

QST



DIGITAL EDITION



ARRL The National Association for
Amateur Radio

September 2024

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Roving by Kayak

QST Reviews

Kenwood TH-D75A Tri-Band FM/
Digital Transceiver

DX Engineering NOISELOOP Portable
Flag Antenna Kit and Portable Receive
Preamplifier-Attenuator

Elk Antennas 2M/440L5 Dual-Band
Portable Log-Periodic Antenna

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- High Resolution 4.3-inch TFT Color Touch Panel Display
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- Equipped with the External Display terminal

*Multi-signal receiving characteristic: 14MHz band/2kHz separation

*TX Phase Noise: 100W, CW mode

FT-710 AECS

- Includes External Speaker SP-40

FT-710 Field

- Includes Carrying Belt
- To use the AECS function, External Speaker SP-40 (Optional) is required
- Display is not included. The image is shown with an optional third-party external display that may be connected using a DVI-D digital cable.



* Photo shows the FT-710 AECS

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

FT-710 Aess

Acoustic Enhanced Speaker System

HF/50MHz 100W SDR TRANSCEIVER

FT-710 Field

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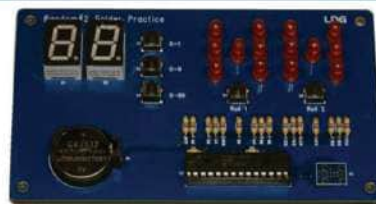
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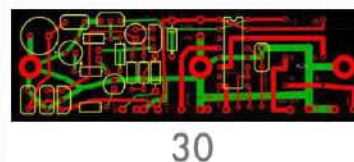
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Our Cover

Matthew, K2EAG, and Angela, N3ARB, Brown, and their friend Dennis Schultz, N2DJS, participated in the US Islands Awards Program's 2023 W/VE Island QSO Party as an Island Rover team, activating five islands in one of the largest lakes in Pennsylvania. The islands in question are accessible only by water, so the team mapped a water route, made camping reservations, packed their gear, and embarked on an activation adventure. Read "W/VE Island QSO Party: A Kayak Rove," by Matthew Brown, K2EAG, to learn how it all turned out. [Matthew Brown, K2EAG, and Angela Brown, N3ARB, photo]



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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
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Monoband Base Station/Repeater Antennas				
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F22A (2 Section)	2m	10.5	200	UHF
CP22E (Aluminum)	2m	8.9	200	UHF
F718A (Coax Element)	70cm	15	250	N
Dualband Mobile Antennas				
SG7900A	2m/70cm	62.2 in.	150	UHF or NMO
SG7500A	2m/70cm	40.6 in.	150	UHF or NMO
NR770H Series	2m/70cm	38.2 in.	200	UHF or NMO
MR77 Series	2m/70cm	20 in.	70	Mag Combo
AZ504FXH	2m/70cm	15.5 in.	50	UHF
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Second Century

Dewey Defeats Truman!

"LoTW is dead and all the data is gone forever!" Who doesn't love a sensational, but completely false, headline? Did you read the posts from the systems gurus and armchair insiders? We did — in emails from panicked members. Alas, the real headlines read more like, "LoTW is back on, and I uploaded my logs!" And, "The LoTW queue of 60,000 logs is now completely caught up in less than 4 days!"

The real hero of this story is Jon Bloom, a former ARRL IT Manager who wrote most of our Logbook of The World. We've been working with Jon for months now, on improvements to LoTW with an eye to the next generation of the system. When we suffered our network attack, Jon jumped into action, taking a full backup of the database off-site. He even has a version of LoTW running on an off-site server with the latest version of Linux, and on a completely different database system. The question of LoTW being safe and sound was never an issue. Despite the headlines. It was more about how we were going to bring it back online with the dependencies it has on other systems in the enterprise, while working to contain and remedy the attack on our network. This took longer than we would have liked, but we were being conservative and deliberate about bringing it back into reliable service.

We take very seriously the responsibility of keeping LoTW up and running. After all, we're administering amateur radio's worldwide logbook and confirmation system! It is one of our most popular and important member benefits. For a long time LoTW has had monthly uptimes of 99% or higher. We've made investments in the platform, servers, and processors. Keeping the hardware current has been important as LoTW users have radically changed the way they use the system. Long gone are the days of occasional large uploads replacing trips to the post office. Today, most of the traffic on LoTW is a single contact — but the envelope that one contact sits within must be processed just as a thousand contacts would.

If you are an LoTW user, or a fanatic like I am, you might find it interesting that most LoTW users are not ARRL members. The service is popular with international users, including top contesters, DXers, and rare DXpeditions. Of course, the personal accomplishment reflected in your log makes LoTW valuable to every user. There are many opinions on how LoTW should be structured to help fund its full operating costs, but being a member is the easiest way to start. President Rick Roderick, K5UR, and I recently sent out more

than 30,000 emails to non-members in Europe who have used LoTW within the past year, asking them to consider supporting LoTW by joining ARRL. How many users stepped up and became members? 74. So, clearly, asking for support from the people who use it is inadequate. A similar issue exists on the support side: Nearly 60% of the support emails we receive on LoTW come from non-members. Should there be a charge to support non-members? You're a member! What are your thoughts? So far this year, I have personally spent nearly \$100 so that DXpeditions will send me confirmations via LoTW. This notion of "pay to play" is the one thing I hear the most feedback on from members. If a DXpedition is collecting money to QSL via LoTW, should they be paying to do so? I already know some of your thoughts!

The future of LoTW looks very bright. ARRL awards, including DXCC, remain very popular. The integrity of the submissions is strictly adhered to. The current version of the system runs very well for the load that is placed on it. We plan on moving LoTW into the cloud so that greater horsepower and storage would be available on demand. Calls for changing the look of the user interface and mobile optimization are few and far between. But the next generation of LoTW can look and feel different.

If you're a new member, or a member who has not yet set up your LoTW account — do it! LoTW is fun because thousands of hams use it. The system is storing nearly 2 billion QSO records! So be the connector who uploads all your contacts to LoTW. Surprise a new ham by uploading the contact you've made with them on the same day, so they will begin earning QSL records and can get started with award hunting. Let's all confirm via LoTW.

David A. Minster, NA2AA
Chief Executive Officer



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PreciseRF HG3 QRO-B Stepper Magnetic Loop Antenna –
reviewed in May 2024 QST

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RigExpert Shackmaster Power 500 – reviewed in May 2024 QST



ACOM 500S 160-4 Meter Linear Amp –
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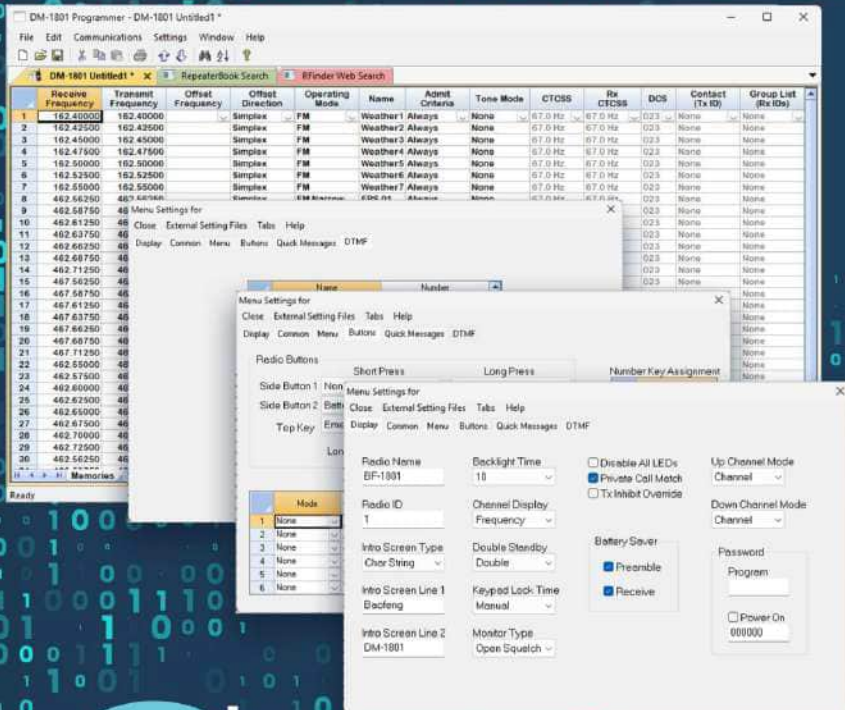
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Member Spotlight

Geoff Mendenhall, W8GNM

Geoff Mendenhall, W8GNM, spent decades in the broadcast transmission equipment industry holding prominent positions at well-known companies such as Broadcast Electronics and Harris Broadcast. He officially retired from Harris Broadcast in 2013. A year later, Geoff and his wife, Nike Mendenhall, W8MNM, built their retirement home on Catawba Island, Ohio.

After retirement, Geoff acted as a Federal Communications Commission consultant concerning issues surrounding the digital TV spectrum repack. He continues to do other consulting work today.

Starting Young

Geoff began tinkering with electronics at the age of 8. What lit the spark was his father's gift of an Olson seven-in-one radio kit. Six years later, Geoff and some of his friends earned their Novice-class licenses.

His first transmitter as a Novice was entirely homebrewed: a CW rig built around an 807 tetrode vacuum tube with a power supply whose components were scavenged from an old television set. Later, with the assistance of the late Bill Orr, W6SAI, Geoff designed and built a linear amplifier for 6 meters using an Eimac 4-400A tetrode. This amplifier was a high school science fair project that ultimately appeared at the national Junior Engineering Technical Society science fair in New York City.

Before graduating high school, Geoff earned his Advanced-class license, not to mention a First Class Radiotelephone license so he could work for local radio and TV stations. Later, he upgraded to the Amateur Extra-class license. Throughout the many years that followed, Geoff's passion for electronics in general, and amateur radio in particular, never waned.

Like many amateurs, Geoff credits the hobby with having a strong influence on his life. According to Geoff, "My ham radio background played a

key role in my pursuit of an electrical engineering education at the Georgia Institute of Technology and my subsequent career choice in RF transmission technology."

While attending Georgia Tech, Geoff worked for WAGA-TV in Atlanta as a camera operator and technician. His first job after graduation was with the COMCO division of EF Johnson in Coral Gables, Florida.

"But I really wanted to get back into broadcast-related design work," Geoff said. "So, I moved to Quincy, Illinois, in 1973 to work for the Gates Radio division of Harris Corporation. Later, I worked at Broadcast Electronics from 1978 to 1993 and then returned to Harris Broadcast and stayed until retirement in 2013."

Geoff is a Harris Corp (now L3Harris) Technology Fellow and holds nine US patents involving broadcast equipment. In 1999, he received the National Association of Broadcasters Radio Engineering Achievement Award for his contributions to FM broadcast technology. Geoff was also a member of the FCC Technology Advisory Committee.

Still Enjoying Amateur Radio and More

Geoff still enjoys homebrewing his own gear, including modeling, building, and evaluating his own antennas. Among his favorite on-air activities are joining friends in various nets and chasing rare DX.

"I'm also on the board of the Port Clinton Lighthouse Conservancy, and I am a docent in the summertime. With several other ham friends, we will be activating the Port Clinton Lighthouse



on August 17 during International Lighthouse/Lightship Weekend, which coincides with the Port Clinton Lighthouse Festival," he added.

In addition to his amateur radio activities, Geoff is an active sailor and enjoys sailing around the Lake Erie Islands. And yes, he occasionally operates amateur radio from a sailboat using an Icom IC-706MKII transceiver with hamstick antennas for 20 meters and up and an inverted-V antenna that hangs from the top of the mast.

Looking Ahead

Geoff takes a generally positive view of the future of amateur radio. "I am encouraged by the large number of licensed amateur radio operators in the US and around the world at the present time," he stated, "but I worry about whether there will be enough next-generation hams coming into this wonderful hobby. I think the new digital transmission modes are important to stimulate interest in young people and attract them to amateur radio."

Geoff believes that science, technology, engineering, and mathematics education opportunities in our school systems, and activities promoted by groups such as Ham Radio Science Citizen Investigation, can be attractive entry points for new amateurs.

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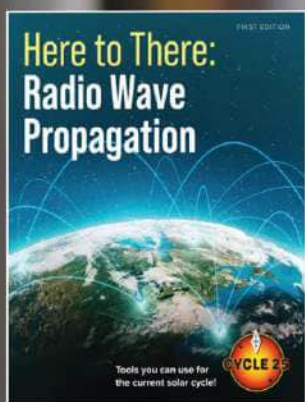
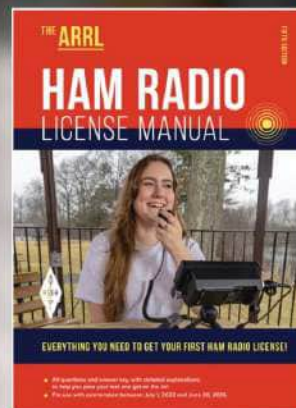
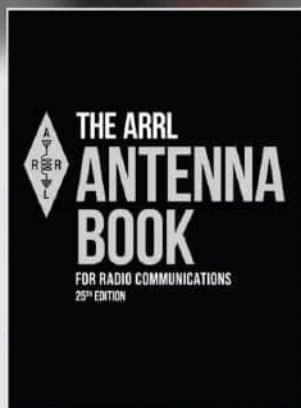
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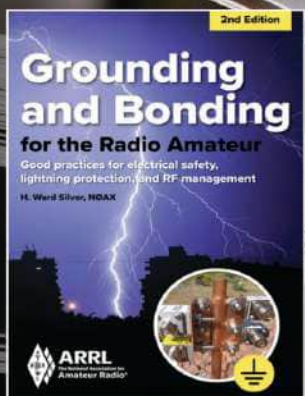
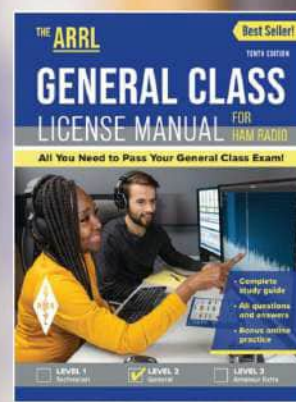
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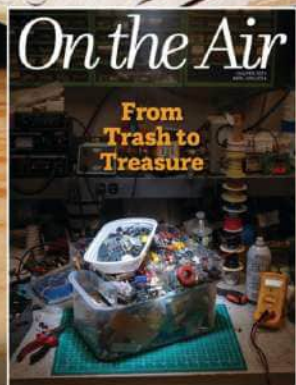
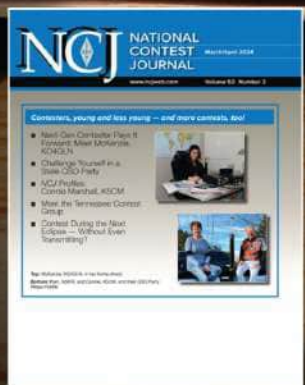
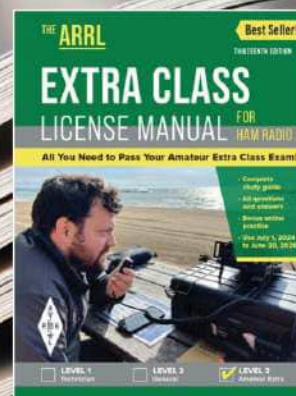


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Comprehensive I/O, plus full remote control

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

K4 KEY FEATURES

Optimized for ease of use

Modular, upgradeable design

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Up to 5 receive antenna sources

Full remote control via Ethernet



The K4 interfaces seamlessly with the KPA500 and KPA1500 amplifiers

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



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Up Front

Building Memories

Bob Davet, W8RID, was finally able to finish the project he and his dad started several years ago. They wanted to make two of these 3-500Z tube lamps (damaged tubes provided by RF Parts), one for each shack. Unfortunately, his dad, Robert E. Davet, W8JFQ (SK), passed away before the project was completed.

While sorting through some of his dad's old radio boxes, Bob came across the tubes along with all the parts. He pulled them out and rekindled the project.

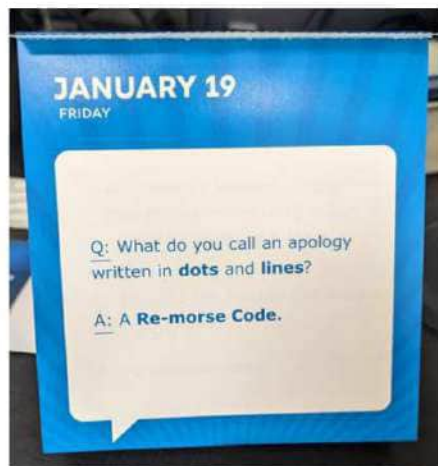
Bob says, "Now every time I turn on my radio equipment, the tube lamp turns on and reminds me of who got me into this hobby."



[Bob Davet, W8RID, photo]

Everyone Loves a Joke

Art Balourdas, AI6KK, shares this joke from the daily "Dad Joke" calendar his son Michael gifted him for Christmas.



[Art Balourdas, AI6KK, photo]

IOTA Beverages

A new drink for Islands on the Air participants? Not exactly. Adrian Stimpson, VE7NZ, shared this photo. This pilsner is part of a line of IOTA non-alcoholic craft beers manufactured by Phillips Brewing and Malting Company in Victoria, British Columbia, Canada. The name comes from the Greek letter iota, meaning an extremely small amount. But sure, you may be able to get some for your next IOTA event.



[Adrian Stimpson, VE7NZ, photo]

Where Elmers Hang Out

Trent Dowler, KG5DTI, found a place for elmers while traveling Highway 86 across Texas, between Nazareth and Tulsa. Trent may be right when he says, "I don't think it has anything to do with ham radio — but it does have an old radio tower out front with large letters that spell ELMER'S." Elmer's, in Tulia, Texas, is a local watering hole.



[Trent Dowler, KG5DTI, photo]

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Letters from Our Members

Hands-On Resources to Get Started

My interest in ham radio waned a bit as the main theme seemed to be making contacts or helping during emergencies. No emergencies have occurred in my rural area for the past century, and I don't find contesting very thrilling. Many would-be amateurs might look at our current high-tech hobby and wonder how to get started if they share similar feelings. I believe the way to begin is to build a very simple transmitter, a radio kit, and a separate receiver and learn by doing, as I did.

This approach gently leads prospective hams into electronics. Videos on the internet help a lot, too. They taught me how to design a variable-frequency oscillator. The analog-style projects and wire dipoles in *Experimental Methods in RF Design* by Wes Hayward, W7ZOI; Rick Campbell, KK7B, and Bob Larkin, W7PUA, are helpful, as opposed to complex digital circuitry that presumes a prior knowledge of many electronic subsets.

Charles Hooker, VE3CQH
Ontario, Canada
Life Member

Work DX with FT8

I enjoyed the article "Work DX with FT8" by Gregory P. Widin, KØGW, in the May 2024 issue of *QST*. The author made excellent points for maximizing the chances of making DX contacts with FT8 using *WSJT-X*. I want to add a couple of suggestions.

First, achieving DX when FT8 frequencies are crowded can be difficult, but switching to the often-overlooked FT4 mode can make a difference because it is less crowded. FT4 is sometimes mistakenly considered only a contest mode, but anyone can use it anytime for faster contacts.

Second, as wonderful as FT8 is, adding the *GridTracker* software connected to *WSJT-X* can create a whole new dimension to the enjoyment of it! It adds grid maps, automatic PSK Reporter spotting, call sign lookups, real-time gray lines, logging confirmation status, alerts, and much more.

Albert Hearn, WA4GKQ
Woodstock, Georgia

You Don't Need a Large Antenna to Succeed

I hope new operators do not think large antennas are required to have fun and succeed in our hobby.

My city has a 35-foot maximum antenna height restriction, and I have a basic three-element SteppIR 20-through 6-meter antenna at that height. I've been a ham for more than 60 years, and during that time, I have experienced some frustration with low-noise loops and phased antennas that can hear really weak signals. You can hear other hams, but they have a hard time hearing you or are working the strong stations they have propagation for. However, I have done very well in numerous contests, worked all US counties and 160-meter DXCC, and have a mixed DXCC total of 347, most of them achieved before FT8. With the advent of FT8, more people can work DX with minimal resources.

Having dual receive on a radio and understanding the concept of "up" will get you a lot of DX stations. I cannot count the number of times I've worked a DXpedition and continued to hear a superstation still calling 20 minutes later.

Just try, do the best you can, and make the most of what you have.

Rick Darwicki, N6PE
Yorba Linda, California
Life Member

Celebrating QST

Every issue of *QST* is a treasure, but the April 2024 issue was outstanding. The "Ask Dave" column featured a great question about antenna tuners, which reminded me of my mentor, Jim Trutko, W8EXI (SK), who helped many hams put up antennas.

The crossword puzzle was a nice touch! Of course, there were the Straight Key Night results, which were outstanding. Additionally, the simple construction projects and Arduino sketches were nice. Thanks for *QST*!

Jim Hebert, W8FDV
Mesa, Arizona

Teaching Kids Morse Code

I built two keys with piezoelectric audio buzzers and two AA batteries.

Young children love secret messages, so I gave the keys to two kids. They practiced using the keys in front of each other to learn the letters. Then they moved to separate rooms and practiced by using their cell phones on speaker mode to hear the audio tones and send and receive what they thought were secret messages over longer distances.

This technique works like a charm. In 1976, I got my two sons on the air, and they earned their General- and Extra-class licenses. Now it's my grandkids' turn. I just delivered these special keys to them.

Jim Garrett, K5BTB
Cumming, Georgia

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W1AW Schedule

PAC	MTN	CENT	EAST	UTC	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM	1300		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM- 12 ⁴⁵ PM	8 AM- 1 ⁴⁵ PM	9 AM- 2 ⁴⁵ PM	10 AM- 3 ⁴⁵ PM	1400- 1945	VISITING OPERATOR TIME				
1 PM	2 PM	3 PM	4 PM	2000	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	2100	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	2200	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	2300	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	0000	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	0100	DIGITAL BULLETIN				
6 ⁴⁵ PM	7 ⁴⁵ PM	8 ⁴⁵ PM	9 ⁴⁵ PM	0145	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	0200	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	0300	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.

♦ Morsecode transmissions: Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 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.

♦ Voicetransmissions: 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 2024, Headquarters and W1AW are closed on New Year's Day (January 1), Presidents Day (February 19), Memorial Day (May 27), Independence Day (July 4), Labor Day (September 2), Veterans Day (November 11), Thanksgiving and the following day (November 28 and 29), and Christmas Day (December 25).



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^{*2}: D-STAR is a digital radio protocol developed by JARL (Japan Amateur Radio League).

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External QSK T/R Switch for HF Amplifiers Using an Inexpensive Power Relay

AD5X describes a low-cost external QSK switch that will work with any amplifier.



The author's new inexpensive relay-based QSK switch.

Phil Salas, AD5X

CW is my favorite mode. It occupies probably 98% of my operating time. I enjoy full break-in operation, especially when chasing DX. In the February 2008 issue of *QST*, I described an external legal-limit, full break-in QSK switch for HF amplifiers. While that design worked well, it was expensive because it used the popular Jennings RJ1A 26 V dc vacuum relay. Also, an internal 50 V dc power supply was needed to power the RJ1A and the 12 V transceiver-switching relay. Recently, fast-switching, high-current relays have become available at very reasonable prices. A relay that I found to be of great interest is the inexpensive Panasonic DK1a1b power relay. Besides carrying legal-limit power, this relay has no contact bounce. Table 1 illustrates the comparison between the Jennings RJ1A vacuum relay and the Panasonic DK1a1b relay.

Table 1 — Jennings RJ1A Vacuum Relay vs. Panasonic DK1a1b Mechanical Relay

Relay	Switching Speed Max	Current Carrying	Lifetime	Cost
RJ1A	8 ms/8 ms operate/release	7 A at 32 MHz; higher current at lower frequencies	2 million operations	\$100+
DK1a1b	10 ms/8 ms operate/release	8 A	50 million operations	\$8

Table 2 — Parts List for External QSK Switch (Prices as of 7/2024)

Qty.	Description	Mouser Part Number	Price (each)
1	DK1a1b relay (RLY2)	769-DK1A1B-12V	\$7.65
1	DK2A-PS socket	769-DK2A-PS	\$4.29
1	DPDT signal relay (RLY1)	653-G6A-274P-DC12	\$5.32
1	16-pin IC socket	653-XR2A-1611-N	\$2.57
1	SPST switch	118-1MS9T1B1M1QES	\$5.34
6	4.7K Ω 1/4 W resistors	660-MF1/4LCT52R472G	\$0.11
2	22 pF 2 kV ceramic capacitors	810-CC45SL3DD220JYNA	\$0.35
1	15 pF 2 kV ceramic capacitor	810-CC45SL3DD150JYGN	\$0.37
1	10 pF 2 kV ceramic capacitor	810-CC45SL3DD100JYNA	\$0.37
3	0.1 μ F 100 V capacitors	581-SR211C104KAR	\$0.32
2	0.01 μ F 1 kV capacitors	810-CK45-E3AD103ZYGN	\$0.50
1	10 μ F 25 V elec. capacitor	80-ESK106M025AC3AA	\$0.22
1	0.33 μ F capacitor	594-K334K20X7RF5TH5	\$0.86
1	78L08 regulator	863-MC78L08ACPG	\$0.60
1	2N3906 PNP transistor (TO92)	512-2N3906TA	\$0.31
1	2N3904 NPN transistor (TO92)	637-2N3904	\$0.10
1	Two-pin header	538-90120-0122	\$0.49
1	Jumper	538-15-29-1024	\$0.48
1	2.1 $\times$ 5.5 mm dc jack	163-1060-EX	\$0.75
4	SO-239 connectors	601-25-7350	\$2.65
1	Phono jack	502-BPJF02X	\$1.68
2	1N4001 diodes	583-1N4001-B	\$0.21
1	Red LED	941-C503BRBNCY0Z0AA2	\$0.21
1	Green LED	941-C5SMFGJFCX14Q7T2	\$0.30
1	1/8-inch stereo jack	523-ACJS-MV35-3S	\$1.13
3	0.25-inch-long #4 Al. standoffs	534-8714	\$0.47
4	#4 solder lugs	534-7325	\$0.20
1	2.3 $\times$ 3.2 $\times$ 4.8-inch aluminum box	563-CU-472	\$12.30
Misc.	4-40 screws, nuts, and split lock washers		

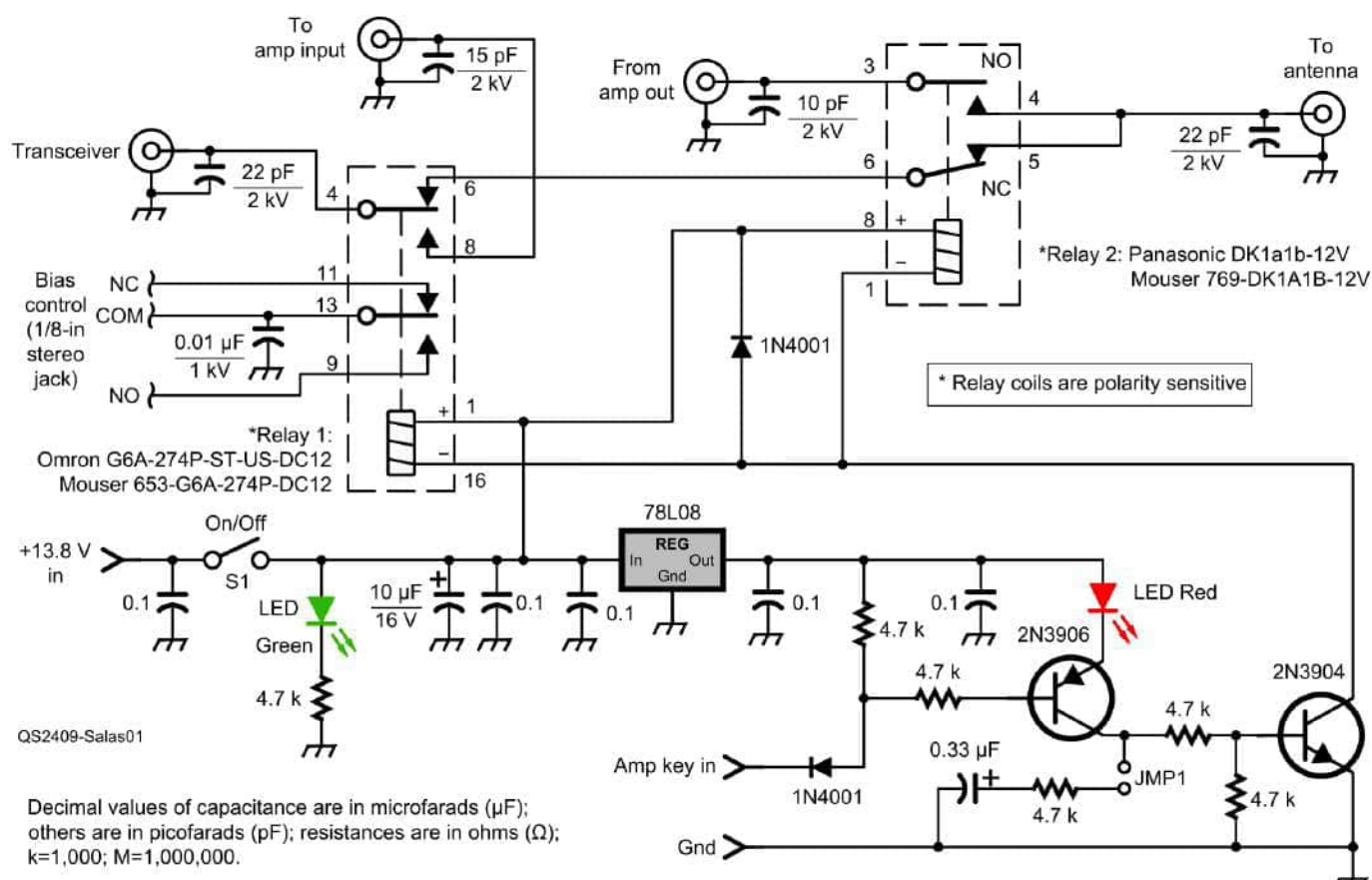


Figure 1 — The QSK switch schematic.

As you can see, the maximum switching times are almost identical. The DK1a1b also has 25 times the operating lifetime compared to a *new* RJ1A (many hams purchase “pulls” — or used relays — as the new cost is quite high). Finally, the DK1a1b is significantly less expensive than the RJ1A. It is interesting to note that the RJ1A vacuum relay is often quoted to have a switching speed of less than 5 milliseconds. While this may be a typical switching speed, we should always plan around the maximum specification to ensure that no damage to the transceiver or amplifier can occur due to hot switching. Timing information will be provided later in this article.

The schematic of the QSK switch is shown in Figure 1, and the components are listed in Table 2. Recommended Mouser part numbers are given. However, you can probably do better on pricing with a little shopping around.

This unit operates directly from your +13.8 V dc station power supply. RLY1, the transceiver-switching relay, is an Omron G6A-274P-ST-US-DC12. It has a current-carrying capability of 3 A and a maximum switching speed of 5 milliseconds. While the total current required by both relays is just 32 mA, I incorporated a

lower-current driver circuit that will interface to any transceiver with an amp-key output. This also interfaces with Icom IC-706 series transceivers, and Xiegu G90, X5105, and G106 transceivers, all of which have keying outputs that go to +8 V dc on receive and 0 V on transmit. The circuit also includes a keying LED, and you can jumper in extra delay to the output switch time in case your transceiver outputs RF after the amp-enable line goes high. I discussed this issue in my November 2011 QST article titled “Internal Full Break-in Keying Interface for the ALS-600 Amplifier.”

Construction Notes

Figure 2 shows my PC board layout (contact me for boards and/or the ExpressPCB layout). I used sockets for the relays in case they ever have to be replaced.

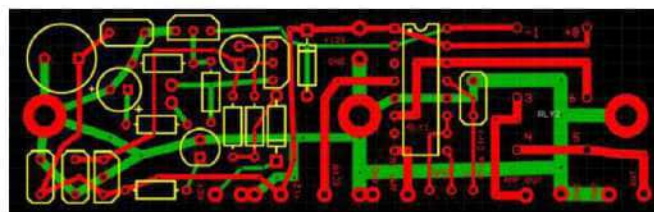


Figure 2 — The layout for the QSK relay-based switch.



Figure 3 — QSK switch internal view.



Figure 4 — Rear panel connector configuration.

However, based on both of the relays' expected lifetimes, this will rarely — if ever — occur.

I built the unit into an existing aluminum box, but the smaller box listed in Table 1 would be an excellent substitute as the complete PC board assembly is quite compact. Figure 3 shows the internal view of my QSK unit, and Figure 4 shows the back panel. I used 18 AWG solid buss wire for the RF and ground connections. Note that the capacitors that compensate for wiring inductance are soldered directly to the RF connectors. All labeling was done using a Casio labeler with black-on-clear labeling tape.

