). Any licensee can download license originals using the password-protected area of

the ULS. ARRL proposed deleting this section in comments filed in early 2025.

3. Delete § 97.315 (b)(2). This provision grandfathered HF amplifiers purchased before April 28, 1978, by an amateur radio operator for use at that operator's station. It also grandfathered those manufactured before April 28, 1978, for which a marketing waiver was issued. The applicability of this rule has long passed.

4. Delete § 97.521(b) and Appendix 2. This rule and appendix relate to Volunteer Examiner Coordinator (VEC) regions, which were based on the traditional amateur call sign areas. The FCC no longer limits VECs to regions, and there is no reason for doing so given the nature of remote exams.

Direct Final Rule proceedings such as this are limited to rules that are no longer applicable because they have sunsetted by operation of law, govern an expired event, regulate an obsolete technology, regulate virtually a null set of FCC licensees, regulate an outdated market structure, or otherwise are no longer used in practice or in the public interest. As of press time, the deletions will become effective 60 days after publication in the *Federal Register*, unless the FCC finds that adverse comments filed within 20 days of publication raise significant issues that merit additional consideration.

ARRL Introduces New Live Online Course for Ham Radio Licensing

ARRL has introduced a new, fully interactive 2-day online course for ham radio licensing. The ARRL Technician Class LIVE Video Course (<https://home.arrl.org/action/Store/Product-Details/productId/2029838874>) includes everything needed to prepare for the FCC Technician-class amateur radio license exam. As of press time, enrollment is open for the inaugural course, which will take place on December 20 – 21, 2025.

Join ARRL Education Specialist Wayne Greene, KB4DSF, for this interactive online class. "We're going to have fun!" said Greene. "I'll guide you through operating your first ham radio to how to communicate through amateur radio satellites. We are going to get

fully immersed in every question and answer with the info you need to pass the test!" he added.

In addition to live instruction, course participants will receive the popular Technician-class prep book authored by ARRL National Instructor Gordon West, WB6NOA, which has helped thousands of new hams get licensed with fast results. One year of ARRL membership is also included, ensuring these new hams will have quick access to all ARRL benefits, services, and programs.

Those who remember ARRL's recorded video courses of the past will recall how valuable it is to see and hear lively video instruction. This new course will ensure

students have an even more personal and interactive experience.

Visit the ARRL Store to complete the paid enrollment for a special introductory price of \$99. If you have

any questions regarding the course, please contact the ARRL Education and Learning Department at 860-594-0285 or email ead@arrrl.org.

Zoe Rodriguez Named 2025 Craigie Memorial Educator

Zoe Rodriguez, a teacher at the Raymond School in Franksville, Wisconsin, has been named the 2025 Carter Craigie, N3AO, Memorial Educator. Rodriguez serves as the school's science, technology, engineering, arts, and mathematics teacher as well as its technology integrator and library media specialist. She also started a club for third-to-eighth graders called Girls Who Code. She attended the ARRL Teachers Institute on Wireless Technology (TI) at ARRL Headquarters held October 6 – 9, 2025.

Rodriguez, a previous Fulbright Scholar who taught English in Colombia, is concurrently participating in the Teacher Innovator Institute, a 2-year program from the Smithsonian's National Air and Space Museum. She's excited to share amateur radio and wireless technology with students. She said:

[TI] would provide tangible ways to help my students engage in critical thinking and solve real-world problems... This program would allow me to create highly engaging and hands-on projects where my students could work collaboratively and build their communication skills. This will not only fit into, but strengthen my curriculum, as I currently teach the engineering design process, circuits, coding, robotics, 3D printing, and cardboard construction.

The Carter Craigie, N3AO, Memorial Educator of the Year program funds a seat at the TI. It was created in 2024 through a generous endowment given by former ARRL President Kay Craigie, N3KN, in memory of her late husband, Carter, who also was an avid radio amateur.



ARRL Director of Education and Learning Steve Goodgame, K5ATA (left), and 2025 Carter Craigie, N3AO, Memorial Educator of the Year Zoe Rodriguez (right).

Ed Hare, W1RFI, Longtime ARRL Lab Engineer, Silent Key

Edward F. "Ed" Hare, Jr., W1RFI, who spent decades as an employee of ARRL, has become a Silent Key. He died on October 10, 2025, at the age of 75 after an illness.

Ed first earned his license as a teenager with the call sign WN1CYF (he later became WA1CYF and KA1CV) and was active in ham radio throughout his life. He was an avid low-power operator, earning his ARRL Worked All States Award with 250 mW on CW. In his professional life, he was an accomplished product test engineer and a leading expert on RFI. After an industry

career in product testing, he came to work for ARRL in 1986.

During his tenure, Ed led the technical aspects of many important advocacy efforts taken on by the ARRL Lab, including the successful fight against Broadband over Power Lines (BPL).

Ed developed a waiver process with the US military to allow amateur radio access to the 70-centimeter band near several high-power radar sites. He also started the ARRL RFI Program, which helps members resolve interference to their stations. He was instrumental in

ARRL's 2023 defense against the high-speed stock traders' petition that risked significant interference to amateur HF bands.

Ed was a prolific author on RFI, writing for *QST* and *The ARRL Handbook*, in addition to writing articles about the practical aspects of electromagnetic compatibility (EMC) that appeared in professional trade journals. He was also one of the editors and authors of *The ARRL RFI Book*, and he was the author of ARRL's book on RF exposure, *RF Exposure and You*.

Ed held a seat for amateur radio on many industry committees, including several of the Institute of Electrical and Electronics Engineers and American National Standards Committee C63, which develops standards for testing and measuring EMC.

Many radio clubs may recall Ed's popular "Stump the Speaker" feature that he held after giving presentations. Ed would allow the audience to try to stump him with radio questions and trivia. It was rarely successful.

He retired from ARRL as Laboratory Manager in 2023, but he continued to serve in the Lab as a volunteer until the time of his passing. He frequently mentored members of ARRL staff.

Ed was a member of the ARRL Diamond Club and the A-1 Operator Club. The ARRL Board of Directors bestowed the ARRL Technical Merit Award to Ed in 2008 for his work on BPL — an honor that, before Ed, was last awarded in 1976 and has not been given since.



Ed Hare, W1RFI (SK).

Section Manager Nomination Notice

To all ARRL members in Illinois, Indiana, Maine, Northern Florida, Oregon, Santa Clara Valley, Vermont, and Wisconsin. 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 6, 2026. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters no later than April 1, 2026, to full members of record as of March 6, 2026, which is the closing date for nominations. Returns will be counted May 19, 2026. Section Managers elected as a result of the above procedure will take office July 1, 2026.

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, 2026. 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

Public Service

USGS ShakeOut Earthquake Drill: At the Intersection of Amateur Radio and Citizen Science

Each year, millions worldwide participate in the Great ShakeOut Earthquake Drills, sponsored by the US Geological Survey (USGS), FEMA's Ready program, and the National Science Foundation. Held annually on the third Thursday in October, ShakeOut helps individuals and organizations practice the lifesaving "Drop, Cover, and Hold On" earthquake safety protocol. This year, 6,858 volunteer amateur radio operators registered on <https://ShakeOut.org>, combining public service, communications, and science.

Amateur Radio Earthquake Mapping

The Amateur Radio Community Intensity Map (ARCIM) project, created by Oliver Dully, K6OLI, ARES District Emergency Coordinator for LAX Northeast, links amateur radio with earthquake science. His district supports 911 receiving hospitals in northeast Los Angeles County. In 2025, LAX Northeast and the EmComm Training Organization (ETO) launched a joint Winlink USGS "Did You Feel It?" (DYFI) exercise, inviting radio operators to participate.

The DYFI program collects reports from people who experience earthquakes, helping scientists map shaking intensity and community impact. Operators can send DYFI reports using Winlink, ensuring data continuity even when the internet is down. ARCIM and ETO generate maps and analytics based on this data, providing feedback to participants and testing network reliability at local and international levels.

National, regional, and local groups, such as San Diego ARES, Orange County RACES, Puerto Rico ARES, WLN-ET, and many more, helped train operators and promote participation, and the ShakeOut newsletter recognized this grassroots collaboration for advancing community preparedness. When the official USGS ShakeOut scenario map was offline due to a government shutdown, radio operators filled the gap and kept the data flowing, underscoring the reliability of volunteer-based communications networks.

Profiles in Public Service: Oliver Dully, K6OLI, and ARES LAX Northeast

Operators with ARES LAX Northeast use innovative technologies — Winlink with VARA HF, VARA FM, packet radio, and AREDN mesh, for example — to facilitate medical facilities' complex communication demands when commercial options are compromised.

Oliver Dully, K6OLI, is one of the initiators of the VARA FM Winlink Autobahn connecting Los Angeles and Ventura Counties. The Autobahn connects VHF and mesh gateways with HF radio mail servers for amateur operators living in earthquake country. Dully provides training and education for local and nationwide amateur radio audiences, Volunteer Organizations Active in Disaster, and government agency personnel. In 2023, he began exploring dashboards for mapping and displaying amateur radio-generated data. Today, he builds and maintains dashboards for VARA FM Chat, Winlink mappable data, and regional DYFI earthquake and ShakeOut reports.

Dully completed the rigorous California Office of Emergency Services Emergency Manager and Public Information Officer (PIO) training programs. He organized his amateur radio emergency communications group with Incident Command System principles, enhancing interoperability with hospitals and other LA County stakeholders, working with the Statewide California Earthquake Center, among others.



Oliver Dully, K6OLI, working on the ARCIM Voice Net Dashboard during the SoCal Great ShakeOut Voice Net.

The 2025 ShakeOut saw record engagement, with operators representing 46 US states and 12 countries — ARCIM participation grew 77.9% compared to 2024, with 1,016 DYFI reports received and 972 mapped.

This year's drill demonstrated how amateur radio strengthens citizen science and data resilience in disaster scenarios. For the Earthquake Country Alliance (ECA) and ShakeOut, the results confirmed strong community preparedness: 65.9% of operators reported performing "Drop, Cover, and Hold On."

Amateur radio and citizen science together make earthquake awareness stronger and more resilient, especially when systems fail. The ARCIM/ETO team thanked USGS and ECA for their continued support in promoting science, safety, and service.

Salvation Army Offers New Disaster Services Courses

For groups looking to enhance their disaster preparedness, the Salvation Army — an ARRL Memorandum of Understanding holder — has introduced a new suite of Emergency Disaster Services training courses designed to equip faith and community organizations with tools to build stronger, more connected communities, foster resilience, and empower service.

This no-cost virtual training series provides an introductory understanding of how emergency management works, the roles that faith and community-based organizations can play during a disaster, and how to appropriately connect to emergency management partners. The courses are available in both Spanish and English. Certification is available, and the training courses are self-paced, interactive, and suitable for different types of adult learners.

The training program offers a variety of disaster-related courses that take 1.5 to 4 hours to complete, including:

1. Introduction to Emergency Management
2. Mass Feeding Essentials
3. Serving Diverse Economic, Ethnic and Religious Communities
4. How The Salvation Army Responds to Disasters: A Partner's Orientation
5. Protecting Your Nonprofit from Disaster Events
6. Preparing Your Congregation for Disasters
7. Long-Term Disaster Recovery: Supporting Communities and Individuals

ARRL Call for Technical Manuscripts

Share your technical insights on your ARRL Field Day setups and emergency communications activities. *QST* invites submissions of technical manuscripts from licensed amateur radio operators for upcoming issues focused on Field Day and emergency communications operations. We're looking for educational, how-to pieces that help fellow hams improve their setups, strategies, and technical know-how. Specifically, we're looking for:

- Innovative or proven techniques for emergency preparedness and response.
- Technical solutions for Field Day operations — power, antennas, logging, digital modes, etc.
- Integration of new technologies (e.g., SDR, mesh networking, solar power) in field scenarios.
- Examples of how the popularity of Parks on the Air® portable activations has changed your approach to setting up Field Day and EmComm stations.
- Examples of how portable antennas and LiFePO batteries have replaced base station antennas and generators.

Manuscripts should have a strong "how-to" component. Tell us what you did, but more importantly, tell us how you did it.

Submission Guidelines:

- Audience: Licensed amateur radio operators.
- Length: 1,000 – 1,800 words, plus high-resolution images with caption and photo credit information (name and call sign of photographer).
- Tone: Educational and collaborative — share what works!
- Format: Plain text or Word document.
- Deadline: January 31, 2026.
- Submit to: qst@arrl.org.

Why contribute? Your article could be published in *QST*, ARRL's membership journal, which reaches thousands of fellow amateurs across the country and beyond. It's a great way to give back to the community and inspire others with your experience.

8. Overview of Incident Command System (ICS) and The Salvation Army
9. How to Engage Tribal Populations in Disaster Response

Course modules and additional information about this training program can be accessed online at <https://learn.salvationarmyusa.org/EDS/faith-and-community-based-organizations>.

ARRL Celebrates Semiquincentennial with America250 WAS Award

Bart Jahnke, W9JJ, ARRL Radiosport & Regulatory Information Manager

During 2026, ARRL will celebrate the semiquincentennial of the US by holding a year-long America250 Worked All States (WAS) Award operating event.

To seek the America250 WAS Award, contacts must be uploaded to and confirmed within Logbook of The World® (LoTW®). The award is a for-purchase WAS certificate suitable for framing.

For this operating event, ARRL will provide a listing of all W1AW/portable stations, who will operate for 7 days from a Wednesday through the following Tuesday for 2 separate weeks in the year, an early week and a late week. A few weeks will be listed as non-W1AW/portable weeks due to contests and ARRL Field Day.

Endorsements

There will also be endorsements available that add to your working all 50 states, including:

- WAS by contacting W1AW/portable stations
- WAS by contacting ARRL Affiliated Club stations
- WAS Triple Play by contacting all states on all three modes (phone/CW/digital)

Operating Etiquette

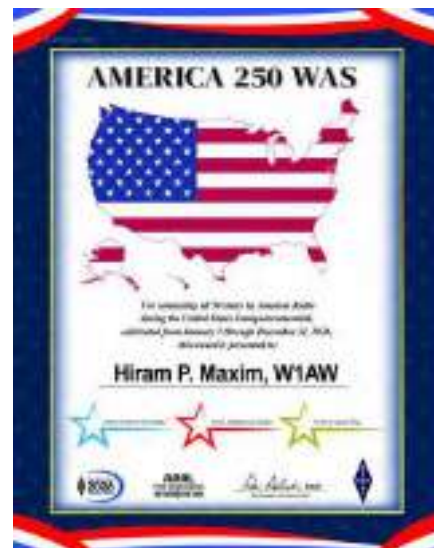
Use of the W1AW call sign is a privilege, and W1AW/portable stations should show best practices and courtesy when operating. Operators must operate using the privileges granted only by their personal license class serving as a control operator (or within the operator privileges of the highest-class control operator present and observing operations).

While the object of the America250 WAS event is to hand out as many contacts with W1AW/portable states as possible, on as many bands and modes as possible, all operators are encouraged to explain celebrating America's 250th anniversary with the ARRL America250 WAS Award to the degree that your operating time allows.

Bands

Activity is encouraged on bands (including WARC bands) from 2200 meters LF through all of HF, through

all of VHF/ UHF/SHF, and through all of the microwave bands including via light (but excluding 60 meters). While all three modes (CW/phone/digital) are allowed, please balance CW and phone activations against the ease of just making digital contacts.



Earn the America250 WAS Award certificate in 2026.

QSLs

There are no planned QSL cards for any of the W1AW/portable America250 operating event stations during this event. All W1AW/portable contacts will be confirmed via LoTW.