Some Timing Measurements

So, how fast is the switching? The plots in Figures 5 – 8 show the actual timing while sending dits at the rate of about 35 WPM.



Figure 5 — Input relay with no turn-off delay.

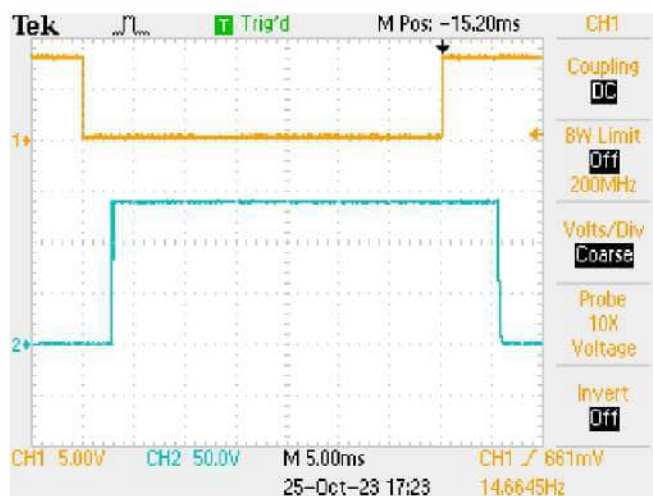


Figure 6 — Input relay with turn-off delay.

Figure 5 shows the input Omron relay timing with no added turn-off delay. The upper (orange) trace is the keying signal, and the lower (blue) trace is the relay operation. The relay keys in 3 milliseconds and unkeys in 2 milliseconds. Figure 6 shows the same relay with the added turn-off delay strapped in. In this case, the keying is still 3 milliseconds, but the unkey is 6 milliseconds.

Figure 7 shows the timing of the high-current Panasonic DK1a1b amplifier relay with no additional turn-off delay. This relay keys in 5 milliseconds and unkeys in 5 milliseconds. These are also the total QSK unit key/unkey switching times, as this is determined by the slowest relay. Figure 8 shows the same relay with the additional strapped-in turn-off delay, which extends the unkey delay to 9 milliseconds.

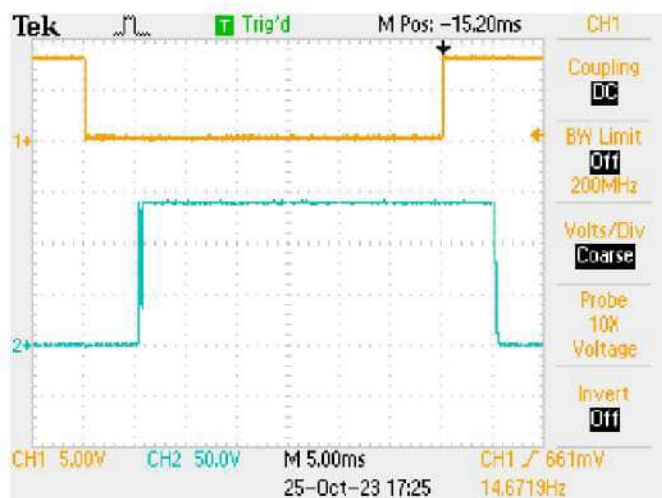


Figure 7 — Output relay with no turn-off delay.

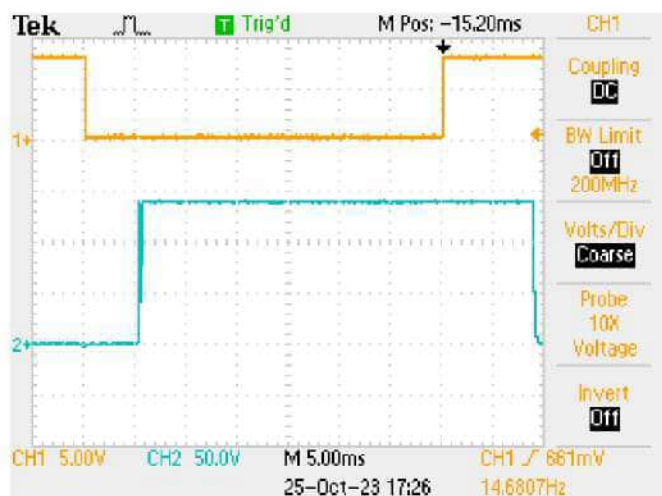


Figure 8 — Output relay with turn-off delay.

Some SWR Checks

As you can see in Figure 3, there is about an inch of wiring between the PC board and the RF connectors. Also, the relays aren't perfect 50 Ω paths either. In general, you add inductance to your circuit with the wiring. This can be compensated for with shunt capacitors (see the sidebar, "Compensating for Added Inductance in Circuits"). A little analysis with a vector network analyzer (VNA) permitted me to choose the capacitors shown in the schematic. With the capacitors shown, the standing wave ratio (SWR) from transceiver to antenna, transceiver to amplifier, and amplifier to antenna is no higher than 1.1:1 from 1.8 to 54 MHz.

Isolation

Because the amplifier is continuously enabled, it is important that the isolation from the amplifier output to its input be high enough that there is no possibility of oscillation. This isolation would be between pins 4 and

5 of the DK1a1b relay. The isolation between contacts is shown in the data sheet only as dielectric strength in root-mean-square V, so I decided it was prudent to measure the isolation. First, I measured the actual capacitance between the open contacts; this was 0.5 pF, which would imply 42 dB isolation at 50 MHz. However, my capacitance measurement was a dc measurement, so I measured the isolation with a VNA. Table 3 shows my VNA-measured isolation.

Table 3 — DK1a1b Contact Isolation	
Frequency	Isolation
1.8 MHz	-68 dB
3.5 MHz	-62 dB
7 MHz	-56 dB
14 MHz	-50 dB
28 MHz	-44 dB
50 MHz	-38 dB

Because ham radio power amplifiers are limited to 15 dB gain by the FCC, there is plenty of margin with regard to the relay isolation.

Using the QSK Switch

It is important that the amp-key-to-RF output of your transceiver exceeds the switching time of this QSK unit to ensure that no hot switching occurs. As this unit switches in 5 milliseconds, this shouldn't be a problem — I don't know of any transceiver that outputs RF any sooner than this after the amp-key line is enabled. But most transceivers have this parameter as a menu option so they can interface with non-QSK amplifiers. To ensure no possibility of hot switching, you may want to set this delay time to 10 milliseconds.

Figure 9 shows the interconnect diagram. Create a shorting plug for the amplifier keying input. Because the amplifier keying input is always grounded, it doesn't matter whether this is an old amplifier with a high-voltage keying requirement, or a newer amplifier with a low-voltage, low-current keying requirement. The bias

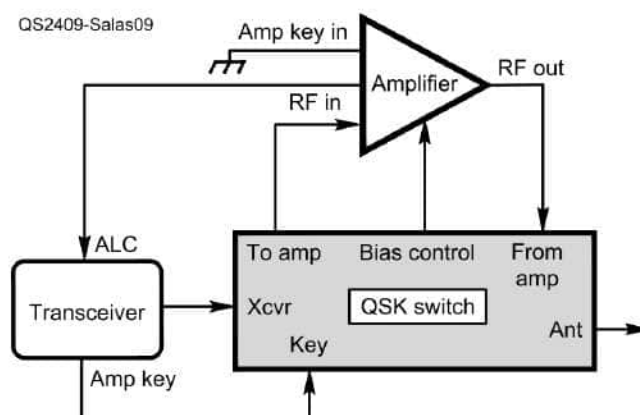


Figure 9 — Interconnect wiring diagram.

Compensating for Added Inductance in Circuits

The characteristic impedance of a transmission line is:

$$Z_0 = \sqrt{[(R + j\omega L)/(G + j\omega C)]} \text{ per unit length,}$$

where $R + j\omega L$ is the series resistive loss and inductance, and $G + j\omega C$ is the shunt admittance loss and capacitance. Assuming low losses in the transmission line and high frequencies, this simplifies to:

$$Z_0 = \sqrt{LC}.$$

When building circuits, it is not uncommon to add extra inductance due to wiring. From the above equation, you can see that if you add series inductance, you can compensate by adding shunt capacitance to keep the impedance constant. This is not a new technique. I first became aware of it when I started work at Texas Instruments in 1972. Wide pads on substrate-to-substrate interfaces were used to simplify tack welding the substrate interconnect straps. Besides making assembly easier for the line operators, the pads were found to improve return loss.

If you have a VNA (such as the inexpensive NanoVNA), you can see the inductive reactance and the SWR over your frequencies of interest. I built up three pairs of clip-leaded capacitors: 10 pF, 15 pF, and 20 pF (see the figure below). You can clip these across your RF connectors and see the resulting improvement in SWR, and from there you can determine the final values needed. This works well up to 6 meters and significantly shortens the time necessary for determining the compensating capacitor values. Above 6 meters, you will need to tack solder various value capacitors across the RF connectors, as the clip-lead lengths become a problem. Over the years, I've found that 10 – 25 pF input/output capacitors are needed for my HF – 6-meter projects. For discrete wiring projects on 144 and 440 MHz, I've typically needed 5 pF and 2.2 pF capacitors, respectively.



The author's capacitor compensation kit.

control can be used if you have access to the bias in your amplifier (permits biasing off the final tubes between dits and dahs). Or, you can use these relay contacts to mute an external software-defined radio receiver if you have one. When you want to operate full break in, set your amplifier to **OPERATE**. The QSK switch will switch your amplifier in and out of line at your keying speed. While you can hear the relays operating, the sound level is fairly minimal and virtually unnoticeable if you are wearing headphones.

Conclusion

New high-current, fast-switching, inexpensive power relays can eliminate the need for vacuum relays often used to implement full break-in amplifiers. And besides being inexpensive, these power relays have a much greater lifespan than vacuum relays.

All photos provided by the author.

Phil Salas, AD5X, an ARRL Life Member, has been licensed continuously since 1964. His interest in ham radio led him to pursue BSEE and MSEE degrees from Virginia Tech and Southern Methodist University, respectively, followed by a 35-year career in RF, microwave, and lightwave design. He held positions from design engineer to vice president of engineering. Now fully retired, Phil enjoys tinkering with ham radio projects. You can contact Phil at ad5x@arrrl.net.

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Coaxial Cables with Foam Dielectric

A detailed look at the physical and electrical reasons that foam is used in low-loss coaxial cables.

José Luis Giordano, CA4GIO

Within the wide array of coaxial transmission lines there's a group known as low-loss coax, whose dielectric is polyethylene foam, or PE(F). I have translated my short article, "Coaxiales con dieléctrico de espuma," originally published in Spanish in the December 2023 issue of *Radioaficionados*, that explains why this material is used.

Coaxial Cable Loss with Frequency

The electrical conductivity of the dielectric located between the conductors of a coaxial transmission line represents a loss. Therefore, it can be thought that low-loss coaxial cables that use foam dielectrics do so because of the lower conductivity of the material. However, the most important losses in a coaxial cable have another origin, because they do not correspond to the conductance between conductors but to the resistance along them.

The propagation characteristics of the line (the transverse electromagnetic wave) cause currents and fields to flow in one direction in the central conductor, and in the opposite direction through the shield of the coaxial cable. Due to the skin effect, this current flow occurs through a surface layer of the central conductor and through the interior of the shield. This causes the specific electrical resistance R' (in Ω/m) and then coaxial cable losses to increase with frequency f in the form:

$$R' = \frac{1}{2\pi} \left(\frac{1}{d} + \frac{1}{D} \right) \sqrt{\frac{\pi f \mu_c}{\sigma_c}}.$$

In this expression d and D , respectively, are the diameter of the central conductor and the inner diameter of the shield (μ_c and σ_c , respectively, are the magnetic permeability and the electrical conductivity of the conductors, assuming the same material). However, because d is typically $\frac{1}{3}$ of D , the expression for R' shows that most of the coax losses produced by skin effect are generated in the center conductor.

Low-loss coaxial cables, such as LMR-400, have less loss than cables like RG-8 or RG-213 because of the increase in the diameter of the center conductor. So, coaxial cables with lower losses generally have a larger outer diameter, thus permitting a larger center conductor. Table 1 lists the characteristics of several popular types of coaxial cables, including the attenuation over 100 meters at 150 MHz in the last column.

Effect of Dielectric on Impedance

To see the relationship between the dimensions and the dielectric, consider the following expression:

$$Z_0 = \sqrt{\frac{L'}{C'}}$$

This is the characteristic impedance of a transmission line where losses can be neglected. The specific inductance L' (H/m), and the specific capacitance C' (F/m) for coaxial cables are given by

$$L' = \mu \frac{\ln\left(\frac{D}{d}\right)}{2\pi} \quad \text{and} \quad C' = \varepsilon \frac{2\pi}{\ln\left(\frac{D}{d}\right)}, \quad \text{respectively.}$$

In these expressions, μ and ε are the magnetic permeability and the electrical permittivity of the dielectric. Because polymers are not magnetic, $\mu = \mu_0$ and $\varepsilon = \varepsilon_r \varepsilon_0$, where ε_r is the dielectric constant of the dielectric material, and μ_0 and ε_0 are the vacuum permeability and permittivity universal constants. Then, when we replace and rearrange the terms, we obtain

$$Z_0 = \frac{\eta_0}{2\pi} \times \ln\left(\frac{D}{d}\right) \times V_f,$$

where the constant η_0 is the intrinsic impedance in vacuum:

$$\eta_0 = \sqrt{\frac{\mu_0}{\varepsilon_0}} \approx 376.73 \, \Omega,$$

Table 1 — Characteristics of Popular Coaxial Cables

Type	Dielectric	d (mm)	D (mm)	V_F (%)	dB/100 m at 150 MHz
RG-58C/U	PE	0.91	2.95	65.9	20.10
RG-8X	PE(F)	1.42	3.94	84.0	11.15
RG-8A/U	PE	2.16	7.24	66.0	8.07
RG-213/U	PE	2.29	7.24	66.0	8.77
LMR-400	PE(F)	2.74	7.24	84.0	5.00
LMR-600	PE(F)	4.47	11.56	85.0	3.20
LDF4-50A	PE(F)	4.83	12.95	88.0	2.67

and V_F is the velocity factor of the transmission line:

$$V_F = \frac{1}{\sqrt{\epsilon_r}}.$$

Therefore, to maintain the same value of Z_0 , it must be

$$Z_0 = \ln\left(\frac{D}{d}\right) \times V_F \approx \text{constant}.$$

So, by increasing the diameter d of the center conductor without changing the outside diameter too much, $\ln\left(\frac{D}{d}\right)$ will decrease. Then, V_F must be increased. This means that the dielectric constant ϵ_r must be decreased. Because compact polyethylene has an $\epsilon_r \approx 2.3$, you can reduce ϵ_r by adding air bubbles ($\epsilon_r = 1$). In this way, the average value of

the dielectric constant can be $\epsilon_r \approx 1.5$ or less (making the velocity factor 0.82 or greater). This permits many low-loss coaxial cables to have a larger-diameter center conductor without significantly affecting the cable's outside diameter. Some larger cables, such as HELIAX®, employ a corrugated copper shield with air cavities that reduce the average dielectric constant. Again, this allows for a larger-diameter center conductor.

In Conclusion

Coaxial cables of a certain diameter manage to reduce losses by using a larger-diameter central conductor. Additionally, to maintain the characteristic impedance, the material between the conductors must have a lower dielectric constant. It is for this reason that coaxial cables of this type are recognized for having foam dielectric and a considerably higher velocity factor.

José Luis Giordano, CA4GIO, is a physicist who has worked at the Balseiro Institute and Bariloche Atomic Centre in Argentina, the University of Zaragoza in Spain, and the University of Talca in Chile. Now retired from academic life, Luis lives in Chile and obtained his amateur radio license in 2021. He is the author of four books, several papers on physics, and articles in *QST* and other ham radio magazines. Luis is especially interested in DX, HF, and broadband transformers. He can be reached at jlgiordano@hotmail.com.

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- 0.1, 0.01, and 0.001 uF precision capacitors

The actual values are provided as measured on our calibrated test equipment. The measured values are on a sticker on the back of the TEC-1. The TEC-1 is available from www.freqdevinc.com.





Certificate of Code Proficiency Recipients



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.

January 2024

Charles W. Campbell, K0CWC 15
Douglas B. Diegert, N2KGT 15
George Wayne Moore, W8SUN 20

February 2024

Charlene K. Lewis, K8XCO 10
Douglas B. Powers, KD5DBP 10
Timothy J. Sinnott, KE2UM 10
Margot L. Wasz, KM6JWY 10
Lawrence Schall, KB2MN 20
Albert J. Whetter, W9WJ 20

March 2024

Mark A. Jessing, N4OJE 10
Stephen M. Riley, WA9CWE 10
Kenneth F. Robinson, K8SCA 10
Steven L. Myers, AI7OL 20
Bernard A. Poskus, KF0QS 20

April 2024

Joseph P. Kononchik, KS1I 10
Bill Durham, KG5ZCI 15
Joseph P. Kononchik, KS1I 15
Glenn R. Barr, Jr., WB0KFC 20
Daryl I. Hammond, W0BZ 20
Gabriel E. Donley, WN7JT 25

May 2024

Tom J. Zajdel, AA3TZ 10
Tom J. Zajdel, AA3TZ 15
John H. Orkney, KA1LHJ 20
Tom J. Zajdel, AA3TZ 20
Daryl I. Hammond, W0BZ 25

June 2024

Robin L. Zinsmaster, N6PHP 25

Congratulations to all of the recipients.

September 2024 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.

September Qualifying Runs will be transmitted by W1AW in Newington, Connecticut, at the times shown on 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675, 50.350, and 147.555 MHz. The West Coast Qualifying Runs will be transmitted by K6KPH on Saturday, September 28, at 2 PM PDT (2100 UTC) on 3581.5, 7047.5, 14047.5, 18097.5, and 21067.5 kHz. Unless indicated otherwise, sending speeds are from 10 to 35 WPM.

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

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

Include \$10 (check or money order) if this is a submission for your initial Code Proficiency certificate; \$7.50 if you are applying for an endorsement (available for speeds up to 40 WPM). Your test 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.arrrl.org/qualifying-run-schedule.

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



W1AW Qualifying Runs — September 2024 (All times are in Eastern Daylight Time.)

Monday	Tuesday	Wednesday	Thursday	Friday
Labor Day		9/4 7 PM – 2300Z 35 – 10 WPM	9/5 10 PM – 0200Z (9/6 – UTC) 10 – 40 WPM	9/6 9 AM – 1300Z 10 – 35 WPM
	9/10 4 PM – 2000Z 10 – 35 WPM	9/11 7 PM – 2300Z 10 – 40 WPM	9/12 9 AM – 1300Z 35 – 10 WPM	9/13 10 PM – 0200Z (9/14 – UTC) 10 – 35 WPM
9/16 7 PM – 2300Z 10 – 40 WPM		9/18 10 PM – 0200Z (9/19 – UTC) 35 – 10 WPM	9/19 9 AM – 1300Z 10 – 35 WPM	9/20 4 PM – 2000Z 10 – 40 WPM
	9/24 10 PM – 0200Z (9/25 – UTC) 10 – 40 WPM		9/26 4 PM – 2000Z 35 – 10 WPM	9/27 9 AM – 1300Z 35 – 10 WPM

Product Review

Kenwood TH-D75A Tri-Band FM/Digital Transceiver

Reviewed by Steve Ford, WB8IMY
wb8imy@arrl.net

Is it accurate to call the Kenwood TH-D75A a “luxury handheld”? Maybe so, especially when you consider its plethora of features. Right off the bat you have the capability to transmit on three VHF/UHF bands — 2 meters, 1.25 meters, and 70 centimeters — at a maximum output of 5 W. And on each band, you can choose to operate analog FM or digital. Your digital options include D-STAR and packet radio (including the Automatic Packet Reporting System [APRS]).

Frequency ranges are divided into two “operation bands” in the display: A and B.

Band A — Frequency Range	
Transmit:	144 – 148 MHz, 222 – 225 MHz, 430 – 450 MHz
Receive:	136 – 174 MHz, 216 – 260 MHz, 410 – 470 MHz
Band B — Frequency Range	
Transmit:	144 – 148 MHz, 222 – 225 MHz, 430 – 450 MHz
Receive:	0.1 – 76 MHz, 76 – 108 MHz, 108 – 524 MHz

The TH-D75A receives FM and D-STAR on Band A. Band B also receives FM and D-STAR, but adds SSB, AM, and CW. Wide FM reception is reserved for FM broadcast frequencies.

The TH-D75A's predecessor, the TH-D74A, did all these things, but the new TH-D75A adds several new features (in addition to its redesigned appearance). With the TH-D75A you now can listen to two D-STAR signals simultaneously and access D-STAR reflectors through a “terminal” mode that doesn't require a D-STAR repeater. APRS enthusiasts will welcome the inclusion of a standalone digipeater function in the TH-D75A.

Lastly, the TH-D75A design adds a USB-C connector, enhanced voice guidance, and support for push-to-talk operation with a Bluetooth headset.

Initial Impressions

The TH-D75A arrives in a somewhat slender box that



contains a male SMA flexible antenna, an 1800 mAh lithium-ion battery, a belt clip, a wall charger, and a sizable user guide. It is possible to charge the battery from a USB connection, but not all USB ports supply the 2 A necessary to do so — hence the wall charger.

Two items are not included, and you'll need them to enjoy full use of the radio: a microSD memory card and compatible USB cable. Fortunately, you'll find both available online and at many retailers. For this review I used a 32 GB memory card, which is the maximum size the transceiver supports.

With the battery installed, the TH-D75A has a substantial amount of heft, weighing almost 13 ounces. You can tell the radio is designed for rugged use, right down to the rubber port caps and its Ingress Protection (IP) weatherproof and toughness rating to IP 54/55 standard. You'll find a Global Positioning System (GPS) antenna at the top of the case, along with concentric knobs for audio volume and frequency/menu selection.

The display is bright and colorful. I had no difficulty reading it even in bright daylight. Below the display you have a multi-function keypad and a multi-position selector surrounded by four pushbuttons.

While the TH-D75A sports the usual “rubber duck” antenna, it also has an internal ferrite bar antenna for use on long-wave, medium-wave, and lower HF frequencies (below 10 MHz). In the menu system you can switch out the bar antenna and use an external antenna instead (more about this later).

Such a feature-packed transceiver is unavoidably complicated. The Kenwood engineers went to great lengths to make the various functions as easy to use as possible, and this attention to detail is particularly

Bottom Line

The Kenwood TH-D75A is perhaps the most feature-rich handheld tri-band transceiver available today. It does so much that it's almost a complete ham shack in the palm of your hand.

evident in the menu system. Even so, I needed to spend time carefully reading the manual. Yes, I was able to power up the rig and make an FM contact straightaway, but to do more than scratch the surface the user manual is invaluable. There's also an "Operating Tips" publication that was released at Hamvention 2024. It's available online at https://kenwood.com/i/products/info/amateur/pdf/TH-D75AE_IDM.pdf.

Listening Around

At first, I spent close to an hour just exploring the extensive receive capabilities of the TH-D75A. The ferrite bar antenna could pull in only the strongest signals, such as several AM broadcast stations in my area. It is fair to say that this antenna is for casual use; you won't be doing much DXing with it. Listening to amateurs and shortwave broadcasters between 160 and 40 meters produced similar results.

However, when I used an SMA adapter to attach my outdoor HF dipole antenna to the TH-D75A, it was a different experience. The receiver's performance seemed to compare favorably with that of a modern HF transceiver or shortwave receiver.

It was remarkable to listen to HF CW conversations on a handheld rig. The TH-D75A even offers a range of IF filter bandwidths. In CW mode, for example, you can narrow the filter to 300 Hz. The receive audio equalization is also selectable, as is the transmit equalization.

You have the ability to listen to separate frequency bands at the same time, stacking one atop the other in the display. VHF and UHF reception is available in both sections of the display. The TH-D75A also has a clever feature that allows you to adjust the audio balance between them via a graphical interface.

I found FM broadcast reception to be quite good, even with just the flexible antenna. With the radio connected to my outside antenna, I needed to switch in the attenuator to prevent overloading.

Aeronautical reception was top-notch. The AM signals were full-bodied and clear. With the flexible antenna you tend to pick up only the closest aircraft, but with the outdoor antenna the range was impressive.

On the Air

My first stop was good old analog FM. The TH-D75A turned in superb performance, with several hams remarking on my audio quality. This was before I began meddling with the radio's parametric equalizer to add a bit of crispness to the transmit audio.



Figure 1 — Connecting to a nearby D-STAR repeater. Thanks to the TH-D75A's GPS and D-STAR repeater list, finding available repeaters takes only seconds.

It had been many years since I had operated on 1.25 meters, so it was a joy to return to the band at long last with the TH-D75A. The transceiver has a built-in repeater list, but it displays only D-STAR machines. Nonetheless, I tracked down several 222 MHz FM repeaters in my area using the *ARRL Repeater Directory*.

D-STAR Digital Mode

The next destination was D-STAR, and the TH-D75A repeater list was put to effective use. Because the radio was always aware of my location (thanks to its GPS receiver), the list helpfully indicated all the nearest repeaters. In Figure 1 you can see the TH-D75A connected to one of my nearby D-STAR repeaters. Even with just the flexible antenna inside my house, I was able to access each one and enjoyed not only local, but also international conversations via the D-STAR reflector network. You can update the repeater list from the Kenwood website.

If you aren't within range of a D-STAR repeater, the TH-D75A offers a "terminal" mode as a new feature that allows you to access the reflector network via an internet-connected computer. The only catch is that you will need to have third-party software running on the computer (or mobile device). The TH-D75A user guide doesn't mention specific applications, and at the time this review was written, Kenwood had not introduced its own.

If you own an Android phone or tablet, you may want to investigate *BlueDV Connect* by David Grootendorst, PA7LIM. This free application, which is available in the Google Play Store, utilizes the TH-D75A's Bluetooth wireless data function to connect the transceiver in

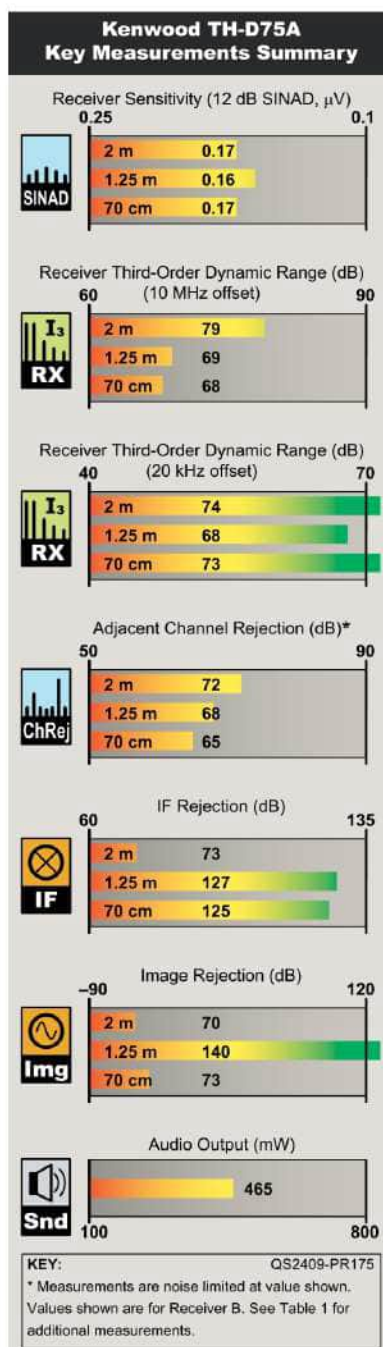


Table 1
Kenwood TH-D75A, Serial number C3C10945
Firmware Version 1.02 (FCC ID# K44521000)

Manufacturer's Specifications

Frequency coverage: Band A receive, 136 – 174, 216 – 260, 410 – 470 MHz; Band B receive, 0.1 – 76, 76 – 108 (WFM), 108 – 524 MHz; transmit, 144 – 148, 222 – 225, 430 – 450 MHz.

Modes of operation:

Receive: CW, AM, SSB, FM, DR, data.
Transmit: FM, DR, data.

Power requirements: Transmit, DC input, 1.4 A (H), 0.9 A (M), 0.6 A (L), 0.4 A (EL) at 13.8 V dc, battery, 2.0 A (H), 1.3 A (M), 0.8 A (L), 0.5 A (EL) at 7.4 V dc; single receive, 260 mA (rated power), 135 mA standby, 48 mA standby with power save on; dual receive, 310 mA (rated power), 185 mA standby, 50 mA with power save on; GPS logger on, 115 mA.

Receiver

Sensitivity, SSB 10 dB S/N: 0.4 μV (1.8 – 54 MHz), 0.79 μV (54 – 76 MHz), 0.16 μV (144 – 148, 430 – 450 MHz), 0.2 μV (222.225 MHz).

Noise figure: Not specified.

AM sensitivity: For 10 dB S/N, 4.0 μV (0.3 – 0.52 MHz), 1.59 μV (0.52 – 1.8 MHz), 0.63 μV (1.8 – 54 MHz), 1.12 μV (54 – 76 MHz), 0.5 μV (118 – 174 MHz), 0.63 μV (200 – 250 MHz), 1.12 μV (382 – 412 MHz).

Measured in the ARRL Lab

Receive, Band A, 136 – 173.995, 216 – 259.995, 410 – 469.995 MHz (FM, DR); Band B, 0.1 – 75.999.98 MHz (AM, CW, SSB), 76 – 107.9 MHz (WFM), 108 – 135.995 MHz (AM, CW, SSB), 136 – 173.995 MHz (AM, FM, CW, SSB, DR), 174 – 215.995 MHz (AM, FM, CW, SSB), 216 – 469.995 MHz (AM, FM, CW, SSB, DR); transmit, 144 – 147.995, 222 – 224.995, 430 – 449.995 MHz.

As specified.

Transmit (H/M/L/EL), DC input, 1.170/0.815/0.525/0.359 A (146 MHz), 1.210/0.830/0.525/0.345 A (223 MHz), 1.150/0.720/0.468/0.275 A (440 MHz) at 13.8 V dc; battery, 1.475/1.360/0.860/0.580 A (146 MHz), 1.550/1.350/0.810/0.429 A (223 MHz), 1.460, 1.230/0.680/0.430 A (440 MHz) at 8.3 V dc (full charge); dual receive, battery, 530¹ mA (no signal max volume & lights), 207¹ mA (standby, max lights), 108 mA (standby, lights off), 42 mA (standby, battery save on), 1 mA (off) at 8.3 V dc.

Receiver Dynamic Testing

Noise floor (MDS), CW, 1 kHz bandwidth Band B:

0.137 MHz	-98 dBm	2.8 μV
0.475 MHz	-128 dBm	0.089 μV
1.0 MHz	-132 dBm	0.056 μV
3.5 MHz	-133 dBm	0.050 μV
14 MHz	-134 dBm	0.045 μV
50 MHz	-132 dBm	0.056 μV
70 MHz	-133 dBm	0.050 μV
144 MHz	-127 dBm	1.00 μV
222 MHz	-133 dBm	0.050 μV
430 MHz	-127 dBm	1.00 μV

14/50/144/430 MHz, 13/15/20/20 dB.

10 dB (S+N)/N 1 kHz, 30% modulation,

3 kHz (measured) BW, Band B:

1.0 MHz	1.60 μV
3.8 MHz	0.75 μV
29 MHz	0.73 μV
50.4 MHz	0.86 μV
70.4 MHz	0.71 μV
120 MHz	0.68 μV
144.4 MHz	0.42 μV
222.4 MHz	0.45 μV
432.4 MHz	0.47 μV

terminal mode to the D-STAR network. Also, in the “Operating Tips,” Don Arnold, W6GPS, provides instructions on how to use the D-STAR reflector terminal mode with *BlueDV Connect* and *BlueDV* for Windows.

APRS

The TH-D75A's APRS capability is versatile to say the least. Once you set it up in the menu system, you can beacon your position, send text messages, and, of course, receive position and text packets from others. I have quite a bit of APRS activity in my area, so the radio was receiving and displaying data almost nonstop (see Figure 2).

Unlike some APRS-capable transceivers, the TH-D75A includes a KISS (Keep It Simple, Stupid) packet radio terminal node controller (TNC). With the USB cable attached to my PC, my APRS software accessed the TNC for total control, displaying decoded information via its map. And sending APRS text messages from my PC was far easier than doing it through the TH-D75A's keypad.

This is an appropriate time to mention that while you can access the TNC using a wireless Bluetooth connection, the TH-D75A uses so-called “classic” Bluetooth. Some mobile devices rely on Bluetooth Low Energy (BLE) protocol instead. BLE operates within the same frequency range as classic Bluetooth but

FM sensitivity: Band B, 12 dB SINAD, 0.32 μ V (28 – 54 MHz), 0.56 μ V (54 – 76 MHz), 0.36 μ V (118 – 144, 148 – 175, 200 – 222, 225 – 250, 400 – 412, 415 – 430, 450 – 524 MHz); Band A, 0.18 μ V (144 MHz), 0.2 μ V (220 and 430 MHz).

Two-tone, third-order IMD dynamic range: Not specified.

Adjacent-channel rejection: Not specified.

Spurious rejection: Band B, VHF, ≥ 45 dB; UHF, ≥ 40 dB; Band A, ≥ 50 ; IF rejection, Band B, ≥ 55 dB, Band A, ≥ 60 dB.

Squelch sensitivity: Not specified.

IF/audio response: Not specified.

Audio output: ≥ 400 mW at 10% THD into 8 Ω @ 7.4 V dc.

Transmitter

Power output: 5.0 W (high), 2.0 W (medium), 0.5 W (low), 0.05 W (extra low).

Spurious signal and harmonic suppression: at least ≥ 60 dB (high/medium), ≥ 50 dB (low), ≥ 40 dB (extra low).

Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified. Receive-transmit turnaround time ("tx delay"): Not specified.

Size (height, width, depth): 4.8 x 2.2 x 1.3 inches. Antenna length: 7.4 inches. Weight: 12.13 ounces.

¹ Single receive typically 50 mA less.

² FM mode, NFM mode increases sensitivity by 0.04 μ V.

³ Measurement was noise limited at the value indicated.

For 12 dB SINAD

	Band B	Band A
29 MHz	0.31 μ V	
52 MHz	0.48 μ V	
70 MHz	0.42 μ V	
146 MHz	0.17 μ V	0.17 μ V ²
162 MHz	0.16 μ V	0.17 μ V
223 MHz	0.23 μ V	0.16 μ V ²
440 MHz	0.17 μ V	0.17 μ V ²
100 MHz	1.30 μ V (WFM)	

Band B, 20 kHz offset: 74 dB (146 MHz)³, 68 dB (223 MHz), 73 dB (440 MHz)³; 10 MHz offset, 79 dB (146 MHz), 69 dB (222 MHz), 68 dB (440 MHz).

Band A, 20 kHz offset: 76 dB (146 MHz)³, 68 dB (222 MHz), 74 dB (440 MHz)³; 10 MHz offset, 77 dB (146 MHz), 71 dB (223 MHz), 71 dB (440 MHz).

Band B, 20 kHz offset: 72 dB³ (146 MHz), 68 dB³ (223 MHz), 65 dB³ (440 MHz); Band A, 74 dB³ (146 MHz), 69 dB³ (223 MHz), 63 dB³ (440 MHz).

IF rejection: Band B, 4 dB (14 MHz, CW), 5 dB (50 MHz, CW), 73 dB (146 MHz), 127 dB (222 MHz), >125 dB (440 MHz); Band A, 72 dB (146 MHz), 131 dB (223 MHz), 135 dB (440 MHz).

Image rejection: Band B, 54 dB (14 MHz), 66 dB (50 MHz), 70 dB (146 MHz), 140 dB (223 MHz), 73 dB (440 MHz); Band A, 63 dB (146 MHz), 84 dB (223 MHz), 76 dB (440 MHz).

Squelch range, Band B, 0.15 – 1.7 μ V (146 MHz), 0.24 – 1.3 μ V (223 MHz), 0.13 – 1.2 μ V (440 MHz); Band A, 0.15 – 1.7 μ V (146 MHz), 0.13 – 1.2 μ V (223 MHz), 0.13 – 1.2 μ V (440 MHz).

Range at -6 dB points: CW, 239 – 1359 Hz (1120 Hz); LSB and USB, 232 – 1666 (1434 Hz); AM, 260 – 1720 Hz (2920 Hz).

Dual receive, 465 mW, single receive, 457 mW at 10% THD into 8 Ω at 8.3 V dc.

Transmitter Dynamic Testing

With battery pack, H/M/L/EL, 5.1/2.0/0.48/0.12 W (146 MHz), 5.0/2.0/0.6/0.16 W (223 MHz), 4.7/1.8/0.45/0.03 W (440 MHz); at 13.8 V dc input, 5.0/1.9/0.50/0.09 W (146 MHz), 4.9/2.0/0.62/0.14 W (223 MHz), 4.8/1.8/0.62/0.03 W (440 MHz).

As specified. Meets FCC requirements.

Squelch on, S9 signal, 93 ms on all bands.

14 ms (146 MHz), 14 ms (223 MHz), 16 ms (440 MHz).



Figure 2 — Monitoring activity on the local APRS network.

uses a different set of protocols optimized for low-power consumption and intermittent data transmission, along with a different modulation scheme and packet structure. The result is that a device expecting a BLE connection won't "talk" to the TH-D75A.

A new addition to the TH-D75A's APRS feature list is the ability for the radio to function as a standalone digipeater. This would be extremely useful in public service applications to provide dependable APRS coverage throughout a specific area, such as a parade route.

Memories and More

It comes as no surprise that the TH-D75A offers an overwhelming number of memories, more than most of us will ever use. There are 1,000 memory channels, 1,500 repeater-list slots, and 30 slots for hotspots.

You can program the memories through the keypad, but a far more convenient alternative is Kenwood's *MCP-D75* software (see Figure 3). This free Windows application is available on the Kenwood website. By simply plugging in the USB cable, I was able to import all the contents of the TH-D75A's memory as well as various function settings. I added

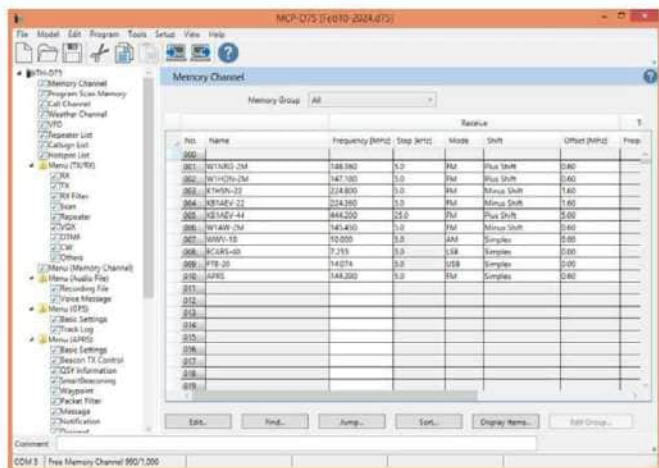


Figure 3 — Kenwood's free *MCP-D75* software for Windows makes it easy to program the TH-D75A's memories and functions.

local FM repeaters, favorite HF frequencies, and several FM broadcast and aeronautical frequencies, and I tweaked a few functions while I was at it. I was able to save everything to my hard drive (always a good idea) before exporting the modified data back to the radio.

Another interesting piece of Kenwood software is the free *ARFC-D75* application (see Figure 4), also for Windows. With this software you can control the radio remotely via the USB connection, changing frequency, mode, etc. The *ARFC-D75* has a volume control, but this adjusts the audio level only at the radio.

The voice guidance function has been enhanced in the TH-D75A. It "speaks" information such as the displayed frequency, memory channels, and function settings. It will do so alphabetically or phonetically and at several different speeds. Playing with the speed function was entertaining, somewhat like copying fast CW. Voice guidance will also announce the sender's call sign when operating APRS as well as the content of any APRS messages addressed to your station. Voice guidance will even announce call signs when you're operating D-STAR.

Speaking of voices, if you have a memory card installed, the TH-D75A will record and play the audio from contacts you've made, or just received audio you've picked up at frequencies of interest. I recorded aeronautical signals, FM repeater activity, and even a bit of the ECARS net at 7.255 MHz. You can export the WAV audio files to another device, such as your computer, for playback or editing.



Figure 4 — The free Kenwood *ARFC-D75* application allows remote control of the TH-D75A.

I would need several more *QST* pages to describe all the features of the TH-D75A, but one that I found particularly intriguing is the ability to tap the receiver's IF output. When this function is enabled, the radio provides an IF output signal at 12 kHz with a 15 kHz bandwidth. If you have compatible software running on your PC, you can display the signal as a kind of band scope, similar to what you'd see with a software-defined receiver. Unfortunately, I lacked the necessary software, and the user guide doesn't recommend applications. Still, if you can make this work, I believe it would be a very cool feature. I wouldn't be surprised to learn that some TH-D75A owners are already doing this. Again, in their "Operating Tips" manual they describe how to use the IF output signal as a band scope display using the *HDSDR* free Windows software.

Conclusion

The Kenwood TH-D75A is perhaps the most feature-rich handheld transceiver available today. Of course, all this functionality — and tri-band transmitting capability — comes at a substantial price. The value proposition hinges on whether a user is willing to thoroughly explore the radio and exploit all its benefits.

Manufacturer: JVCKENWOOD USA Corporation, Communications Sector, 1440 Corporate Dr., Irving, TX 75038, www.kenwood.com/usa. Price: \$749.95.

DX Engineering NOISELOOP Portable Flag Antenna Kit and Portable Receive Preamplifier-Attenuator

Reviewed by Stephen Anderson,
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I have been an ARRL RFI Engineer for a little more than 2 years now, and if there's one thing that I've learned it's that you can't find out *what* is making a noise until you know *where* the noise is coming from. The importance of ruling out your own home can't be overemphasized, but close behind that is having a go-to noise loop that you can depend on to find the offending RFI source. This loop certainly fits that bill. The availability of a companion preamp and attenuator makes this a good all-around tool for conducting a noise investigation.

This review consists of two DX Engineering products that work together: the DX Engineering NOISELOOP Portable Receive Flag Antenna Kit (DXE-NOISELOOP) and the DX Engineering Portable Receive Preamplifier-Attenuator (DXE-NL-PRE-ATT-1).

Description

The Flag Antenna (DXE-NOISELOOP)

This antenna comes from a design by Don Kirk, WD8DSB (see the March 2021 issue of *QST* for Don's article on the antenna design). The DX Engineering version of the design contains durable materials (sold as a kit), with fiberglass support rods for the loop, a sturdy fiberglass mast, and stainless-steel hardware. The kit also includes circuit boards for the transformer (which uses a double-aperture type of toroid core) and load resistor, antenna wire, and coaxial cable.

Bottom Line

The DX Engineering noise loop flag antenna uses a field-proven design and is an excellent choice for someone looking for a durable direction-finding loop. The preamp is both lightweight and versatile and makes a great addition to the loop.



DX Engineering bills the antenna as broadband, unidirectional, and portable. They also state that the antenna was designed to be as large as possible (to maximize gain), but at the same time enable the user to fit the antenna into a vehicle.

The antenna dimensions are 48 inches long and 24 inches high, and the mast is 48 inches in height. The receive frequency is between 1.8 and 30 MHz, and the radiation pattern is as stated by WD8DSB

(see Figure 5). This is a receive loop only (don't transmit into the loop). The instruction manual states that the SWR will typically be between 1:1 and 2:1 when measured over the HF band (more on this later).

If you use a transceiver with the loop and it has a transmit prohibit option, it's best to use that to ensure you don't mistakenly damage the loop; it's the same for

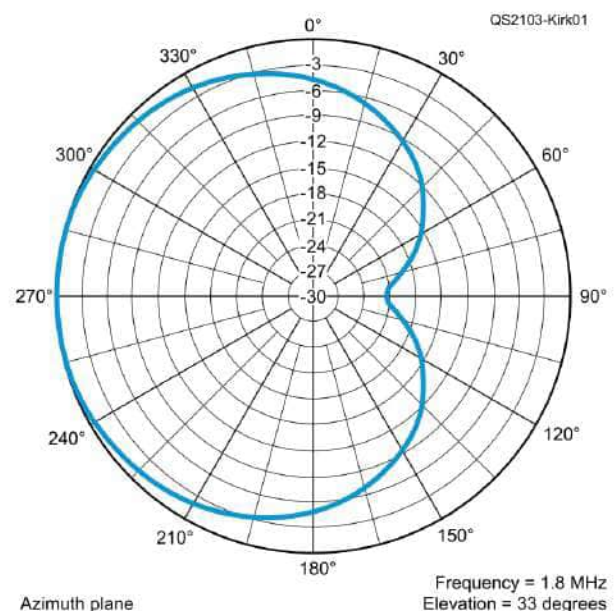


Figure 5 — Cardioid pattern as modeled in *4nec2* (as shown in the March 2021 issue of *QST*).

the preamplifier-attenuator unit.

Preamplifier-Attenuator (DXE-NL-PRE-ATT-1)

This preamp-attenuator is an excellent companion to the flag antenna. It's a relatively small unit, making it possible to attach to either the flag antenna mast or a receiver. I've seen it used in both configurations. If you have a lightweight receiver, it may be best to add it there instead of adding additional weight to the flag antenna. The device includes an AM broadcast band rejection filter, a preamp, and both 10 and 20 dB attenuators that can be switched in separately, giving the ability to attenuate by three levels: 10, 20, or 30 dB. For the manufacturer's specifications of this unit, see Table 2.

Table 2 — DX Engineering NOISELOOP Portable Flag Antenna Kit	
Receive frequency range	100 kHz – 30 MHz
Preamplifier gain	30 dB, nominal
Noise figure	4.5 dB
Receive feed-line connector type	BNC
Optimal voltage range	9 V dc, internal battery
Device dimensions (width, height, depth)	3.25 × 7.0 × 1.0 inches

Assembling the Noise Loop Flag Antenna

Remember, this is a kit, and Figure 6 shows the contents of the box with the noise loop. DX Engineering stated that simple hand tools and a soldering iron are all that are required for assembly, and that the antenna would take between 1 and 2 hours to build. I found this to be accurate, as it took me one evening (with typical interruptions) and no tools beyond the simple hand tools and soldering supplies we all keep in our workshops. Detailed instructions were provided with the antenna, along with a theory of operation, a parts list, quality photos for every step in the build process, and instructions for use of the antenna.

With respect to construction, there is really only one place I ran into trouble, and that was with the construction of the transformer, specifically the Teflon tube. The instructions require that the builder cut an already small Teflon tube in half (ensure your cut is exact because there really is no extra tubing). I wound up with an uneven cut that was not enough to affect the operation of the transformer, but it could easily have caused me to have to find another piece of tubing. It would have been nice to have an extra piece of tubing or pre-cut tubing to work with.

Once the antenna is constructed, if you did get the preamplifier unit, it's best to figure out a way to carry everything before you get out into the field with the antenna, the preamp, and your receiver. I've seen this



Figure 6 — DXE NOISELOOP Portable Receive Flag Antenna Kit contents of box, as shipped.

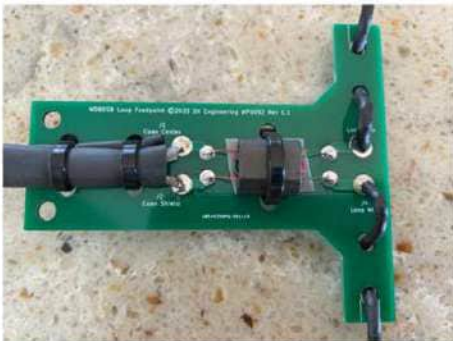


Figure 7 — DXE flag antenna noise loop feed-point board.



Figure 8 — DXE flag antenna noise loop load resistor board.



Figure 9 — DXE flag antenna noise loop as built.

dealt with in two different ways — one is to affix the preamp to the antenna, and the other is to affix it to the receiver. Either way will work. It's likely going to depend on what you have for a receiver and whether it's convenient to put it in one place or the other. I chose to use 3M Dual Lock fasteners and affix it to the antenna.

Figures 7, 8, and 9 show the constructed circuit boards and the as-built noise loop in my shack. Figure 10 shows the preamplifier, which requires no assembly.



Figure 10 — DXE Portable Receive Preamplifier-Attenuator.



Figure 11 — The DXE flag antenna noise loop SWR results.



Figure 12 — Test lighting device.

And the lead photo shows the loop with the preamplifier attached to the mast.

Using the Antenna and Preamp

Before heading out with the noise loop, as recommended in the instructions, it's good to use an antenna analyzer such as a RigExpert to run the test recommended in the instructions, looking at the SWR over the HF range from 0 to 30 MHz. If all goes well with the build, you should see an SWR between roughly 1:1 and 2:1. The results are shown in Figure 11.

Over the course of the last few months, I have used this loop on several occasions in the field, mostly looking for power-line noise. The loop is a good starting point, working from a ham's station, to find an initial direction for the noise. Of course, once you have a general direction, your search quickly becomes more of a VHF/UHF hunt for the actual power-line noise sources.

Similar to other noise loop testing I have done, I also brought home a noisy device and put the loop through its paces around my home. In this case, I used a set of strip lights that a ham recently provided to us for testing in our EMC lab. The lights failed to meet FCC Part 15 limits, and because the manufacturer had replaced them, the ham was kind enough to send them to us for the good of science. The lights are shown in Figure 12. Leaving the lights turned on in my garage, at a setting I knew to have the worst-case emissions, provided an excellent test bed for the loop.

The loop worked well under these conditions. I was able to go to the farthest edges of my 2-acre property and still pick up the noise from the lights using the preamp. Even without the preamp, with a decent receiver (I used my Yaesu FT-818), the noise could be heard from a good distance away. As specified, I



Figure 13 — The DXE flag antenna noise loop in the Toyota Prius.

found there was a good null produced when the back of the antenna was pointed toward the noise source. The attenuator also worked well, allowing me to keep checking for the null as I got closer to the noise source without overloading the receiver.

Conclusion

Don Kirk's, WD8DSB, design is a proven one, as evidenced by the number of hams I've seen come up with creative ways to mimic the design, using everything from the original wood design to those stakes folks use for the snowplow driver.

Based on both my controlled testing of the loop and my use of it in the field, I think this is an excellent noise loop. The loop itself is made of durable materials, the assembly instructions are clear and concise, and with some minor tweaks (mainly attachment of the preamp), it's an easy way to get yourself set up to locate interference sources around your station. Lastly, the loop is as portable as it can be and fits nicely into my Toyota Prius — both with and without the mast (see Figure 13).

Manufacturer: DX Engineering, 1200 Southeast Ave., Tallmadge, OH 44278, www.dxengineering.com. **Price:** Portable Receive Flag Antenna Kit (DXE-NOISELOOP), \$135.99; Portable Receive Preamplifier-Attenuator (DXE-NL-PRE-ATT-1), \$175.99.

Elk Antennas 2M/440L5 Dual-Band Portable Log-Periodic Antenna

Reviewed by John Leonardelli, VE3IPS
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With renewed interest in satellite communications and the need for a portable antenna for VHF/UHF operations, I found the Elk Antennas 2M/440L5 particularly compelling. Elk Antennas, owned by James (Jim) Simons, W6LK, has been crafting antennas for more than 30 years. Although I already have several Yagi antennas, this one stands out due to its log-periodic design, which eliminates the need for a duplexer for dual-band use.

The log-periodic design offers wide frequency coverage from 144 to 470 MHz, accommodating both 2 meters and 70 centimeters in a compact, two-foot-long package. This feature simplifies most operating environments by removing the need for a duplexer, allowing the use of a single coaxial cable, and enabling operation at high power levels. Whether you are bouncing signals through satellites or working simplex two or three counties away, this antenna is a reliable choice. It is also an excellent option for ham radio operators using General Mobile Radio Service (GMRS) and Multi-Use Radio Service (MURS) radios.

My portable radios are the Icom IC-705 and Yaesu FT-818 due to their multi-band and multi-mode capability. These pair very well with the Elk 2M/440L5, and I can also add a 60 or 150 W amplifier for single-band use.

I can now replace several Yagi antennas with just one. For scanner and air show enthusiasts, this antenna is ideal for listening to domestic air, public safety, and military air bands. It is also perfect for Summits on the

Bottom Line

Whether you are operating portable or permanent, you will find that the dual-band log-periodic Elk antenna is an incredibly convenient and powerful tool for your communication operations.

Air (SOTA) or Parks on the Air (POTA) activations, and it is a must-have for your ARES emergency communications go-kit. While waiting for this antenna to arrive, I realized how useful it would be as a multi-purpose antenna, even though my initial interest was in satellites.

My operating style demands antennas that are easy to deploy, lightweight, high-performance, and easy to transport by car or in a backpack.



Description

The Elk antenna comes packaged in a plastic bag with an instruction sheet. You can purchase the antenna with either a standard UHF or N-type connector, and even opt for a black powder-coated finish. With five anodized aluminum elements per boom, this antenna offers excellent gain and rust protection. The design includes two booms, with the elements attached sequentially to one or the other. Figure 14 shows the unassembled components,

and the lead photo shows the assembled antenna.

The antenna elements are made from actual arrow rods and are fitted with hardware that allows for easy, tool-free, finger-tight installations. The manufacturer mentioned that the element material is custom-made for them by Easton Technical Products in Salt Lake City, Utah. The rods are color-coded for easy setup, and the rubber-tipped elements highlight the high-



Figure 14 — Unassembled Elk antenna.

quality construction and components used. Everything is precision-cut with no wobbly parts. Due to its design, the antenna can be sensitive to a metal mast adjacent to it when deployed in a vertical position.

Unlike a Yagi, a log-periodic antenna is fed at the front and has three boom elements. Two of these are aluminum tubes that are part of the feed system, providing energy in the correct phase to the radiating elements. In a log-periodic antenna, any of the elements could effectively be radiators depending on the frequency of operation. The screw-in elements range from 16.1 inches (41 centimeters) to 18.5 inches (47 centimeters) long, operating as approximate quarter-wave elements on 2 meters and as $\frac{5}{8}$ wave elements on 70 centimeters.

The third boom or mounting assembly is made from generic PVC plumbing tubing, which provides insulated mechanical support for the antenna. This design allows users to create various low-cost custom mounting methods. If fabricated from metal, the mounting component would have been expensive, but the PVC handle included for handheld operation proves to be extremely useful. This setup makes the antenna ideal for satellite communications, direction finding, emergency communications, and portable operation.

International Space Station (ISS) and Satellite Communications

The Elk antenna is a straightforward solution for listening to the ISS or for satellite communications, as a duplexer is not required. The design allows for feeding the 2-meter downlink and 70-centimeter uplink simultaneously through a single coaxial cable. This is ideal for connecting this antenna to my Icom IC-705 or Yaesu FT-818 or even a handheld radio. I mounted the boom on an adapter I made using some junk box PVC tubing, attached to a three-axis tripod head on a camera tripod. This setup allowed me to adjust both the azimuth and elevation. I used a standard elevation of about 25 degrees as a start.

I tracked the satellite passes using the ISS app and patiently waited for the bird to appear on the horizon. I was able to rotate the antenna as it made its pass across the sky listening to the operators share grids as fast as they could.

I also tried manually adjusting the direction of the antenna using the handle; its length and weight are manageable for the short 10- to 15-minute passes. Juggling the antenna, radio, and notepad with two hands is an acrobatic feat by itself. The Elk being lightweight will be ideal for automated rotation with an application like *PstRotator* and 3D-printed rotating solutions.

Comparing the Elk antenna to my other satellite Yagi antenna, I found the Elk is easier to use due to its shorter length and lighter weight, with reception quality on par with the Yagi. The Yagi offered more elements on 450 MHz with a few more dB gain. But its boom was more than 3 feet. The PVC mounting system is simpler to use than the typical Yagi antenna mount, and it allows for easy rotation of the antenna for horizontal or vertical polarization on the fly.

Initially, I had concerns about the generic PVC mounting system's usability, but after spending time with the antenna, I realized its great benefit in allowing easy customization. There are already 3D-printed parts available for this antenna to facilitate various mounting options. The instruction sheet also provides mounting suggestions for their antennas.

On the Air

The antenna is excellent for operating portable from various grid squares during the ARRL Spring Sprints Contest. Its wide frequency coverage allows me to use a single antenna and a single coax to cover both bands, and it can support power levels of 100 W or more. The SWR across the CW/SSB and FM portions of the bands was not an issue. The antenna fits easily in the back seat of the car, and I can deploy it quickly while roving to different grid squares.

As shown in Figure 15, I swapped out the PVC center mast coupler for one that provides $\frac{1}{2}$ NPT threading,



Figure 15 — The Elk antenna on a mast out in the field.

which screws directly into my Buddipole masts for the portable deployment on 2-meter SSB.

I also tried a 65 W Daiwa 2-meter amplifier with this antenna, and this gave me a “big” signal combined with the antenna gain, with performance similar to a base station using a vertical.

I conducted a shakedown evaluation from Signal Hill with my Icom IC-705 at an elevation of 300 feet, overlooking the city. Using the Elk antenna, I was able to reach several previously scratchy repeaters more than 100 miles away with clear signals. This included repeaters in the Buffalo area, more than 80 miles away, which I couldn’t access with just a mobile vertical antenna. I used a 20-inch length of PVC tubing for the mast, as recommended for vertical polarization.

When I switched to SSB, the antenna improved my signal by 2 – 3 S-units, consistent with its number of elements. I also confirmed that the front-to-back ratio aligns with the manufacturer’s specifications (see Table 3).

Table 3 — Elk Antennas 2M/440L5	
Dual-Band Portable Log-Periodic Antenna	
Manufacturer’s Specifications (not tested in the ARRL Lab)	
Operating frequencies	144 – 148 MHz and 427 – 450 MHz
SWR	1:1 SWR on both bands (144 – 148 MHz and 427 – 450 MHz)
Power rating	200 W on 2 meters, 100 W on 70 centimeters
Front-to-back ratio	20+ dB
2-meter gain	6.6 dBd (8.7 dBi)
70-centimeter gain	7 dBd (9 dBi)+
Weight	1.63 pounds (1.23 pounds without the handle)
Unassembled dimensions	24.5 × 3 × 3 inches
Connector type	Two options: UHF or N
Boom coating	Uncoated aluminum booms or black powder-coated booms

Rotating the boom to vertical for FM and horizontal for CW/SSB modes was easy, requiring just a twist of the PVC mounting assembly. I asked some friends to call me on 146.520 and 144.200 MHz for range checks, and they were impressed with the signal levels both on point and 90 degrees off point. It appears that this antenna has broader lobes than my five-element 2-meter Yagi, despite being less than 3 feet long. While weak-signal operators may prefer antennas with 17 elements and tight lobe patterns, the Elk offers improved signals and enhanced coverage in a portable package.

Foxhunts

I would not recommend using this antenna for foxhunts, as it may bend or break if caught in a tree branch or

bounced against the ground. For such activities, a tape-measure Yagi would be more suitable. However, the Elk is ideal for fixed mobile use — perfect for taking a signal bearing, quickly jumping out of your vehicle for a scan, and then placing it back in the trunk to take another bearing elsewhere. Elk offers replacement parts at reasonable prices, allowing repairs to be made by the operators, increasing the lifespan of the antenna.

SOTA and POTA

This is a must for SOTA operations, and its size and weight make it backpack-friendly as many are enjoying operations above 2 meters from various summits. There are also many state parks for POTA with high points that can also be activated on 2 meters and 70 centimeters.

ARES/Emergency Communications/GMRS/MURS

I drove out to a fire station located in a valley, which had issues accessing the club repeater used for ARES simulated emergency test events. Using an 18-foot Buddipole mast and tripod, I was able to deploy the Elk antenna in less than 5 minutes. Pointing it toward the repeater site, the signal improved from unreadable to readable but still a bit noisy. The antenna provided communication capability that wouldn’t have been possible with a mobile antenna or J-pole. Next time, I plan to position the antenna higher to see if the signal quality can be further improved.

The FCC in the US allows the use of GMRS repeaters, and I frequently hear hams using them during my travels across the border. GMRS is becoming more common with neighborhood watch groups and emergency communication teams. ARES groups are also adding MURS radios to their kits for interoperability with other emergency communication teams. This antenna covers GMRS and MURS frequencies along with other ham bands, providing a single, versatile solution. It can be quickly deployed on a PVC mast, significantly improving signal quality and communication range.

Scanning Public Safety, Air Shows, and Fleet Week

The Blue Angels and Snowbirds Airshow teams will use frequencies between 250 and 390 MHz. I have not seen any antenna to provide this coverage except a modified TV antenna (that is typically also a log-periodic design). The Elk antenna is ideal for this. The ability to have directionality and gain will allow reception of the airplanes a lot farther out. Of course, with marine band coverage this antenna will also improve reception for marine and naval vessels during Fleet Week.

I also found it beneficial in the standard air band pointing the antenna toward medical helicopters and, of



Figure 16 — The Elk antenna SWR sweeps for 144.200, 146.520, 223.500, 437.200, and 446.000 MHz.



Figure 17 — The Elk antenna SWR sweeps for 123.450, 156.800, 255.500, 462.000, and 446.000 MHz.

course, airport towers to improve reception. It was also helpful in pulling in signals from the Public Safety P25 repeater in the next county during a five-alarm fire that I heard via my Whistler scanner.

SWR Graphs

SWR is low across the ham bands for which it is designed, but it is not usable for transmit on 220 MHz or even the marine band at 156.8 MHz. However, it can be used on the UHF band beyond 70 centimeters covering GMRS and MURS frequencies. Figures 16 and 17 show the SWR sweeps on different frequencies. My testing showed excellent results on receive when connected to my scanning receiver.

Hacks or Modifications

My idea is to transport the antenna in a 3 × 24-inch PVC tube with endcaps. Elk offers a cloth carry case as an option, but a tube also offers good protection. The small size allows it to be compact and sit in the trunk of a car and be available for use anytime.

I used a PVC T-connector with ½-inch NPT threads so I can use it on a third-party mast. The Elk generic PVC mount makes this very easy to modify.

A 20-inch mast extender for use when the antenna is deployed vertically is just as easy to make.

With its PVC boom, it's possible to come up with various low-cost mounting solutions, especially with the availability of 3D printer files.

The last addition I made was to add 50 feet of RG316 coaxial cable and required SMA adapters to connect

to my software-defined receiver and scanning receiver. The wide frequency coverage lends itself very well to listening or locating public safety repeaters as well as searching for activity on the scanner bands. I can now enjoy this activity from portable locations.

Conclusion

I had a couple of questions, and they were answered quickly by the owner, Jim. He also offers various accessories and a complete set of replacement parts. I suggested that they offer a hard-shell carrying case and a BNC connector option. The Elk antenna that started off as an antenna for satellite communications has now become a must-have antenna due to its broad frequency coverage that can be used for many other radio activities. Comparing the prices to several single-band fixed Yagis, the Elk offers a lot more capability and flexibility for the portable operator. You may find yourself buying a second one for the go-kit or for fixed use at home with a small TV rotator.

I also looked into using this antenna for travel purposes. I can fit the antenna into a checked 26-inch suitcase and its low weight doesn't cause any bag weight anxiety. I can see several SOTA locations in the San Francisco and Denver areas that can be easily activated on 2-meter simplex. The Elk would be a perfect antenna for this type of radio activity.

Manufacturer: Elk Antennas, 47 Big View Rd., Clark, WY 82435-8174, www.elkantennas.com. **Price:** between \$137.95 and \$170.95, depending on the selected options.

Ask Dave

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

Inside SWR and Static Buildup

SWR Can Lead Down a Rabbit Hole

Q Elias Deverent asks: I always thought that a standing wave ratio (SWR) greater than 1:1 indicated some reflection in the transmission line. I built a simple circuit in *SimSmith* that contains only a constant RF voltage source with an output impedance of 50 Ω . I attached a 150 Ω resistor across the output and was surprised to see an SWR of 3:1 with a reflection coefficient of 0.5. What is going on?

A SWR measures how well the transmission line and antenna combination absorb power from a transmitter. A law in electrical engineering says that the most efficient power transfer takes place when a device's output impedance matches the input impedance of the load. In your case, the output impedance is 50 Ω , and the load impedance is 150 Ω . Thus, the power transfer law's prerequisites are not met, and the power transfer will not be 100%. In RF circuits, we see this partial power transfer as a reflection of some of the power back to the transmitter. If you connect an oscilloscope across the load input, you will see the combination of the forward RF power and the reflected power as a standing (not moving) wave. Of course, some power, 50% in this case, is being transferred, so the combination waveform will show progress.

The formula for SWR in terms of the reflection coefficient is $SWR = (1 + |\Gamma|) / (1 - |\Gamma|)$. $|\Gamma|$ is the magnitude of the reflection coefficient (the reflection coefficient is a complex number, but here we take the magnitude and ignore the phase angle). If the reflection coefficient is 0.5, this comes out to $1.5 / 0.5$, or an SWR of 3:1. Reactance is not involved. The non-unity SWR arises from a violation of the maximum power transfer law.

Note that I have not yet defined the load as an antenna. It could be three 50 Ω dummy loads in a series, but we like to deal with antennas. A large majority of the transmitters we use have a 50 Ω output impedance. Much of the transmission line we use is 50 Ω . So, for maximum power transfer, we want a load of 50 Ω .