Stations who contact W1AW at ARRL HQ can upload such contacts to LoTW and/or send QSL cards (with SASE) to W1AW, ARRL HQ, 225 Main St., Newington, CT 06111 — for contacts only made directly with the W1AW Hiram Percy Maxim Memorial Station.

Applications

Applications for the America250 WAS Award can be made via LoTW once a minimum of 50 state QSO confirmations appear in LoTW for contacts made in 2026. To apply within LoTW, look at your usual LoTW WAS page summaries, which will show your progress toward the America250 Award, then when applying in LoTW, the usual WAS Award processing fees will be displayed for the America250 certificate and shipping.

After the initial America250 Award certificates are issued, endorsements can be sought. These will be supplied as America250 endorsement stickers to apply to your America250 Award certificate. Contact awards@arrrl.org with any questions.

2025 ARRL International Digital Contest Results

The ARRL International Digital Contest was held June 7 – 8, 2025.

There were 995 entries this year, which is the second highest in the 4-year history of the ARRL International Digital Contest (IDC). In 2025, 529 logs were received from stations located in the continental US and Canada, with 466 DX stations participating.

Once again, 20 and 15 meters remained the most popular bands this year, comprising about 80% of all reported contacts in the contest. The third most popular band was 40 meters, with 19,425 contacts (12.11%). On the 6-meter band, 622 contacts were reported. The IDC is the only ARRL-sponsored contest that includes 6 meters as well as the HF bands, yet very few operators take advantage of the unexpected band openings that can occur during the peak of the E-skip season.

The most popular of the entry categories remains the Single Operator, One Radio categories, which comprised 91.6% of the total entries. Single Operator, Two Radios categories were 3.8% of all entries, with the Multioperator categories totaling 1.8%. Single-operator

participants who are unable to erect towers or install antennas outside of a structure have the option to enter in the All-Enclosed Antennas overlay. This year, 202 participants worldwide declared the overlay in their entries, up from 185 in 2024. Youth participation in the IDC is also on the rise. Worldwide, 14 participants aged 25 and younger submitted using the Youth overlay. This is up from 10 youth participants in 2024.

Contacts by Band

Band (Meters)	Contacts
160	43
80	613
40	19,425
20	84,030
15	44,261
10	11,406
6	622

Top Ten — US and Canada

* = All-Enclosed Antenna Overlay; Y = Youth

Single Operator, One Radio, Low Power		Single Operator, Two Radios, Low Power	
K6OK	10,743	K3MM	15,962
K9OM	10,203	N8HRZ	13,749
K6SEA (KA6BIM, op)	9,041	WT2P (@K1TTT)	9,862
N3QE	7,767	NA5M	7,050
N4ML (Y)	6,755	KC3PIB	6,896
KA2MGE	5,975	NA3M*	6,123
WJOW	5,739	KW6S	5,785
W0ZA	5,709	W9AV	4,610
K1HTV	5,571	W7PP	4,484
K4EA	5,384	NF3R	4,229
Single Operator, One Radio, Low Power, 8 Hours		Single Operator, Two Radios, Low Power, 8 Hours	
K6LL	5,395	KW1X	2,983
KA6JAR*	2,595	K9CT	2,326
AB1J*	2,463	AI9T	2,085
W3RGA	2,245	KT9L	1,829
N2YCH	2,074	AA3B	1,751
N4BP	1,870	N7GP	1,723
KB4DSL	1,851	W1UJ	508
N9TF	1,748	N1NAZ	284
W4ANT	1,697	Single Operator, Two Radios, QRP	
AB4YI	1,593	KN6OKY	1,242
Single Operator, One Radio, QRP		WA2VKG	279
WA2DNI	2,560	Single Operator, Two Radios, QRP, 8 Hours	
N5ER	2,217	WQ5L	2,172
N3MWQ	1,110	Multioperator, Single Transmitter, Low Power	
W0CP	875	W1RCR	6,710
WW6W	635	W4MLB	4,386
KB3VAV	511	W2ZQ	4,315
NO4D	509	NA7SS	4,010
W6AJR	274	N9QY	3,726
WB0IWG	201	W1FM	3,242
N6ACA	200	WD9EXD	2,683
Single Operator, One Radio, QRP, 8 Hours		AK4NF	1,786
W2HCB	1,635	K4GNM	626
AA3R	1,214	W2GSB	506
W0CJ	938	Multioperator, Single Transmitter, QRP	
N0UR	848	K6UFO	4,017
K7EDM	686	KC2GOW	3,779
N4IJ	653		
N8URE	537		
W0KI	364		
K7WA	292		
W0ADL	250		

Top Ten — DX

* = All-Enclosed Antenna Overlay; Y = Youth

Single Operator, One Radio, Low Power		Single Operator, One Radio, QRP, 8 Hours	
VK3BDX	19,266	KH6WI	3,208
YE9BJM	15,975	PY2CER	1,360
DA0RR (DJ2KP, op)	11,072	R6OU*	1,224
PY5AMF	10,352	SP4LO*	1,145
PY5ZHP	9,385	NP4TX	1,103
VK4AFU*	9,154	UN7EG	990
ON7ZJ*	8,137	YD3ASV	709
BI4KYT*	7,898	ZL3TE	675
HS0ZOY	7,688	YC4SIZ	484
PY2QT	7,513	JR2EKD	431
Single Operator, One Radio, Low Power, 8 Hours		Single Operator, Two Radios, Low Power	
ZL4YL	8,946	5B4AMM	18,115
LU5VV	5,159	XQ3SK*	9,888
VK2EHQ	4,501	PA4O*	9,193
PY2GTA	4,338	ON4PB*	1,368
VK4VCC	3,650	Single Operator, Two Radios, Low Power, 8 Hours	
PY8WW	3,392	LU6ETB	4,779
PA6T (PA3DZM, op)*	1,957	Single Operator, Two Radios, QRP	
ZS6ELI	1,884	UT3N (UT3NK, op)	1,584
VK2WW	1,879	Single Operator, Two Radios, QRP, 8 Hours	
BG4OXQ*	1,868	SQ3RAX*	415
Single Operator, One Radio, QRP		VR2WAA* (Y)	13
RG5A	7,163	Multioperator, Single Transmitter, Low Power	
PA3EOU	4,228	6Y5PW	14,589
DH8BQA	3,758	CB4T	10,405
EU4E	3,413	4A2MAX	10,071
YV6BXN	3,294	LT5D	7,335
JA6GCE*	3,258	GM5G	7,316
PU2TWZ	2,595	AY9W	7,274
IV3LNQ	2,015	OI5AY	6,194
H15YJM	1,674	OY6FRA	5,283
PY2WLM	1,544	DL0MT	5,034
		DV1K	3,048



Marion Mason, W1GRL, participated in the 2025 ARRL International Digital Contest. She stated that it was her first serious contest effort, ramping up to 2025 ARRL Field Day. [Stan Mason, W1BOY, photo]

Affiliated Club Competition

Club	Score	Entries
Medium		
Potomac Valley Radio Club	84,125	36
Society of Midwest Contesters	44,415	22
Northern California Contest Club	41,764	13
Frankford Radio Club	33,089	18
Yankee Clipper Contest Club	29,178	17
Florida Contest Group	22,066	8
Arizona Outlaws Contest Club	21,008	9
DFW Contest Group	17,752	5
Tennessee Contest Group	14,335	9
Willamette Valley DX Club	12,297	3
Great South Bay Amateur Radio Club	10,888	10
Swamp Fox Contest Group	10,794	6
Minnesota Wireless Association	8,575	9
Carolina DX Association	8,422	9
Southern California Contest Club	6,597	6
Hudson Valley Contesters and DXers	4,952	3
Grand Mesa Contesters of Colorado	4,871	4
North Coast Contesters	1,909	3
Portage County Amateur Radio Service	912	3
Local		
Pizza Lovers 259	7,507	3
Central Ohio Operators Klub	6,945	6
Meriden Amateur Radio Club	3,501	3

Logs Received by Category

Category	Logs Received
Single Operator, One Radio, Low Power	583
Single Operator, One Radio, Low Power, 8 Hours	238
Single Operator, One Radio, QRP	49
Single Operator, One Radio, QRP, 8 Hours	41
Single Operator, Two Radios, Low Power	23
Single Operator, Two Radios, Low Power, 8 Hours	9
Single Operator, Two Radios, QRP	3
Single Operator, Two Radios, QRP, 8 Hours	3
Multioperator, Single Transmitter, Low Power	21
Multioperator, Single Transmitter, QRP	2
Checklog	23

Continental Winners

* = All-Enclosed Antenna Overlay; Y = Youth

Africa

Single Operator, One Radio, Low Power	ZS1BHJ*	2,980
Single Operator, One Radio, Low Power, 8 Hours	ZS6ELI	1,884

Asia

Single Operator, One Radio, Low Power	BI4KYT*	7,898
Single Operator, One Radio, Low Power, 8 Hours	BG4OXQ*	1,868
Single Operator, One Radio, QRP	JA6GCE*	3,258
Single Operator, One Radio, QRP, 8 Hours	UN7EG	990
Single Operator, Two Radios, Low Power	5B4AMM	18,115
Single Operator, Two Radios, QRP, 8 Hours	VR2WAA* (Y)	13
Multioperator, Single Transmitter, Low Power	JL3ZHU	1,959

Europe

Single Operator, One Radio, Low Power	DA0RR (DJ2KP, op)	11,072
Single Operator, One Radio, Low Power, 8 Hours	PA6T (PA3DZM, op)*	1,957
Single Operator, One Radio, QRP	RG5A	7,163
Single Operator, One Radio, QRP, 8 Hours	R6OU*	1,224
Single Operator, Two Radios, Low Power	PA4O*	9,193
Single Operator, Two Radios, QRP	UT3N (UT3NK, op)	1,584
Single Operator, Two Radios, QRP, 8 Hours	SQ3RAX*	415
Multioperator, Single Transmitter, Low Power	GM5G	7,316

North America

Single Operator, One Radio, Low Power	CO2QU*	4,143
Single Operator, One Radio, Low Power, 8 Hours	KL7J	1,632
Single Operator, One Radio, QRP	HI5YJM	1,674
Single Operator, One Radio, QRP, 8 Hours	NP4TX	1,103
Multioperator, Single Transmitter, Low Power	6Y5PW	14,589

Oceania

Single Operator, One Radio, Low Power	VK3BDX	19,266
Single Operator, One Radio, Low Power, 8 Hours	ZL4YL (Y)	8,946
Single Operator, One Radio, QRP	YE3AJJ	637
Single Operator, One Radio, QRP, 8 Hours	KH6WI	3,208
Multioperator, Single Transmitter, Low Power	DV1K	3,048

South America

Single Operator, One Radio, Low Power	PY5AMF	10,352
Single Operator, One Radio, Low Power, 8 Hours	LU5VV	5,159
Single Operator, One Radio, QRP	YV6BXN	3,294
Single Operator, One Radio, QRP, 8 Hours	PY2CER	1,360
Single Operator, Two Radios, Low Power	XQ3SK*	9,888
Single Operator, Two Radios, Low Power, 8 Hours	LU6ETB	4,779
Multioperator, Single Transmitter, Low Power	CB4T	10,405

Top Ten Youth Overlay Scores

Category	Call	Score
Single Operator, One Radio, Low Power, 8 Hours	ZL4YL	8,946
Single Operator, One Radio, Low Power	N4ML	6,755
Single Operator, One Radio, Low Power	W2DIY	4,558
Single Operator, One Radio, Low Power	LZ3NYK	1,399
Single Operator, One Radio, Low Power	KE0JGH	1,265
Single Operator, One Radio, Low Power	BG7LZL	1,206
Single Operator, One Radio, QRP	BD7PVQ	948
Single Operator, One Radio, Low Power, 8 Hours	HA1NB	652
Single Operator, One Radio, Low Power, 8 Hours	KC3VPB	615
Single Operator, One Radio, Low Power, 8 Hours	BI1THA	430

The 2026 ARRL International Digital Contest will be held June 6 – 7, 2026.

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 ARRL February School Club Roundup

ARRL's twice-yearly School Club Roundup begins on Monday, February 9, 2026, at 1300 UTC and runs through Friday, February 13, 2026, at 2359 UTC.

- ◆ Stations may operate for up to 24 hours during the entire contest and may operate for only 6 hours during any single 24-hour period. Any mode — SSB, CW, or digital — is allowed.
- ◆ There are five participation categories: Elementary/Primary, Middle/Intermediate/Junior High School, Senior High School, College/University, and Non-School. There's also a category for individuals (individual participation is vital, as the schools need and want to contact as many stations as possible).
- ◆ School Club Roundup (SCR) is co-sponsored by ARRL and the Long Island Mobile Amateur Radio Club (LIMARC). Results will appear in *QST* and online at <https://contests.arrl.org>. The top three entries in each category will receive an award certificate.
- ◆ Share your team's photos and stories, and be sure to include a photo release (www.arrl.org/photo-video-release-form) for participants under 18 years of age. One of the best parts of



In the February 2025 School Club Roundup, Sonora Elementary School in Springdale, Arkansas, topped the Elementary/Primary School category with 253 contacts and a score of 40,227 points. See all the scores from last year at <https://contests.arrl.org/scores.php?eid=7&iid=1080>.

SCR is showing off your team members and station! Upload your photos and stories when you submit your score at <https://contests.arrl.org/arllscoresubmission.php>.

For complete rules, logging sheets, and other resources, visit www.arrl.org/school-club-roundup

Strays

An SCARC Sendoff



At their September 2025 meeting, the Ski Country Amateur Radio Club (SCARC) hosted a presentation by Violetta Latham, KN2P, about her personal journey in ham radio and how to involve youth in the hobby. The club provided her with a sendoff from Glenwood Springs, Colorado, for her upcoming DX/contesting adventure to Manihiki (E51) and Curacao (PJ2). [Photo courtesy of Mike Ferguson, KØMF]

See your club in *QST* during 2026, the Year of the Club! Email a high-resolution group photo of your club, along with caption information, to qst@arrl.org.



Club Station

Boosting Engagement with Build Nights

The York County Amateur Radio Society (YCARS), K4YTZ, in Rock Hill, South Carolina, wanted to get members moving, talking, and building, so we decided to host a hands-on kit-building event. We didn't want to just talk about kit building; we wanted to have tangible projects.

We hosted two build nights: one for building antennas, and one for building a simple AM/FM radio kit. Each night brought new energy to our club meetings, attracted members of all skill levels, and helped foster the sense of accomplishment that comes only from building something yourself.

We tied them into our regular monthly presentations. During the radio build night, I talked about why every ham should be building kits, covering how it can improve soldering skills, reinforce circuit understanding, and teach radio fundamentals. The following month, the room was full and buzzing with excitement for another build!

Build Night #1: End-Fed Half-Wave Antenna

John Gendron, NJ4Z, led our first build night, which focused on one of the most popular and practical DIY ham projects: the end-fed half-wave (EFHW) antenna. This antenna is compact, forgiving, and easy to deploy, and it works well from 40 to 10 meters. It's also simple enough that first-time builders could succeed with a little guidance, and useful enough that even experienced hams would want one in their go-bag.

We used ARRL's EFHW kit (<https://home.arrl.org/action/Store/Product-Details/productId/133267>), which provided everything we needed — toroids, wire, hardware, and instructions — making it easy to scale for a group setting. The club purchased a few extra tools, including soldering irons, wire strippers, and meters, to ensure no one was left waiting for a part or a tool to complete their project.