Let's look at the antenna. The load resistance will have a reactive component, as shown in Figure 1. In

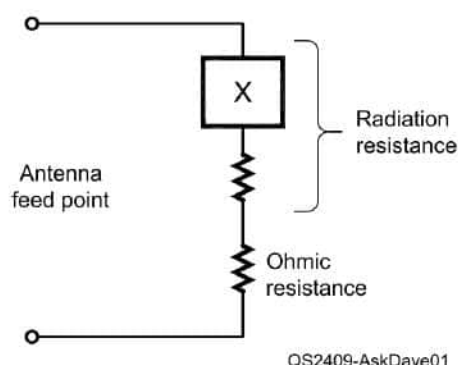


Figure 1 — A simple antenna model. Any antenna can be considered ohmic resistance in series with the radiation resistance. The ohmic resistance is the resistance in the antenna's components that creates heat. This heat is the antenna loss and can be reduced by making the wire or tubing more conductive. The radiation resistance represents the portion of energy that is radiated. This radiation resistance is composed of a resistive part and a reactive part. If the reactive part of the radiation resistance is zero, the antenna is resonant. If the reactance is zero, and the sum of the radiation resistance equals 50 Ω , we will have 1:1 SWR. This happens only on a single frequency.

its simplest form, an antenna can be modeled as an ohmic resistance that dissipates power as heat and a radiation resistance that represents the coupling of the RF power to the electromagnetic field. The radiation resistance will have zero reactance at only one frequency. Given this is true for all antennas, what can we do?

We can add a matching device, usually an antenna tuner, between the transmitter and the combination of the transmission line and antenna. The most common configuration of an antenna tuner is two variable capacitors in a series with the load and a variable inductor connected between the two capacitors and the cable shield, usually grounded, as shown in Figure 2. The input impedance to the properly adjusted tuner is 50 Ω with no reactive component. The output impedance is equal to the complex conjugate of the impedance of the combined feed-line and the antenna impedances. This means that if the load impedance is inductive, an equal and opposite capacitive impedance

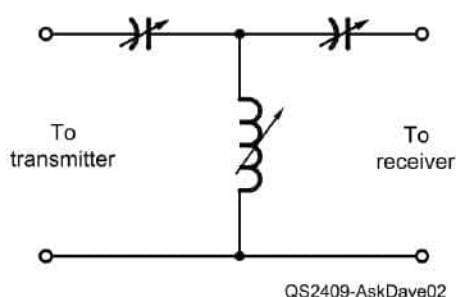


Figure 2 — A tee-tuner schematic. Most manual tuners use this circuit. When properly adjusted, the transmitter will see 50 Ω . The antenna will see the complex conjugate of its impedance. The tuner captures the reflected power from the antenna and sends it back to the antenna in sync with the RF signal.

can collect the reflected power and send it back to the antenna during the next RF voltage cycle. These two reactances form a tuned circuit. The circuit has ohmic resistance in the antenna and transmission line, which will dissipate power as heat, reducing the power radiated as RF. We can avoid these losses by carefully tuning our antennas so that we aren't relying on tuners so much.

Not every system works at 50 Ω . We encounter antennas that require a matching device to work with the transmission line, and many transmission lines are not 50 Ω . With some antennas, the tuner goes right at the input to the antenna, but the same principles apply.

Static Buildup on Wire Antennas

Q Chris Richmond, KK7DRM, asks: I attached my ARRL end-fed half-wave kit to the roof post of my deck and strung a 20-foot mast into the yard. At the unun box, a copper wire attaches the counterpoise terminal down to ground. I also have a lightning arrestor on a ground rod set up where the cable enters my house. Because of how the unun is wound, will that provide a proper path to ground for the static, so that it won't come into the radio?

A Yes. Think of dc, which includes static buildup, as different from RF. The RF sees proper impedances in the unun, but the unun is a dc short between all the inputs and outputs. Thus, the static buildup will easily find a path to ground.

The answer is not quite so simple if you're using a standard dipole. In a common feeding method, the coax inner cable is connected to half of the dipole, and the other half is connected to the coax shield. The coax shield is grounded at the lightning arrestor where

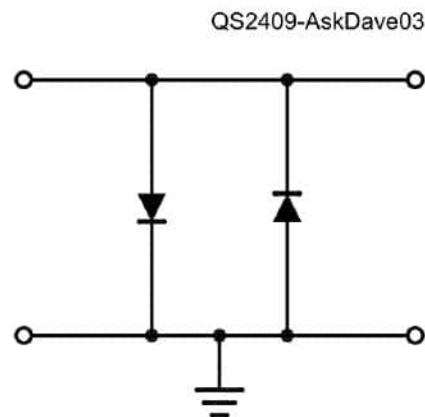


Figure 3 — A simple limiter circuit. Each silicon diode has a threshold voltage of about 0.7 V. If a signal is less than 0.7 V peak to peak, it will not be limited. This is true on nearly all received RF signals. However, if static buildup exceeds 0.7 V, one or both diodes conducts and bleeds off, protecting the receiver's front end.

it enters the house, which provides an easy path for static buildup. However, the other half of the antenna does not have an easy path to ground. Fortunately, when the voltage builds to a certain point, the lightning suppressor will arc over and send the static into the ground.

Many radios have input filtering circuits that involve inductors across the input. This can pass a small amount of static buildup to ground. Too much static buildup can cause issues with these delicate circuits. A common fix for over-voltages of this sort is a set of back-to-back diodes, as shown in Figure 3, across the receiver input inside the transceiver. At first, it looks like a contradiction, but recall that a common diode such as the 1N914 will not conduct until the voltage across it exceeds 0.7 V. So, if the received signal is less than ± 0.7 V, which is true nearly all the time, it passes through to the receiver's front end. However, if the static voltage is greater than this, the diodes will conduct and limit the voltage. Such a circuit is a form of a limiter.

The best protection is to provide a dc path to ground. Many baluns and ununs provide a dc short across the terminals. When this is not the case, such as with common dipoles, a lightning arrestor can provide a path to ground.

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

Sharing Audio the Easy Way; Gutters as Stealth Antennas; A Wood Base for Prototyping

Dual Headphones and Speaker

If you need to share the audio output of a receiver or transceiver between two headphones, such as at the Scout gathering shown in Figure 1, Figure 2 shows a device that makes it easy.

I devised this simple circuit and built it into an existing external plastic speaker housing to enable two individuals — an operator and a guest — to simultaneously listen to a transceiver's audio output. Toggling



Figure 1 — Hal Frank, KF6RRR (left), and William Green, a Scout from Pasadena, California, using the dual-headphone/speaker at a campout 4,800 feet above Lake Hughes, California. The dual-headphone/speaker box appears in the lower-left corner. [Michael Newman, KM6KAQ, photo]

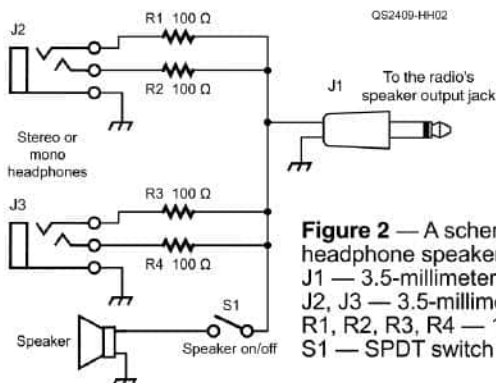


Figure 2 — A schematic of the dual-headphone speaker.
J1 — 3.5-millimeter plug
J2, J3 — 3.5-millimeter stereo jacks
R1, R2, R3, R4 — 100 Ω , 1/2 W resistors
S1 — SPDT switch

the switch adds a speaker to the output stream to allow more people to listen. — 73, Allen Wolff, KC7O, kc7o@arri.net

Another Approach to a Gutter Antenna

We recently moved into a home where the HOA rules severely limit my HF radio activities — especially when it comes to antennas. I tried an end-fed half-wave wire, but it was impossible to get it up high enough to be effective. It was also too noticeable, and it would have been in the maintenance folks' way. The attic turned out to be unusable for HF, too.

My wife suggested that I investigate the gutter system as a potential antenna. As far as I could tell, neither the gutters nor the connecting downspouts were grounded.

I ran the hot wire from my 49:1 balun (the type frequently used with end-fed antennas) via my patio door to the downspout. I also installed a ground rod outside the patio door for the ground side of the balun



Figure 3 — The 49:1 balun is mounted in the blue box with the antenna lead also shown, and the ground connection and feed line are at the opposite end. The antenna and ground wires exit through the patio door and are secured via self-adhesive cable tie anchors. [Rich Barnett, N9NP, photo]



Figure 4 — The finished stealth antenna system. Look closely and you can see the antenna and ground lines exiting the patio door and the white self-adhesive clips carrying the antenna wire over to the connection at the downspout of the left side of the building. [Rich Barnett, N9NP, photo]

and routed this wire through the door opening.

I kept the balun inside the home (see Figure 3) because while the door could easily close on the thin insulated wires, a coaxial cable connected to an outdoor balun would be too thick. Besides, not all baluns are designed for permanent outdoor installations. The finished installation is shown in Figure 4.

Using a manual antenna tuner, I can achieve standing wave ratios of less than 2:1 on 160 – 10 meters. The automatic tuner in my Icom IC-7300 transceiver will achieve an acceptable match on the 10-, 15-, 20-, and 30-meter bands. I keep my RF output low for safety concerns, and yet I am still able to make contacts throughout the world. In fact, I am even able to participate in a weekly net on 80 meters.

My gutter antenna can be mildly directional. For example, it has a sharp lobe to the southwest on 17 meters. And, of course, the antenna tunes differently when the gutters are filled with rain or snow! — 73, *Jim Kocsis, WA9PYH, wa9pyh@arri.net*

A Wood Foundation for Prototyping

After adding all of the parts to a PC board, I needed to add interface components to test my prototype. These consisted of two potentiometers, a pushbutton, an earphone connector, and a toggle switch. Rather than having these components hang loose during testing, I decided to try a more durable, yet temporary approach.

I secured the PC board to a wood plank with wood screws and small standoffs. I attached each interface component to the board by forming loops of #12 AWG



Figure 5 — In this close-up view, you can see how a pushbutton is held in place with a loop of copper wire that is secured to the wood plank with a screw. [Jim Kocsis, WA9PYH, photo]



Figure 6 — By using this technique, all of the interface components are firmly held in place for testing. Assuming the testing goes well, they can be easily removed for permanent installation in a suitable enclosure. [Jim Kocsis, WA9PYH, photo]

copper wire that fit snugly around the threaded part of the device. With the copper wire bent at a right angle, the straight part of the wire is secured to the breadboard with a wood screw and a washer that has been bent slightly to capture and hold the wire (see Figure 5).

In addition to having a quick way to finish construction of a project's test phase (see Figure 6), a side benefit is that all of the leads are short, which keeps crosstalk to a minimum. — 73, *Jim Kocsis, WA9PYH, wa9pyh@arri.net*

"Hints and Hacks" items have not been tested by QST or ARRL unless otherwise stated. Although we can't guarantee that a given hint will work for your situation, we make every effort to screen out harmful information. Send technical questions directly to the hint's author.

QST invites you to share your hints with fellow hams. Send them to hh@arri.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.

Flash Drills

Create opportunities for your group to practice skills and prepare for an emergency situation.

Mike Pulley, WB4ZKA

Disaster simulations on the air are far too valuable for training to be relegated to an annual Simulated Emergency Test (SET) every October. However, a worthwhile simulation can be hard to design and conduct more often than that. Flash drills solve that problem so simulations can happen more frequently. They remain interesting and challenging, and exercise decision making and Incident Command System (ICS) principles, not just net protocols in the field.

Field Cell Structure

A unique feature of flash drills is that they're designed in small, manageable cells or modules of deployed and non-deployed role players located near one another, as shown in Figure 1. Each module has a leader, much like we're taught in the ICS. They are the Drill Facilitator for that cell and are responsible for the hams who take care of the simulated disaster.

We're not necessarily conducting an ICS simulation but borrowing the principles so they're familiar when trouble strikes. We're not in charge; we're in service, but we practice principles of modularity, management by objectives, span of control, and other fundamentals that make the ICS so powerful.

Each Drill Facilitator gives out assignments in advance, knows where each role player is and what skills and capabilities each role player has and wants to learn, and visits each role player during the drill. The Drill Facilitator assumes a mobile tactical call sign, a role that is expected to move around solving problems in a disaster.

The Drill Facilitator designs the cell's role-play instructions. As more hams sign up to participate, more Drill Facilitators should be acquired and spawn off cells using the same role-play material. There won't be repetitious duplication on the net because each role player's tactical call sign, traffic, and issues will be different from other hams with the same roles. This cell architecture makes flash drills scalable, so with one set of planning materials, drills can involve only a half dozen or up to several dozen role players.



Listen to Mike, WB4ZKA and his team tackle a flash drill in the digital edition of QST (www.arrrl.org/qst).

In addition to the cells, role players need to exchange traffic with the other cell role players. For example, evacuation shelters need to talk with the American Red Cross chapter, someone at a downed power line needs to talk to a utility company liaison and maybe the police for traffic control, and someone monitoring a flooded stream crossing needs to talk to the Flood Control Department liaison at the county Emergency Operations Center (EOC). These role-play instructions are reusable for next time, so no preparation time is wasted.

Drills, Not Performances

One way to design a simulation is to give the role players scripts to read in sequence, like a stage play, which sounds good in theory but you're really only exercising the role player's ability to read aloud over the air. That's a performance, not a drill. Disasters don't come with scripts.

In contrast, flash drills provide instructions and objectives, not scripts, so role players learn to improvise. For instance, the role player is instructed to report when they're on the station. It's up to them to know (or learn) how to check into a net, receive a tactical call sign, note what other stations are on the net, get

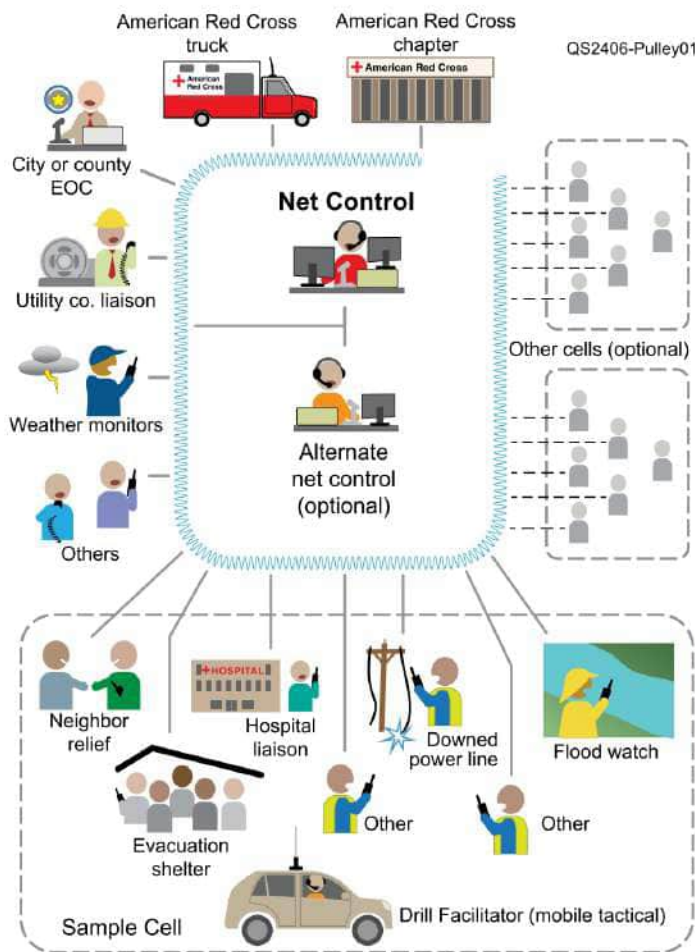


Figure 1 — A sample flash drill tactical net for a destructive storm. Expand the simulation by adding more cells. Design the cells and roles to complement your simulated disaster. You can have multiple evacuation shelters, hospital liaisons, or other roles within a cell, too. Cells don't have to be identical, just manageable by a Drill Facilitator.

net control's attention using their assigned tactical call sign, give their report succinctly and clearly, and close with their FCC call sign. If it's not second nature, it can be challenging. So, we tell them what they need to accomplish but not how. They get to learn these skills for next time.

By not scripting traffic, the role player has more information than they need, and they have to decide what to do with it. Do they blindly blurt out everything they know? If not, what do they report, and what do they keep to themselves unless asked? They must grasp what is important in the moment. Making useful traffic is much more than just saying it clearly over the air.

Furthermore, every flash drill is an exercise for net control and the Drill Facilitators, too. They don't know everything that will happen or when. Their job is to handle whatever comes up. No two drills are the same, based on who participates and what assignments

they're given. So, it's a true drill for these leaders, too.

The results will probably amaze you. Your people will figure out how to adapt and overcome, but mistakes and failures will happen. A simulation is the right place for failures when life, limb, and property don't hang in the balance. So, embrace the mistakes, laugh at the funny ones, and learn and improve for next time.

Directed, Deliberate, and Actionable

One of the central aims of flash drills is to encourage role players to think before keying the mic button. The explanations for the following terms illustrate the importance of learning to make directed, deliberate, and actionable message traffic:

Directed — Who needs to receive your message? Or whom do you need to get information from? Just blurting out to net control isn't usually the answer. For instance, it's best if the role player begins their exchange with "I request direct with county EOC" so net control can connect those two parties and the message can be said once, not fumbled through several hands. Net control has no business relaying a message between stations; their job is to connect those two and let them handle their business directly.

Deliberate — Why does that person need your message? What parts of it do they really need, and what parts are useless to them? Leave out the useless parts.

Actionable — What do you want to happen as a result of your information? Don't throw traffic onto the net and hope someone will guess what to do about it. Tell the station what you want them to do up front.

Use the following command-tense verbs to communicate more effectively:

- Begin your message with "Be advised" if you just want them to know what you are going to say, but not necessarily do anything about it.
- Use "Notify" when you want them to pass your message to someone, such as an evacuation shelter captain.
- If you want the American Red Cross chapter to send more coffee cups, then say, "Send 250 coffee cups to this shelter by 5 AM tomorrow morning." Be specific.

Learn the list of other common command words, such as "confirm," "say again," "acknowledge," and "disregard." They pack a lot of information. Know what you want, and learn to say it clearly.

Directed, deliberate, and actionable traffic is foreign to most hams. Outside of disasters and drills, hams usually make social connections or staccato contest exchanges. They must be trained on the notion of radio with a purpose. A real communicator has a reason to key up and knows how to give or get the help they need.

Keep It Challenging

Because it's not a scripted performance, give every ham a challenging (but not overwhelming) job that can teach them something by doing. Flash drill role-play instructions are designed around a list of training objectives broken into beginner, intermediate, and advanced emergency communications topics. Each category has five levels of increasing skills, capabilities, and responsibilities to master.

Level 1 for beginners focuses on mastering simulation role play, basic net operations, VHF/UHF repeater operations, and making routine reports to the net. Deployed beginner role players get to exercise basic portable operations. They'll be assigned to a simulated evacuation shelter, flooded crossing, a power line that is down, or some other portable role. They'll operate from a school, church, park, or hospital near their home. Non-deployed role players get to practice base station operations. They'll be assigned to simulate a portable role or play a fixed role like an American Red Cross chapter, telephone liaison, or National Weather Service weather monitor.

Intermediate and advanced role players get to do more, from deploying a significant field antenna, passing formal message (radiogram) traffic, leading a field team, operating digital modes on VHF/UHF and HF, to serving as net control.

Each level has different traffic to handle, so even though a ham may simulate an evacuation shelter every time, their traffic will change as they advance up the skill ladder. That helps prevent flash drills from becoming predictable.

What You Need to Craft a Flash Drill

Once you grasp the basic nature of flash drills (the scalable field cell structure, deployed and non-deployed roles, reusable instructions and not scripts, and prescribed training levels), you only need the fiction writer's craft. You are, after all, writing a story for each role player to improvise.

Put yourself in the role, and craft realistic stories that an evacuation shelter might have that require on-air business with a net, an American Red Cross chapter,

or other evacuation sites, and write scenarios that produce useful, relevant message traffic. Include a way to make each person's traffic details different for each role. It can be fun if you have a knack for fiction writing. If you don't, recruit someone who does.

An Hour Well Spent

In the Phoenix, Arizona, area, flash drills run for a single hour. The short time lends urgency to the net — the same feelings that will surface when people and property are really at stake. Adrenaline threatens to unravel you. Learning how to stay calm under stress separates the amateurs in the worst sense from the reliable amateur radio professionals.

For instance, we don't pre-assign tactical call signs. We assign them as stations check in during the simulation, just like it happens in an unfolding disaster. When time is short, and everyone needs the net's help, tensions rise as the net struggles to wrest order from the jaws of chaos. Then traffic can flow.

When the hour is up, regardless of any traffic still pending, we close the drill. Because several stations are deployed, we review what went well and what we could improve while tracking everyone safely back to their homes.

We learn about as much as we can absorb in the hour, and it lets the role players know what time commitment they're signing up for. We've found that longer isn't necessarily better. I confess it took us months to learn how to organize ourselves quickly and then get to the traffic at hand, but we eventually learned.

A World with Affordable Simulations

When disaster simulations are relatively cheap to produce, you can elect to have one a month. All year, you can get the excitement, training, and experience your group needs without burning out the organizers. As the group becomes more efficient, more traffic is handled, and more issues are identified and resolved before the hour expires. Hams grow to fill more responsible roles. The improvements become tangible and measurable.

Spark your fellow hams' imaginations by making the disaster and the stories they play out relevant to what they could likely encounter. Simulate what you would like everyone to gain some 20/20 hindsight on before it actually happens. Your disaster could simulate destruction from a hurricane, a tornado, a microburst, floods, mudslides, a paralyzing winter storm, a burp cloud from a thermonuclear power plant, a train derailment, a multi-vehicle highway pileup that overwhelms local

services, or a ruptured gas line. You could rescue a lost hiker or exercise evacuations for wildfires (possibly including livestock rescue). Maybe build a simulation around Field Day. Sometimes, simulating a calm, routine bicycle or foot race public service event might be a nice change of pace, especially just before the start of the season for such events in your region. Pick your disasters based on what's likely to happen in your area, and mix it up to avoid getting into a rut.

You can find the beginner role-play instructions we've used on the *QST* in Depth web page at www.arrl.org/qst-in-depth to start conducting your own flash drills. You can see the format that has worked well for us, sample net control logs, and other types of assignments. Training objectives for each role-player level are also available so they can have fun, benefit from the situation, and come back next time.

When trouble strikes, you won't have to make everything up on the fly or try to remember what you heard in a classroom or on a discussion net. You've practiced for this very day. Best of all, everyone gets to have a good time honing their skills on something that matters in the company of others doing the same. That's radio with a purpose!

See *QST* in Depth for More!

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

- Flash drill portable operations exercises from various locations
- Net control logs and scripts
- Role-play instructions for various roles
- Sample odometer reading files for various locations

ARRL Life Member Mike Pulley, WB4ZKA, cut his emergency communications teeth on the tornadoes of Alabama. At age 16, he served as net control on the night of the 1974 Super Outbreak, the most violent tornado outbreak ever recorded at the time. Mike has lived, volunteered, and helped train ham volunteers in the Phoenix, Arizona, area for more than 30 years. He invented flash drills to bridge the gap between emergency events and the realities of disaster communications. Mike also invented the exercise-based Arizona Emergency Net — Maricopa (see "Reviving Your ARES Training Net" in the September 2016 issue of *QST*) to help train ham volunteers for public service. He led this net for more than a decade. For a limited time only, Mike is willing to help develop flash drills for your group. Contact him directly at Mike.J.Pulley@cox.net.

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

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If you enjoyed this article, cast your vote at www.arrl.org/cover-plaque-poll

New Products

Radio Separation Kit

SwapMyRigs (SMR) now has a radio separation system in kit form! The kit lets you swap radios without ever having to install new cables. By routing all the conductors through a common VGA cable, any radio with industry-standard RJ connectors can be installed or replaced without using manufacturers' proprietary, multi-cable separation systems. The photo below shows all the parts included in the kit. No soldering is required; all circuit boards are fully populated and soldered. Assembly requires only common tools.

The patented SMR kits are sold in pairs and include a 15-foot VGA cable with all the shunts and jumpers necessary for configuring the units for supported transceivers. The kit is substantially cheaper compared to assembled and configured units. The chart below shows a list of supported radios and tested separations. For more information or to purchase, please visit www.swapmyrigs.com.



Radios & Tested Separation

Yaesu	Kenwood	ICOM
FT-891 100'	TM-D710A/G 75'	ID-880H 15'†
FT-857 75'	TM-V71 75'	IC-2720/30H 100'
FTM-350 75'	TS-480 100'	IC-2820H 25'
FTM-100/400 90'	TM-D700 100'	ID-5100 100'
FTM-200/300 15'†	TS-2000 100'	ID-4100 65'
FTM-500/6000 15'†		IC-7100 100'
FT-7-8xxx* 100'		

*Also TYT TH-9800

† Tested with 15' VGA cable only

Now! UNIVERSAL KIT WITH 15' VGA CABLE \$69.99 COMPLETE

W/VE Island QSO Party: A Kayak Rove

Three experienced POTA operators teamed up to activate five islands in a Pennsylvania lake that are accessible only by water.

Matthew Brown, K2EAG

In 2023, members of the Radio Association of Western New York (RAWNY), W2PE, participated in the W/VE Island QSO Party (<https://usislands.org/qso-party-rules>) for the first time. We decided to include a five-island rove — all by kayak! I learned about the 2023 event while listening to RAWNY's weekly information net. Run by the US Islands (USI) Awards Program, this QSO party takes place once a year on the last Saturday in August.

Discovering Portable Operating

Angela Brown, N3ARB, and I have been active with Parks on the Air® (POTA) for a few years. Our first POTA activation was at a picnic table at Whirlpool State Park in Niagara Falls, New York. After that, we were hooked on portable operating. The next time out, we brought two of everything and operated simultaneously from nearby tables. During the colder months, we progressed from operating in a vehicle to operating in an ice fishing tent with a propane heater, and eventually began using an Aliner Scout pop-up camper that we can tow with our mid-size SUV. We've made upgrades to the camper that allow us to activate more quickly, such as mounting two Yaesu FT-450D HF/50 MHz transceivers and a Yaesu FT-8800R dual-band mobile in the front of the camper, just below where it folds down. Normally, all we have to do is deploy a couple portable HF antennas with coax fed into the camper. Our friend Dennis Schultz, N2DJS, also has gotten into camping through POTA and recently purchased a 16-foot Wolf Pup travel trailer that he modified by replacing the front queen bed with a custom desk and equipment rack for portable operations. We now partake in some sort of camping and portable operating every other weekend or so, including at dispersed sites in nearby state and national forests, even in the winter.

Deciding to participate in the W/VE QSO Party at the last minute was not something we were afraid to take on. However, this activation was going to be different from our regular park and forest activations, as four



Matthew Brown, K2EAG, operated CW with a straight key from an inflatable kayak. The antenna was mounted a short distance away on one of the islands that made up Glenn Island.

out of the five islands we selected to activate can be accessed only by water.

Planning the Rove

Learning about the W/VE Island QSO Party reminded me of the numerous islands I've seen at Pymatuning State Park in western Pennsylvania during recent POTA camping trips. The Pymatuning Reservoir is one of the largest lakes in Pennsylvania, stretching into Ohio, with state parks covering both sides of the lake. There are seven named islands and more than 20 unnamed islands. I thought this would be a great opportunity to combine portable operating with camping and kayaking, while potentially activating multiple islands.

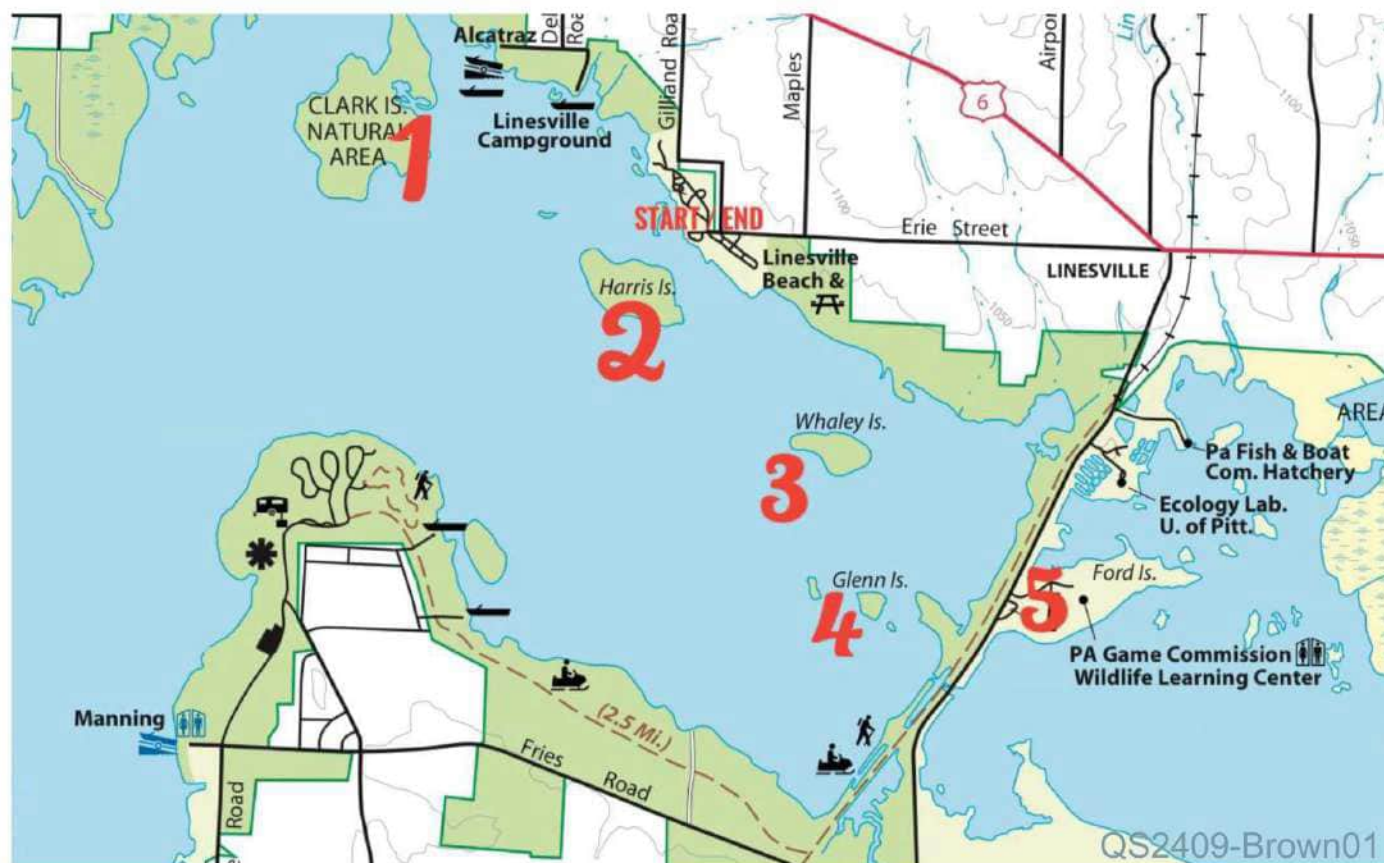
In my research, I discovered that only one of Pymatuning Reservoir's seven islands (Ford Island) already qualified as a USI Awards Program island. *Qualification* refers to the initial activation of an island, when it completed at least 15 contacts. I reached out to the USI Qualifications Manager and submitted a request, along with my plan to qualify four other Pymatuning Reservoir islands (Clark, Harris, Whaley, and Glenn



Dennis Schultz, N2DJS, made SSB contacts on 40 and 20 meters with 20 W. This allowed the W2PE team to make contacts locally, regionally, and farther away.

Islands), each about a mile apart, which met the USI program requirements. The island reference numbers were assigned, and our planned activity got added to the award program's calendar. Once I had that confirmation, I made camping reservations for Friday night through Sunday morning at the Linesville Campground on the northern shore closest to our islands. Angela, Dennis, and I decided to participate in the W/VE Island QSO Party as an Island Rover. Because we would be using a single call sign, we approached RAWNY's Board of Directors and trustee with our plan and received permission to operate with the club's call, W2PE.

Travel between all the islands with all our gear was done by kayak. At least Angela and I had some experience, as we've been participating in a local kayak meetup group, getting to explore many local waterways while meeting new people. Together, we paddled two blue Sea Eagle Explorer 300X inflatable kayaks with our food and supplies. We used a Sea Eagle 465ft FastTrack inflatable kayak to carry additional radio equipment, folding tables, and chairs. These kayaks are extremely stable and were able to easily carry all our gear for the day.