Participants measured wire, wound toroids, soldered connections, and tested continuity. The room filled with chatter and questions, while members helped each other troubleshoot problems and offered building tips from their own experience. For those unfamiliar with



Hams working on their AM/FM radios during one of YCARS's build nights.

toroid winding or impedance matching, it was a hands-on crash course in real-world radio fundamentals.

Everyone left with a functioning antenna and a deeper understanding of how it worked.

Build Night #2: AM/FM Radio Kit

I wanted an even more approachable project for our second build night, so we selected an AM/FM radio kit that's often marketed as a soldering practice project. It's simple and satisfying to complete. When finished, the builder has a fully functional radio they can use.

This kit turned out to be a great pairing with the first project. Hams with a wide range of experience levels showed up — some had never touched a soldering iron, and others hadn't built anything in years. The simplicity of the project made it accessible to everyone, but it was rewarding enough to feel substantial.

To support this build, the club invested in a few more soldering stations and magnifiers. As the evening progressed, I circulated the room, checking on hams' progress and helping them troubleshoot. One member had never soldered anything before. I guided him through each step, from orienting components to making clean joints. When he flipped the switch on and the radio came alive, the look on his face said it

all. Seeing the spark in his eyes made all the work of putting the event together worth it.

The only hiccup we had for this build event was with lighting. Our club's overhead lights aren't ideal for close-up work, and a few builders struggled to see clearly. After the event, I spoke with the YCARS president about upgrading the lighting for future builds. It's a small change, but it would make a big difference.

Engagement, Confidence, and Camaraderie

Not every event needs to be flashy. These build nights proved that simple projects, when well executed, can bring real value to club members. We didn't see a flood of new licensees or inactive hams pouring in, but we did see a lot of excited participants. They left with working projects and renewed excitement for the hobby. Even those who didn't build anything stuck around to watch, chat, and learn. There was a sense of community that can only be created by sharing your work.

One member told me, "I've had this license for years and never built anything. I finally feel like I know what's going on under the hood." That's a win!

What Worked for Us

- **Start with a presentation.** Use your club's regular meetings to set the stage and build anticipation. A short, enthusiastic talk on the value of kit building can go a long way.
- **Choose simple, practical projects.** The EFHW antenna was a great build, and the AM/FM kit was approachable and fun. Make sure it's something your builders can finish in one sitting.
- **Provide tools and materials.** Not everyone has a soldering iron or meter at home. Having loaners available makes it easier to include everyone.
- **Make it social.** Our builds were structured but not rigid. Members were encouraged to help one another, and the room was full of conversations, not lectures.
- **Watch your lighting.** We learned the hard way that good lighting is essential. Task lights or upgraded

fixtures can prevent eye strain and improve soldering quality.

- **Celebrate success.** Encourage members to show off their finished builds! That little bit of recognition can help solidify the experience and make them want to come back for more.

Closing Thoughts

These two build nights reminded us that amateur radio isn't just about getting on the air — it's about understanding what makes it all work. And that understanding grows fastest through hands-on learning.

We're already thinking about what to build next — maybe an antenna tuner or a QRP radio. Whatever it is, we'll keep it approachable, practical, and fun, because in a hobby built on experimentation, the magic happens when we roll up our sleeves.

So, if your club meetings have been feeling stale, consider bringing out the soldering irons. You might be surprised at what you build, both on the table and in your community.

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 October 20, 2025.



Renewing SSCs

Cambridge ARA, W8VP
Federal Way ARC, WA7FW
Orlando ARC, W4PLB
Silver Comet ARS, Inc., W4RSC

Cambridge, OH
Federal Way, WA
Orlando, FL
Acworth, GA

New SSCs

W. Travis Loftin High
School ARC, K4WTL

Gainesville, FL

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.

Ham Media Playlist

The Comms Channel

One of the things I love about amateur radio YouTube channels is the variety. The fact that there is online video content for just about every facet of the hobby never ceases to amaze me. Every now and then, a true gem of a channel pops up and makes me wonder how I had not come across it before. This is what happened when I discovered The Comms Channel, hosted by Kevin Cornwell, KG4EHH (www.youtube.com/@The_Comms_Channel).

I was looking for information on an aspect of amateur radio that we are considering including in some of our ARRL Teachers Institute courses: Meshtastic. As I scoured YouTube for information that was relatively complete, I found The Comms Channel and was immediately impressed.

At the time of this writing, the channel has more than 52,000 subscribers and 122 videos. Most of the videos on his channel are about Meshtastic, but there are several other great videos sprinkled in.

Kevin discovered radio at 11 years old. His father purchased a used crystal-based scanner at a flea market. He was amazed that he could listen in on local police, fire/EMS, and airport frequencies and sought out a more advanced scanner. This time, he ended up with a RadioShack PRO-70, which boasted 50 programmable channels. As Kevin spent time listening in on the airwaves, his dad took notice and picked up



Kevin steps viewers through the construction of a Meshtastic BBS node.

a Gordon West study guide at RadioShack, as well as some basic amateur radio study software.

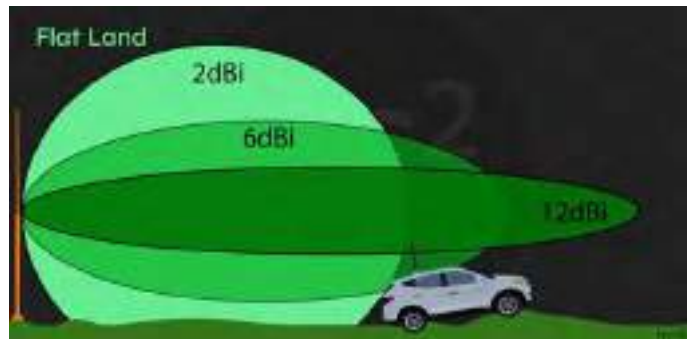
Dad and son both earned their amateur radio licenses, and Kevin's interest in computers led him to experiment with packet radio and APRS, finding the integration of two different technologies appealing, and propelling him into a future of experimentation with newer modes and technologies as they develop.

Getting Started with Meshtastic

The video I stumbled upon that led me to The Comms Channel was the introduction to a series called "Getting Started with Meshtastic" (<https://tinyurl.com/TCC-Start-Mesh>). This series, which Kevin has placed in a playlist for ease of use, steps viewers through the process of choosing hardware, preparing it, and using it. Hams love antennas, and Kevin made sure that he had a video in the series focusing on antenna choice and function. He does a great job explaining how they work, which ones you may or may not want to purchase, and use cases for different varieties.

APRS Bulletin Board Systems

Sticking with the integration of computers and radio, the video titled "A NEW take on BBS over radio! - Introducing the TC² Off-Grid APRS BBS & Mail system!" (<https://tinyurl.com/TCC-BBS>) harkens back to the early days of dial-up bulletin board systems (BBSs).



Kevin, KG4EHH, uses graphics to explain different antennas that can be used with Meshtastic devices.



Kevin demonstrates the operation of his new APRS BBS system and explains the equipment he is using.

In this video, Kevin shows viewers how to use a Raspberry Pi to create a BBS that can be used via APRS. Kevin cautions viewers not to use the main APRS frequency for the BBS, as it would interfere with other traffic. The APRS BBS is a variety of the Meshtastic version he goes into great detail with in the playlist titled “TC² BBS-mesh” (<https://tinyurl.com/TC2-MeshBBS>). In that series, Kevin walks viewers through the process of preparing and flashing the Raspberry Pi, building the outdoor node in a weatherproof container, deploying it, and using the BBS system. Kevin’s no-fluff presentation style is especially appealing in that he explains everything in precise terms and stays true to the subject matter in each video. This playlist inspired me to order the components, and I will be building a BBS node myself.

Working the International Space Station

One video I enjoyed, which fed into my personal interests because it was about working the International Space Station (ISS), was titled “Working the ISS APRS Digipeater Without a Satellite Antenna” (<https://tinyurl.com/TCC-ISS>). I have

recently taken more of an interest in satellite operations, and this video gave me additional opportunities to experiment. Kevin does a fantastic job of briefly explaining the pros and cons of two different types of antennas for satellite operations: the eggbeater and the Yagi.

He then shows viewers the process of setting up and receiving APRS signals from the ISS digipeater. He demonstrates transmitting his location via APRS and how to verify that he was actually digipeated. Because this is part of another series on his channel, Kevin answers questions viewers had after some of the other videos in the series. It’s always nice to see YouTube creators actively engage

with their viewers and take time to assist them in their experimentation.

Whether you are interested in Meshtastic, digital modes, or general off-grid communications, check out The Comms Channel. It is chock-full of great videos, and Kevin, KG4EHH, has a fantastic presentation style that lends itself to teaching others.



Kevin demonstrates tracking the ISS prior to attempting to contact the ISS digipeater.



Kevin shows a Meshtastic solar node.

How's DX?

Standout Clubs in the DX Community

In this month's column, I highlight the Arkansas DX Association to kick off ARRL's Year of the Club, and guest author Adrian Ciuperca, KO8SCA, details past and present goings-on at the United Nations Amateur Radio Club.

The Arkansas DX Association

Organized in 1967 by Larry Woosley, W5HJA (SK); Moritz Shollmier, WA5EFL (SK); Dick Freeling, W5TIZ (SK), and San Hutson, K5QHS (now K5YY), the Arkansas DX Association (ADXA) is the only DX club in Arkansas and has 100 percent ARRL membership. With more than 75 members, their ranks include some of the top DXers in the world, including 10 #1 DX Century Club (DXCC) Honor Roll holders, two members of the DXCC Challenge 3,000 club (two others are very close to the mark), and top-ranked DX contest competitors. As a recurring financial sponsor of major DXpeditions, ADXA is focused on educating and supporting its members to improve the technical capability of their stations and good operating practices through on-the-air experience.

ADXA originally met weekly on 3815 KHz. They now hold virtual quarterly meetings and an annual conference with special guests from among the top DXers in the world. More information about ADXA may be found on their website at www.adxa.org.

The United Nations Amateur Radio Club

The following section is by Adrian Ciuperca, KO8SCA:

The United Nations Amateur Radio Club (UNARC) has a proud, decades-long history. It first took to the air from New York in May 1948 as K2UN. With the approval of the UN Secretary-General, the station received its current call sign, 4U1UN, in 1978 — a milestone largely achieved through the efforts of UNARC President Emeritus Max de Henseler, HB9RS (SK), then the UN's Chief Cartographer in New York. De Henseler also made the first 4U1UN contact after the station became a separate DXCC entity in 1978. He retired in 1989 and returned to Switzerland.

Over the years, 4U1UN has been activated many times through weekend team operations, major contests (like ARRL DX), and special event call signs marking key anniversaries, including 4U70UN and 4U75UN.

After a long hiatus during post-9/11 renovations, the club experienced a major revival in 2018. Volunteers installed new equipment and a SteppIR BigIR vertical under the club president's guidance. In the last 7 years, 4U1UN has been more active than ever, tallying more contacts than in all previous years combined.

In 2020, Joe Taylor, K1JT, visited the station and made the first-ever FT8 contact from

4U1UN. Shortly after, members and guest operators activated the station in the SSB portion of the ARRL International DX Contest. That same year, the Yasme Foundation presented the Yasme Excellence Award to me and UNARC President Emeritus James Sarté, K2QI, for leadership and persistence in advancing 4U1UN. You can see the award details at www.yasme.org/yasme-excellence-awards.

This year, the club reached an important milestone; 4U1UN's standing on Club Log's DXCC Most Wanted List improved dramatically from #27 in 2018 to #99 in 2025 — just shy of the goal to break out of the top 100.

Operating Environment and Challenges

Our biggest challenge is urban RF noise (typically S5 – S7) that eases somewhat on weekends. Modern electronics everywhere, especially in an area like Manhattan, generate broadband noise that can mask weaker stations. But with persistence and regular



Antennas for 4U1UN on the roof of the UN Headquarters. The main antennas are a SteppIR BigIR vertical and an inverted-V dipole. [Adrian Ciuperca, KO8SCA, photo]

activity, most callers eventually make it into the 4U1UN log.

Antenna work requires multi-department approvals in a secure facility like the UN Headquarters. Maintenance involves several roof visits each year, and New York's hurricanes and winters test any installation perched atop a 500-foot building. The equipment rack sits on the 42nd floor, in a restricted room that also hosts UN electronics. It is conveniently located just below the roof for shorter coaxial and control cable runs.

Our antennas (atop the 500-foot building) include an Alpha Delta DX-LB trapped dipole (inverted V) for 160/80/40 meters (www.dxengineering.com/parts/alf-dx-lb), a SteppIR BigIR vertical for 40 – 6 meters, an M2 Antenna Systems 6M-3SS three element for 6 meters (www.dxengineering.com/parts/msq-6m3ss), and a Cushcraft MA5VA five-band antenna used as a 10/12/15/17/20-meter Northern California DX Foundation (NCDXF) beacon (www.dxengineering.com/parts/csh-ma5va).

For our station equipment on the 42nd floor, we also use a FLEX-6600 (loaned by FlexRadio; www.flexradio.com/products/flex-6600-signature-series-sdr-transceiver), an ACOM 500S (donated by DX Engineering; www.dxengineering.com/parts/aom-500s-120), an ACOM 06AT (also donated by DX Engineering; www.dxengineering.com/parts/aom-06at), an ACOM eBox (donated by ACOM; www.dxengineering.com/parts/aom-ebox-ss), and a SteppIR antenna and controller (partly donated by SteppIR).

We selected the FLEX-6600 (courtesy of FlexRadio) for its remarkably simple, robust remote operation. There are no special cabling or elaborate settings, allowing for easy connection to the local network and internet. FLEX-6600 has delivered more than 5 years of continuous service, and its built-in panadapter helps operators visualize and work around local city and UN building noise. A fiber-optic internet link ensures highly reliable connectivity. Since the COVID-19 pandemic, club operations have been mostly remote, enabling UN club members (some of whom are located overseas) to operate with ease.

The compact and lightweight ACOM 500S made installation straightforward, and with the ACOM eBox, it is fully remote controllable. The ACOM 06AT includes an integrated antenna switch, letting operators make

selections among the three antennas without extra hardware. This amplifier/tuner combination has already produced several thousand contacts in a couple of weeks of operation.

Thanks to the amplifier and a newly installed low-band inverted V, the club is ramping up activity on 80 and 160 meters, where demand for this DXCC entity is highest. Securing approvals for a large low-band antenna at the UN Headquarters was a lengthy process; special thanks go to UNARC President Metin, K2ECE, for his persistence in making it happen. We're also gearing up for contest season to give participants a rare and exciting multiplier.

Metin's efforts have resulted in another recent addition. The M2 Antenna Systems 6M-3SS beam has transformed our 6-meter season; we logged almost 2,000 6-meter contacts from 37 entities with the new beam this year. With the ACOM 500S now in the chain, we expect even better results next season, which will be especially welcomed by Magic Band DXers overseas.

On the roof you'll also find the NCDXF-sponsored 4U1UN/B beacon using a Cushcraft MA5VA antenna. The beacon recently underwent major repairs, including the replacement of a failed beacon radio. Since 1985, 4U1UN/B has contributed to a worldwide network of 18 beacons that help operators assess ionospheric conditions and HF propagation in real time. The current beacon radio is an Icom IC-7200 (www.dxengineering.com/parts/ico-ic-7200), installed in the same rack as the club gear.

Herbert Aeby, HB9BOU, has served as volunteer QSL manager since 2004. He handles all 4U1UN QSL cards, Club Log, and Logbook of The World® uploads, and he answers all QSL-related inquiries from operators worldwide.