The W2PE team's roving plan included paddling between each of the five named islands in the northern Pymatuning Reservoir and activating them for the W/VE Island QSO Party.



Matthew Brown, K2EAG, and Angela Brown, N3ARB, operated Glenn Island among the lily pads in their kayaks.

At each island, we worked together to set up and tear down our portable station, at which we took turns operating SSB, CW, and FT8 to maximize our multiplier at each island. Our station consisted of a Xiegu G90 for phone and CW operations and a Xiegu X6100 for FT8 operations. Both radios were powered by a 20 Ah lithium iron phosphate battery. We used a Chameleon MPAS 2.0 vertical antenna, which tuned up perfectly for us on 40, 20, and 15 meters, and it was easier than trying to deploy wire antennas in the thick, overgrown brush. We also had a second battery and antenna and additional coaxial cable to use for backup.

Island Operations

Of the five islands we were activating, Glenn Island was actually a group of islands and was a bit of a marshy jungle. We couldn't find a good place to operate from, so we operated from the kayaks, floating in the middle of a field of lily pads while tethered to the antenna mounted on land. We still managed to operate all three modes, including straight key CW, from the kayak. We were able to make a park-to-park contact with a close friend of ours, Junie Cassone, N1DUC. Another memorable contact was with Dave Thorne, VE3LDT. He was the only operator who contacted us on all five islands.

The fifth and final island we reached was Ford Island, which was the only one that was accessible by car. It was already dark by the time we were set up, and the insects were terrible. We probably should've started earlier, as we would've liked to have operated longer. There were a lot of folks fishing from where we docked and set up, and we got to share what we were doing with a few guests who stopped to say hello.



Matthew Brown's, K2EAG, portable station on one of the kayaks.

A Journey Well Traveled

We made about 30 contacts on each island, as traveling to each one and setting up and breaking down our station took a bit of time between activations. Despite being our first year participating, our team came in first place in the roving category!

It was a fun adventure and one I look forward to doing again this year (2024 marks the 30th anniversary of the US Islands Awards Program). We activated all five islands, qualified four new islands, and operated three modes on each island. At the end of the long day, we had a relaxing paddle back to our campsite under the moon and stars.

All photos provided by Matthew Brown, K2EAG, and Angela Brown, N3ARB.

Matthew Brown, K2EAG, is an ARRL Life Member, has been licensed for 25 years, and serves as a Regional Coordinator for POTA and as the ARRL Western New York Section Traffic Manager. He and his wife, Angela Brown, N3ARB, enjoy operating together from parks, while also participating in other outdoor activities, including camping, archery, and kayaking. Matt has been an active CW operator for 2 years, thanks to the Long Island CW Club and the Straight Key Century Club. Matt and Angela are active in the National Traffic System as Official Relay Stations and net control stations for their local Western District Net. Matt can be reached at k2eag@arrl.net.

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



Conducting a Foxhunt at a Scouting Festival

A Scouting volunteer was asked to showcase amateur radio at a community event; here's how he delivered.

John Abbott, K6PFN

Our local Scout District in western Los Angeles, California, was planning a Festival of Scouting in August 2023 to showcase the skills that youth can learn and use in Scouting. The event was for both current Scouts and youngsters who might be interested in joining a Cub Scout Pack, Scout Troop, Sea Scout Ship, or Venturing Crew.

The organizers wanted more science, technology,

engineering, and mathematics activities among the various booths they were planning for the Festival. They asked me, a volunteer in my sons' troop (Troop 50), "Is there some radio thing you could do?" When a ham is asked that question, you know the answer is going to be a big "Yes!" But at first, I was wondering what "radio thing" I should do.

We needed something that would look interesting from afar and motivate Festival visitors to approach

The author (left) and his son Joseph (right) testing a tape-measure Yagi for the Festival of Scouting foxhunt. [John Abbott, K6PFN, photo]



our booth. I thought that if we did a foxhunt, the eye-catching Yagis would attract peoples' attention. A foxhunt, also known as amateur radio direction finding, is when participants use directional antennas and signal attenuators to find hidden transmitters (aka foxes). The activity also needed to be something tactile, and something that participants could get comfortable with at their own pace. With a foxhunt, they would be able to enjoy aiming their antenna, adjusting the attenuator, and learning how it all works while doing a fun activity.

Calling for Help

I have participated in a foxhunt before, but I have never run one. A fellow Scout leader, Walter Hicks, KN6FAT, put me in contact with Michael Hart, KC6MEH, who has previously conducted foxhunts for Scouts and is a serious foxhunter himself. Michael loaned me four directional PVC tape-measure antennas with plastic handles he made on his 3D printer; these handles also housed the attenuators. I purchased the foxes from Byonics (www.byonics.com/mf) and gathered some less expensive 2-meter radios from fellow hams.

The Plan

We planned for the transmitters to be on the same frequency and rotate transmission cycles. My sons and I programmed short melodies to serve as the signature tones for each transmitter. For example, participants would hear Song A in one direction to deduce that Transmitter A was in that same direction. Then, they'd hear Song B in another direction to deduce that Transmitter B was in that direction.

As Festival attendees came to our booth, we'd explain how the directional antenna and attenuator worked. One of the Scouts volunteering from my troop would walk along with each team to help them if they forgot how to work the attenuator knob, or if they needed a little encouragement to find a fox.

Michael gave us another activity for our booth: decoding Scout phrases in Morse code. Attendees would take a slip of paper with a Scout saying written in Morse code, and then they would use a decoder key and pencil to transcribe the message. I saw it as a way to give people something to do while they waited for an antenna to become available.

How It Turned Out

About 100 young people and various parents, grandparents, etc. visited our booth. We had some especially young visitors (ages 2 – 4) who were delighted to hold the antenna and rotate it to hear the fox signals fade in and out.

The reception of the Morse code activity surprised me. It wasn't just something to do while waiting in line for the foxhunt; people really enjoyed it. It was touching to see parents working with the younger children on decoding the phrases. Morse code is fun for all ages!

Lessons Learned

The next time our troop takes part in a Festival of Scouting, we will plan to have other activities in addition to foxhunting and Morse code decoding. I'd like to add a Get on the Air station for those who want to hear radio traffic and maybe operate.

Be ready for any opportunity to bring amateur radio to a community event. Let your organizations and your neighbors know you're a ham who can do a "radio thing" — such as a foxhunt — at their next event.

John Abbott, K6PFN, has been a licensed amateur radio operator since 2017. He currently serves on the committees of Cub Scout Pack 55 and Scouts BSA Troop 50 in the Western Los Angeles County Council of the Boy Scouts of America. John can be reached at k6pfn@arri.net.

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



2024 Simulated Emergency Test

The annual ARRL SET will be October 5 – 6, 2024.

**Steve Ewald, WV1X,
ARRL Field Organization Supervisor**

It's time to prepare for the 2024 ARRL Simulated Emergency Test (SET)! ARRL Field Organization leaders are planning simulated practice events that will actively involve the Amateur Radio Emergency Service® (ARES®), the Radio Amateur Civil Emergency Service (RACES), the National Traffic System (NTS), SKYWARN®, the Community Emergency Response Team (CERT), The Salvation Army Team Emergency Radio Network (SATERN), other auxiliary communications groups, and public service-oriented radio amateurs.

This nationwide annual event is among the best chances of the year for amateur radio operators to plan for and practice their emergency communications skills in an organized and coordinated effort with public service agencies and organizations in your community, ARRL Section, or state.

Coordination and Cooperation

ARRL has established formal relationships with national organizations and agencies such as the Federal Emergency Management Agency (FEMA), the American Red Cross, The Salvation Army, the National Weather Service, the National Communications System, the Association of Public-Safety Communications Officials-International (APCO-International), Citizen Corps, National Voluntary Organizations Active in Disaster (NVOAD), REACT International, Inc., the Society of Broadcast Engineers (SBE), and the Boy Scouts of America. More details about these organizations and agencies can be found at www.arrl.org/served-agencies-and-partners.

ARRL Field Organization leaders work closely with many of these organizations as well as others at the local, Section, and state levels. The SET offers a prime opportunity to test these working relationships and to help ensure efficient coordination when an actual emergency or disaster summons a call to action.



The ARRL SET encourages planning and coordination with public safety, emergency response, and amateur radio communities to be successful. [Andreas Ott, K6OTT, photo]

How to Get Involved

To find out how to get involved in this year's SET, contact your local ARRL Emergency Coordinator or Net Manager. ARRL Affiliated Clubs may know about the nearest ARES group and who the Emergency Coordinator is. In addition, refer to the ARRL Section web pages at www.arrl.org/groups/sections. Your ARRL Section Manager can assist, too. See page 16 in any issue of *QST* for a list of Section Managers' contact information.

In consideration of schedules, ARRL Field Organization leaders may conduct their annual ARRL SET events at other times throughout the year. Consult with your local or Section Field Organization leaders for more information.

Additional background information regarding the annual SET is presented in the article "Simulated Emergency Test 2023 Results" in the July 2024 issue of *QST*. Guidelines and specific SET reporting forms for ARRL Section and Field Organization leaders and reporting participants can be found at www.arrl.org/public-service-field-services-forms. If you are an Emergency Coordinator, Net Manager, or Section leader in charge of reporting this year's SET activity on behalf of your group, please fill out the online reporting forms.

The 2024 QST Antenna Design Competition

The QST Antenna Design Competition is back for 2024! You don't have to be an antenna expert to enter — or win. Just send us your best design for a portable, mobile, or base station antenna, and it will be evaluated according to the competition rules. Entrants are encouraged to consider the needs of new hams, as well as hams living in environments with antenna restrictions. Even if your design doesn't earn a prize, it may still be published in QST.

Choose your category wisely, and send only one entry per person or team. The deadline is **December 16, 2024!**

Official Competition Rules

Entry Categories:

Enter in one of three categories:

- 160 meters, LF or VLF
- 80 through 10 meters
- 6 meters and up

Entries Must Include:

- Drawings with dimensions (hand drawings are acceptable)
- A list of materials required to build the antenna
- A description and summary of any testing, modeling, and measurements (including SWR data)
- High-resolution photographs of the installed antenna
- The entry category you've chosen for your design
- Your name, call sign, postal address, and email address

Send your entry to:

QST

Attn: Antenna Design Competition
225 Main St.
Newington, CT 06111

Or email your entry to qst@arrl.org. In the subject line, include your call sign and the words "Antenna Design Competition."

When using email, the total size of all attached files must not exceed 6 megabytes (MB). If you need to send more than 6 MB of attachments, please use several separate email messages.

Only one entry per individual or team will be accepted. Entrants must be ARRL members. ARRL Headquarters staff and QST advertisers are not eligible.

Non-Commercial Designs Only: Antennas based on submitted designs must be the sole creation of the entrants and not available for sale.

Submission Deadline: December 16, 2024

Judging: All entries will be reviewed, and the most promising entries will be evaluated through software modeling. Winners will be chosen based on performance as predicted in modeling, as well as ingenuity of design, mechanical and electrical safety, and durability.

Prizes: First-place winners — individuals or teams — in each category will receive checks in the amount of \$500. Second- and third-place winners — individuals or teams — in each category will receive checks in the amount of \$250 and \$100, respectively. Winning designs will also be eligible for publication in QST magazine.

Disclaimers: By participating in the competition, you are verifying that you are the owner and producer of the design, and that no third-party ownership rights or patents apply to your design. While ARRL will not claim ownership of your design, through your participation you are granting ARRL a perpetual, worldwide, non-exclusive, royalty-free right to publish your entry materials in all media now known or hereinafter created, anywhere in the world, for any lawful purposes.



This page displays two past winners of the 2017 QST Antenna Design Competition, 80 through 10 meters category, both published in the March 2018 issue of QST. The photo to the left is "Cat Whiskers," The Broadband Multi-Loop Antenna," by Jacek Pawlowski, SP3L. The

background photo is "A Three-Element Moxon-Style Vertical Yagi Antenna for the 75-Meter Band," by Al Christman, K3LC, and Joe Johnson, K3RR.

2024 ARRL International DX Phone Contest Results

This year's ARRL International DX Phone Contest was held March 2 – 3, 2024.

Coming off of the ARRL International DX CW Contest, which had amazing conditions, hopes were high that similar conditions would hold up for the ARRL International DX Phone Contest, and for the most part, they did! With Solar Cycle 25 approaching its peak, reports of decent conditions, particularly in the first 24 hours of the contest, allowed for more DX to be worked, more fun to be had, and more participation than last year.

A total of 5,193 logs were submitted for the contest this year. This is an increase of 349 from 2023 and the highest number of logs submitted in the event's history.

Logs Received	
Year	Number of Logs
2024	5,193
2023	4,844
2022	3,976
2021	3,737
2020	3,527
2019	3,120

The total number of contacts also had a healthy increase, with 306,454 more contacts reported this year. In looking at the number of reported contacts per band, there was an increase across the board from last year, with the largest increase being on 20 meters.

A real indication of the effect of Solar Cycle 25 on DX Phone is the number of contacts made on 10 and 15 meters between 2022 and 2024. While the activity on all the bands has increased in the last 2 years of the contest, both bands saw the largest increases.



The PJ2T team for the 2024 ARRL International DX Phone Contest poses for a photo after the contest. The team took second place overall in the Multioperator, Multitransmitter category and took first place in DX. Pictured from left to right are Andy Catanzaro, W9NJY; Dorothy; Ryan Dahlberg, N0OJ; Cindy Foote, N4LGL; Curtis Foote, WX4W; Jan Heise, K4QD; Ray Fallen, ND8L; Geoff Howard, W0CG/PJ2DX; Pete Gladysz, K8PGJ; Vince Weal, K4JC, and Walter Aucoin, K5LD. [Geoff Howard, W0CG/PJ2DX, photo]

Contacts by Band			
Band	2022	2023	2024
160 meters	6,539	4,808	6,709
80 meters	46,356	49,825	56,872
40 meters	167,014	158,882	181,609
20 meters	390,778	328,245	434,885
15 meters	415,503	481,510	566,032
10 meters	217,513	789,506	871,099
Total	1,243,703	1,812,776	2,119,230

WRTC 2026 Qualification

The 2024 and 2025 ARRL International DX contests were selected as qualifying events for the World Radio-sport Team Championship (WRTC) scheduled for 2026 in the United Kingdom. As such, many operators jumped into the contest full force, looking to qualify for their specific regions.

Top Ten – DX

Single Operator, High Power		Single Operator, High Power, 160 Meters		Single Operator Unlimited, High Power, 40 Meters		Single Operator Unlimited, Low Power, 20 Meters		Single Operator Unlimited, Low Power, 15 Meters		Single Operator Unlimited, Low Power, 10 Meters	
8P5A		DL2SAX	180	9A3K	206,190	HK3LRB	188,268	KP4PUA	209,214	PY2UD	234,030
(W2SC, op)	8,061,273	UA7K	108	YT1A	179,025	PP2CC	97,185	SP7Y	104,940	PY2HT	177,480
CR6K		F5VLV	3	IV3YYK	80,295	H18SDR		PY2VZ	89,088	PU1JSV	164,787
(CT1ILT, op)	7,018,380			S51CK	76,986	(H18ESF, op)	63,066	SV2AEL	82,296	EA8TR	143,898
V31XX				JH7MQD	52,773	YV5WL	62,400	H13TT	71,775	PY2CPS	125,001
(K4XS, op)	4,879,710			DL1GLH	33,120	OK1K		EA3XR	55,845	IB2M	101,808
T11K				JA5WNH	31,584	(OK1XOE, op)	53,550	UR2Y		PY1KV	97,962
(T15CDA, op)	4,748,850			IP8T	27,495	R3AQ	15,720	(USØYW, op)	39,015	PY3FOX	88,536
E7DX	4,326,588			S56Y	20,202	ES1TAR	10,185	EF7O		IZ3NYG	80,478
OM2VL	3,630,324			JA2GTW	17,766	HB9HBY	7,392	(EA7ZC, op)	36,990	SP9XCN	71,898
EW5A						SP3WKW	5,913	OK4FD	28,602		
(EU1A, op)	3,582,621					TA3NE	4,350	PY2IB	22,755		
FM5KC											
(F5VHJ, op)	3,578,175										
KH7M											
(NA2U, op)	3,458,976										
CT3KN	3,325,014										
Single Operator, Low Power		Single Operator, High Power, 80 Meters		Single Operator Unlimited, Low Power, 40 Meters		Single Operator Unlimited, QRP, 20 Meters		Single Operator Unlimited, QRP, 15 Meters		Single Operator Unlimited, QRP, 10 Meters	
NP4Z	4,265,028	KP4KE	89,676	HB9PUJ	5,307	IO6R (IK6QRH, op)	3,450	EE3O (EA3O, op)	38,634	CB3A	
HH2AA		T32AZ	18,348	JJ1AEB	630	EM3ABM	27	HG1S		(XQ3SK, op)	51,561
(N2TTA, op)	3,932,832	YT4A	8,475	DL1AMT	48			(HA1DAE, op)	24,288	SP7M	15,120
EA8RM	1,965,837	OL4N		(OK1DTP, op)	2,376			EF5U (EA5U, op)	3,300	YØ8WW	5,880
H13T	1,858,950	F5VBD	990	JH2MYN	36			3G3A (XQ3SK, op)	1,152	IK5RUN	5,250
CO8ZZ	1,572,468	JE2OTM	96	YD4FYI	3			UT7A (UT7AA, op)	144	G4MJS	4,557
HA3NU	1,375,290									IT9/OLØM	
T12OY	1,249,794									(OK1CDJ, op)	240
H18PAP	1,007,532									CS7AWJ	27
PY2NY	898,161										
XE1YL	804,441										
Single Operator, QRP		Single Operator, Low Power, 80 Meters		Single Operator Unlimited, QRP, 40 Meters		Single Operator, High Power, 10 Meters		Single Operator, High Power, 10 Meters		Multioperator, Single Transmitter, High Power	
YV6BXN	202,860	JE1SPY	930	PA3CWN	240	D4K		PX2A		ZF1A	7,818,900
PA2TMS	63,750	F6EPO	90	JH3DMQ	210	(IZ4DPV, op)	708,288	(PY2LED, op)	596,214	CN3A	5,912,136
JH1OGC	58,869	UY7AM	75			HK1T	425,520	KP4JA		CR2X	5,553,840
JH7UJU	50,052	JH4CES	27			CR6T	399,489	(EB7DX, op)	529,938	TM6M	5,513,508
IZ4AIF	45,264					PW2D		KP2B (NP2V, op)	504,804	TO5M	5,324,664
JQ1NGT	24,576					(PY2BK, op)	334,800	NP2J (K8RF, op)	443,208	T11T	4,660,335
7N4WPY	18,216					ED5R (EA5Z, op)	314,760	S55OO	373,116	HP3AK	4,352,610
PY2PLL	15,984					9A5X	300,192	D4M	271,080	IO5O	4,260,240
F4FSV	14,964					OG8M		EA6S	241,248	TO3Z	4,154,007
DM2DX	14,523					(OH8MCT, op)	293,166	F6ARC	223,551	4A7S	4,090,500
Single Operator Unlimited, High Power						SP5GRM, op)	261,783	OL9Z			
V3O						QO4U	233,460	(OK2PVF, op)	221,454		
(DL8UD, op)	5,082,024							OM5R			
9A1P	4,105,485							(OM5DX, op)	217,848		
EB5A	4,095,960										
RW1F	3,881,520										
ED8M	3,482,130										
OM7M											
(SP9LJD, op)	2,985,048										
TM1K											
(F5USK, op)	2,857,608										
LY4A	2,813,796										
PT5J	2,731,350										
ED3X	2,475,846										
Single Operator Unlimited, Low Power											
WP3C	3,980,112										
PJ5/SP9FIH	2,884,140										
6Y1A											
(NØGJW, op)	2,109,756										
S52NR	1,713,360										
5K4X											
(KC1XX, op)	1,640,820										
PJ7EE	1,351,371										
VP9I											
(N1SV, op)	1,304,790										
ZW8T											
(PS8HF, op)	894,672										
PY7ZC	814,842										
YV5RAB	812,670										
Single Operator Unlimited, QRP											
UR7U	76,398										
PC2F	39,342										
PG2AA	5,439										
UT7AA	4,851										
G1WVK	189										
IN3JIO	75										

Continental Winners

Africa

Single Operator, High Power	CT3KN	3,325,014
Single Operator, Low Power	EA8RM	1,965,837
Single Operator Unlimited, High Power	ED8M	3,482,130
Single Operator, Low Power, 20 Meters	EA9ACD	128,628
Single Operator Unlimited, High Power, 20 Meters	EA8ZS	219,834
Single Operator, High Power, 15 Meters	D4K (IZ4DPV, op)	708,288
Single Operator, Low Power, 15 Meters	EA8KY	217,038
Single Operator, High Power, 10 Meters	D4M	271,080
Single Operator, Low Power, 10 Meters	EA8KR	111,882
Single Operator Unlimited, High Power, 10 Meters	V55Y (V51WH, op)	300,498
Single Operator Unlimited, Low Power, 10 Meters	EA8TR	143,898
Multioperator, Single Transmitter, High Power	CN3A	5,912,136
Multioperator, Single Transmitter, Low Power	S77HQ	7,776
Multioperator, Two Transmitter	ED8W	6,450,492

Asia

Single Operator, High Power	JA7NVF	1,172,565
Single Operator, Low Power	JS1OYN	244,545
Single Operator, QRP	JH1OGC	58,869
Single Operator Unlimited, High Power	JR2GRX	1,370,565
Single Operator Unlimited, Low Power	JH1EAO	344,088
Single Operator, High Power, 80 Meters	JE2OTM	96
Single Operator, Low Power, 80 Meters	JE1SPY	930
Single Operator, QRP, 80 Meters	JH1APZ	48
Single Operator, High Power, 40 Meters	7M2FTR	105
Single Operator, Low Power, 40 Meters	DS5TOS	1,080
Single Operator, QRP, 40 Meters	JR1ABS	432
Single Operator Unlimited, High Power, 40 Meters	JH7MQD	52,773
Single Operator Unlimited, Low Power, 40 Meters	JJ1AEB	630
Single Operator Unlimited, QRP, 40 Meters	JH3DMQ	210
Single Operator, High Power, 20 Meters	RW9LL	3,528
Single Operator, Low Power, 20 Meters	4L9M	1,620
Single Operator, QRP, 20 Meters	JH0KFI	12
Single Operator Unlimited, High Power, 20 Meters	R9AE	64,200
Single Operator Unlimited, Low Power, 20 Meters	TA3NE	4,350
Single Operator, High Power, 15 Meters	JJ0VNR	218,595
Single Operator, Low Power, 15 Meters	JA7HYS	13,680
Single Operator, QRP, 15 Meters	JR4DAH	12,528
Single Operator Unlimited, High Power, 15 Meters	JF9JTS (JA0TEA, op)	142,443
Single Operator Unlimited, Low Power, 15 Meters	JL4OUX	1,350
Single Operator, High Power, 10 Meters	JP7DKQ	140,616
Single Operator, Low Power, 10 Meters	JA6WFM	34,194
Single Operator, QRP, 10 Meters	JK1CNL	3,600
Single Operator Unlimited, High Power, 10 Meters	JA7OWD	140,397
Single Operator Unlimited, Low Power, 10 Meters	JG2TSL	56,154
Multioperator, Single Transmitter, High Power	JH4UYB	1,248,198
Multioperator, Single Transmitter, Low Power	BY4DX	13,968
Multioperator, Two Transmitter	JH8YOH	1,818,648
Multioperator, Multitransmitter	JA3YBK	2,656,866

Europe

Single Operator, High Power	CR6K (CT1ILT, op)	7,018,380
Single Operator, Low Power	HA3NU	1,375,290
Single Operator, QRP	PA2TMS	63,750
Single Operator Unlimited, High Power	9A1P	4,105,485
Single Operator Unlimited, Low Power	S52NR	1,713,360
Single Operator Unlimited, QRP	UR7U	76,398
Single Operator, High Power, 160 Meters	DL2SAX	180
Single Operator Unlimited, High Power, 160 Meters	S56X	1,170
Single Operator, High Power, 80 Meters	YT4A	8,475
Single Operator, Low Power, 80 Meters	F6EPO	90
Single Operator Unlimited, High Power, 80 Meters	F6AGM	91,416
Single Operator Unlimited, Low Power, 80 Meters	OK2BFN	3,420
Single Operator, High Power, 40 Meters	TM6P	
	(F4DVX, op @ F6KNB)	217,326
Single Operator, Low Power, 40 Meters	OZ9V	714
Single Operator, QRP, 40 Meters	OK6OK	300
Single Operator Unlimited, High Power, 40 Meters	9A3K	206,190
Single Operator Unlimited, Low Power, 40 Meters	HB9PUE	5,307
Single Operator Unlimited, QRP, 40 Meters	PA3CWN	240
Single Operator, High Power, 20 Meters	OH8L (OH8LQ, op)	299,205
Single Operator, Low Power, 20 Meters	CT1FOQ	10,788
Single Operator, QRP, 20 Meters	F5BEG	7,722
Single Operator Unlimited, High Power, 20 Meters	HG5E (HA1AH, op)	303,414
Single Operator Unlimited, Low Power, 20 Meters	OK1K (OK1XOE, op)	53,550
Single Operator Unlimited, QRP, 20 Meters	IO6R (IK6QRH, op)	3,450
Single Operator, High Power, 15 Meters	CR6T	399,489
Single Operator, Low Power, 15 Meters	F8CGL	16,728
Single Operator, QRP, 15 Meters	R6DVL	6,603
Single Operator Unlimited, High Power, 15 Meters	IB9T (IU3BTY, op)	328,485
Single Operator Unlimited, Low Power, 15 Meters	SP7Y	104,940
Single Operator Unlimited, QRP, 15 Meters	EE3O (EA3O, op)	38,634
Single Operator, High Power, 10 Meters	S55OO	373,116
Single Operator, Low Power, 10 Meters	MD2C (MD0CCE, op)	96,237
Single Operator, QRP, 10 Meters	IZ5JLF	13,566
Single Operator Unlimited, High Power, 10 Meters	OK7K (OK1BN, op)	387,630
Single Operator Unlimited, Low Power, 10 Meters	IB2M	101,808
Single Operator Unlimited, QRP, 10 Meters	SP7M	15,120
Multioperator, Single Transmitter, High Power	CR2X	5,553,840
Multioperator, Single Transmitter, Low Power	ZB2BU	859,662
Multioperator, Two Transmitter	EI7M	7,039,680
Multioperator, Multitransmitter	9A1A	7,970,853

North America

Single Operator, High Power	8P5A (W2SC, op)	8,061,273
Single Operator, Low Power	NP4Z	4,265,028
Single Operator Unlimited, High Power	V3O (DL8UD, op)	5,082,024
Single Operator Unlimited, Low Power	WP3C	3,980,112
Single Operator, High Power, 80 Meters	KP4KE	89,676
Single Operator, High Power, 40 Meters	KP4AA	350,460
Single Operator, Low Power, 40 Meters	CO2JD	72,675
Single Operator, High Power, 20 Meters	NP4VM	49,950
Single Operator Unlimited, Low Power, 20 Meters	HI8SDR (HI8ESF, op)	63,066
Single Operator, High Power, 15 Meters	T15GCO	248,124
Single Operator, Low Power, 15 Meters	XE1AY	741
Single Operator Unlimited, High Power, 15 Meters	HI3K	281,784
Single Operator Unlimited, Low Power, 15 Meters	KP4PUA	209,214
Single Operator, High Power, 10 Meters	KP4JA (EB7DX, op)	529,938
Single Operator, Low Power, 10 Meters	XE1CT	115,974
Single Operator, QRP, 10 Meters	XE1AQY	1,053
Single Operator Unlimited, High Power, 10 Meters	HI6M	158,592
Single Operator Unlimited, Low Power, 10 Meters	T13ATS	54,567
Multioperator, Single Transmitter, High Power	ZF1A	7,818,900
Multioperator, Single Transmitter, Low Power	VP5M	4,101,432
Multioperator, Two Transmitter	J62K	10,679,340

Oceania

Single Operator, High Power	KH7M (NA2U, op)	3,458,976
Single Operator, Low Power	KH6CJJ	726,516
Single Operator Unlimited, High Power	DU3T	237,006
Single Operator Unlimited, Low Power	KH6AQ	569,664
Single Operator, High Power, 80 Meters	T32AZ	18,348
Single Operator, High Power, 40 Meters	YB8MJG	1,386
Single Operator, Low Power, 40 Meters	YB9YBB	2,394
Single Operator Unlimited, Low Power, 40 Meters	YD4FYI	3
Single Operator, High Power, 20 Meters	VJ3O (VK3TX, op)	5,916
Single Operator, QRP, 20 Meters	NH6O	12
Single Operator Unlimited, High Power, 20 Meters	KH3X	20,418
Single Operator, High Power, 15 Meters	YB1DX	13,566
Single Operator, Low Power, 15 Meters	KH6WI	32,430
Single Operator, QRP, 15 Meters	YC4SIZ	270
Single Operator, High Power, 10 Meters	DU1EV	14,175
Single Operator, Low Power, 10 Meters	DW7EVQ	15,810
Single Operator Unlimited, High Power, 10 Meters	4G0T (DU1RB, op)	24,960
Single Operator Unlimited, Low Power, 10 Meters	YC1CMZ	9,675
Multioperator, Single Transmitter, High Power	7I6O	12
Multioperator, Two Transmitter	VL4A	383,040
Multioperator, Multitransmitter	9MBJ	1,785

South America

Single Operator, High Power	PZ5RA	1,160,325
Single Operator, Low Power	PY2NY	898,161
Single Operator, QRP	YV6BXN	202,860
Single Operator Unlimited, High Power	PT5J	2,731,350
Single Operator Unlimited, Low Power	5K4X (KC1XX, op)	1,640,820
Single Operator, High Power, 40 Meters	LU2DVI	1,980
Single Operator, Low Power, 40 Meters	OA4DKN	25,440
Single Operator, Low Power, 20 Meters	PY4EK	176,436
Single Operator Unlimited, High Power, 20 Meters	PY8WW	91,896
Single Operator Unlimited, Low Power, 20 Meters	HK3LRB	188,268
Single Operator, High Power, 15 Meters	HK1T	425,520
Single Operator, Low Power, 15 Meters	PY2QT	106,533
Single Operator Unlimited, High Power, 15 Meters	ZW2A (PY2SGL, op)	172,221
Single Operator Unlimited, Low Power, 15 Meters	PY2VZ	89,088
Single Operator Unlimited, QRP, 15 Meters	3G3A (XQ3SK, op)	1,152
Single Operator, High Power, 10 Meters	PX2A (PY2LED, op)	596,214
Single Operator, Low Power, 10 Meters	PY2EX	269,748
Single Operator, QRP, 10 Meters	CB6LR (CE6GDR, op)	46,512
Single Operator Unlimited, High Power, 10 Meters	PV2G (PT2IC, op)	562,680
Single Operator Unlimited, Low Power, 10 Meters	PY2UD	234,030
Single Operator Unlimited, QRP, 10 Meters	CB3A (XQ3SK, op)	51,561
Multioperator, Single Transmitter, High Power	ZPOX	2,411,076
Multioperator, Single Transmitter, Low Power	PY2ZR	454,812
Multioperator, Two Transmitter	P4QL	11,570,895
Multioperator, Multitransmitter	PJ2T	11,309,142