What's Next

There's always a to-do list at 4U1UN. The top priorities are reducing RF noise and improving reception so weaker, distant stations — especially in Asia — can make it into the log more easily, and boosting SSB totals. We're experimenting with AI-assisted noise-reduction tools that have already shown significant S/N improvements in testing, and we plan to deploy them soon.

For a deeper dive into UNARC's history, visit www.4u1un.net.

The World Above 50 MHz

Propagation from North America to Saudi Arabia; Remembering K2ZD

On October 11, there was a 6-meter F2 opening between eastern North America and Europe, Africa, and the Middle East. Lefty, K1TOL (FN44), spotted Abdulrahman, HZ1DG (LK18). On October 13, the path repeated and went farther west. Fred, NO5Z (DM62); Ned, AA7A, and N7NR (DM52) worked HZ1DG at around 2052 UTC. HZ1DG runs an IC-7300 at 100 W to a five-element Yagi.

The direct great-circle path from Fred to HZ1DG is 30 degrees, with a path length of 18,570 kilometers. The North American stations found that HZ1DG's signals peaked at around 110 – 120 degrees. From Saudi Arabia, Abdulrahman said he was pointed at 270 degrees. He noted that the Caribbean, South American, and Mexican stations were strong, meaning this was not the result of a direct great-circle path. Instead, I believe signals from Arizona and New Mexico went into the transequatorial propagation (TEP) zone, and then they zigzagged back and forth until they exited; it is likely an enhanced forward side scatter. In such instances, the signals move along under the TEP bulge until they find a weak point and break out. They may go either north or south. People often make the mistake of turning their Yagi to the great-circle path

heading, which leads to the signal going away. Jim, KH6/K6MIO, described the same mode from Hawaii to Argentina on 6 meters. I reviewed this TEP path in the June 2025 column.

Mario Karcich, K2ZD, Silent Key

Mario Karcich, K2ZD, became a Silent Key. Mario was a consummate 6-meter DXer, an avid Earth-moon-Earth (EME) advocate, and a frequent contributor to this column. He had 228 countries confirmed on 6 meters. Lance Collister, W7GJ, noted:

According to the ARRL 6-Meter Firsts list, Mario was the first 6-meter station from North America to work the following [DX Century Club entities via] 6-meter EME:

1. Seychelles — W7GJ's first 6-meter EME contact from S79GJ in 2019.
2. Cocos/Keeling — W7GJ's first contact when he was there as VK9CGJ in 2017.
3. Mayotte — W7GJ's first contact when he was there as TO7GJ in 2022.

Lance continued, "So, not only did Mario have a great 6-meter EME station, he also knew how to use it very well to work DX!"

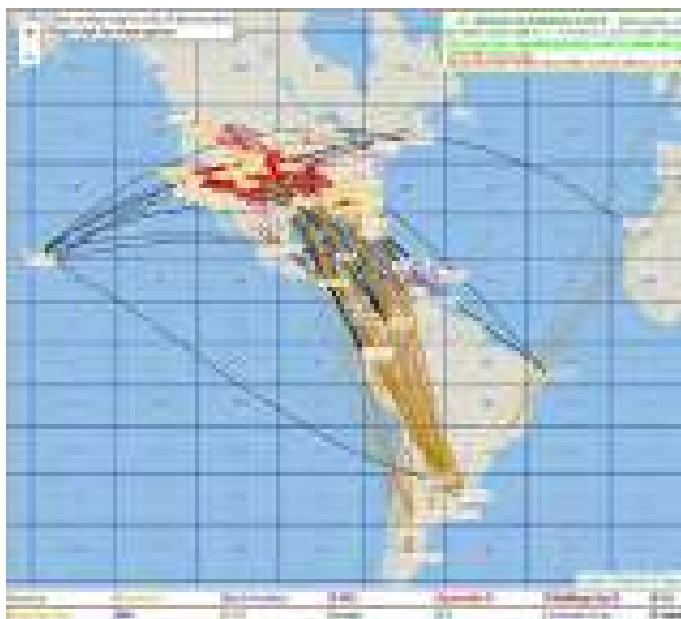
On the Bands

50 MHz. Greg, AA5C (EM13), copied YJØRS on October 3 at 0245 UTC. An unusual late-afternoon opening occurred on October 12 between North and South America. Jim, AAØMZ (EM29), logged CX1TH at 2210 UTC. I copied CA6SNT (FF30) working KC3OL (EM28). HC2GRC (FI07) appeared at 2245 UTC while working N5UM. After they completed the contact, I called and worked HC2GRC. I also logged Rick, HC1MD/2 (EI97), after he popped up with a strong signal peaking +4 dB. All signals were gone by 2252 UTC. There seemed to be TEP for the CE- and CX-region stations, with a possible E_s link. As for Ecuador, perhaps that was double-hop E_s.

A tardy coronal mass ejection arrived in the afternoon on October 18. The K index went to 6, and Argentina was in to much of North America. Here in Kansas, signals from HC2FG, HC1MD/2, and LW4DYI (GF02) were strong. Dan, K7SMA (DN13), said:



Mario Karcich, K2ZD. [Scott Karcich, N2RVU, photo]



A DX Maps screenshot depicting the 6-meter propagation conditions on October 18, 2025. [www.dxmaps.com]

[I] started seeing CX stations at around 22:33 [UTC]. Saw Mac, K7MAC (DN14), pick up CX2TQ at around 2234. [I] then worked CX2CC at 2240 UTC in GF15! [I] also saw LU8EX and LU3DX at around 2253 [UTC and] around -21 [dB]. Scott, W7IMC, and Mike, W7OSG, worked them both.

Later that evening, sporadic E appeared. Jim, AA0MZ (EM29), copied but didn't work FK8HA. FK8HA worked N0PB (EM39) on 50.110 MHz SSB. I noted strong sporadic E to Arizona, California, Nevada, New Mexico, and Utah. Rich, K1HTV (FM18), worked 12 LU, seven CX, and three CE stations at around 2200 UTC. On October 22, Marco, EA8AQV, logged the rare 6O3T DXpedition at 1820 UTC via FT8.

On October 25, John, KL7HBK (BO49), worked five stations in Argentina, one in Brazil, and another in Uruguay. Joe, N6KK (DM03), copied LW2DAF sending a 73 to John at 2126 UTC. These were amazing 6-meter contacts — what was the propagation mode? There was TEP from the southeast states to South America. A strong sporadic-E opening took place from Kansas and Missouri to Utah at the same time. K5XI (DM52) spotted KL7HBK. So, perhaps there was a weak single F2 hop from Alaska to the Rocky Mountain states, and then an E_s link to TEP. The E_s link allowed stations in the Pacific Northwest to work South America as well. On October 27, some well-placed E_s clouds let Mike, KC0Y (EM17), log Rémi, FK8CP, at 2250 UTC. Mike also copied WH6EY (BL02). Signals from JA stations were reported in Arizona, California, Colorado, and Texas.

Greg, AA5C, noted that 7Q6M (KH67) was “in solid for 10 minutes” at around 1830 UTC on October 30. On Halloween, Greg Cerny, WQ0P (EM19), copied 7Q6M calling CQ twice at around 1710 UTC. Later that afternoon, there was a strong opening to Argentina, Brazil, and Uruguay. Mike, W0MU (DM79), spotted a real Halloween treat: loud signals from the 5K0UA San Andrés Island DXpedition. I, N0JK (EM28), put LW2EDM and LU5DF in my log. I copied 5K0UA at 2036 UTC, but I didn't make a contact. Mike, KC0Y, made 10 contacts — seven in Argentina, two in Uruguay, and one in Brazil. Dan, K7SMA, worked LU5DF at 1915 UTC, and then HC3RJ (FI06) and CA6SNT at 1954 UTC. Kim, KI0E (DN13), and Dan saw a signal from 5K0UA without being able to complete the contact. Paul, K7CW (CN87), reported working one CX station and said, “PY3SOL was in strong for a long time.”

222 MHz. Dave Olean, K1WHS, worked Martin, PJ4MM, via EME on October 28. He said that Martin uses two long Yagis, and he is easy for smaller 222 MHz EME stations to work.

Here and There

Jim Andrews', KH6HTV, ATV club, the Boulder Amateur Television Club, W0BTV, works with the Boulder (Colorado) Amateur Radio Club (BARC). ATVer Debbie, WB2DVT, organized the BARCfest held on October 5. It had 93 exhibitor tables and 338 paid attendees. Jim's ATV group had a display table “with a live-video ATV demonstration.”

The Quadrantid meteor shower is predicted to peak on January 4, 2026, at 0036 UTC. The “Quads” have a narrow 6-hour peak, and activity drops to half the maximum value in 4 hours. Unfortunately, in 2026, the Quads' radiant doesn't rise above the horizon until after local midnight in North America. Thus, meteor rates in North America will be low. Europe will be in the best spot.

Feedback

In the December 2025 issue, a clerical error resulting in the misreporting of the number of contacts for ARRL Field Day 2025 led to errors in the overall statistics presented on pages 66 – 67 and the Class 3A scores. The statistics and scores have been corrected in the digital edition and on the ARRL Field Day web page.

Exam Info



Reducing License Grant Times from Weeks to Days

To ensure faster service for candidates, all Volunteer Examiner (VE) teams must submit completed exam session results via our private and secure upload web page. This vital feature allows us to transmit applications to the FCC quickly and efficiently.

- **Weekday sessions:** Typically transmitted the same day.
- **Weekend sessions:** Transmitted within 1 – 2 business days.
- Authorized VEs will receive a private URL for uploads. Contact vec@arrl.org for instructions.

Business Reply Mail Account Closure

Effective **November 1, 2025**, our Business Reply Mail account with the US Postal Service is closed.

We will no longer accept Volunteer Examiner Coordinator (VEC) postage-paid return labels or envelopes.

Do not mail exam sessions to the VEC.

All session documents must be submitted via our secure upload page.

Transition to Secure Digital Uploads

All exam session results must be submitted digitally.

- If your team already uploads session documents, **no action is needed**.
- If your team **has not yet transitioned**, please contact vec@arrl.org to receive access and instructions.

Mailing Exam Fees

Teams that choose to mail exam fee checks to the VEC may retain a portion of the collected fees to help offset postage costs. Checks should be sent using a standard business-size envelope and include a reference to the **session date and location**. Teams also have the option to pay the exam fees by credit card.

Reminder: ARRL VEC Is Going Digital

The ARRL VEC transitioned to a fully digital program in 2025. Printed booklets and supply shipments have been discontinued as all VE teams move to using the

ExamTools system (www.exam.tools) for administering amateur radio exams — either online or in printed format.

VE teams can now conduct exams in two ways:

- **Fully electronic:** Online exams for in-person or remote video-supervised sessions.
- **Printed exams:** Generate and print exams directly from the ExamTools platform for in-person sessions.

Teams that have not yet made the transition can find guidance at <https://docs.exam.tools/docs/general>, or they can contact vec@arrl.org for support and instructions.

These updates are designed to:

- Streamline exam processing.
- Enhance security.
- Support VE teams during the transition.

Comprehensive Exam Session Management

The ExamTools system supports all types of exam sessions and offers a complete solution for VEs.

Key features include:

- Candidate registration and tracking.
- Automated grading for on-screen and paper exams.
- Online signing of Certificate of Successful Completion of Examination (CSCE) and 605 forms.
- Session statistics and VE participation reports.
- Output files for VEC upload.
- Printed exams compatible with blue overlay grading templates.

This easy-to-use platform streamlines exam administration and enhances the experience for both VEs and candidates.

Additional information about these services is located on the Resources for VEs web page at www.arrl.org/resources-for-ves. ARRL VEC staff can also provide detailed information by email.

New Technician Question Pool Takes Effect July 1, 2026

A revised Element 2 Technician-class question pool will take effect for all exam sessions starting July 1, 2026. Released by the National Conference of Volunteer Examiner Coordinators (NCVEC) Question Pool Committee in December 2025, the updated pool includes 410 questions (26 new, 28 removed, and approximately 150 modified). Three graphics are required.

The updated question pool incorporates significant changes from the prior pool. The questions were checked for technical accuracy and relevance to current amateur radio practices, grammar, syntax, format, clarity, and redundancy within and between the pools. View all question pools at www.ncvec.org.

VECs and VEs must have new test designs available for exam sessions starting on July 1. Previously supplied versions of ARRL VEC Technician-class exam booklets (2022 series) and computer-generated

Technician-class exams from the 2022 question pool are valid until midnight on June 30, 2026. At that time, VE team leaders may destroy the old versions of the Technician-class exams.

Important

The ARRL VEC will no longer print or ship exam booklets. VE teams must use ExamTools (www.examtools) to print updated exams for in-person sessions. Teams not yet using ExamTools should create an account and contact vec@arrl.org for setup and authorization. We encourage all teams to transition to digital exam management and printing well before July 2026. We're here to help every step of the way.

Our Commitment to Service

We remain dedicated to delivering high-quality programs and services, ensuring a positive experience for all current and future customers while demonstrating our value to the amateur radio community.

Thank you for your continued support and service to our VEC. We look forward to assisting you wherever your examining journey takes you.

ARRL VEC Program Available Services

ARRL Member Licensing Support

Ongoing FCC licensing guidance and support to our ARRL members, including license renewal help, is an important part of our program services.

Online Amateur Radio Exams

ARRL VE teams can go completely electronic by using a web-based examination system to administer online exams at in-person or remote video-supervised sessions.

Remote Video-Supervised Sessions

Remote sessions are conducted using an online video conferencing platform with on-screen tests.

Electronically File Exam Sessions to the VEC

Upload exam session documents or files for quicker service! New and upgraded licenses are transmitted to the FCC within 1 – 2 business days for weekend sessions, and they are usually transmitted on the same day for weekday sessions.

Please contact the VEC department at vec@arrl.org for information about our services.

The 2026 ARRL VEC Exam Fee Remains \$15 for Adults and \$5 for Youth

Visit www.arrl.org/arrl-vec-exam-fees for more information.

Don't Envy the Book Author; Become One!

ARRL is the largest amateur radio book publisher in the world, and we're looking for new authors.

ARRL provides:

- ♦ Technical vetting by experienced engineers
- ♦ Professional editing
- ♦ Technical illustration
- ♦ Book design
- ♦ Marketing and publicity

Email your proposal to qst@arrl.org (no telephone calls, please). Send a short outline of your idea, including a list of chapter topics, and a sample of your writing.



Contest Corral

January 2026

Check for updates and a downloadable PDF version online at www.arrrl.org/contest-calendar. Check <https://contests.arrrl.org> for recent results. 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	1	0100	3.5	AGB New Year Snowball Contest	CW Ph Dig	RST, serial, mbr (if any)	www.qsl.net/eu1eu/agnb_nysb.htm
1	0000	2	0300	7	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or pwr	qrpcontest.com/pigwalk40
1	0800	1	1100	3.5,7	SARTG New Year RTTY Contest	Dig	RST, serial, name, happy new year (native language)	www.sartg.com
1	0900	1	1200	3.5-14	AGCW Happy New Year Contest	CW	RST, serial, mbr (if any)	www.agcw.de
1	1700	1	1800	3.5	IRTS 80m Counties Contest	CW Ph	RS(T), serial, county	www.irts.ie
3	0000	3	2359	3.5-28	PODXS 070 Club PSKFest	Dig	RST, SPC	www.podxs070.com
3	0700	3	2100	3.5-14	Marconi Club ARI Loano QSO Party Day	CW	RST, mbr or serial	www.ariloano.it
3	1200	4	1200	1.8-28	WW PMC Contest	CW Ph	RS(T), PMC abbrev or CQ zone	www.s59dcd.si
3	1800	4	2359	3.5-28	ARRL RTTY Roundup	Dig	W/VE: RST, SP; non-W/VE: RST, serial	www.arrrl.org/rtty-roundup
3	1800	3	2359	3.5-14, 18, 21, 24, 28, 2-m rpters	ARRL Kids Day	Ph	Name, age, QTH, favorite color	www.arrrl.org/kids-day
3	2000	4	0700	1.8	EUCW 160m Contest	CW	RST, name, mbr or "NM"	www.uft.net
4	1200	5	1200	1.8-28,50	FOC Old School Classic 1960s QSO Party	CW	RST, 3-letter class, year first licensed, name	www.g4foc.org
6	0100	6	0300	3.5-28	ARS Spartan Sprint	CW	RST, SPC, pwr	ars-qrp.com
7	2000	7	2100	3.5	UKEICC 80m Contest	Ph	6-char grid square	www.ukaiccc.com
10	0000	10	2359	3.5-28	YB DX Contest	Ph	RS, serial	ybdxcontest.com
10	0500	10	0859	3.5-28	Old New Year Contest	CW Ph	RS(T), sum of operator age and years on air	www.contest.ru/old-new-year-contest
10	1200	11	1200	3.5-28	UBA PSK63 Prefix Contest	Dig	RSQ, UBA section or serial	www.uba.be
10	1200	11	2359	1.8-28,50	SKCC Weekend Sprintathon	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
10	1800	11	0559	1.8-28	North American QSO Party, CW	CW	Name, SPC	www.ncjweb.com/NAQP-Rules.pdf
11	0630	11	0830	3.5,7	NRAU-Baltic Contest, SSB	Ph	RST, serial, 2-letter fylke/län/province/region	www.nraubaltic.eu
11	0900	11	1059	28	DARC 10m Contest	CW Ph	RS(T), serial, DOK (if any)	www.darc.de
11	0900	11	1100	3.5,7	NRAU-Baltic Contest, CW	CW	RST, serial, 2-letter fylke/län/province/region	www.nraubaltic.eu
12	0100	12	0300	1.8-28	4 States QRP Group Second Sunday Sprint	CW Ph	RS(T), SPC, mbr or pwr	www.4sqrp.com
14	2300	18	2300	1.8-14	AWA Linc Cundall Memorial CW Contest	CW	RST, eqpt year, input power (see rules for format)	www.antiquewireless.org
15	0000	16	0300	14	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or pwr	qrpcontest.com/pigwalk20
15	1900	15	2000	3.5-14	NTC QSO Party	CW	Max 25 WPM; RST, mbr or "NM"	pi4ntc.nl/ntcqp
17	1200	18	1159	1.8-28	Hungarian DX Contest	CW Ph	RS(T), 2-letter county (if HA) or serial	ha-dx.com/en/contest-rules
17	1200	18	1159	3.5-28	PRO Digi Contest	Dig	RST, serial, "M" (if mbr)	proradiocontestclub.com
17	1800	18	0559	1.8-28	North American QSO Party, SSB	Ph	Name, SPC	www.ncjweb.com/NAQP-Rules.pdf
17	1800	18	0559	1.8-28	NA Collegiate Championship, SSB	Ph	Name, SPC (if NA)	www.w9smc.com/nacc
17	1900	19	0359	50 and up	ARRL January VHF Contest	CW Ph Dig	4-char grid square	www.arrrl.org/january-vhf
17	2000	18	0559	1.8-7	Feld Hell Sprint	Dig	See rules	sites.google.com/site/feldhellclub
18	2300	19	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or pwr	qrpcontest.com/pigrun
19	2000	19	2200	3.5-28	RSGB FT4 Contest	Dig	Signal report	www.rsgbcc.org
22	0130	22	0330	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or pwr	naqcc.info/sprint_rules.html
23	2200	25	2200	1.8	CQ 160m Contest, CW	CW	RST, SP or CQ zone	www.cq160.com
24	0600	25	1800	3.5-28	REF Contest, CW	CW	RST, French dept or serial	concours.r-e-f.org
24	1200	25	1200	3.5-28	BARTG RTTY Sprint	Dig	Serial (no signal report)	bartg.org.uk
24	1600	25	2159	No WARC	Winter Field Day	CW Ph Dig	Category, ARRL Section, MX or DX	www.winterfieldday.com
25	2200	26	1000	1.8-28	Australia Day Contest	CW Ph Dig	RST, 4-char grid square	www.wia.org.au
28	0000	28	0200	1.8-28,50	SKCC Sprint	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
28	2000	28	2100	3.5	UKEICC 80m Contest	CW	6-char grid square	www.ukaiccc.com
29	0130	29	0330	1.8	NAQCC CW Sprint	CW	RST, SPC, mbr or pwr	naqcc.info/sprint_rules.html
31	1300	1	1300	3.5-28	UBA DX Contest, SSB	Ph	RST, serial, ON section (if ON)	www.uba.be

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.

At the Foundation

New ARRL Foundation Grant Recipients

The ARRL Foundation Board has reviewed the grant applications submitted during the 2025 grant cycles and has voted to approve funding for the following proposals:

- ARROW Communication Association in Saline, Michigan, received support toward their Ham Radio Operator Outreach Program.
- The Brown University Radio Club in Providence, Rhode Island, was able to purchase equipment to support hands-on satellite communications and Morse code training workshops.
- CommUnity Nexus Inc. in Genesee, Idaho, will establish a Beginner Rocketry and Amateur Radio Education Program to engage youth.
- The Grove City College Amateur Radio Club in Grove City, Pennsylvania, received a grant to purchase station equipment and ARRL publications to support their efforts to grow the club.
- The National Trail Amateur Radio Club in Effingham, Illinois, received an award for purchasing equipment for Basic Electronic Theory courses for youth.
- Occoneechee Amateur Radio Society (KN4TRE) in Raleigh, North Carolina, will purchase a repeater for use at a Scouting camp and in the community.
- The Rockville Science Center in Rockville, Maryland, received a grant to purchase radio equipment for an on-site radio club.
- The Texas A&M University Amateur Radio Club in College Station, Texas, received a grant to purchase a shack-in-the-box-style go-kit for use on campus.
- Two Rivers Amateur Radio Club in Greenock, Pennsylvania, received ARRL publications for a Technician licensing class.
- The University of Utah Amateur Radio Club in Salt Lake City, Utah, received ARRL publications to help start an amateur radio club on campus.
- The Butler County Amateur FM Association in Evans City, Pennsylvania, will purchase more IGateS to increase connectivity in popular hiking, camping, and public spaces in the greater Pittsburgh and western Pennsylvania areas.
- Emporia State University in Emporia, Kansas, will purchase equipment to build a network and sensors to use Meshtastic technology, an open-source, low-cost, long-range communication system designed for amateur radio.
- The Illinois Space Society in Urbana, Illinois, received an award for a fixed-wing radio relay drone project.
- Kids On The Air (KOTA) in Mooresville, North Carolina, received assistance toward obtaining their 501(c)(3) status and having a booth at the 2026 Dayton Hamvention.
- Ridge Area Arc Inc. in Avon Park, Florida, received Technician- and General-class license prep books



to start a radio club at an adult day training facility.

- Sarasota Military Academy in Sarasota, Florida, will equip the student lab tables with SDR receiving systems and soldering equipment.
- The Scotlandville Pre-Engineering Magnet Academy in Baton Rouge, Louisiana, will create a radio station and launch a ham radio club at the school.
- The University of Arizona Amateur Radio Club, K7UAZ, in Tucson, Arizona, will construct and test a pico balloon.

The money for these grants comes from established funds within the Foundation. These funds include: the Victor C. Clark Youth Incentive Program; the CW Operators Educational Fund; the Alfred E. Friend Jr., W4CF, Educational Activities Fund; the Keith Pugh Education to Promote Amateur Radio Fund; the Keith Pugh Satellite Projects Fund, and the ARRL Foundation General Fund.

To learn more about the ARRL Foundation Grant Program, please visit www.arrrl.org/amateur-radio-grants or contact Development Operations Manager Christina Lessard, KC1TDM, at clessard@arrrl.org.



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 2025

Bruce A. Smith, W4DPI	10
Jeremy L. Wallace, NR9I	10
Vincent L. DeCaprio, KD2VLQ	15
Kenneth F. Robinson, K8SCA	15
Thomas P. Stelmach, N0QBX	15
Barry G. Fluxe, W4LSV	25

June 2025

Glenn M. Davies, KO4NTA	10
Michael A. Krahenbuhl, K0ARA	25
Gary C. Tartanian, K3WK	25

July 2025

Thomas Duong, KR4DOT	10
William H. Rupert, KI5JWV	10
Mark A. Jessing, N4OJE	15
Daniel L. Schaible, KD8UZS	15

August 2025

James M. Joyce, VE3LTN	10
Gary D. Mentro, Sr., N3OS	10
Todd E. Foster, W2TEF	15
Margaret L. Bowen, KY4WH	20
Richard McCleaf, K3EYJ	20
Denis O'Brien, N2JJF	40

September 2025

Richard F. Bobrowicz, K2RFB	10
J. Andrew Hall, N5ASE	10
Thomas F. Corcoran, VE3NY	20
David R. Koberstein, N9DK	30

October 2025

Douglas M. Dukes, W5DMD	10
Thomas F. Corcoran, VE3NY	25

November 2025

Thomas D. Tarman, AF5TT	10
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Congratulations to all of the recipients.

January 2026 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.

January 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 K9JM on Wednesday, January 28, at 9 PM PST (0500 UTC on January 29) on 3581.5 kHz. Unless indicated otherwise, sending speeds are from 10 to 40 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 Run Schedule – January 2026 (All times are in Eastern Standard Time.)

Monday	Tuesday	Wednesday	Thursday	Friday
		1/7 7 PM – 0000Z (1/8 – UTC) 35 – 10 WPM	1/8 10 PM – 0300Z (1/9 – UTC) 10 – 40 WPM	1/9 9 AM – 1400Z 10 – 35 WPM
	1/13 4 PM – 2100Z 10 – 35 WPM	1/14 7 PM – 0000Z (1/15 – UTC) 10 – 40 WPM	1/15 9 AM – 1400Z 35 – 10 WPM	
	1/20 9 AM – 1400Z 10 – 35 WPM	1/21 10 PM – 0300Z (1/22 – UTC) 35 – 10 WPM	1/22 7 PM – 0000Z (1/23 – UTC) 10 – 35 WPM	
1/26 10 PM – 0300Z (1/27 – UTC) 10 – 40 WPM	1/27 9 AM – 1400Z 35 – 10 WPM		1/29 4 PM – 2100Z 35 – 10 WPM	

Special Event Stations

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

Jan. 2 – Jan. 31, 0000Z – 2359Z, K3Y, Ellicott City. Straight Key Century Club. **20th Annual Straight Key Month**. 3.550 7.055 14.050 21.050. Certificate & QSL. SKCC c/o Ted Rachwal, K8AQM, 6237 Twin Lakes Dr., Smiths Creek, MI 48074. www.skccgroup.com/k3y

Jan. 9 – Jan. 11, 1600Z – 2200Z, W0JH, Stillwater, MN. Stillwater Amateur Radio Association. **Remembering Father Metcalf**. 3.860 7.260 14.260 21.360. Certificate. Shel Mann, N0DRX, 1618 Pine St. W, Stillwater, MN 55082. www.radioham.org

Jan. 10, 1600Z – 2230Z, W9RH, Milwaukee, WI. Milwaukee Radio Amateurs' Club. **MRAC 109th Anniversary**. 7.250 14.250 145.390. Milwaukee Radio Amateurs' Club, P.O. Box 26938, Milwaukee, WI 53226. www.w9rh.org/special-event-station

Jan. 24, 1330Z – 2100Z, K3S, Odenton, MD. Nuclear Ship Savannah ARC. **First Wireless-Coordinated High Seas Rescue 1909**. 14 18 21 28. QSL. Ulis Fleming, 980 Patuxent Rd., Odenton, MD 21113. *Check spotting networks for frequency.* www.qrz.com/db/k3s

Jan. 25 – Jan. 27, 1700Z – 0100Z, AG6AU, Placerville, CA. El Dorado County ARC. **Discovery of Gold in California 177th Anniversary**. 7.248 14.248 21.348 28.348. QSL. El Dorado County ARC, P.O. Box 451, Placerville, CA 95667. www.edcarc.net

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 **April QST** would have to be received by **February 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.

You can view all received Special Events at www.arrl.org/special-event-stations.

Life Members

Elected November 4, 2025

Abie Alexander, AB1F
Andrew S. Alexander, KC4WD
Jonathan Anderson, K17BSJ
Jeffrey E. Bail, NT1K
Mark W. Bailey, N6DY
John P. Bailey, III, WR1M
Paul D. Beihold, KA9SDQ
Aaron G. Bentley, KJ5LKW
Carla S. Berg, K15KTE
Patrick R. Boutall, KK4WZR
Chase D. Boyd, KG7HWS
Lucas T. Bridges, KF7KNH
Michael D. Brown, KF0DXV
David J. Burt, W4OFO
James R. Carpenter, KE7TJG
Charles E. Church, AD6UX
William D. Cohron, WD4AMC
Robert L. Cosentino, WB6AGE
Jeffrey A. Craig, KE7FEK
Matthew R. Crook, Sr., W1MRC
Joseph F. Decker, N7AO
Drake B. Doyle
Keith E. Doyne, KC3ZXE
Susan J. Edmonds, N2GNN
Tyson C. Eppink, N1TXN
Brian D. Erickson, N5ANW
Christopher T. Fahrenbach, WB9G
Timothy Fitzpatrick, KN6QYX
Diann R. Gentile, KD2BND

Albert J. Goto, N6SX
Frank S. Greco, AC0TT
Jeremy E. Griffel, K2GRI
Michael F. Grimsley, KF4W
Stephen L. Haggard, W3SLH
Richard E. Hoerner, KB3VAE
Aubrey L. Holt, KC5VLC
Timothy R. Holzheimer, N6DIY
Scott B. Howard, N9SBH
Kurt R. Jackson, W1OBQ
John C. Keel, Jr., AA5JK
Michael R. Keller
Mark S. Kempisty, AA3K
Gregory D. Knippa, KD5HLV
Brian F. Knoll, AA4BK
Uwe Koenneker, DL8OBF
John K. Lamb, II, KU5D
Matthew A. Lankford, AA5ML
Gordon B. LaPorte, K1VHR
John N. LaRock, K8XD
Lora L. Lemons, NJ2J
James D. Lowery, K14USA
Benito Loyola, Jr., K4BLV
George E. Maynard, KQ4ARK
Daniel R. Mc Eleney, AC1JL
Nicholas R. McLarty, N4AMU
Louis A. Molettieri, W1LAM
Eric M. Morehead, K4UXO
James L. Norris, III, K4JLN

Louis E. Paulerio, AE6LP
Justin Plock, KC1LMF
Douglas L. Preston, K7VVW
Greg W. Putman, AD8PF
Scott C. Rock, KQ4RTN
Jason J. Sample, KB1PQB
Matt Schooley, KD0NZL
Jeffrey P. Seaman, KJ7TTY
John F. Sheaffer, W6TXR
John T. Shingara, II, WB3EYB
James S. Simeone, KC2AOF
Lawrence A. Simpson, KF5TX
Stephen T. Smith, N4TYL
George C. Strother, KL7GS
Robert L. Toellner, WB5EKS
Rex A. Turvin
Bryant H. Walley, K5KRZ
Jason E. Woods, KG5OHV
Joel D. Wright, W4TZY