Top Ten – US and Canada

Single Operator, High Power	Single Operator, Unlimited, QRP	Single Operator Unlimited, High Power, 40 Meters	Single Operator Unlimited, QRP, 20 Meters	Single Operator, High Power, 10 Meters	Single Operator, Unlimited, QRP, 10 Meters
N5DX 8,188,440	VE3WVG 185,319	WD6T 58,734	VA3OGG 10,998	KQ2M 761,400	NQUR 61,770
NN3W (@N4RV) 6,648,345	WQ6E 123,576	W9RN 40,176		N1PGA 604,296	K3TW 55,770
K1RX 6,126,648	W3EK 101,790	VA3SK 29,580	Single Operator, High Power, 15 Meters	K9BGL 562,695	W4/DJOMY 39,690
K5TR 6,061,689	N05V 48,510	K9CJ 7,830	KU2M 668,520	N4OX 556,830	VA3HY 4,554
XL3T	K8ZT 26,508	K7STO 3,360	W1OWA (W0EWD, op) 406,788	N1DD 299,100	
(VE3AT, op) 5,705,064	K2YG 18,954	AC8Y 2,178	N7RQ 392,040	K1TO 292,410	Multioperator, Single Transmitter, High Power
VY2TT 5,461,425	W1M0G 2,418	NW7E 768	N6WM 302,304	N6KN 252,954	K1LZ 10,386,360
ND7K 768	W2/DL8CX 2,325	W42VIU 675	N4EK 18,354	VE3DZ 188,460	W4RM 5,257,692
(N6MJ, op @N6WIN) 5,249,673	N9SM 768	VE4IM 12		VE6UM 115,830	NY6DX 4,942,674
K5GN 5,124,240	N2DYYT 168			N7MGW 104,850	N4SS 4,488,750
K4AB 5,020,470	Single Operator, High Power, 160 Meters	Single Operator Unlimited, Low Power, 40 Meters	Single Operator, Low Power, 15 Meters	Single Operator, Low Power, 10 Meters	K3ND 4,441,440
W9RE 4,820,739	K12M 11,232	K1NY 26,496	NF7E 93,075	N1WRK 191,373	K8AZ 4,165,920
Single Operator, Low Power	N4XD 9,933	KT3T 24,375	N4EK 18,354	W2AW (N2GM, op) 124,872	KQ3F 3,450,144
N1UR 4,006,800	W4JVN 48	KK4BZ 18,231		W7BNM 102,510	WW4LL 3,169,140
N8II 1,527,120	Single Operator, High Power, 80 Meters	WBWTS 2,916		WB4TDH 84,816	W3MF 2,778,135
KF8N 783,558	W3BGN 44,100	KY6AA 75		K6GHA 77,688	N1BA 2,623,200
K8ZM 718,074	W1HI 14,406	Single Operator, High Power, 20 Meters		N4MM 74,181	Multioperator, Single Transmitter, Low Power
VE6FI 705,120	NS8O 2,175	W7WA 419,175		W3DF 70,374	W1FM 1,137,420
(VE6AQ, op) 687,537	Single Operator, Low Power, 80 Meters	W1AVK 259,368		W9ILY 68,598	WA1F 1,000,620
AC4G 657,045	K4SXT 19,152	N3MWQ 39,372		WB0LQC 62,622	W3ZGD 998,598
ND1X 635,850	N7AU 4,140	W8GOC 25,545		KA8JBK 59,796	W1JSR 488,037
W6DVS 604,992		AJ4SN 5,328		Single Operator, QRP, 10 Meters	N8YXR 193,920
VE2HIT 531,288		4U1WB (AJ3M, op) 3,096		ND0C 90,036	K1WAS 129,504
Single Operator, QRP	Single Operator Unlimited, High Power, 80 Meters	Single Operator, Low Power, 20 Meters	Single Operator, QRP, 15 Meters	WB2AMU 20,328	K4TG 124,278
KA8SMA 146,916	W3NO 28,917	NG3Q 76,362	NSAW 12,699	K9JK 18,285	K1RQ 61,341
W7LG 73,440	W1VT 12,750	VE3OOZ 33,165	N8URE 4,257	NK8Q 10,956	W2ZJ 41,796
N7IV 58,464	VE6JY 3,813	K9LA 27,300	K2TV 675	N0JK 9,384	N0TJN 6,048
KD2CTZ 49,005	Single Operator Unlimited, Low Power, 80 Meters	W9WJ 21,924		VE3GJP 8,190	Multioperator, Two Transmitter
AC2N 41,454	WA4JUK 15,453	NG2S 15,870	Single Operator Unlimited, High Power, 15 Meters	KC3WCB 4,752	W3LPL 12,929,616
K2ORC 13,452		VY2DIY 15,105	VA2WA 752,928	W4ER 2,646	K9CT 8,923,200
NT4W 11,592		WB2KLD 13,230	K7RL 623,298	KN6ODG 1,500	W2PV 7,388,160
NS6X 11,130		K4RDU 10,350	VO1KVT 337,995	W3TS 576	N2AA 7,075,908
K3SLH 10,140		KQ4AHO 7,626	W2FU 326,340	Single Operator Unlimited, High Power, 10 Meters	K2AX 6,877,791
NF9Z 5,880		W3EH 7,605	AA7A 234,531	N2IC 778,830	K9RS 6,472,890
Single Operator Unlimited, High Power	Single Operator, High Power, 40 Meters	Single Operator, QRP, 20 Meters	K1TR 197,274	KV0Q 605,625	KB4DX 5,503,302
K5ZD 7,354,398	W7BJN 47,424	VE3BFU 3,159	WX5S 154,752	KY7M (@NATTB) 500,040	K41ZD 5,124,765
N3RD 6,353,550	N7RK 23,166	W4NBS 540	KC4GL 139,200	K3EST 422,136	WG3J 4,297,110
AA3B 5,781,870	AA0MQ 17,160	W1WAH 18	VA7KK 128,583	K4WI 400,890	W2CG 3,791,034
N2NT	W4JCK 15,048		N0MHL 9,522	K0AP 365,967	Multioperator, Multitransmitter
(K17WX, op) 4,915,260	N8OL 7,626	Single Operator Unlimited, High Power, 20 Meters		K6LL 342,240	K3LR 18,463,860
W4NF 4,860,171	NT4OM 1,587	N7TU 73,644	Single Operator Unlimited, Low Power, 15 Meters	K1UB 336,312	K1TTT 11,226,831
WA1Z 4,521,600	VE7RME 768	NM5M 37,233	W5DX 178,770	N1MM 319,347	WX3B 10,357,137
WY3A 4,145,745		KJ5CF 9,576	N4IJ 144,060	N5TJ 275,946	AA1K 6,949,908

Sponsored Plaque Winners

Thanks to the generous support of numerous clubs and individuals, we are pleased to list the winners of the sponsored International DX Phone Contest plaques below. For more information on plaque sponsorship or to order a duplicate plaque, contact the ARRL Contest Program at 860-594-0232 or contests@arrl.org. Plaques cost \$95, which includes all shipping charges.

Winner	Plaque Category	Plaque Sponsor
CW Winners		
N5DX	WVE Single Operator, High Power	Frankford Radio Club
N1UR	WVE Single Operator, Low Power	The CW Operators' Club
W2FU	WVE Multioperator, Single Transmitter, High Power	The CW Operators' Club
W3LPL	WVE Multioperator, Two Transmitter	The CW Operators' Club
W3BGN	WVE Single Operator, High Power 3.5 MHz	The CW Operators' Club
N2MF	WVE Single Operator, High Power 14 MHz	The CW Operators' Club
CR6K (CT1ILT, op)	World Single Operator, Low Power	The CW Operators' Club
D4L (IK2NCJ, op)	World Single Operator, QRP	The CW Operators' Club
TO4A (VE3DZ, op)	World Single Operator Unlimited, High Power	The CW Operators' Club
VP9I (AB2E, op)	World Single Operator Unlimited, Low Power	The CW Operators' Club
KP2M	World Multioperator, Two Transmitter	Frankford Radio Club, K2TD, Memorial
OM2XW	World Single Operator, High Power 7 MHz	The CW Operators' Club
W1FJ	North America Single Operator, QRP	The CW Operators' Club
ZF1A	North America Multioperator, Single Transmitter	The CW Operators' Club
KP2M	North America Multioperator Unlimited	The CW Operators' Club
W9KM	Central Division Single Operator, Low Power	Society of Midwest Contesters
K9NW	Central Division Single Operator Unlimited, High Power	Society of Midwest Contesters
WE9R	Central Division Single Operator Unlimited, Low Power	Society of Midwest Contesters
AA9A	Central Division Multioperator, Single Transmitter	Society of Midwest Contesters
K1NY	Hudson Division Single Operator Unlimited, Low Power	Albany ARA — In memory of George Wilner, K2ONP
W2XX	Pacific Division Single Operator Unlimited, Low Power	J. P. Kleinhaus, W2XX
CR3DX (OM3RM, op)	Africa Single Operator	The CW Operators' Club
JE6RPM (JH5GHM, op)	Asia Single Operator, High Power	The CW Operators' Club
JH4UYB	Asia Multioperator, Single Transmitter, High Power	Yankee Clipper Contest Club
NP4Z	Caribbean Single Operator, Low Power	Frankford Radio Club, 9Y4VU, Memorial
LY9A	Europe Single Operator, QRP	The CW Operators' Club
ED7W (EB7A, op)	Europe Single Operator Unlimited, High Power	The CW Operators' Club
IO4X	Europe Multioperator, Single Transmitter	The CW Operators' Club
CR2N	Europe Multioperator, Two Transmitter	The CW Operators' Club
J1RXQ	Japan Single Operator, Low Power	The CW Operators' Club
KH6J (N6TJ, op)	Oceania Single Operator	The CW Operators' Club
P44W (W2GD, op)	South America Single Operator	The CW Operators' Club
CW/Phone Combination Winners		
N1UR	WVE Single Operator, Low Power Combined Score	Ellen White, W1YL, Memorial — ARRL Contest Branch
KE8RJU	WVE Youth Overall Winner	Frankford Radio Club, W2OX, Memorial
Phone Winners		
N5DX	WVE Single Operator, High Power	Frankford Radio Club
K1XM	WVE Single Operator Unlimited, Low Power	Swamp Fox Contest Group — In memory of Marc Tarplee, N4UFP
V3O (DL8UD, op)	World Single Operator Unlimited, High Power	Charles Dietz, W5PR
W9RE	Central Division Single Operator, High Power	Society of Midwest Contesters
WD9CIR	Central Division Single Operator, Low Power	Society of Midwest Contesters
K9NW	Central Division Single Operator Unlimited, High Power	Society of Midwest Contesters
AJ9C	Central Division Single Operator Unlimited, Low Power	Society of Midwest Contesters
JH4UYB	Asia Multioperator, Single Transmitter, High Power	Yankee Clipper Contest Club
DU1EV	Oceania Single Operator, High Power 28 MHz	Ken Taylor, KH6QJ
T32AZ	Oceania Single Operator, High Power 3.5 MHz	Burton M. Parmeter, KG7MD, Memorial Award
KH7M (NA2U, op)	Oceania Single Operator, High Power	Albert Crespo, F5VHJ — In memory of Carl Cook, AI6V

The next ARRL International DX Phone Contest will be held March 1 – 2, 2025.

Full Results Online

You can read the full results of the contest online at <http://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.

Happenings

Hurricane Beryl Aftermath and Update

Remnants of Hurricane Beryl, which became a post-tropical cyclone as of the writing of this article, moved northeast with heavy rain and 35 mph winds. The storm was forecasted to move through Pennsylvania, upstate New York, northern New England, and Canada. Beryl was the fastest and earliest storm of the hurricane season, and during its 8-day run it left behind severe damage to the Windward Islands and Mexico before making landfall in Texas.

More than 7,000 residents in New York, Michigan, Pennsylvania, and New England lost power. Houston entered recovery mode after the core of Hurricane Beryl passed very close to the downtown area. Wind gusts of more than 80 mph caused power outages on a massive scale.

Amateur radio had been active since the early formation of the hurricane. The Hurricane Watch Net concluded operations for Tropical Cyclone Beryl on July 8, 2024, at 12:00 PM EDT (1600 UTC). Net Manager Bobby Graves, KB5HAV, said, "Solar activity was not kind to us

over the past few days. Propagation on both 20 and 40 meters was horrible and iffy at times. But our dedicated team of operators banded closely together to get the job done."

"I've said this for many years, and it remains true to this day. We greatly appreciate the daily users and various nets who use 14.325.00 and 7.268.00 MHz for allowing us a clear frequency. It certainly makes our job easier, and I know those in the affected area appreciate it as well," added Graves.

The voice over IP (VoIP) Hurricane Net also secured operation on July 8 at 11:00 AM EDT as Beryl weakened to a tropical storm. The VoIP net fielded dozens of reports from online weather stations reporting wind gusts between 50 and 98 mph, with winds above 74 mph being hurricane-force wind gust criteria.

Director of Operations for the VoIP Hurricane Net Rob Macedo, KD1CY, reported, "We wish to extend a special thank you to the South Coast Reflector and amateur radio oper-

ator N6KNE (hopefully, we got that call sign correct) for allowing a connection into our net, where close to 10 amateur radio operators checked in and provided storm reports that were sent to WX4NHC." He added, "We would love to see more of this cooperation in the future with other parts of coastal areas threatened by hurricanes." WX4NHC is the amateur station at the National Hurricane Center in Miami, Florida.

The VoIP Hurricane Net also relayed reports of storm damage via social media and public safety radio feeds during the 9-hour net activation from 2:00 to 11:00 AM EDT.

Forecasters at the National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center predict above-normal hurricane activity in the Atlantic basin this year. NOAA's outlook for the 2024 Atlantic hurricane season, which spans from June 1 to November 30, predicts an 85% chance of an above-normal season, a 10% chance of a near-normal season, and a 5% chance of a below-normal season.

Celebrating Software-Defined Radio

At HAM RADIO 2024, the international amateur radio exhibition in Friedrichshafen, Germany, the Software Defined Radio Academy (SDRA) celebrated its 10-year anniversary. Founded in 2014, the SDRA has become a new platform for the exchange of knowledge surrounding software-defined radio (SDR). In the early years, the academy's lectures were recorded with primitive camera technology, but today, a video team takes the recordings to a completely different level. The SDRA's YouTube

channel now has 150 uploads, 4,850 subscribers, and many more viewers.

The winners of the Ulrich L. Rohde Award, created in 2022 for innovative research in the field of SDR, were also announced:

- The GNU Radio project for its good software solutions for SDR technology. GNU Radio is a free software development toolkit that provides signal processing blocks

to implement SDRs and signal-processing systems.

- The German Amateur Radio Club AJW team for the SDR questions in a new amateur radio questionnaire, and for the standardization of education. According to an X post by group leader Matthias Jung, DL9MJ, the team's work "focused on integrating SDR into the German amateur radio exam and educational materials."

- Rob Robinett, AI6VN, and Paul Elliott, WB6CXC, for their fundamental work and influence on scientific research in other areas.
- Christoph V. Wüllen, DL1YCF, and Laurence Barker, G8NJJ, for fundamental work on stations.

Dr. Ulrich Rohde, N1UL, is an avid amateur radio operator holding several licenses in the US and Germany. He has been licensed since 1956 and has received worldwide recognition for his involvement in technology and systems. In 2015,

he won first place in the ARRL DX Contest in the Northern New Jersey Section. He also operates as N1UL/MM on his yacht, the *Dragonfly*, and he is Trustee of the Marco Island Radio Club, K5MI.

2024 ARRL Field Day Wrap-Up

The 2024 ARRL Field Day was successful despite severe weather and extreme temperatures impacting much of the country. Social media has hundreds of photos and stories from the US. As of the writing of this article, nearly 2,200 log entries have been received, with more arriving hourly.

ARRL member-volunteers on the Board of Directors, along with Section Managers and other Field Organization staff, fanned out to visit as many sites as possible in their areas.

Kenzie Denton, KO4GLN, is the Assistant Section Manager for Youth in the ARRL Virginia Section, and she was the 2023 winner of the Roanoke Division ARRL Service

Award, the Division's highest honor. A junior at Old Dominion University (ODU) majoring in pre-med, she is president of the ODU Amateur Radio Club and undertakes many youth outreach initiatives. Her latest was a foxhunt aimed at encouraging girls to participate by using the legacy of Amelia Earhart as inspiration. The Williamsburg Area Amateur Radio Club (WAARC) is known for having a high percentage of active woman members.

Denton and her mother, Nicole, made 62 pennants to memorialize Silent Key members of WAARC. The pennants were strung on two lines that hung adjacent to the park shelter where the club was operating for category 3A. It took about 30

minutes to make each pennant, and the collection will remain a fixture for future club events.

ARRL Treasurer John Sager, WJ7S, joined the Utah Valley Amateur Radio Club (UVARC) at their Field Day operation in Trout Creek, Utah. "I joined what was supposed to be a three-man team of CW operators: John Mitton, KK7L; Ralph Nunn, K7RLN, and me...as a 3A station operating under the UVARC call sign, K7UVA," said Sager. "We were joined by Forrest Stephenson, KI7QCF, a fairly new CW operator and Parks on the Air activator, who wanted to see our CW effort in action. We ended up making about 500 CW 3A [contacts] during Field Day for the K7UVA effort."



Assistant Section Manager for Youth of the ARRL Virginia Section Kenzie Denton, KO4GLN. [Bill Morine, N2COP, and Jim Boehner, N2ZZ, photo]



The Trout Creek, Utah, ARRL Field Day operating site. ARRL Treasurer John Sager, WJ7S, is operating next to the RV. [John Mitton, KK7L, photo]



ARRL Hudson Division Vice Director Ed Wilson, N2XDD, drove a total of 947 miles to visit 18 different Field Day sites within the Division. He started by visiting the Warren County (New York) Radio Club. After a last-minute cancellation of their original site, they quickly secured a new location in Lake George, New York. "It was great visiting all of the clubs and speaking about my passion for bringing more clubs together on joint efforts, as well

International Amateur Radio Union Secretary Joel Harrison, W5ZN (background), and ARRL Delta Division Director David Norris, K5UZ (foreground), operating for ARRL Field Day with the North Central Arkansas Amateur Radio Service in Searcy, Arkansas. [David Norris, K5UZ, photo]

as my strong beliefs on increasing education outreach within the hobby," said Wilson. "Along the way, I got to meet various club officials and members, listening to their concerns and sharing my visions for the future. I was also able to meet 10-year-old Michael Jones and his 12-year-old brother, Zaydin Jones, grandchildren of April MacMurray, WU2BBY, at the Schenectady Curling Club joint site. On Long Island, at the Long Island Mobile Amateur Radio Club site, I met two more kids, Aiden Reiter, KE2BXH, and Caleb Sullivan, who were busy making contacts when I arrived."

Colorado Teacher and Ham Accepted to the Albert Einstein Distinguished Educator Fellowship Program

Dara Gardner, KF0NIX, a member of the Pikes Peak Radio Amateur Association (PPRAA), has been accepted to the Albert Einstein Distinguished Educator Fellowship (AEF) Program. The AEF Program provides a unique opportunity for accomplished K–12 educators in the fields of science, technology, engineering, and mathematics (STEM) to serve in the national education arena.

"It's pretty exciting," said Gardner. "I'm overwhelmed and honored. I've known about the Einstein program for a few years. The program invests a lot in the teachers, but the teachers get back tremendous amounts of professional development. It's also exciting that a person like me can have their voice heard

on Capitol Hill." Gardner added that she is still learning how the whole process works, but she wants parents to have a choice in their childrens' education and to better prepare students for the workforce.

As an AEF Fellow, Gardner will serve on the House Committee on Education and the Workforce in Washington, DC. Her 11-month assignment began on August 19 and will run until July 2025.

Gardner is a teacher at the Thrive Home School Academy and helped establish a special program with Amateur Radio on the International Space Station, which brought shuttle astronaut General (Ret.) Kevin Chilton and shuttle and ISS astronaut Lieutenant General (Ret.) Susan Helms, KC7NHZ, to

Harrison High School in Colorado Springs, Colorado. The highlight of the program was an amateur radio contact with astronaut Jeanette Epps on April 22, 2024, as the ISS passed over Stratton Meadows Elementary School.

Public Information Coordinator of the ARRL Colorado Section and member of PPRAA John Bloodgood, KD0SFY, said Gardner is highly motivated and very energetic when it comes to working on STEM activities. "She's a dedicated teacher and completed the ARRL Teachers Institute, and [she] brings a wealth of knowledge to the classroom," he added.

For more information about the AEF Program, visit <https://science.osti.gov/wdts/einstein>.

Contest Corral

September 2024

Check for updates and a downloadable PDF version online at www.arrl.org/contest-calendar.

Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.

Start - Finish		Date-Time	Date-Time	Bands	Contest Name	Mode	Exchange	Sponsor's Website
Date-Time	Date-Time							
1	1700	2	0300	All, no WARC	Tennessee QSO Party	CW Ph Dig	RS(T), TN county or SPC	tnqp.org
2	1900	2	2030	3.5	RSGB 80m Autumn Series, SSB	Ph	RS, serial	www.rsgbcc.org
2	2300	3	0300	1.8-28,50	MI QRP Labor Day CW Sprint	CW	RST, SPC, mbr or pwr	www.miqrp.net
3	0000	3	0200	3.5-28	ARS Spartan Sprint	CW	RST, SPC, pwr	ars-qrp.com
4	2000	4	2100	3.5	UKEICC 80m Contest	Ph	6-char grid	www.ukaicc.com
5	0000	6	0300	7	Walk for the Bacon QRP Contest	CW	RST, SPC, name, mbr or pwr; 13 WPM max	qrpcontest.com
5	1800	5	2200	28	NRAU 10m Activity Contest	CW Ph Dig	RS(T), 6-char grid	nrau.net
7	0000	8	2359	1.8-28	All Asian DX Contest, Phone	Ph	RS, 2-digit age	www.jarl.org
7	0600	7	0800	7,14	Wake-Up! QRP Sprint	CW	RST, serial, suffix of previous QSO	qrp.ru
7	0800	8	1000	50,144,432	SARL VHF/UHF FM Contest	Ph	RS(T), 6-char grid	www.sarl.org.za
7	0800	8	1000	1.8-28	SARL Field Day Contest	CW Ph Dig	RS(T), # of rigs, category, province or "DX"	www.sarl.org.za
7	1300	8	1259	1.8-28	IARU Region 1 Field Day, SSB	Ph	RS, serial	www.darc.de
7	1300	8	1300	3.5-28	RSGB SSB Field Day	Ph	RS, serial	www.rsgbcc.org
7	1400	7	2200	3.5-28	Ohio State Parks on the Air	Ph	OH park abbreviation or SPC	ospota.org
7	1400	8	1400	145	IARU Region 1 145 MHz Contest	CW Ph Dig	RS(T), serial, 6-char grid	www.iaru-r1.org
7	1600	7	1900	7	AGCW Straight Key Party	CW	RST, serial, class, name, age	www.agcw.de
7	2000	7	2359	1.8-28	CWops CW Open	CW	serial, name	cwops.org
7	2000	8	2000	3.5	PODXS 070 Club Jay Hudak Memorial 80m Sprint	Dig	RST, SPC	www.podxs070.com
8	0000	8	0359	3.5-14	North American Sprint, CW	CW	Other's call, your call, serial, name, SPC	ncjweb.com
8	1000	8	1400	144	WAB 144 MHz QRO Phone	Ph	RS, serial, WAB square or country	wab.internip.net/Contests.php
9	0000	9	0200	1.8-28	4 States QRP Group Second Sunday Sprint	CW Ph	RS(T), SPC, mbr or pwr	www.4sqrp.com
9	1900	9	2300	144	144 MHz Fall Sprint	CW Ph Dig	4-char grid	www.packratvhf.com
11	1900	11	2030	3.5	RSGB 80m Autumn Series, CW	CW	RST, serial	www.rsgbcc.org
14	0000	15	2359	3.5-28	WAE DX Contest, SSB	Ph	RS, serial	www.darc.de
14	1500	14	1900	3.5-14	Africa FT4 DX Contest	FT4	Signal report, 4-char grid	www.sarl.org.za
14	1800	16	0259	50 and up	ARRL September VHF Contest	CW Ph Dig	4-char grid	www.arrl.org/september-vhf
15	0000	15	0359	3.5-14	North American Sprint, RTTY	Dig	Other's call, your call, serial, name, SPC	ncjweb.com
15	1700	15	2059	3.5-28	BARTG Sprint PSK63 Contest	PSK63	Serial	bartg.org.uk
15	2300	16	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or pwr	qrpcontest.com
16	1900	16	2030	3.5-28	RSGB FT4 Contest	FT4	Signal report	www.rsgbcc.org
17	1900	17	2300	222	222 MHz Fall Sprint	CW Ph Dig	4-char grid	www.packratvhf.com
19	0000	20	0300	14	Walk for the Bacon QRP Contest	CW	RST, SPC, name, mbr or pwr; 13 WPM max	qrpcontest.com
19	0030	19	0230	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or pwr	naqcc.info
19	1900	19	2000	3.5-14	NTC QSO Party	CW	Max 25 WPM; RST, mbr or "NM"	pi4ntc.nl
20	1600	20	1700	3.5	AGB NEMIGA Contest	CW Ph Dig	RST, serial, mbr (if any)	ev5agb.com
21	0000	22	2359	2.3 GHz and Up	ARRL EME Contest	CW Ph Dig	See rules	www.arrl.org/eme-contest
21	0900	23	0759	10 GHz to light	ARRL 10 GHz and Up Contest	CW Ph Dig	6-char grid	www.arrl.org/10-ghz-up
21	1200	22	1200	3.5-28	Scandinavian Activity Contest, CW	CW	RST, serial	www.sactest.net
21	1400	22	0159	3.5-28	New Jersey QSO Party	CW Ph Dig	RS(T), NJ county or SPC	www.k2td-bcrc.org
21	1400	22	0200	All, no WARC or 60	Iowa QSO Party	CW Ph Dig	RS(T), IA county or SPC	www.w0yl.com
21	1400	22	2000	All, no WARC	Texas QSO Party	CW Ph Dig	RS(T), TX county or SPC	www.txqp.net
21	1600	21	2300	All, no WARC	Wisconsin Parks on the Air	CW Ph Dig	WI park number or SPC	wipota.com
21	1600	22	2200	3.5-28	New Hampshire QSO Party	CW Ph Dig	RS(T), NH county or SPC	www.w1wqm.org
21	1600	22	2359	1.8-28,50	Washington State Salmon Run	CW Ph	RS(T), WA county or SPC	salmonrun.wwdxc.org
25	1900	25	2300	432	432 MHz Fall Sprint	CW Ph Dig	4-char grid	www.packratvhf.com
25	2000	25	2100	3.5	UKEICC 80m Contest	CW	6-char grid	www.ukaicc.com
26	1900	26	2030	3.5	RSGB 80m Autumn Series, Data	Dig	RST, serial	www.rsgbcc.org
28	0000	29	2359	3.5-28	CQ Worldwide DX Contest, RTTY	Dig	RST, CQ zone, (US/VE state/prov)	www.cqwwrtty.com
28	1200	29	1200	1.8-28	Maine QSO Party	CW Ph	RS(T), ME county or SPC	www.ws1sm.com
28	1400	28	2200	3.5-28	Masonic Lodges on the Air	Ph	Lodge name, lodge no., jurisdiction or SPC	cqmorelight.com
28	2000	29	2359	1.8-14,28	AWA Amplitude Modulation QSO Party	Ph	Name, SPC	antiquewireless.org
29	0700	29	1000	50	UBA ON Contest, 6m	CW Ph	RS(T), serial, ON (for 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 WATBNM 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, WATBNM, in providing this service.

Public Service

Meet KPARN Volunteer Coordinator Duane Mariotti, WB9RER

Duane Mariotti, WB9RER, is veteran volunteer coordinator of the well-known, well-respected Kaiser Permanente Amateur Radio Network (KPARN; www.kparn.org) in southern California. He is an electrical engineer, specializing in biomedical integration, and has been involved in emergency communications for almost 30 years as an engineer, responder, and policy leader in various roles.

Following the events of September 11, 2001, he served on several state and national committees working to improve hospital emergency preparedness and communications systems, and published works on these topics. Most recently, Duane was a Clinical Engineer for Kaiser Permanente, integrating patient safety initiatives and medical technology in new facilities.

KPARN is comprised of radio amateurs who serve hospital emergency preparedness and response by providing redundant communications systems, or multiple backup communication modalities. It serves five counties in southern California and, along with similar amateur radio organizations, such as Western Washington Medical Services Emergency Communications and the South Carolina Healthcare Emergency Amateur Radio Team, serves as a model program from which other groups can glean best practices and technical operational details to improve their internal planning and response.

KPARN-supported hospitals have dedicated amateur radio stations installed near the hospital emergency operations centers. Each station has multiple single-band Alinco radios with dedicated antennas operating on 2 and 6 meters, as well as 220 and 440 MHz. A few locations have roll-out portable setups, and there are go-box portable systems that can be deployed in the field. Some hospital stations in the Los Angeles and San Diego areas also have HF radios, primarily to augment communications between these areas, where VHF and UHF repeaters may be out of range.

I reached out to Duane to find out more about his experience, as well as KPARN.



KPARN Volunteer Coordinator Duane Mariotti, WB9RER. [Photo courtesy of WB9RER]

Q How did your professional experience with hospital emergency preparedness, medical technology, and public safety communications dovetail with your KPARN management role?

A It was a natural fit. In college, I combined my coursework with amateur radio. I already had an interest in being a first responder, and my coursework led me to biomedical electronics. I also earned my EMT certification and worked for the local ambulance service, while actively participating with the local ham club to relocate repeaters and participate in public service work. Eventually, these two things merged, and I found that on an ambulance at a public service event, I could be an unpaid radio operator assigned to the ambulance and also be an EMT.

At that time, interoperability wasn't really a thing, but I upgraded the single-channel ambulance radio to three channels and four tones, so we could talk to hospitals, county sheriffs, and the state police station. It turned out that police officers, firefighters, and EMS relied on radios, but had little knowledge of how the radio system worked.

When I landed my first job in a hospital, I found RF knowledge to be helpful with understanding operating room equipment (and RF noise), as well as getting portable radios to work better in the building. My electrical and amateur radio education and practical experience, combined with book knowledge, turned out to be of great value in planning, building, and inspecting new hospital facilities.

While working at a hospital, I earned my paramedic certification, and my knowledge base of medical and amateur radio information helped me gain acceptance in those communities. I assisted with regional hospital disaster drill planning, emergency preparedness, and the design and implementation of regional and statewide (State Department of Public Health) hospital-specific radio communication systems. While at the University of Washington Harborview Medical Center in Seattle, which functions as Disaster Medical Hospital Control (DMHC) for all King County hospitals, I was the Emergency Preparedness Liaison. I was responsible for DMHC functions and interfacing with other agencies for emergency preparedness planning, drills, and event executions. This kind of experience led me to using amateur radio for critical hospital preparedness and functioning in natural or manmade disasters and ultimately, with KPARN.

Q Has other experience played a role in your pursuit of using amateur radio as a hospital disaster resource?

A Yes. I coordinated numerous mass casualty incidents and drills with city and county agencies in Washington. I've served on the Seattle Local Emergency Planning Committee, Central Region EMS and Trauma Council, King County Hospital Disaster Committee, Washington State Hospital Bioterrorism Oversight Committee, and various committees related to hospital disaster planning for the US Department of Health and Human Services.

Q Does KPARN hold training nets and/or drills?

A Yes. KPARN net control stations conduct a monthly drill with a 6-meter command net, followed by a net on 40 meters. KPARN members are encouraged to attend community events that promote emergency preparedness and the KPARN mission.

Q Can you tell us about the KPARN training regimen?

A Members must sign the KPARN Member Expectations document and complete six mandatory courses, which include the FEMA Independent Study courses on the Incident Command System (ICS), as well as the

Introduction to the California Standardized Emergency Management System. These courses provide the fundamental knowledge necessary to understand the emergency management environment. Other courses include the Volunteer Amateur Radio Operator Hospital Orientation and the Health Insurance Portability and Accountability Act (HIPAA) Privacy Training. These courses are necessary for amateur radio operators to successfully work in the California hospital environment.

Q Are there any additional resources or requirements for new KPARN members?

A There's a required reading list for new members, including "When Hospitals Respond to Disasters" and the "LA County Health Amateur Radio Policy," among others. New operators also receive a KPARN Technical Orientation, KPARN organizational documents, and an introduction to KPARN and the relevant ICS forms.

Q What kind of disaster or emergency response is likely to involve KPARN activations?

A Fortunately, the number of events requiring KPARN activation are few. Southern California doesn't have regular severe weather events like tornadoes and hurricanes, so our primary response plan revolves around responding to earthquakes. Therefore, most of KPARN's activities are drills and training that are local, regional, and statewide such as the annual Great California ShakeOut earthquake drills.

Our activations have generally been large-area utility failures that affect only a couple of hospitals over our five-county coverage area, which is approximately the size of Indiana.

Q KPARN places high value on volunteers recording their volunteer hours. Why is that?

A KPARN needs to track its efforts to justify support and funding. The hours reported must be accurate and consistent with the KPARN mission.

It's amazing the number of hours members spend interfacing with local emergency managers, testing and programming radios, with web programming, and implementing and documenting business practices. Participation in KPARN is much more than push-to-talk.

Club Station

Fostering Club Partnerships with Dual Field Days

Field Day isn't just a June event, at least as far as one southern Illinois club is concerned. Since 2019, the Southern Counties Amateur Network (SCAN) has held a second Field Day every fall. In this month's column, SCAN member Buddy Adelsberger, K9BJA, shares why they started a second Field Day and how it differs from ARRL's annual June event.

SCAN's fall Field Day grew from several years of cooperation with the Shawnee Amateur Radio Association (SARA). Both clubs have operated at the Saline County State Fish and Wildlife Area at the Glen O. Jones Lake campground in southeastern Illinois during ARRL Field Day for years. This location is a bottom-land along the Saline River and the hills that border the Shawnee National Forest. The campsite itself is primitive — no electricity, running water, or modern restrooms. This allows amateur radio operators to experience setting up under conditions that they could find in an emergency, where they must supply all the basics, like food, water, power, etc.