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

Arizona (Glendale) — Jan. 17 F H Q R S T V

8 AM – 4 PM. *Spr*: Amateur Radio Council of Arizona. Haven Church, 5902 W. Cactus Rd. *TI*: 147.040 (162.2 Hz) and 146.150 PL (100.0 Hz). *Adm*: \$5. www.tbirdfest.org

QUARTZFEST

January 18 – 24, Quartzsite, Arizona

H S V

All day. *Spr*: Quartzfest Committee. Roadrunner BLM camping area, La Paz Valley Rd. *TI*: 146.55 (simplex). *Adm*: \$5. www.quartzfest.org

ARRL SOUTHERN FLORIDA SECTION CONVENTION

January 16 – 17, Fort Myers, Florida

D H R S T V

Fri. 12 PM – 5 PM, Sat. 8 AM – 3 PM. *Spr*: Fort Myers ARC. Florida SouthWestern State College, 8099 College Pkwy. *TI*: 145.170 (136.5 Hz). *Adm*: \$10 Advance, \$12 door. www.swflhamfest.com

Illinois (Collinsville) — Jan. 24 D F H Q R S V

8 AM – 1 PM. *Spr*: St. Louis and Suburban Radio Club. Gateway Convention Center, 1 Gateway Dr. *TI*: 146.97. *Adm*: \$13 Advance, \$15 door. <https://winterfest.slsr.org>

Indiana (Danville) — Feb. 7 D F H Q R S V

9 AM – 1:30 PM. *Spr*: Hendricks Co. ARS. Hendricks Co. 4-H Fairgrounds and Conference Center, 1900 E. Main St. *TI*: 147.015 (88.5 Hz). *Adm*: \$7. www.n9hc.org

Kansas (Mound City) — Feb. 7 D F H R

9 AM – 1 PM. *Spr*: Mine Creek ARC. Linn Co. Fair 4H Building, 8510 KS-7. *TI*: 147.285 (91.5 Hz). *Adm*: Free. Email: kb0dti@arrrl.net

Louisiana (Ponchatoula) — Jan. 16 – 17 D F H Q R S T V

8 AM – 4 PM. *Spr*: Southeast Louisiana ARC. Ponchatoula Community Center, 300 N. 5th St. *TI*: 147.00 (107.2 Hz). *Adm*: \$5. www.selarc.org

ARRL MISSISSIPPI STATE CONVENTION

January 30 – 31, Jackson, Mississippi

D F H Q R S T V

Fri. 4 PM – 7 PM, Sat. 8 AM – 3 PM. *Spr*: Jackson ARC. Mississippi Trade Mart, 1200 Mississippi St. *TI*: 146.76 (77 Hz). *Adm*: \$10. www.msham.org

New York (Almond) — Feb. 7 F H V

8 AM. *Spr*: Keuka Lake ARA. Almond Community Center, 1 Marvin Ln. *Adm*: Free. www.klara.us

Ohio (Shade) — Jan. 18 D F H R V

9 AM – 2 PM. *Spr*: Sunday Creek Amateur Radio Federation. Shade Community Center, 2380 Old US 33. *Adm*: \$6. Email: jeramy_duncan30@yahoo.com

Ohio (Struthers) — Jan. 31 H R S V

8 AM – 1 PM. *Spr*: Struthers Regional Operators of Amateur Radio. St. Nick's Hall, 764 5th St. *TI*: 146.91 (110.9 Hz). *Adm*: \$5. www.facebook.com/profile.php?id=61580196127715

Oklahoma (Henryetta) — Jan. 10 D F H V

8 AM – 2 PM. *Spr*: Crossroads ARC, Henryetta ARC. The Briefcase, 315 W. Main St. *TI*: 146.52 (simplex). *Adm*: \$10 Advance, \$15 door. Email: radioarc@gmail.com

Texas (Harlingen) — Feb. 7 H R S V

8 AM – noon. *Spr*: Rio ARC. Encore Sunshine RV Resort, 1900 Grace Ave. *TI*: 146.70 (114.8 Hz). *Adm*: Free. Email: info@rioarc.org

Virginia (Gloucester) — Feb. 7 D F H R S T

9 AM – 4 PM. *Spr*: Middle Peninsula ARC. Moose Lodge 886, 6565 Moose Dr. *TI*: 145.370 (100 Hz). *Adm*: \$10. www.mparchamfest.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.arrrl.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.arrrl.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 **February 1** to be listed in the **April** 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@arrrl.org.

Field Organization Reports — October 2025

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.

455 WA3QLW	222 KB5PGY K9SX	185 AG9G K9LGU	148 WM2C KC1OIP KC8T	129 W5WMC	110 KM4WHO N1HAN WB8TQZ WV5Q	98 KE8CYC	88 N0ET W4TTO	79 NT1N W4PXE	75 WB3FTQ	73 W8IM W2ZXN	71 KD2TDG
407 KE8BYC	220 NW3X	184 KD2GXL	140 W4CMH WK4WC KK3F	125 W1TCD N3GE K1YBO	109 K1XFC	97 KT4WX K1CJV	84 KC3FAU	78 N3RPB	74 KF7GC W2QMI W3ZR KB0DTI	72 N4NOA AA3N N7UWX	70 K6RAU K8RDN KB1NAL
360 KT5SR	218 KC8YVF	180 W2PAX W1RVY	135 WA9SWW KE5YTA AD3J KB8PGW W3YVQ	122 KY2MMM	107 KB2YAA	95 WB9EDL WB2VUF	80 KG4AOP KB4OLY	77 NJ5R	The following stations qualified for PSHR in previous months, but have not been recognized in this column yet: (September) NA7G 120, N7UWX 80. (August) W4CMH 175 [corrected number of points].		
345 WM5N	210 K7OED	175 K2VTT	134 WA9SWW KE5YTA AD3J KB8PGW W3YVQ	120 WA4VGZ WC4FSU KD0HHN KA5AZK K3JL KO4OL NA7G	100 N3STP W2OOD AD4DO KZ8Q WB4RJW W1KX N1IQI N1LAH KC1KVY K2MTG K3YAK KB2QO W2AH N4CNX W4EDN KD2PQP AA3SB	94 N2TSO	The following Section Traffic Managers reported: AR, AZ, CO, CT, EMA, ENY, EPA, GA, IA, IL, IN, KS, KY, MDC, ME, MI, MO, MS, NC, NFL, NLI, NM, NNJ, NNY, NTX, OR, RI, SD, SFL, SJV, SNJ, STX, TN, UT, WCF, WI, WMA, WNY, WPA, WWA, WY.				
335 N9VC	204 N0JAR KD2LPM	171 KD2NMG	132 W7PAT	118 AC0KQ	91 WW3S K1STM	90 AA4XV KB9GO KC9UC WA3QPX N1CVO W1VEG K8ED W4KX KD2IWN AB9ZA WB8RGE W3STN	Section Traffic Manager Reports				
325 W7EES	202 W9EEU	170 N1ILZ	131 K3EAM	117 N2DW W1LEM	89 K2PHD KA2HZP	Section Emergency Coordinator Reports					
303 W0PZD	196 KE8DON	166 NI2W	130 N2JBA KB9ROB WB9WKO KY2D KM4WXX KW1U N1UMJ W9BGJ	113 WA5EWN K9BJA	The following Sections submitted ARES Activity Reports for September: AL, CT, EMA, EPA, EWA, GA, IN, LAX, MDC, ME, MN, MO, NC, NFL, NH, NLI, NNY, NTX, NV, OH, OK, SC, SNJ, STX, TN, VA, WCF, WI, WMA, WTX.						
300 W9RY	195 W9GRG	165 WO2H KF5OMH AE5MI	115 NX9K K5ANP KN4WX	99 WJ3P KC1HHO	Brass Pounders League						
280 KC9FXE	190 KV2J ND8W	160 W4DNA	155 KA9IKK	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.							
259 KD2QAR	189 KO5KUS	150 KN4QJ KR4PI	186 W5RFY	WB9WKO 985, NX9K 906, WA3QLW 745, KK3F 707, KW1U 522, AG9G 505, KY2D 100.							
247 KA9IKK	187 W8ROY										
235 KT2D											
230 KB3YRU											

The following stations qualified for PSHR in previous months, but have not been recognized in this column yet: (September) NA7G 120, N7UWX 80. (August) W4CMH 175 [corrected number of points].

Section Traffic Manager Reports

The following Section Traffic Managers reported: AR, AZ, CO, CT, EMA, ENY, EPA, GA, IA, IL, IN, KS, KY, MDC, ME, MI, MO, MS, NC, NFL, NLI, NM, NNJ, NNY, NTX, OR, RI, SD, SFL, SJV, SNJ, STX, TN, UT, WCF, WI, WMA, WNY, WPA, WWA, WY.

Section Emergency Coordinator Reports

The following Sections submitted ARES Activity Reports for September: AL, CT, EMA, EPA, EWA, GA, IN, LAX, MDC, ME, MN, MO, NC, NFL, NH, NLI, NNY, NTX, NV, OH, OK, SC, SNJ, STX, TN, VA, WCF, WI, WMA, WTX.

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. WB9WKO 985, NX9K 906, WA3QLW 745, KK3F 707, KW1U 522, AG9G 505, KY2D 100.

Congratulations

October 2025
QST Cover Plaque Award Winner

Yasuhiro Kawai
JH1KOJ

In his article, "An Exponential Spiral Antenna," Yasuhiro explains the design of his no-tune spiral antenna for 160 to 10 meters, which was the third-place winner in the 80 through 10 meters category of the 2024 QST Antenna Design Competition.

QST Cover Plaque Awards are given to the author or authors of the most popular article in each issue. You choose the winners by casting your vote online at

www.arrl.org/cover-plaque-poll

Log in now and choose your favorite article in this issue!

An Exponential Spiral Antenna

This no-tune antenna for 160 to 10 meters won third place in the 80 through 10 meters category of the 2024 QST Antenna Design Competition.

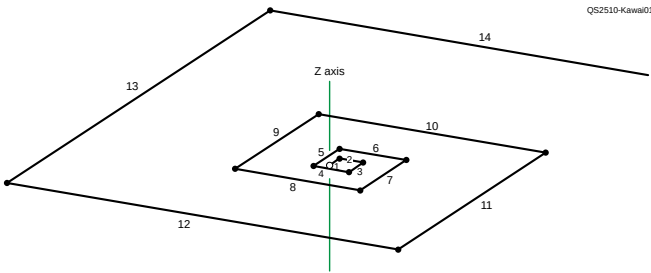


Figure 1 — Layout of wire segments 1 through 14.

Yasuhiro Kawai, JH1KOJ

This antenna is designed to operate across all HF bands without requiring tuning, and it has some circular polarization. For wide bandwidth, it's necessary to employ antenna structures such as self-complementary or traveling-wave types. Because I thought it would be easier to build without a terminating resistor, I considered a helical- or spiral-type design. A circular- or polygonal-shaped foundation would make the design more complex, so I opted for a shape based on a quadrilateral. If constructed at a constant height, it becomes a spiral antenna, and if the height gradually increases, it forms a helical antenna. I chose a simple spiral design. Because bifilar spiral antennas are difficult to construct, I opted for a single-wire design working against the ground. The antenna's gain was not a priority, and I considered a level of around 0 dBi to be acceptable.

To achieve broadband characteristics, the length of each element is adjusted exponentially. The 14-element configuration uses a base of 1.34 for the exponential adjustment, ensuring the longest element is approximately 45 meters (17 feet). By calculating $L1 = 1$, $L2 = 1.34$, $L3 = (1.34)^2$, $L4 = (1.34)^3$, and so on,

In practice, the 90-degree angles and element lengths differ slightly from the calculated values, as guy wires are secured using existing trees or buildings.

I used stainless-steel stranded wire with a diameter of 1 millimeter for the antenna elements. This

type of wire is lightweight, durable, and unobtrusive. Additionally, when purchasing from Amazon or similar online retailers, you often receive figure-eight-shaped crimping sleeves, which are very convenient. Be sure to use sharp pliers when cutting stainless-steel wire so you get a clean cut. Otherwise, threading the wire

Table 1 — Length of Each Segment

Segment Number	Length (Meters)	Length (Feet)
1	1.0	3.3
2	1.3	4.4
3	1.8	5.9
4	2.4	7.9
5	3.2	10.6
6	4.3	14.2
7	5.8	19.0
8	7.8	25.4
9	10.4	34.1
10	13.9	45.7
11	18.7	61.2
12	25.0	82.0
13	33.5	109.9
14	44.9	147.3

A Look Back



Celebrating Our Legacy

Returning to Radio After 4 Decades

I earned my Novice license in 1978, when I was 18. I passed the written exam and 5 WPM code test on my first try, thanks to an ARRL study guide, Morse code cassette tape, and coaching by my father, K7YNW (SK). As a boy, I loved the smell of warm vacuum tubes and seeing the yellow light cast by a beat-up, hand-me-down shortwave receiver bearing news from the world beyond my bedroom.

I was thrilled when a seasoned operator I worked complimented my fist, but I still suffered from stage fright when I was on the air. After a couple of months, my on-air time tapered off as I became focused on college and work. I let my license lapse, and eventually my old radios — including a Heathkit HW-8 QRP transceiver my father built for me as a Christmas present — were boxed up.

Over the intervening years, the allure of radio stayed with me. After retiring from the US Coast Guard in 2021, I returned to ham radio. I earned my Technician license before quickly upgrading to General. Later, I earned my Amateur Extra.

Since getting back into radio in 2021, I've enjoyed thousands of contacts, many of which were made using CW. I had to re-learn code almost from scratch, and while I'm not very fast, I get by. I've even made some contacts using my old HW-8 (that survived 4 decades of neglect) and the straight key my dad gave me. I'm glad that old gear is still with me — and that the stage fright is not.

Rob Hanley, NB8R
Moorefield, West Virginia

My Journey to General

In 1976, my Novice ticket was about to expire, so I decided to go for my General-class license. I was confident I could pass, but I had to get from New Jersey to the FCC office in New York City. I got permission from my parents to miss school and make the journey on the bus with a neighbor who was a high school junior and fellow radio enthusiast, but on the day of the test, they didn't show, so I took a solo bus trip to the city at just 14 years old.

I studied on the bus until we reached Manhattan, where I took a train downtown to Houston Street. As I exited the station, I had no idea I was heading in the wrong direction until a friendly stranger tapped my shoulder — a fellow ham on the train saw me studying and knew I was on my way to take my test! He pointed me in the right direction and wished me luck.

I passed the test and returned home, never telling my parents about my solo trip to the big city until decades later!

Michael Broihier, K2SAX
Spearfish, South Dakota

Connecting Amateur Radio with Computer Programming

In 1953, I attended the National Boy Scout Jamboree. One activity that really caught my interest was a demonstration of an amateur radio station making contacts all over the US. Our troop leader was a licensed ham and helped me learn Morse code as well as the technical requirements for a ham radio license.

I spent my career in real-time computer programming for super-

visory control systems and data communications. When I heard about software-defined radio (SDR) in 2019, I was excited to learn how to combine my computer programming experience with my amateur radio interests. Because I graduated from college in 1961, the concepts of digital signal processing (DSP) and SDR had not been conceived yet, so I had no formal education in those subjects. As a matter of fact, there was no course in computer programming either! All my programming education was self-taught.

I became interested in the GNU Radio Project, a free, open-source software development toolkit that provides DSP blocks to implement software radios. When I first started studying GNU Radio, I had to learn about DSP concepts as well as how the hundreds of GNU Radio functional blocks worked.

Now that I'm retired, I spend most of my time experimenting with digital data transmission methods, testing new versions of the GNU Radio Project software, and monitoring the GNU Radio chat rooms to answer questions and help the newbies, among other things.

Barry Duggan, KV4FV
Madison, Alabama

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.

Classic Radio

Collins Radio's Contributions to Ham Radio Technology

Collins Radio made many contributions to the technology used in the design of amateur radio equipment. Some designs were protected by patents, while others were widely and rapidly replicated. Most of their significant contributions occurred after World War II. During the war, the immediate beneficiaries of their products were the US government and the military, not the public.

Upgraded Oscillators Gave Operators More Choices

In 1946, the 75A and 75A-1 receivers were the first to use crystal-controlled first conversion in the front end of receivers, a tunable first intermediate frequency (IF) with a fixed range, and an unswitched tunable oscillator. These new ideas gave the same tuning rate and frequency readout on all bands. The Collins 75A to 75A-3 receivers were excluded from having the same frequency readout on all bands, because they covered the 10- and 11-meter bands by doubling the frequency of the tunable oscillator and making the tunable IF on those bands twice as wide as the lower and narrower bands. But, all the later Collins receivers, transceivers, and transmitters, starting with the KWS-1 in 1955, used these basic ideas.

R. L. Drake and Cosmos Industries were the first to adopt these concepts: Drake with their historic 1-A SSB receiver, and Cosmos Industries with their Cosmophone 35 transceiver that had two variable frequency oscillators (VFOs), allowing the transceiver to receive and transmit on the same or two different frequencies.



The Collins KWM-1 transceiver used a PTO that covered only 100 kHz. [Photo courtesy of www.rigpix.com]

Collins developed a very stable variable oscillator for their products that used variable inductance to tune the oscillator, called a permeability tuned oscillator (PTO). The PTOs used in the 75A to 75A-4 receivers covered 1000 kHz, as did the PTOs in the general-coverage 51J-1 to 51J-4, 51S-1, and military-based R-388/URR, R-390/URR, R-391/URR, and R-392/URR. The Collins KWM-1 transceiver used a PTO that covered only 100 kHz. A year or two later, the S-line and KWM-2 used a PTO covering 200 kHz, so all the amateur radio bands from 80/75 to 15 meters took only two or three band-switch positions.

A New Way to Transceive

In 1958, Collins developed the concept of transceiving where a transmitter and receiver (in this case, the famous Collins S-line) operated on the exact same frequency and were both tuned using the receiver dial. This concept was widely copied. In 1958, Eldico replicated Collins Radio's new transceiving idea with the S-119 SSB/CW station that consisted of the R-104 receiver, T-102 transmitter, P-109 power supply, and M-135 station console that contained an RF wattmeter and a phone patch.



R. L. Drake's T-4 transmitter transceived only with their R-4. [Photo courtesy of www.rigpix.com]

In 1962, Hallicrafters used the transceiving idea devised by Collins with their SX-117 receiver and HT-44 transmitter. Like Collins, the HT-44 transmitter had a front-panel switch to select transceive or to separate frequency control by the receiver and transmitter. And, like the Collins and Eldico transmitters, a separate ac power supply was needed to operate the transmitter.

The third major amateur radio company to seize the transceiving idea from Collins was Heathkit in 1964, with the SB-400 transmitter that transceived with the SB-300 receiver. However, the original SB-400 required that the cables to the SB-300 be changed inside of the SB-400 to switch between transceiving and separating control of the receive and transmit frequencies.

Also in 1964, R. L. Drake released their R-4 receiver and T-4 transmitter, which transceived only with the R-4 and didn't have an internal VFO to separately control frequency on the T-4. In 1966, Drake's 4-line product portfolio was expanded to include the T-4X transmitter with an internal VFO to allow the R-4 and T-4X to choose to transceive or to control the operating frequency separately via a front-panel switch on the transmitter. Drake used a permeability tuned oscillator but couldn't call it a PTO because that term was a registered trademark by Collins Radio.

In 1966, Heathkit updated the SB-400 to the SB-401, adding a front-panel switch to go between transceiving with frequency control by the receiver or separating control with the receiver and transmitter, setting their own frequency. The SB-401 retained the internal power supply but lost the crystals to operate without a companion. Heathkit sold a set of crystals to enable the SB-401 to operate as a standalone transmitter.

Additional Inventions

Collins also invented the mechanical filter to provide excellent selectivity for receivers and a means to generate SSB signals in a transmitter or transceiver.



Cosmos Industries adopted Collins Radio's idea of an unswitched tunable oscillator with their Cosmophone 35 transceiver. [Photo courtesy of www.rigpix.com]

The mechanical filters I've encountered are designed to operate at frequencies between 250 and 500 kHz. The KWM-1, KWM-2, S-line, 75A-3, and 75A-4 receivers, as well as the Eldico S-119 SSB station and the Sideband Engineers SB-33 largely solid-state transceivers, all used Collins' mechanical filters operating at 455 kHz.

I also credit Collins with the concept of an SSB transceiver that transmits and receives on the exact same frequencies without any operator intervention. This was possible with their KWM-1 SSB and CW transceiver. I believe the next transceiver was the five-band Collins KWM-2, which sold for \$1,150. After that, Swan Electronics released their single-band transceivers for 20, 40, and 75 meters.

Collins continued to upgrade the S-line receivers and transmitters until 1964. They sold the S-line, KWM-2, and KWM-2A until 1975, without making any changes. In 1978, Collins released the solid-state KWM-380 SSB/CW transceiver, which was the last amateur radio product that Collins manufactured.

100, 50, and 25 Years Ago

January 1926

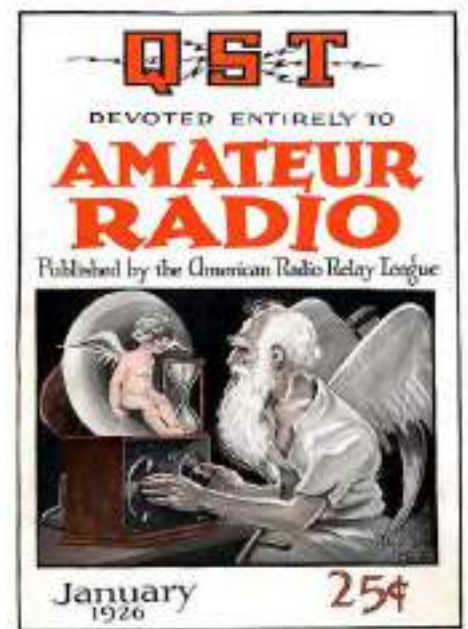
- The cover, by Clyde Darr, 8ZZ, rings in the new year with a depiction of Old Man 1925 introducing Baby New Year 1926 to the miracle of modern radio.
- Traffic Manager F. H. Schnell takes readers on a trip through the South Pacific in "The Cruise of NRRL Aboard the U. S. S. Seattle," explaining his operation of the ship's station.
- In "A New Reflex Circuit," L. W. Hatry, 1OX, outlines a new setup for receiving using the circuit described as "the bane of more fans than any other circuit."
- "Practical Crystal-Controlled Transmitters" features two different setups: a crystal oscillator at 4XE by William Justice Lee, and an A. C. crystal control set from John M. Clayton.
- Technical Editor Robert S. Kruse, 1BAO, walks readers through "The Voss Picture Transmitter," describing how it works and where it might have difficulties.
- An article by K. B. Warner summarizing "The Fourth National Radio Conference," held November 9 – 11, 1925, in Washington, DC, details the rejection of a proposal for broadcasting to take over the 150- to 200-meter band from amateurs, among a few other items.

January 1976

- The cover features ARRL staffer Donna making measurements on a new 432 MHz amplifier.
- In a big change, QST moves from its original size of 6.5 × 9.5 inches to its current size of 8.5 × 11 inches, which editor Richard L. Baldwin, W1RU, explains is a method of saving money on paper costs, and a reason to make some positive changes to the magazine's content.
- "A Tramp Amplifier for 432 MHz" by Thomas McMullen, W1SL, and Clarke Greene, WA1JLD, provides an easy way to get more power for Oscar 7, Mode B, via a table-top conduction-cooled unit that would deliver 100-watt output at a drive level of less than 10 watts.
- Jay Rusgrove, WA1LNQ, outlines the construction of a transmitter for 15 meters called "A 15-Meter Goober Whistle."
- Jerry Hall, K1PLP, and Charles Watts, WA6GVC/1, start a series called "Learning to Work with Integrated Circuits," providing an instructional and practical guide to getting started.
- "Trash Can Art" by Irving Smith, WB2BCY, describes how Bob Buus, WA2HVA, combined extra electronic parts from the trash at his work with some non-junk parts to build an Oakey on the cheap.
- In "I Wish I Had Known," Edward J. Durnall, K1BYE, provides some outside-the-box tips on preparing for FCC licensing exams.

January 2001

- The cover features the launch of "the most advanced Amateur Radio satellite ever created," Phase 3D (later renamed AMSAT-OSCAR 40).
- Robert Johns, W3JIP, provides instructions on "A Ground-Coupled Portable Antenna" he built patterned after an Alpha Delta Communications, Inc. model. However, instead of using radials, his antenna uses a simple and very small grounding system with no tuning required.
- Don A. Gagnon, WB8HQS, asks the question "Does Your Club Need a Web Site?"
- "MFSK for the New Millennium" by Murray Greenman, ZL1BPU, dives into the "newest super-RTTY," MFSK16, and sees how it stacks up against the digital-mode standard at the time, PSK31.
- In "The HF Digital 'Tower of Babel,'" Steve Ford, WB8IMY, takes a look at the various digital modes that were available to HF operators at the time, including RTTY, AMTOR, PACKET, PACTOR, Clover, G-TOR, PSK31, Hellschreiber, MT-63, and MFSK16, plus a look at what the future might bring.
- "Simulating Circuits and Systems with *Serenade SV*" by David Newkirk, W9VES, walks the reader through tests of several of the features of the *Serenade SV* program, including simulating an amplifier, an oscillator, a mixer, and a BPSK communication system.



Silent Keys

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

▼K1CGH W1DAY ▼K1DPO WA1HFQ ◆N1IST ▼K1JCF ▼WM1M ◆KY1O ▼KC1PEZ ▼NQ1Q W1RFI N1SAK ▼N1SRU W1TEM N1VP ▼N1ZMD ▼W1ZQR ▼AC2D KC2EZL WA2FHV WB2FSL W2HF N2HFN ▼K2HVB KE2IL WA2ILD K2IUN ▼W2LB ◆NK2M KA2NXY ▼KD2OYS W2RLB WA2SLK ▼KR2T ▼WB2TBT ▼K2TQN ▼KU2US ▼W3AVB N3CS ▼K3FK ▼KB3FWW W3HHN ▼KA3GW ◆K3LVS ▼K3NAU ▼KB3RA ◆KD3RN ◆K4AC ◆W4ALE ◆N4AMI ▼KJ4CRO N4DIA ▼W4ENE WB4FAA ◆WB4FFV ◆KM4HOZ ▼K4ITV W4IVF K4KFQ KD4KZB KA4LDZ ▼KF4LQR	Lennon, John L., Kingston, NH Day, David E., Amherst, NH LeBel, Leo A., Stratford, CT DiMaggio, Joseph A., Wethersfield, CT Ardai, Michael L., Malden, MA Farrell, Joseph L., Wallingford, CT Amacher, David, Lyme, CT Morgan, Alan D., Lawrenceburg, KY Gendron, Bob, Tyngsboro, MA Neff, Edward C., Sautee Nacoochee, GA Hare, Edward F., Burlington, CT Barron, James M., Pepperell, MA Solomon, Harold R., Fall River, MA Drake, Ronald E., Jamestown, RI Carron, Earl A., Leesburg, FL Trainer, Leonard L., Hanover, MA Kenick, Joseph L., Exeter, NH Nord, John A., Jamestown, NY Cochrane, James L., East Rochester, NY Boyle, Thomas G., Nassau, NY Cascone, Robert S., Pequannock, NJ Holle, Alan S., Lawrence, KS Glaser, Craig S., Manchester, NJ Van Beuzekom, Henry, Ringoes, NJ DiQuattro, Salvatore, Cornelia, GA Tallman, Donna L., Delanson, NY Cox, Champion C., Hertford, NC Brightenfield, Laurence, Farmington, NY Williams, Gary H., Springfield, MI Dean, Thomas J., Buffalo, NY Bennett, Guy, Olean, NY Brossard, Richard L., Depew, NY Burke, Charles C., Farmingdale, NJ Vecchiola, James L., Voorhees, NJ Blodgett, Edward E., Webster, NY Dilks, John H., Egg Harbor Township, NJ Villone, Kenneth J., Conesus, NY McClellan, Robert J., Kernersville, NC Smith, Chris, Youngsville, NC Irving, Richard A., Edgewater, MD Brown, Raymond B., Great Mills, MD Young, Timothy M., Stillwater, NY Henry, Rodger G., York, PA Brizzolara, Alfred A., Wilmington, DE Bliley, Charles A., Webster, NY Gusty, George, Millsboro, DE Krohn, Ray A., Danville, PA Rehman, Doug, Reedy, WV Fisher, Ron B., Jefferson, GA Franklin, Ted C., Sugar Hill, GA Jones, Tony, Swannanoa, NC Jacobus, Michael, Cantonment, FL Tonne, James L., Oak Ridge, TN Cissell, Ann H., Bartlett, TN Wiley, Ralph W., Storm Lake, IA Jones, William R., Roberta, GA Whicker, Charles R., Bristol, VA Anderson, Gary N., Stuart, VA Lucas, Donald A., Sacramento, CA Kenamer, Parnell D., Tuscumbia, AL Mangham, Thomas R., Opelika, AL Blount, Everett H., Venice, FL	K4MLR ◆N4ND ◆KD4NLE ▼K4NUM ▼K14NXU ▼KL4O ▼KU4RB N4SLM ▼W4TTK ▼W4UKE ▼W4VTY K4XDE ▼KD4YMP ▼KE4YWT ▼KB4ZW ▼KJ5AUE ◆N5CDF ◆KG5DLB KD5DVT WA5GES ▼KM5GZ VP5JM KC5LQP ▼KI5P KE5PO ▼W5TW ▼KD5WER ▼W6BCW ◆AC6BW ◆W6EB KH6GQM W6IJ K6IMR ◆K6JAT ◆W6KM K6LT N6MM W6NN KB6OIN K6OKW ▼K6OSR ◆N6REP ▼AA6TN ▼KD7BUO K7BUS W7CZA KB7DRX ▼KD7DYR ▼N7GJV ▼N7KR ◆KL7LF ▼W7LKG ▼KW7LT N7NDC WZ7P ▼WA7SFL ▼AC7UL N7XHX ▼KE7YUI AE7Z AF7ZQ ▼K8AKF ◆KU8C KC8DFM	McKenzie, Robert W., Decatur, AL Shepherd, Sue E., Soddy-Daisy, TN Mouw, Gloria, Dade City, FL Wester, Arthur, Sarasota, FL Worley, Grady C., Mars Hill, NC Bruce, John, Delta Junction, AK Rowe, Donald F., Sebring, FL Miles, Steven L., Columbus, MS Caughman, Walton M., Cumming, GA Gutt, Rudy F., Vienna, VA Frizzell, Ben M., Bristol, TN Ray, Daniel C., Raleigh, NC Woodrow, Larry W., Boone, NC Brewer, Marvin R., Clay City, KY Ginn, Fred L., Lander, WY Davis, Michael W., Buckholts, TX Furlong, Chris D., Tampa, FL Polizzi, Robert J., Del Valle, TX Woods, David W., Tulsa, OK Fields, Bertrand, Milano, TX Coxsey, Robert C., Edmond, OK Millspaugh, Jody O., Lake Worth, FL Renouard, Kenneth B., Albuquerque, NM Pierce, Leroy, Jacksonville, TX Long, Stewart W., Fulshear, TX Lott, Billy D., Tuscaloosa, AL Flaig, Timothy A., Oklahoma City, OK Wolfe, Bobby C., San Diego, CA Miller, Roger W., San Jose, CA Abraham, James W., Los Altos Hills, CA Ah Sam, Henry, Columbus, GA Farr, Thomas A., Denair, CA Pearson, Philip D., Cincinnati, OH Tiemstra, James A., Oakland, CA Letrich, Richard M., San Jose, CA Tudor, Lauren J., Pleasant Grove, CA Colouch, Joseph A., Newark, CA Sombor, Anna, Los Gatos, CA Goertzen, James H., Sonoma, CA Stone, Howard I., Encino, CA Davidson, Gary M., Sonora, CA Crossland, Shawn R., Greenville, TX Neal, Terrance M., Costa Mesa, CA Cowell, Curtis M., Prescott, AZ Casady, Keith D., Harrah, AZ Rogers, Clyde E., Spokane, WA Shellman, Terry P., Camas, WA Cooper, Thomas M., Camas, WA Streep, Steven N., Arco, ID Stephens, Michael W., Veradale, WA Voelkelt, Joe, Greeley, CO Leary, Richard S., Tacoma, WA Nigro, Louis N., Fort Myers, FL Trout, Napa C., Las Vegas, NV Wilde, Richard C., Chandler, AZ Meinen, Donald L., Kansas City, MO Reid, William E., Kuna, ID Burgess, David E., Sandy, UT Mostachetti, Larry E., Brookings, OR Beal, Lon, Spokane, WA Andrews, Douglas C., Concrete, WA Bailey, Charles V., Ashville, OH Robinson, Robert, Parkersburg, WV Shook, Margaret A., Coalton, OH	◆K8EHA KE8GMI ▼W8IWF ▼K8JJ W8JWP ◆W8KGR ▼W8LMN KE8MFP ▼W8QFN KR8R N8RPA ▼KG8XC N8XV ▼W19ARC ◆AA9CI KB9DPF ◆W9DRW K9ILG K9ITX ▼KA9IVP WA9JDR W9KE ◆W9KWG ◆N9WK K9WMM ▼WB9YLR KD9YOV W0AFO N0ATC ▼KD0CAG ◆KI0F W0HXS ▼W0KG N0KUX WA0MMZ ◆KA0ORI KC0RZN ◆W0TVI ▼W00V ▼NU0W ▼N0XAQ VE3MJH VK9NL ◆ARRL Life Member ◆Current Diamond Club ◆Maxim Society ▼Veteran ◆Former call sign	Miller, Edward J., Parma, OH Bowen, Roger, Shelby, MI Webster, Richard A., Grand Rapids, MI Jones, James R., Shepherd, MI Williams, Richard A., North Canton, OH Roersma, Karl G., Cedar Springs, MI Larson, Richard W., Saline, MI Linn, Douglas L., Pinckney, MI Ackerman, John W., Kent, OH Paetzel, Gerhard, Chesterland, OH Pennebaker, Brian, Macedonia, OH Hamel, Roger W., Rogers City, MI Culver, William H., Howell, MI Buck, D. Stephen, Menomonee Falls, WI Golownia, Bernard G., Saukville, WI Buesching, Dennis P., Fort Wayne, IN Herman, Richard N., Glenview, IL Davis, George A., Indianapolis, IN Bickett, Glenn, Lafayette, IN Schonhoff, Loran L., East Dubuque, IL Schmidt, Pilotwi J., Altoona, WI Doyle, Tom E., Middleton, WI Stroud, Richard S., Kokomo, IN Koltz, William F., Oshkosh, WI Monkewich, Rudolph A., New Buffalo, MI Sides, B. J., Lindenhurst, IL Gotski, Thomas A., Berwyn, IL Akin, Jay R., Plattsburg, MO Wittig, Charles B., Oak Grove, MO Mason, Noel F., Loganville, GA Wise, Roger F., Wabasha, MN Woodworth, Lawrence E., Overland Park, KS Goodall, Arthur L., St. Peters, MO Ryan, John M., Lawrence, KS Brown, Steven P., West Liberty, IA Nelson, Donna K., Davenport, IA Hafner, Todd P., Sykeston, ND Toenjes, Thomas J., St. Marys, KS Seawright, Marshall C., Escanaba, MI Hanson, Gary, Duluth, MN Leeds, Floyd A., Council Grove, KS Hayward, James H., Mississauga, Ontario, Canada Jenkins-Smith, Kirsti, Norfolk Island, Australia
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For information on how to list a Silent Key in QST, please visit www.arrrl.org/silent-key-submission-guidelines.