Because that site works so well for the June Field Day, we thought it would also be a good place for our fall Field Day. Despite being held at the same location, the June event is often a competitive one, with clubs and operators wanting to rack up points and make lots of contacts. SCAN President Roy Glasscock, KB9ORF, describes fall Field Day as being more educational, making it “more relaxed and giving us an opportunity to schedule classes ranging from antenna construction to digital communications without interfering with [the competitive nature of June Field Day].”

The 2022 fall Field Day drew radio operators from several local clubs. Some arrived early to camp out, work on their radios and antennas, and be off the grid for most of the week. Roy gave tours to visitors, provided radio demonstrations, and discussed his solar system, which powered many of the trailers, tents, radio equipment, and lights at the campsite. Radio stations were operational with antennas in nearly every tree; ground-mounted antennas were also used. Members operated CW and phone on HF, VHF, and UHF.



A local Boy Scouts of America troop working toward their radio badges at one of SCAN and SARA's fall Field Days.

A Focus on Education

SCAN's main goals for Field Day (ARRL Field Day and our fall Field Day) are having fun, sharing knowledge, and learning. We also like to extend an invitation to non-hams who are camping in the area to see what we're doing and introduce them to amateur radio.

SCAN makes both of our Field Days open to everyone, including kids, but our fall Field Day has proven to be a great opportunity to promote the hobby, especially to young people. At our fall 2020 event, an entire local Boy Scouts of America troop came out to earn their radio badges. ARRL Illinois Section Manager Thomas Beebe, W9RY; the troop's Scout Leader Shawn Banks, K9PWW, and a couple of other radio operators provided a class on the fundamentals of amateur radio operations. “Afterward, each Scout made a radio contact using HF, VHF, and UHF,” Roy said. “It was rewarding all around — 10 Scouts earned their radio badge.”

We also provide VE testing at both Field Days for those who want to earn their license or upgrade their current one.

Shared Benefits

An advantage of having a second Field Day in the fall is that it gives clubs another opportunity to highlight amateur radio to the public. “When people see the banners and multiple antennas strung in trees and



During SCAN and SARA's fall Field Day, participants often set up near one another to create a communal area. Each night often ends with dinner around a campfire — SCAN member Bill Killion, KD9IUVV, volunteers to cook.

ground-mounted on poles, there's a natural curiosity as to what is going on," Thomas added. "Operating our Field Days — particularly in a public campground surrounded by vacation campers — twice a year is a great way to generate interest in amateur radio."

In addition to drawing the public's attention, SCAN and SARA cast a wide net when it comes to inviting amateur radio operators to participate in their June and fall Field Day activities. Several members of SCAN and SARA are members of other local clubs, and some even serve as club officers.

SCAN visits local radio clubs to share information and coordinate radio nets and events. These relationships are more than an exchange of ideas and skills; SCAN and SARA also have linked repeaters that cover a huge area from Missouri to Indiana and Kentucky and are used for general contacts and storm spotting by the Illinois District 11 Amateur Radio Emergency Service® (ARES®) group (which covers the bottom 11 counties in Illinois), and they're used for public service events like the annual River to River Relay, an 80-mile course that spans the Mississippi River to the Ohio River. Clubs from across the area also provide communications for the 100-mile Shawnee Hills Trail Race through the Shawnee National Forest.

Our fall Field Day provides a broad setting for local clubs and individual hams to discuss and learn more about amateur radio. In addition to the traditional Field Day communications focus, the event provides an informal setting for club meetings, discussions on the

role of and relationship between amateur radio and the National Weather Service, storm spotting, ARES training, and interactions with local emergency training agency officials (something not normally offered in June).

"We get together in times of non-emergency and stress-free situations and let our members' knowledge and expertise shine," Roy said. "Then, during emergencies and high-stress situations, we know who to count on for any particular task that may be required by the professional agencies that we serve."

In Conclusion

The turnout for the first fall Field Day was small, with several radio amateurs camping out for up to a week. Since then, it's grown rather quickly. Recently, there were at least 10 to 15 participants who came in their trailers or campers, showing off their radio trailers and portable radio setups. The event has also developed into an unofficial hamfest. If hams have extra gear to sell, our fall Field Day is a good place to offer equipment to other radio enthusiasts.

"The informality of an event like this works to solidify why ham operators enjoy their hobby, right down to the informal supper and conversation around a campfire and the challenge of operating in an open environment," Roy said. "The satisfaction of holding Field Day twice a year works for us — you just can't beat it."

All photos by the author.

Write for "Club Station"

QST's "Club Station" column is a designated space for clubs to share specific and practical ideas about what has contributed to their success, in the hope that the information will help other clubs grow and thrive. Visit www.arrl.org/qst-club-station-guidelines-and-profile-form for more information, including author guidelines and a Club Profile Form (this form is required in order for "Club Station" submissions to be considered complete).

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 July 11, 2024.

Renewing SSCs

Nellis Radio Amateur Club, KC7TMC	Las Vegas, NV
Shreveport ARA, K5SAR	Shreveport, LA
Delaware Valley Radio Association, W2ZQ	West Trenton, NJ



Ham Media Playlist

Portable Antenna Projects

With the weather beginning to cool off enough to make the outdoors more inviting, one can't help but consider portable operating. Keeping things compact and lightweight is an important factor to consider. Because I am gearing up for some fall POTA activations, I thought I would delve into some portable antenna projects on YouTube.

Many hams find it rewarding to build a piece of equipment and get it on the air. It's tremendously satisfying to turn a box of parts into a completed, functioning project, so I thought I'd look around and choose my next build.

Ham Radio Tube

With 10 meters being a favorite band right now, I decided to look at some options for a wire antenna. Yes, I know how to build one, but I always like to watch a few videos just to see how other hams do things. One great video I found was at Ham Radio Tube (www.youtube.com/@hamradiotube). "DIY 10 Meter Dipole For Under \$10" (<https://tinyurl.com/10-M-Dipole>) combines not only an easy-to-build antenna, but also the ability to do it very inexpensively.

Mike, K8MRD, explains the equipment and materials needed and where to get them. He then steps viewers through the actual build process. Even though he takes the time to stop and explain why he is taking various steps, Mike quickly gets viewers to the completed antenna and shows how to deploy it. With the video being targeted at Technician-class operators, the antenna was built for the Tech portion of the 10-meter band. Mike also shows how to tune the antenna in the field. The editing of the video helps to keep this section short.



Mike, K8MRD, demonstrates how to build your own antenna insulator.



Mike, K8MRD, tests the SWR of his newly constructed antenna.

Coastal Waves and Wires

Next, I headed over to Salty Walt's, K4OGO, channel, Coastal Waves and Wires (www.youtube.com/@COASTALWAVESWIRES; see the Ham Media Playlist column in the June 2024 issue for more information about this channel). Walt posts a lot of videos of him operating from beaches. Walt starts his video titled "Top Ten Wire Antennas for HF Ham Radio" (<https://tinyurl.com/Wire-Antennas>) by saying he is making it in response to questions and comments he received on a previous video. He enjoys responding to viewers, and this video is evidence of that. Walt steps viewers very quickly through some relatively basic wire antennas. He doesn't get into the nitty gritty of the build, instead opting to give a brief description of each antenna, a general use case, and a picture of it deployed. While not all of the antennas are lightweight and compact, the video shows a great variety of what can be done, serving as a catalyst to get us thinking about ideas to build something on our own.



Salty Walt, K4OGO, shows one of his favorite portable antennas.

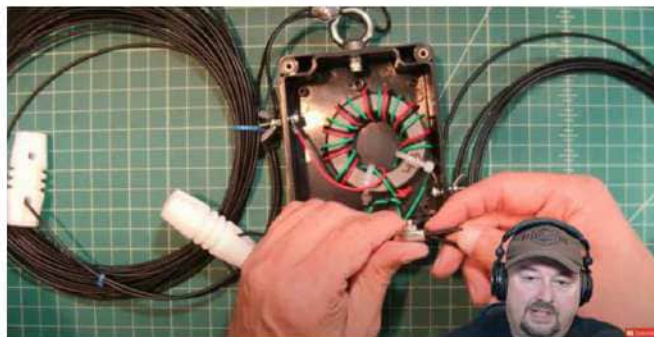


Salty Walt, K4OGO, shows the small size and compactness of one of his favorite portable antennas.

TheSmokinApe

A trip down the YouTube antenna-building rabbit hole would not be complete without stopping by TheSmokinApe's channel (www.youtube.com/@TheSmokinApe). In Ape's video titled "DIY 9:1 Unun End Fed Random Wire Antenna for Ham Radio" (<https://tinyurl.com/Unun-End-Fed>), he starts out by explaining basic terminology. In an avocation that is full of abbreviations and acronyms, this is a step that many YouTubers leave out, to the chagrin of viewers.

Ape then goes on to explain why one might choose this antenna, discussing the low cost and ease of build. He shows some options to deploy the completed antenna, explaining that the ease of use while operating is key, eliminating the need to manually adjust the antenna. He makes sure to discuss some of the potential disadvantages, equipping viewers to make an



Ape demonstrates how to build an end-fed half-wave antenna.

educated decision prior to building one.

Ape then goes through the process of building the antenna. As is typical of TheSmokinApe's videos, he shows each step in detail and explains the reasoning behind what he is doing. Viewers are shown the entire process of building the antenna and toroid, preparing the enclosure, and displaying the finished results.

There are thousands of antenna-building videos available on YouTube. The beauty of using the platform as a learning tool is that you can tailor what you watch for your personal preferences. No matter what part of amateur radio you are interested in, the odds are there are many videos catering to your interest. Head over to YouTube now, fall down a rabbit hole, and learn something about amateur radio.

New Products

COMPACtenna 20/40 Micro HF Antenna

The new revolutionary COMPACtenna is a compact antenna ideal for condos and other HOA-restricted areas. Designed for the 20- and 40-meter HF bands, it is 10 inches long and weighs only 2.5 pounds.

Its plug-and-play design allows you to connect it right to your radio or coaxial lead and operate in seconds. It does not require a ground plane or counterpoise system.

Place the antenna one or two floors above ground level, such as in an attic. It can also be placed outside, on or in a wooden, fiberglass, PVC, or other structure made of non-RF-interacting material. The new COMPACtenna 20/40 Micro HF Antenna is available from www.COMPACtenna.com and other retailers.



How's DX?

6O — Somalia

Somalia is divided into seven federal member states, which are apportioned into 18 regions and multiple districts. The federal states are Puntland, Jubaland, Galmudug, Khatumo, South West, Hirshabelle, and Somaliland. The capital of Somalia is Mogadishu, which has a population of about 2.6 million people. Somaliland is in the northwest part of Somalia, just south of the Gulf of Aden and bordering Djibouti and Ethiopia. In May 1991, Somaliland, whose capital is Hargeisa, claimed independence. In recent years, multiple DXpeditions have taken place from the western regions of Somaliland, where it is much safer than other regions of the country.

6O3T DXpedition

In December 2023, a group from Italy announced plans for a 2024 DXpedition to Somalia. These are the teammates who brought you TY1KS, D64K, and XR0ZR. This DXpedition was planned for early 2024, but it has been pushed to September. Their initial press release indicated a “focus on the low bands and 6 meters” using SSB, CW, and digital modes on 1.8 – 50 MHz, including 60 meters (5 MHz). In January, the team announced their plans on Facebook (www.facebook.com/Dxexplorernet) to go to Somaliland using the call sign 6O3T, with the exact dates to be announced later due to safety concerns.

Currently, Somalia ranks number 46 on Club Log's DXCC Most Wanted List. The last DXpedition to Somalia took place in 2019 and was conducted by Ken Opskar, LA7GIA, who operated as 6O7O. Around that same time frame, Ali Solhjoo, EP3CQ, was working for the United Nations in Mogadishu and was active in his spare time as 6O1OO. There are no resident amateur radio operators in Somalia at present, although Alex Alessandro, IT9HRK, occasionally operates as T5/IT9HRK from the capital.

This past April, the 2024 6O3T team announced that their operators would include Fabri, IV3JPP; Paolo, IV3DSH; Frank, IZ8GCE; Maurizio, IV3ZXQ; Mauro, IV3AZV, and a yet-to-be-announced “young operator.” They also created a website at www.dxexplorer.net. A few weeks later, the team announced their young operator will be Kris Misa, YL3JA, from Latvia, and they also revealed that the DXpedition would take place in fall 2024.



Abraham Moyo, 7Q4AM (left); Urgent Jere, 7Q6UJ (middle), and Blessings Msimuko, 7Q5BM (right), are three of Malawi's newest ham radio operators. [Don Jones, 7Q6M, photo]

The 6O3T team plans to operate from Hargeisa in Somaliland. They will be operating for 15 days from a safe compound sometime in September; watch your favorite DX outlet for exact dates as September approaches. Plans are to have three Yaesu FTDX10s, two FT-991 rigs, two SPE 1.5Ks, and other LDMOS amplifiers. They will also have two Spiderbeams, one hexbeam, verticals for the low bands, and a seven-element Yagi for 6 meters. In addition, they expect to have a beacon running on 6 meters.

CY9 — St. Paul Island

The Canadian St. Paul Island is located some 24 kilometers (15 miles) northeast of Cape Breton Island and 71 kilometers (44 miles) southwest of Newfoundland (VO1). The island is 4.8 kilometers (3 miles) long and 1.6 kilometers (1 mile) wide with the highest point, Crogan Mountain, being 147 meters (482 feet) high.

St. Paul Island was not on the original postwar DXCC list but was added to the list in 1976 under what was then the Point 3 criteria (separation by foreign land). Point 3 stated, “Where foreign territory divides a country, there will be a minimum distance of 75 miles of foreign land separating the two areas or places in question. In the case of island groups this distance requirement does not apply.”

Contacts made with St. Paul Island on or after November 15, 1945, would count as a new DXCC country. The first operation there was by VE1UC in 1949. At the time (1976) that St. Paul was added to the ARRL DXCC Country List, the prefix was VY0. In the early 1980s, the prefix was changed to CY0, but it was



Blessings Msimuko, 7Q5BM, operating FT8 from Malawi. He can also be found operating SSB. [Don Jones, 7Q6M, photo]

changed to CY9 shortly after and has remained as such ever since.

CY9C DXpedition

In April 2023, Murray Adams, WA4DAN, who led the very successful March 2023 CY0S DXpedition to Sable Island, announced that the team's next project would be to once again activate CY9C from St. Paul Island — this time from August 26 to September 5, 2024. They will be using a boat and two helicopters to transport equipment and operators. Plans are to be active on 160 – 6 meters on SSB, CW, FT8, and RTTY, along with satellite and Earth-moon-Earth activity. This "tent-and-generator DXpedition" will count for not only DXCC, but also Parks on the Air (CA-0122) and Islands on the Air (NA-094). Additionally, it will count as a lighthouse (STP-002).

The team will include Jay, K4ZLE; Craig, K9CT; Mike, K9NW; Pat, N2IEN; Lou, N2TU; Dan, W4DKS; Glenn, W0GJ; Larry, W0PR; Murray, WA4DAN, and Lee, WW2DX. St. Paul Island currently ranks number 52 on Club Log's DXCC Most Wanted List. It's number 22 in Asia, 26 in Oceania, and 41 in Africa. The team has a very helpful website (www.t-rexsoftware.com/cy9c) with many details.

7Q — Malawi

There are now eight amateur radio operators in Malawi (7Q). The three latest additions are teenage Malawian nationals. 7Q5BM (www.qrz.com/db/7q5bm) is 16-year-old Blessings Msimuko (aka KC3ZHE), 7Q6UJ (www.qrz.com/db/7q6uj) is 17-year-old Urgent Jere (aka KC3ZHC), and 7Q4AM (www.qrz.com/db/7q4am) is Abraham Moyo (aka KC3ZHD), who is

also a teenager. All three were trained by Don Jones, K6ZO (aka 7Q6M). They were first licensed under the Volunteer Examiner Coordinator program, which qualified them for 7Q licenses. Some countries do not provide ways to take the tests and get licensed, but they often allow those who have a US license to get a respective license for said country. "These youngsters will be participating in contest activities," said Don. The three fledgling teens expect to attend the Youngsters On The Air Camp being held in Prague, Czech Republic, on August 16 – 23. Travel arrangements were made thanks to a grant by the Yasme Foundation.

Quick Bits from Around the Globe

Rikk, WE9G, plans to be active from Futiga, American Samoa, as WE9G/KH8 on August 15 – 29. Alan, VK1AO, will be back in East Timor as 4W/VK1AO from August 19 to September 4. Yann, F1SMB, plans to be back in the French Polynesian Islands as FO/F1SMB from August 15 to September 15, with stops in Tahiti (OC-046), Fakarava (OC-066) Tahaa (OC-067), and Moorea (OC-046). Listen for him on SSB and FT8 on 40, 20, 17, 15, 10, and 6 meters.

Take, JG8NQJ (JG8NQJ/JD1), should be ending his work assignment on Minami Torishima around September 20. He's mostly on CW on 17 and 15 meters. Adam, M6NXW, will be visiting family in Kumasi and Accra, Ghana, and operating low power in his spare time as 9G5AS between August 26 and September 4.

HA5AO will be on an African tour with stops in Zimbabwe (Z22AO) on September 3 – 13, Zambia (9J2AO) on September 14 – 23, Botswana (A25AO) on September 24 – October 4, and Namibia (V51/HA5AO) on October 5 – 14. Visit his website at www.ha5ao.com/index.php/dxpeditions/africa-tour-2024/africa-tour-2024.

Last but not least, Vlad, OK2WX, is planning to be active as 5H1WX from Mafia Island (AF-054), Tanzania, from September 17 to October 8 (www.mdxc.support/5h1wx/2024/06/17/hello-world).

Wrap-Up

That's it for this month, with thanks to IV3JPP, K6ZO, WA4DAN, and The Daily DX for helping to make this month's column possible. I hope to see many of you at this year's W9DXCC on September 13 and 14. Don't forget to send your DX news, photos, and club newsletters to bernie@dailydx.com. Until next month, see you in the pileups! — Bernie, W3UR

The World Above 50 MHz

E51EME South Cook Islands

Bob Sutton, ZL1RS, operated from the South Cook Islands on 6 meters on June 8 – 24, 2024, as E51EME. Despite this being a less-than-optimal season to work North America and Europe from the South Pacific — and a lackluster, uneven North America sporadic-E season — Bob was very successful. His first opening to North America was on June 12 when he worked N9PGG. Later, he logged UN3G via transequatorial propagation (TEP). The next morning, he had W4, W5, W8, W9, and W0 stations in for nearly 4 hours. On June 13, he worked northeast stations as far as K1TOL in Maine. The next day, Mike, KM0T (EN13), put E51EME in his log despite his computer trying to do a Windows update in the midst of the contact. Jim, K5ND (EM12), and Rich, K1HTV (FM18), worked E51EME on June 17. On June 18, Bob noted a flurry of W8 and W9 stations in, as well as a few W0s. Phil, N0PB (EM39), logged Bob at 2242 UTC. Phil noted that E51EME was in for almost an hour. Bob made a contact with a station in Ireland at 15,600 kilometers away, and he worked KJ9I on Earth-moon-Earth. E51EME had a PSK flag from CU2DX on June 22, but CU2DX was not at the radio. Bob ended up with more than 1,000 6-meter contacts.

The E51EME station consisted of an Icom IC-705 and a homebrewed laterally diffused metal-oxide semiconductor (LDMOS) amplifier. An LDMOS is a planar, double-diffused metal-oxide semiconductor field-effect transistor used in amplifiers. LDMOS amplifiers are compact and efficient. Antennas for the E51EME station were stacked, three-element Yagis at 7.5 and 10.5 meters high. The Yagi stack had a wider azimuth than a single long 6-meter Yagi. As for propagation, Bob reported typical TEP to Japan and mid-Asia. To North America, there was likely a combination of TEP linking to sporadic E. There was summer seasonal sporadic E in North America that may have facilitated the links. Usually, this type of propagation is better around the equinoxes. High solar activity from Solar Cycle 25 also helped increase the F-layer maximum usable frequency. The solar flux was around 170. A G1-class geomagnetic storm took place on June 15, but it didn't seem to help. However, regular mid-latitude sporadic E in North America let the magic happen.

YOTA Member 7Q6UJ Now on 6 Meters

On July 1 at 1821 UTC, Greg Cerny, WQ0P (EM19), copied Urgent Jere, 7Q6UJ, on 50.313 MHz FT8 at –19 dB. Phil Baldwin, N0PB (EM39), worked 7Q6UJ on FT8 on July 23 at 1752 UTC. It may have been Urgent's first US contact on 6 meters. I noted PSK flags from 7Q6UJ to Europe on 6 meters. Urgent is 17 years old. He said, "I am one of three new amateur radio operators in Malawi. I hope to see you on the air. I am licensed as a result of a project created by the HacDC Amateur Radio Club of Washington, D.C. Please visit www.w3hac.org/project-malawi."

Urgent appreciates Don, 7Q6M; Junior, 7Q7JN, and Elayi, 7Q7EB, "for helping me along the way!" With the peak of Solar Cycle 25 approaching this fall, Urgent may make many contacts on 6 meters. He has been invited to attend the Youngsters On The Air (YOTA) summer camp. For more information about YOTA summer camp, visit www.ham-yota.com.

June Grid Expeditions

Numerous expeditions to rare grids were conducted by adventurous explorers. Nick, VA2VT, went to FN57 during the ARRL June VHF contest. Propagation was poor, but he put more than 30 stations in his log. Chuck, NJ6D, operated from DM27 and DM28. He made 83 contacts from DM27 and 62 from DM28, again with poor E_s propagation. The AE0EE group was on from DN85, and K0DAS/R operated from several South Dakota grids during the June VHF Contest. Jeff, WB8LYJ, operated from several rare Texas grids. He was in EL28 on June 2 – 10. He worked Fred Fish Memorial Award (FFMA) chasers Edfel, KP4AJ, and Tac, JA7QVI, along with 395 others. Jeff later went to EL17 on June 10 and made 11 contacts before going to EL07 the next day, but it was too hot to set up and operate. He proceeded to EL08 for 2 nights, and he finally went to EL18 on June 13, making 92 contacts on 6 meters.

I, N0JK, did a brief pop-up activation of DM89 from eastern Colorado on June 6, where I made seven contacts. I ran 100 W and a quarter-wave whip antenna. I was back in DM89 on June 28, and I made one contact with K6TW (DM03); it was too hot to stay for longer. Ed, N7PHY, did an awesome operation from DN77 on June 27 – 30 while running 400 W and a six-

element loop-fed array Yagi. A severe thunderstorm on June 28 destroyed his tent. Ed noted:

The end result was the total annihilation of my operating shelter. However, I was able to move the radio gear into the truck between rain squalls and continue operating. I had a couple of decent propagation days. At one time or another, I was able to hit most of the country, with the exception of the fox grids, which were conspicuously absent. I especially wanted to work Edfel, KP4AJ, but didn't get any closer than Florida. I also spent some time pointing at JA land, but [there was] absolutely nothing in that direction. All in all, however, this has been my most productive grid expedition this year. I logged 401 6-meter contacts and a handful of 2-meter contacts, the farthest 6-meter contact being Belize.

Portable grid operations — big or small — give people pursuing the VHF/UHF Century Club and FFMA awards the opportunity to work a rare grid.

On the Bands

50 MHz. Mike White, K7ULS (DN41), worked Dean, 9A5AFF (JN64), on June 4. Dean was running 100 W and a four-element YU7EF Yagi. From Florida, Chip, KM4SJM, worked 13 different grid squares on June 9 for the June VHF Contest. On June 11, K1HTV logged HQ9EB (Mike, AB5EB). TG9AJR (EK44) was into the midwest states on June 12. On June 17, Ken, AC4TO (EM70), logged UN3GX (MN83) and UN3G, and he copied EY8MM. Later, an E_s-to-TEP opening to South America occurred for me. I, N0JK (EM28), logged LU9FVS and CX8FB (GF06). That afternoon, AC4TO logged JA8LJL and had strong single-hop E_s to the W0 region and double hop to VE6. Ken then saw a CQ from Rick, DU6/PE1NSQ (PK10). Ken said, "I immediately answered and — to my utter shock — quickly completed the [contact]! It goes to show you must be diligent all the time." Rick said it was his first Florida contact on 6 meters from the Philippines. K1HTV worked a 90-minute opening to Europe on June 18, with best DX being HB9CQK. He noted that Mike, W3IP, copied SU1SK at 1015 UTC but did not complete a contact. On June 20, WQ0P (EM19) had a strong opening to Europe. Greg worked two stations in France while running just 20 W and a five-element Yagi. On June 21, Jim, K5ND, logged 19 stations in Japan. He noted 25 JA stations on one FT8 frame sequence!

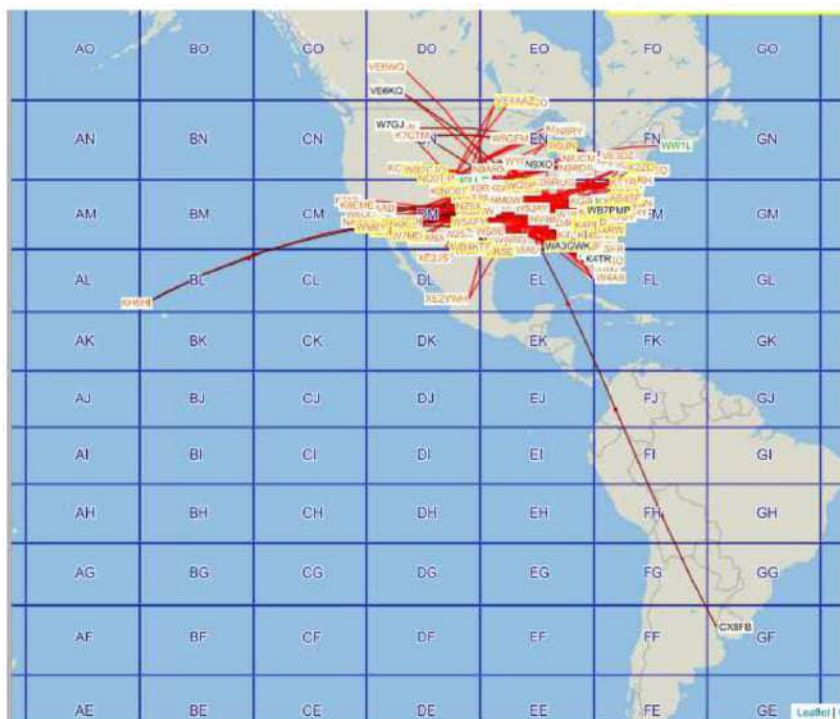
Ron Klimas, WZ1V (FN31), also had Japan in, and he logged 20 JA stations from 2235 to 2328 UTC. He said W1VD (FN31) worked stations in Japan, too. On June 28, John Lock, KF0M (EM17), worked KH6HI (BL01). John mentioned that WB0DBS (EM17) also worked KH6HI using only a Squalo antenna in his attic. On July 1, K7ULS (DN41) worked CE2SV via an E_s-to-TEP link at 2308 UTC.

144 MHz. Tropospheric propagation appeared in the midwest on June 23. Larry Lambert, N0LL (EM09), worked AA9MY (EN50) on FT8.

432 MHz. Sam, K5SW (EM25), reported reception of N5PYK/B (DM93) at 652 kilometers away on June 14 via tropospheric propagation.

Here and There

The peak of Solar Cycle 25 appears to be almost here, per the National Oceanic and Atmospheric Administration. This fall and next spring may feature the best 6-meter F-layer propagation of the Solar Cycle. Geomagnetic storms may be more numerous, with opportunities for aurora contacts around the fall equinox due to the Russell-McPherron effect, which involves how the Sun's and the Earth's geomagnetic fields line up.



A DX Map showcasing the E_s-to-TEP opening when I, N0JK (EM28), logged Rainer Pauls, CX8FB (GF06). [www.dxmaps.com]

Special Events

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

Aug. 11 – Aug. 16, 0000Z – 0000Z, N7HG, Chinle, AZ. N7HG. **Navajo Code Talkers**. 7.265 14.265 18.133 21.265. Certificate. Herbert Goodluck, N7C, P.O. Box 06, Chinle, AZ 86503. n7hgster@gmail.com

Aug. 17, 1400Z – 1800Z, W0CXX, Cedar Rapids, IA. Collins Amateur Radio Club. **Celebrating Gene Senti's Birthday**. 14.263. QSL. Brice AntonJensen, 1110 Lyndhurst Dr., Hiawatha, IA 52233. www.qrz.com/db/w0cxx

Aug. 17 – Aug. 18, 0001Z – 2324Z, W7FLO, Florence, OR. Oregon Coast Emergency Repeater Inc. **International Lighthouse Lightship Weekend 2024**. 14.265. QSL. COCARC, P.O. Box 254, Florence, OR 97439. info@w7flo.com

Aug. 17 – Aug. 19, 0001Z – 0000Z, T44IJ, Isla de la Juventud, Cuba. Radioclub Isla de la Juventud (CO9DAA). **International Lighthouse Lightship Weekend**. 7.091 10.131 14.090 21.091. QSL. Vasilij, P.O. Caja "8," g. Novopavlovsk, distrito de Stavropol, Rusia 357300, Cuba. *Activating Carapachibey Lighthouse, NA-056*. www.qrz.com/db/t44ij

Aug. 31 – Sep. 2, 1600Z – 2200Z, K7R, Ellensburg, WA. Kittitas County Amateur Radio Club. **Ellensburg Rodeo and Kittitas County Fair 2024**. 14.055 14.275 21.055 21.335. Certificate. KCARC, 110 West Sixth Avenue, Ellensburg, WA 98926. www.qsl.net/kcarcs/rodeo.html

Sep. 1 – Sep. 30, 0000Z – 2359Z, CG3CBHC, Sault Ste. Marie, ON, Canada. Algoma Amateur Radio Club. **100th Anniversary of the Ontario Provincial Air Service**. 7.074 14.074. Certificate. Dave Rowlinson, 315 Old Garden River Rd., Sault Ste. Marie, ON P6B 5A7, Canada. www.aarclub.ca

Sep. 7, 1400Z – 2000Z, W2MNR/W1QI, Danbury, CT. Metro-North Railroad and Candlewood Amateur Radio Associations. **Commemorating the Danbury Railway Museum's 30th Anniversary and First Responders Day**. 7.235 14.235; other frequencies as conditions permit. Certificate. PDF available on request. www.cararadioclub.org

Sep. 7 – Sep. 15, 0700Z – 1559Z, W6Q, Brookfield, IL. Citrus Belt Amateur Radio. **Route 66 On the Air**. 14.266 28.366 146.970 443.300; HF, CW, SSB, FT8, and FM. QSL. Mike Huedepohl, 3532 Raymond Ave., Brookfield, IL 60513. www.w6jbt.org

Sep. 7 – Sep. 15, 0000Z – 2359Z, K9ONA, Brookfield, IL. Six Meter Club of Chicago. **Route 66 On the Air**. 28.366. QSL. Mike Huedepohl, 3532 Raymond Ave., Brookfield, IL 60513. www.k9ona.com

Sep. 8, 1300Z – 2100Z, W4CA, Roanoke, VA. Roanoke Valley Amateur Radio Club. **Blue Ridge Bonanza**. 7.265

14.265. QSL. Roanoke Valley ARC, P.O. Box 2002, Roanoke, VA 24009. *Multiple stations and frequencies, 20 and 40 meters, along the Blue Ridge Parkway. See website for frequencies and QSL information.* www.blueridgebonanza.info

Sep. 8 – Sep. 12, 0000Z – 0000Z, K4A, Cordova, AL. Alabama Contest Group/WA1FCN. **9/11 Remembering Our Heroes**. 7.040 14.040 21.040 28.040. Certificate & QSL. Robert Sarnecki, NF7D, 591 Deer Run Rd., Alabaster, AL 35007. *Certificate for three QSOs on three bands any model/band combination.* wa1fcn@charter.net or www.alabamacontestgroup.org

Sep. 14, 1300Z – 2100Z, K3S, Baltimore, MD. Nuclear Ship Savannah Amateur Radio Club. **Baltimore Defenders Day**. 7.1 14.1 21.1 28.1. QSL. K3LU, 980 Patuxent Rd., Odenton, MD 21113. *Check spotting networks.* www.qrz.com/db/k3s

Sep. 14, 1400Z – 1800Z, W0CXX, Cedar Rapids, IA. Collins Amateur Radio Club. **Celebrating Arthur Collins' Birthday**. 14.263. QSL. Brice AntonJensen, 1110 Lyndhurst Dr., Hiawatha, IA 52233. www.qrz.com/db/w0cxx

Sep. 14, 1400Z – 2000Z, W3A, Holtwood, PA. State Line Radio Club. **State Line Radio Club Annual Picnic**. 7.240 14.240 21.280. QSL. Ted Reichenbach, 108 Park Cir., Elkton, MD 21921. *Muddy Run Park, open to the public, Scout groups welcome.* www.statelineradioclub.com

Sep. 14, 1400Z – 2000Z, KS0LV, Leavenworth, KS. Pilot Knob Amateur Radio Club. **Fred Harvey House Museum on the Air**. 14.303 21.361 28.355; FT8 and JS8Call. QSL. Steve Rice, 6850 Deer Ridge Dr., Shawnee, KS 66226. www.pkarc.org

Sep. 14, 1600Z – 2300Z, N6IW, San Diego, CA. USS Midway Museum Ship. **Commemorating the USS Midway's Commissioning on 9/10/45**. 7.250 14.320; 14.070 PSK31, D-STAR on PAPA System repeaters. QSL. USS Midway Museum Ship COMEDTRA, 910 N. Harbor Dr., San Diego, CA 92101. www.qrz.com/db/n6iw

Sep. 14 – Sep. 15, 0000Z – 2359Z, N1A, East Freetown, MA. US Coast Guard Auxiliary. **Commemorating the 85th Birthday of the US Coast Guard Auxiliary**. 7.190 14.300 28.493. QSL. Paul G. Sadeck, 90 Doctor Braley Rd., East Freetown, MA 02717.