Note: Silent Key reports must confirm the death by one of the following means: a copy of a newspaper obituary notice or death certificate, or a letter from the family lawyer or executor. Please be sure to include the amateur's name, address, and call sign. Allow several months for the listing to appear.

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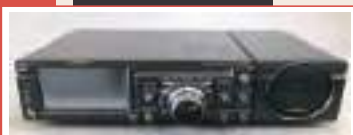
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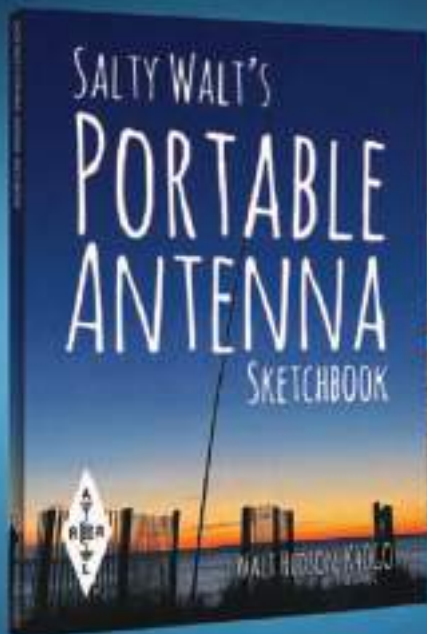
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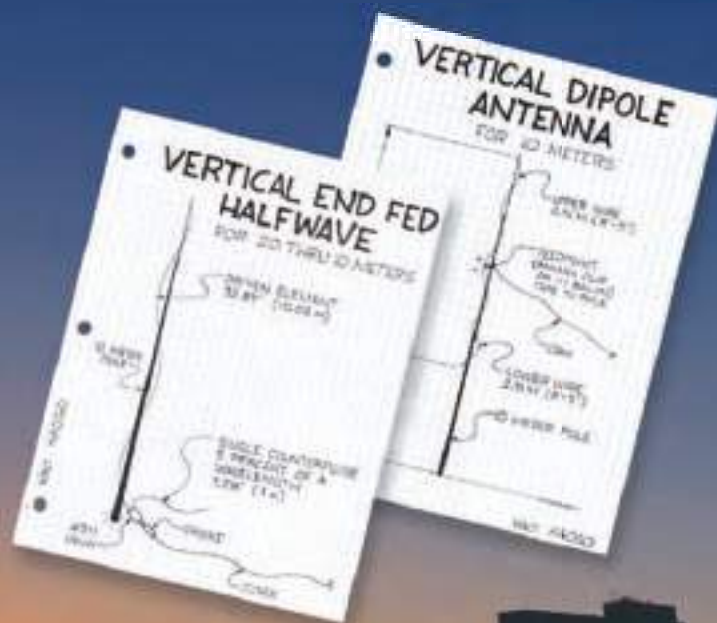
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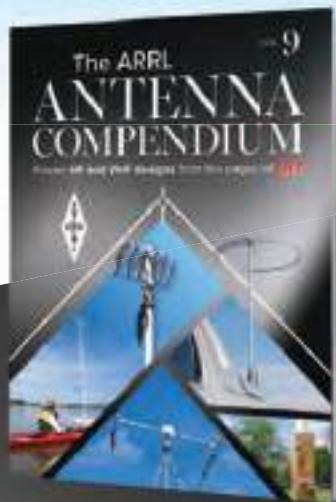
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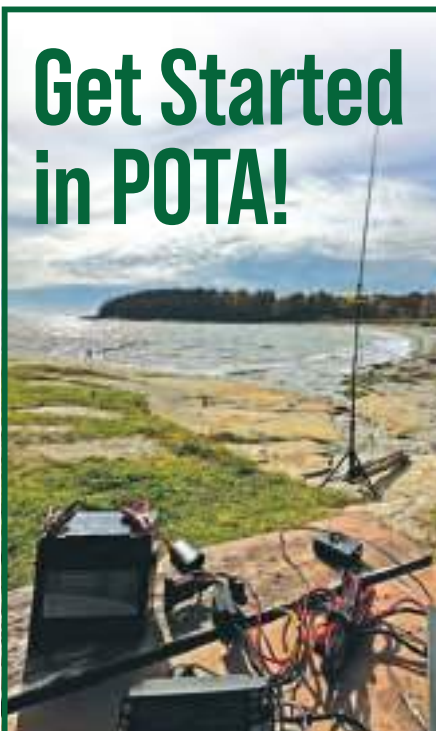
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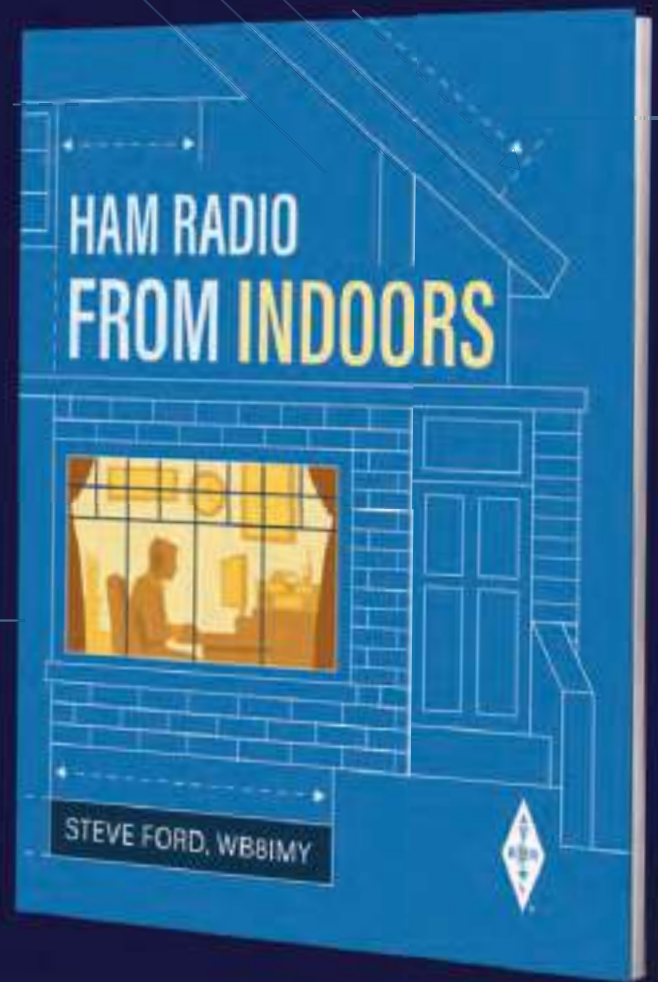
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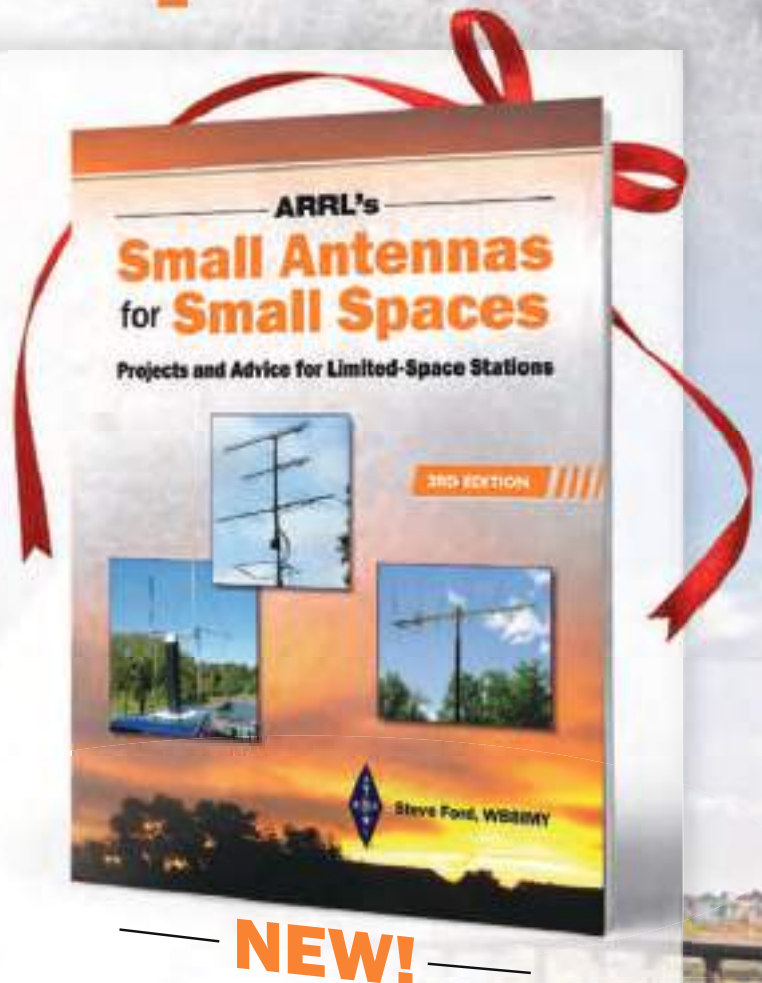
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- Public service events
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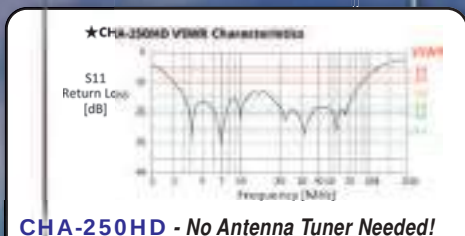
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3 COMET GP-6 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA

Wavelength: 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 5 • Gain-146 MHz: 6.5dBi / 446 MHz: 9dBi • Max Pwr: 200W • Length: 10'2" • Weight: 3lbs. 8ozs. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

4 COMET GP-9 / GP-9N DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA

Wavelength: 146MHz 5/8 wave x 3 • 446MHz 5/8 wave x 8 • Gain-146 MHz: 8.5dBi / 446 MHz: 11.9dBi • Max Pwr: 200W • Length: 16' 9" • Weight: 5lbs. 11ozs. • Conn: GP-9 Gold-plated SO-239 • GP-9N Gold-plated N-type female • Construction: Fiberglass, 3 Sections

5 COMET CX-333 TRI-BAND 146/220/446MHZ BASE REPEATER ANTENNA

Wavelength: 146MHz 5/8 wave x 2 • 220MHz 5/8 wave x 3 • 446MHz 5/8 wave x 5 • Max Pwr: 120W • Length: 10'2" • Weight: 3lbs. 1oz. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

6 COMET GP-15 TRI-BAND 52/146/446MHZ BASE REPEATER ANTENNA

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