Sep. 14 – Sep. 15, 0000Z – 2359Z, K4D, Homosassa, FL. US Coast Guard Auxiliary District 7 Division 15. **Commemorating the 85th Birthday of the United States Coast Guard Auxiliary**. 7.074 14.074 14.080 21.074. Certificate. Melissa Frank, 6854 W. Holiday St., Homosassa, FL 34446. melissa.frank09@yahoo.com

Sep. 14 – Sep. 15, 0900Z – 0500Z, W1H, Elkins, NH. KB1QXJ. 7.250 14.285 21.300 18.150. **Coast Guard Anniversary**. QSL. Bill Hopwood, P.O. Box 272, Elkins, NH 03233.

Sep. 14 – Sep. 15, 1400Z – 1700Z, W5NX, Springdale, AR. Bella Vista Radio Club. **Highest Point in Arkansas**. 7.040 7.260 14.040 14.260. QSL. Don Banta, 3407 Diana St., Springdale, AR 72764. *Portable operation from Mount Magazine, highest point in Arkansas.* www.qrz.com/db/w5nx or www.bellavistaradioclub.org

Sep. 14 – Sep. 15, 1400Z – 2300Z, N4A, Crystal River, FL. US Coast Guard Auxiliary Division 15 District 07. **US Coast Guard Auxiliary 85th Anniversary**. 7.250 14.250 21.350 28.350. QSL. D. Thomas, 4515 N Loquat Pt., Crystal River, FL 34428-5946. solutionsdebra@gmail.com

Sep. 14 – Sep. 15, 1415Z – 1515Z, N2S, Cape May, NJ. United States Coast Guard Auxiliary. **Commemorating the 85th Birthday of the United States Coast Guard Auxiliary**. 7.250 14.310 18.200. Certificate. Mike Slepian, 12 Continental Ln., Marlton, NJ 08053. www.cgaux.org

Sep. 14 – Sep. 15, 1600Z – 2359Z, N6A, Los Angeles, CA. United States Coast Guard Auxiliary. **Commemorating the 85th Birthday of the United States Coast Guard Auxiliary**. 14.065 14.330 18.075 18.160. QSL. Edward Little, 19816 Ridge Manor Way, Yorba Linda, CA 92886. www.cgaux.org

Sep. 17 – Sep. 19, 1200Z – 2000Z, K8A, London, OH. Madison County Amateur Radio Club. **The Ohio State University Farm Science Review**. 7.275 14.320 28.320. QSL. MCARC, 4665 Lilly Chapel Opossum Rd., London, OH 43140. *Check spotting networks.* www.mcarcoh.org

Sep. 18 – Sep. 22, 0000Z – 2359Z, K4MIA, Loxahatchee, FL. PBSEC. **National POW/MIA Recognition Day**. 7.195 14.265 18.150 28.400; SSB, CW, FM, digital modes, SSTV, satellite, and EME is possible. QSL. Michael Bald, 6758 Hall Blvd., Loxahatchee, FL 33470. *There will be 15 sister stations in operation, K4MIA/1 through K4MIA/8. Please take time to remember our POWs, MIAs, and KIAs, as well as their families.*

Sep. 18 – Sep. 23, 0001Z – 2359Z, N5D, Albuquerque, NM. Duke City Hamfest, Inc. **Duke City Hamfest**. 145.330 100 Hz tone, 444.000+ 100 Hz tone. Certificate. Jeff Burmeister, W5OMU, 7344 Tree Line Ave. NW, Albuquerque, NM 87114. dukecityhamfest.org

Sep. 20, 1800Z – 2100Z, N3TAL, Lanham, MD. American Legion Post 275 A.R.T. **National POW/MIA Recognition Day**. 7.275. QSL. American Legion Post 275 Amateur Radio Team, 8201 Martin Luther King Jr. Hwy., Lanham, MD 20706. n3tal275@gmail.com or www.qrz.com/db/n3tal

Sep. 21, 0000Z – 2359Z, K3IEC, Mechanicsburg, PA. Cumberland Amateur Radio Club. **60th Anniversary**. 7.250 14.300 21.300 28.400. QSL. Frank Mellott, 1010 Good Hope Rd., Mechanicsburg, PA 17050. www.radioclub-carc.com

Sep. 21, 1230Z – 1930Z, W4G, Villa Rica, GA. West Georgia Amateur Radio Society. **Villa Rica Gold Rush Special Event**. 15, 20, 40, and 80 meters; CW, SSB, digital. Certificate. Downloadable from website. www.wgars.com

Sep. 21 – Sep. 30, 0000Z – 2359Z, W7Y, Cheyenne, WY. Shy-Wy Amateur Radio Club. **W7Y Come and Get Wyoming**. All bands, all modes. Certificate & QSL. Shy-Wy ARC, P.O. Box 22483, Cheyenne, WY 82003. *All logs will be uploaded to LoTW and QRZ at the conclusion of the event.* shywyarc.net/wp/comeandgetwyoming

Sep. 22, 0000Z – 2359Z, NJ2KC, Vineland, NJ. New Jersey Knights of Columbus Amateur Radio Club. **22nd Annual Padre Pio Festival**. 7.250 14.250 18.140 21.350. Certificate & QSL. Thomas M. Perrotti, N2JIE, 785 Vineland Ave., Bridgeton, NJ 08302-4822. www.nj2kc.org

Sep. 28, 1400Z – 2200Z, W8PAR, Parkersburg, WV. Parkersburg Amateur Radio Klub. **Volcano Days, West Virginia Oil and Gas History**. CW 7.050 14.050, SSB 7.200 14.250, FT8 on 20 and 40 meters. Certificate & QSL. Jerry Wharton, 1722 20th St., Parkersburg, WV 26101. www.w8par.org

Sep. 28 – Sep. 29, 1521Z – 1519Z, W9WKP, Lincoln, NE. Southeast Nebraska Amateur Radio Club. **88th Anniversary, 1936-2024**. 7.265 7.285. Certificate & QSL. Charles Bennett, P.O. Box 67181, Lincoln, NE 68506. senebradioclub@gmail.com

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 **December** QST would have to be received by **October 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.

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

Alabama (Gadsden) — Sept. 21 D F H R S T V

8 AM – 1 PM. Spr: Gadsden ARC. The Venue at Coosa Landing, 201 George Wallace Dr. TI: 146.670 (100 Hz). Adm: \$5. www.gadsdenhamfest.com

Arizona (Payson) — Oct. 5 D F H T V

8 AM – noon. Spr: Tonto ARA. Advantage Realty, 609 Beeline Hwy. TI: 147.39 (100 Hz). Adm: Free. www.n7tar.org

MICROWAVE UPDATE 2024

October 3 – 5, Delta, British Columbia

F H R S

8 AM – 5 PM. Spr: WCWSA, PNWVHFS. Cascades Casino Delta, 6005 Hwy. 17A. TI: 146.52. Adm: \$275 (Canadian dollars), \$199.49 (US dollars) Advance; TBD door. www.microwaveupdate.org

Colorado (Longmont) — Oct. 6 D F H R V

9 AM – 1 PM. Spr: Boulder ARC. Boulder Co. Fairgrounds, 9595 Nelson Rd. TI: 146.70. Adm: \$5; under 18, free with paid adult. www.barcw0dk.org

Illinois (Belvidere) — Sept. 22 D F R T V

6 AM – 3 PM. Spr: Chicago FM Club. Boone Co. Fairgrounds, 8791 IL-76. TI: 146.760 (107.2 Hz). Adm: \$8 Advance, \$10 door. www.chicagofmclub.org

ARRL ILLINOIS SECTION CONVENTION

September 21 – 22, Chillicothe, Illinois

D F H Q R S T V

Sat. 8 AM – 4 PM, Sun. 8 AM – 1 PM. Spr: Peoria-Area ARC. Three Sisters Park, 17189 IL-29. TI: 147.075 (156.7 Hz). Adm: \$8 Advance, \$10 door. www.w9uvi.org/midwest-superfest

Illinois (Naperville) — Sept. 13 – 14 D H Q S

Fri. 8 AM – 5 PM, Sat. 9 AM. Spr: Northern Illinois DX Association. Chicago Marriott Naperville, 1801 N. Naper Blvd. Adm: CTU/DXU \$45 (13th), \$60 Advance; \$65 door (14th). Email: robert.r.ronk@gmail.com

Iowa (Columbus Junction) — Oct. 6 D F H R S T V

7 AM – 2 PM. Spr: Muscatine ARC. Louisa Co. Fairgrounds, 101 Fairground Rd. TI: 146.985 (192.8 Hz). Adm: \$10. www.muscatinearc.org

Kentucky (Lexington) — Oct. 5 D F H R S T V

8 AM – 2 PM. Spr: Bluegrass ARS. Highlands Baptist Church, 2032 Parallel Rd. TI: 147.76 (67 Hz). Adm: \$5 Advance, \$6 door. www.bluegrassars.org

Kentucky (Paintsville) — Sept. 28 H R T V

9 AM – 1 PM. Spr: Amateur Radio Community Services. Paintsville Recreation Center, 232 Preston St. TI: 147.225. Adm: \$5. www.ky4arc.com

Kentucky (Richmond) — Sept. 14 D F H R T V

8 AM – 1 PM. Spr: Central Kentucky ARS. Madison Co. Fairgrounds, 3237 Old Irvine Rd. TI: 145.370 (192.8 Hz), also Fusion. Adm: \$7 Advance, \$8 door. www.ckars.org

Maine (Alexander) — Sept. 21 D F H R T V

8 AM – noon. Spr: St. Croix Valley ARC. Alexander Elementary School, 1430 Airline Rd. TI: 147.330 (118.8 Hz). Adm: \$5. www.stcroixvalleyamateurradioclub.com

Maryland (West Friendship) — Oct. 6 D F H Q R T V

6 AM – 3 PM. Spr: Columbia ARA. Howard Co. Fairgrounds, 2210 Fairgrounds Rd. TI: 147.39 (156.7 Hz). Adm: \$10. www.carafest.org

Michigan (Adrian) — Sept. 15 D F H R T V

8 AM. Spr: Adrian ARC. Lenawee Co. Airport, 2651 W. Cadmus Rd. TI: 145.37. Adm: \$6. www.w8tqe.com

Michigan (Gaylord) — Sept. 28 D H R T V

9 AM – 1 PM. Spr: Top of Michigan, Thunder Bay ARCs. Gaylord Knights of Columbus Hall, 2573 Wilkinson Rd. TI: 146.82 (118.8 Hz). Adm: \$5. www.nm8rc.org

Michigan (Kalamazoo) — Oct. 5 D H Q R S V

9 AM – 4 PM. Spr: Kalamazoo ARC, Southwest Michigan Amateur Radio Team. Kalamazoo Co. Fairgrounds and Expo Center, 2900 Lake St. TI: 147.04 (94.8 Hz). Adm: \$8. www.kalamazoohamfest.org

Michigan (St. Clair Shores) — Oct. 6 D Q R

8 AM – 1 PM. Spr: Utica Shelby Emergency Communications Association. VFW Post #1146 (Bruce Post), 28404 E. Jefferson Ave. Adm: \$5. www.usecaarc.org

Michigan (Shelby Township) — Sept. 14 F R

8 AM – noon. Spr: General Motors ARC. Packard Proving Grounds Historic Site, 49965 Van Dyke Ave. TI: 443.075 (PL 123.0 Hz). Adm: \$5 per car; GMARC members, free. www.gmarc.org

Michigan (West Branch) — Sept. 14 F R

9 AM – 1 PM. Spr: Ogemaw Arenac ARS. Ogemaw Nature Park, 5626 W. Rose City Rd. TI: 146.94 (103.5 Hz). Adm: Free. www.k8oar.club

ARRL MINNESOTA STATE CONVENTION

October 5, Brooklyn Park, Minnesota

D H Q R S V

9 AM – 4 PM. Spr: Minnesota Amateur Radio Consortium. Hennepin Technical College, 9000 Brooklyn Blvd. TI: 146.76 (114.8 Hz). Adm: \$30 Advance, \$40 door. www.mnconvention.org

Minnesota (Lake Elmo) — Sept. 14 F H T

9 AM – noon. Spr: Metro Area Repeater Association. Helwig Farm, 8247 27th St. N. TI: 146.85. Adm: Free. Email: wb0wot@arrrl.net

Nevada (Reno) — Sept. 14 FRT

7 AM – noon. *Spr:* Sierra Nevada ARS. Cabela's Reno, 8650 Boomtown Garson Rd. *Tl:* 147.210 (100.0 Hz). *Adm:* Free. www.renohamswap.com

New Jersey (Tinton Falls) — Sept. 28 DFQRV

8 AM – 1 PM. *Spr:* Garden State ARA. MOESC, 100 Tornillo Way. *Tl:* 147.045 (67 Hz). *Adm:* \$5. www.gsara.club

New Jersey (Wayne) — Sept. 14 DFH

7 AM – noon. *Spr:* Wayne Radio Amateur Emergency Team. United Methodist Church, 99 Parish Dr. *Tl:* 145.210 (79.7 Hz). *Adm:* \$5. www.wraet.com

ARRL NEW MEXICO STATE CONVENTION

September 20 – 22, Albuquerque, New Mexico

DFHQRSTV

8 AM – 5 PM. *Spr:* New Mexico Hamvention, Inc. University of New Mexico Continuing Education Center, 1634 University Blvd. NE. *Tl:* 145.33 (100 Hz). *Adm:* \$15 Advance, \$20 door. www.dukecityhamfest.org

New York (Henrietta) — Oct. 1 – 5 DFHIRST

All day long, each day. *Spr:* Antique Wireless Association. RIT Inn and Conference Center, 5257 W. Henrietta Rd. *Adm:* See website. www.antiquewireless.org/homepage/annual-conference

North Carolina (Lexington) — Sept. 28 V

8 AM – 1:30 PM. *Spr:* The Healing Springs Mountain VHF Society. Farmers Market Flea Market, 366 Livestock Market Rd. *Tl:* 146.910 (107.2 Hz). *Adm:* \$5. www.w4par.org

ARRL DAKOTA DIVISION CONVENTION

September 28, West Fargo, North Dakota

FHQRSV

8 AM – 1 PM. *Spr:* Red River Radio Amateurs. West Fargo Fairgrounds Hartl Bldg., 1805 Main Ave. W. *Tl:* 145.350 (123 Hz). *Adm:* \$10. www.rrra.org

Ohio (Athens) — Sept. 1 HTV

8 AM – noon. *Spr:* Athens Co. ARA. Athens Masonic Lodge, 12 W. Carpenter St. *Tl:* 145.15. *Adm:* Free. www.ac-ara.org

Ohio (Berea) — Sept. 22 DFHQRSTV

8 AM – noon. *Spr:* Hamfest Association of Cleveland. Cuyahoga Co. Fairgrounds, 160 Eastland Rd. *Tl:* 145.410 (110.9 Hz), 442.225 (131.8 Hz). *Adm:* \$10. www.hac.org

Ohio (Lima) — Oct. 5 FHRT

6 AM – 2 PM. *Spr:* Northwest Ohio ARC. New Hope Christian Center, 2240 Baty Rd. *Tl:* 146.67 (118.8 Hz). *Adm:* Free; donation accepted. www.nwoarc.com

Ohio (Piketon) — Oct. 5 DFTV

8 AM – noon. *Spr:* Scioto Valley ARC. Pike Co. Fairgrounds, 311 Mill St. *Tl:* 146.850 (74.4 Hz). *Adm:* \$5. Email: kd8chp@cqohio.com

Oklahoma (Enid) — Sept. 14 DFHQRSTV

8 AM – 3 PM. *Spr:* Enid ARC. Chisholm Trail Event Center, 111 W. Purdue Ave. *Tl:* 444.825. *Adm:* \$10. www.enidarc.org

Pennsylvania (East Stroudsburg) — Sept. 15 FHRSTV

8 AM. *Spr:* Eastern Pennsylvania ARA. Moose Lodge 1336, 705 Stokes Mill Rd. *Tl:* 147.045 (131.8 Hz). *Adm:* \$7. www.qsl.net/n3is

Pennsylvania (New Holland) — Oct. 5 FHRSTV

8 AM. *Spr:* Red Rose Repeater Association. Garden Spot Fire Rescue, 339 E. Main St. *Tl:* 147.015 (118.8 Hz). *Adm:* \$5. Email: rett42@yahoo.com

Wisconsin (Milwaukee) — Sept. 20 – 21 DQSV

Fri. noon – 5 PM, Sat. 9 AM – 3 PM. *Spr:* Ham Radio Outlet. Ham Radio Outlet Milwaukee, 5710 W. Good Hope Rd. *Tl:* 145.130 (127.3 Hz). *Adm:* Free. Email: w9tjp@hamradio.com

To All Event Sponsors

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

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

The deadline for receipt of items for this column is **the 1st of the second month preceding publication date**. For example, your information must arrive at HQ by **October 1** to be listed in the **December** 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.

At the Foundation

ARRL Foundation Presents the 2024 Scholarship Recipients

The ARRL Foundation is pleased to present the students selected to receive scholarship awards for 2024. Scholarships are made possible through the generosity of individuals and clubs. This year, 135 scholarships totaling more than \$715,000 were awarded. The ARRL Foundation Board of Directors offers these amateur radio operators best wishes for continued success as they pursue their college degrees. The 2025 application period is expected to open in October 2024. For more information, please visit www.arrl.org/scholarship-program.



**Andrej Antunovikj,
K8TUN**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Ithya Bacon,
KI5QOS**
The Fred
R. McDaniel
Memorial
Scholarship



**Joshua Banister,
KB4JHB**
The IRARC
Memorial,
Joseph P. Rubino,
WA4MMD,
Scholarship



**Cameron
Bannasch,
KN6YZZ**
The Dick Warren,
K6OBS, Memorial
Scholarship



**Allan Baum,
K2AJB**
The East Coast
Amateur Radio
Service (ECARS)
Scholarship



**McKayla Beldyk,
KO4NXG**
The North Fulton
Amateur Radio
League (NFARL)
Scholarship



**Ariel Berger,
K2NYS**
The Anthony J.
(Tony) Medeiros,
Jr., W1PM,
Scholarship



**Ryan Bibby,
KN4RQL**
The Atlanta Radio
Club Scholarship



**Ian Bigler,
KC3DTE**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Aaron Bilow,
KC3WAM**
The Maryland
Military Auxiliary
Radio Service,
Inc. (MMARSI)
Scholarship



**Ethan Boyd,
WV8EHB**
The Alfred
E. Friend, Jr.,
W4CF, Memorial
Scholarship



**Christopher
Brault, KD8YVJ**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Nolan Brechtel,
KI5TJO**
The Richard
W. Bendicksen,
N7ZL, Memorial
Scholarship



**Beau Chennault,
N5BOA**
The Hy and Mimi
Ginsberg Memorial
Scholarship



**Geneva Cline,
N3VAC**
The Helen
Laughlin AM
Mode Memorial
Scholarship



**Aaron Cocke,
KI5PSN**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Caroline Conolly,
KI7AJB**
The Wilse
Morgan, WX7P,
Memorial ARRL
Northwestern
Division
Scholarship



**Dominic
Cronauer,
KC3NNW**
The Richard
G. Kirkpatrick,
K8WU, Memorial
Scholarship



**Giulietta Dean,
N6DLG**
The Ernest L.
Baulch, W2TX,
and Marcia E.
Baulch, WA2AKJ,
Scholarship



**Alison Dean,
KO4IOK**
The Fort Myers
Amateur Radio
Club Scholarship



**Corey Dennen,
NW1BB**
The Michael,
K8MJH, and Mary
Holt, KC8OIP,
Scholarship



**McKenzie Denton,
KO4GLN**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Krish Desai,
KD9RGN**
The Rev. Paul E.
Bittner, W0AIH,
Memorial
Scholarship



**Sean Donelan,
KM6NGN**
The YASME
Foundation
Scholarship



Silas Ernst, KE0NQO
The Paul and Helen L. Grauer Scholarship



James Ervin, KI5UXW
The Robert A. Rodriguez, K5AUW, Scholarship



Isabella Eves, KQ4NCC
The Gwinnett Amateur Radio Society Scholarship



Robert Feuerriegel, N4THS
The Charles Clarke Cordle Memorial Scholarship



Dylan Fielding, KJ7MFU
The Charles N. Fisher Memorial Scholarship



Katherine Forson, KT5KMF
The World Wide Radio Operators Foundation, Inc. (WWROF) Scholarship



Landon Gale, AI7HE
The Amateur Radio Digital Communications (ARDC) Scholarship



Jacob Gardner, KE8NIX
The Amateur Radio Digital Communications (ARDC) Scholarship



Ryan Gedminas, WW6RAG
The Michael R. Ware, NN3I, Scholarship



Andrew Gentry, K4UPX
The Gary Wagner, K3OMI, Scholarship



Michael Gilbert-Cabaceira, KI5TXS
The Amateur Radio Digital Communications (ARDC) Scholarship



Ruslan Gindullin, KE8ZCA/R9WFW
The Donald Riebhoff Memorial Scholarship



Nicholas Glennon, KQ4LII
The Amateur Radio Digital Communications (ARDC) Scholarship



Raj Gohil, KI5TLO
The Robert A. Rodriguez, K5AUW, Scholarship



Russell Goss, KD9FAL
The Six Meter Club of Chicago Scholarship



Elaine Gross, KI7PWR
The Scholarship of the Morris Radio Club of New Jersey



John Michael Hall, KQ4DNY
The Dayton Amateur Radio Association Scholarship



Thomas Hardin, K04FFA
The Challenge Met Scholarship



Nathaniel Harmon, KQ4FCT
The Amateur Radio Digital Communications (ARDC) Scholarship



Elijah Hawk, KD8DQH
The PhD ARA Scholarship



Brynn Hebert, KG5KRV
The Amateur Radio Digital Communications (ARDC) Scholarship



Sarah Hedberg, KE0YXG
The Amateur Radio Digital Communications (ARDC) Scholarship



Andrew Hendricks, KD0ZQK
The Pikes Peak Radio Amateur Association (PPRAA) Memorial Scholarship



John Horan, AE0ZY
The Dayton Amateur Radio Association Scholarship



William Houser, KN4EZW
The Walter Gallinghouse, K5DSL, Scholarship



Anika Huang, KN6OQK
The Yankee Clipper Contest Club, Inc. Youth Scholarship



Mikayla Hunt, KK7HSE
The Amateur Radio Digital Communications (ARDC) Scholarship



Andrew Johnson, N4HFR
The Amateur Radio Digital Communications (ARDC) Scholarship



Rachel Jones, KO4HLC
The Amateur Radio Digital Communications (ARDC) Scholarship



Ryan Kaelle, KN6OJE
The K2TEO Martin J. Green, Sr., Memorial Scholarship



Akshay Kapur, K5AKX
The Amateur Radio Digital Communications (ARDC) Scholarship



Jonathan Keiser, AG5SY
The Amateur Radio Digital Communications (ARDC) Scholarship



**Aidan Kern,
N3AMK**
The CARA Merit
Scholarship



**William Klipfel,
KF0JQD**
The Ray, NØRP,
& Katie, WØKTE,
Pautz Scholarship



**Caroline Kuebert,
KM4VCO**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Drew Laikin,
KQ4AIG**
The Free Family
Scholarship



**Vincent Lambraia,
K4VBL**
The Potomac
Valley Radio
Club (PVRC)
Scholarship



**Alexander Lanari,
W0BBE**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



Hope Lea, ND2L
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Zechariah Lea,
WX4TVJ**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Joshua Lee,
KN6GFZ**
The Maryland
Military Auxiliary
Radio Service,
Inc. (MMARS)
Scholarship



**Maggie Li,
KI5YMO**
The Dayton
Amateur Radio
Association
Scholarship



Sarah Li, K7SLI
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Joao Lima,
KQ4AUS**
The North Fulton
Amateur Radio
League (NFARL)
Scholarship



**Alisha Lin,
K6AML**
The Palomar
Amateur Radio
Club (PARC)
Scholarship



**Ashley Lin,
K6BOO**
The Palomar
Amateur Radio
Club (PARC)
Scholarship



**Lauren Linxweiler,
K7LRN**
The Joel R. Miller,
W7PDX, and
Martha C. Miller
STEM Scholarship



**Jake Long,
KO4JUZ**
The Maryland
Military Auxiliary
Radio Service,
Inc. (MMARS)
Scholarship



**Matthew Lyon,
KN4MXH**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Ian MacDonnell,
N0IAN**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Zachary Martin,
KC3EWK**
The L. B. Cebik,
W4RNL, and Jean
Cebik, N4TZP,
Scholarship



**Anna Matson,
KN4IVD**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Audrey McElroy,
KM4BUN**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**McKenzie
Menefee, KI5MHA**
The Medical
Amateur Radio
Council (MARCO)
Scholarship



**Javan Miller,
W8UA**
The Ronald
Hesselbrock,
W8LOW,
Memorial
Scholarship and
The CWops
Scholarship



**Jeremiah Moix,
KG5TZR**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Tiana Molina,
WB7TIA**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Aleksey Moshkov,
KD2SEM**
The ARRL
Scholarship to
Honor Barry
Goldwater



**Boris Moshkov,
KD2HXI**
The Dr. James L.
Lawson Memorial
Scholarship



**Iain Nicol,
KQ4BDT**
The New England
Federation of
Eastern
Massachusetts
Amateur Radio
Associations
(FEMARA)
Scholarship



**Ava Grace Noe,
KI5HHH**
The Mississippi
Scholarship



**Evan Ody,
KD9YYJ**
The David
Knaus Memorial
Scholarship



**Grace Papay,
KE8RJU**
The L. B. Cebik,
W4RNL, and Jean
Cebik, N4TZP,
Scholarship



**Theo Pastrana,
W8QI/LU1XOP/
VE7XOP**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**John Patrick,
KJ7QQG**
The Mary Lou
Brown Scholarship



**Joseph Patton,
WU3N**
The You've Got
a Friend in
Pennsylvania
Scholarship



**Colin Pokowitz,
WW0CJ/M7WCJ**
The Jake McClain
Driver, KC5WXA,
Scholarship



**Ryan Pribulsky,
W3LID**
The K2PLF
Martin J. Green
Jr. Memorial
Scholarship



**Campbell Reed,
KD9GEK**
The Dayton
Amateur Radio
Association
Scholarship



**Maria Reichard,
KE8SPB**
The Alan G.
Thorpe, K1TMW,
Memorial
Scholarship



**Luke Rickert,
KE0MDW**
The World Wide
Radio Operators
Foundation,
Inc. (WWROF)
Scholarship



**Aidan Riley,
W9POG**
The Clive
Frazier, K9FWF,
Scholarship



**Thomas Riley,
KA4ACE**
The L. Phil and
Alice J. Wicker
Scholarship



**Delaney Ringer,
N1DMR**
The Byron
Blanchard,
N1EKV, Memorial
Scholarship



**Luz Naomi Rivera,
KF0MVN**
The Dayton
Amateur Radio
Association
Scholarship



**Paola Rivera,
KF0NIC**
The RFinder
LLC – Arthur L.
Greenberg, W2LH,
and Madeleine
Greenberg,
W2EEO, Memorial
Scholarship



**Jack Roberts,
W9RFT**
The Indianapolis
Amateur Radio
Association
Scholarship



**Emma Schaefer,
KC9YGJ**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Michael Schlesier,
KE2BXM**
The Frankford
Radio Club
Scholarship



**Isaac Schofer,
AC3CJ**
The Potomac
Valley Radio
Club (PVRC)
Scholarship



**Victoria
Schousek,
KD9UXW**
The Clive
Frazier, K9FWF,
Scholarship



**Tyler Schroder,
NT1S**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Matthew Shook,
KQ4JQU**
The Gulf Coast
Amateur Radio
Club Scholarship



**Robert Snyder,
KD2UCJ**
The Irving W.
Cook, WA0CGS,
Scholarship



**Savannah Steele,
KK6NLY**
The K6GO Gayle
Olson and NA6MB
Mike Binder
Scholarship



**Declan Steele,
KC1NPL**
The Henry
Broughton,
K2AE, Memorial
Scholarship



**Nathan
Streitmatter,
KD9UDN**
The Bill, W2ONV,
and Ann Salerno
Memorial
Scholarship



**Sophia Strobel,
KY4ZQ**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Augustine
Terneus, KE0TRN**
The William
C. Winscott,
N6CHA, Memorial
Scholarship



**Dahmesh Upton,
KB1OTB**
The New England
Amateur Radio
Festival (NEAR-
Fest) Memorial
Scholarship



**Liam Van Citters,
KN6QXX**
The William
Bennett, W7PHO,
Memorial
Scholarship



**Kees Van
Oosbree, W0AAE**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



**Sean Warwick,
KI7ODS**
The Dayton
Amateur Radio
Association
Scholarship



**Ruth Willet,
KM4LAO**
The Amateur
Radio Digital
Communications
(ARDC)
Scholarship



Photos were unavailable for the following scholarship recipients:

Joan Amacker, K5JOZ
The Magnolia DX Association
Scholarship

Jennifer Daugherty, KO4BIL
The William Gordon Buckner,
WQVZK, Memorial Scholarship

Tradd Edwards, KN4IXC
The Fritz Nitsch, W4NTO,
Memorial Scholarship

John Ferguson, KN4YGJ
The Vienna Wireless Society
Scholarship

McKenzie Garrett, KJ7IRT
The Carole J. Streeter, KB9JBR,
Scholarship

Malaki Guenther, KK7ACX
The Lois Manley, K7LMZ, and
Randall Pitchford, WW7ZZ,
Scholarship

Benjamin Honecker, KC3YFM
The Maryland Military Auxiliary
Radio Service, Inc. (MMARSI)
Scholarship

Alyssa Hunt, KK7HTJ
The Bill, W2ONV, and Ann
Salerno Memorial Scholarship

Maximus Johnson, AI7MD
The Central Arizona DX
Association Scholarship

Alex Kinch, K8CD
The Amateur Radio Digital
Communications (ARDC)
Scholarship

Dana Morris, K8OOF
The Betty Weatherford, KQ6RE,
Memorial Scholarship

Miriam Olson, KF5MPD
The Allen and Bertha Watson
Memorial Scholarship

Parker Siebe, KJ7VSW
The Amateur Radio Digital
Communications (ARDC)
Scholarship

Write for QST

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

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

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

Whether your manuscript has a technical or general focus, a strong “how-to” component will make it stand

out. Readers should come away from the article with specific ideas for recreating your experience.

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

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

ARRL VEC Volunteer Examiner Honor Roll

Special Edition

It's been more than 40 years that ARRL has been authorized by the FCC to give amateur radio exams. Prior to today's volunteer-based examination system, the FCC conducted testing at its field offices around the country on specified schedules. In late 1982, President Ronald Reagan signed into law the Goldwater-Wirth Bill, known as Public Law 97-259. This bill amended the Communications Act of 1934, permitting the FCC to accept the voluntary and uncompensated services of licensed radio amateurs to serve in preparing and administering examinations. The amateur community would conduct the testing itself, under a new Volunteer Examiner (VE) program drafted by ARRL with the FCC staff. ARRL and the FCC signed the Volunteer Examiner Coordinator (VEC) Memorandum of Agreement at the ARRL National Convention in New York City on July 21, 1984. The agreement officially authorized ARRL to accredit VEs and coordinate amateur radio exam sessions.

ARRL VEC Volunteer Examiners

July 21, 2024, marked the 40th anniversary of the inception of the ARRL VEC. Our program has a long-standing tradition of serving the amateur radio community and the FCC with integrity and expertise. The ARRL VEC program is nationally and globally known as a great contributor to the amateur radio community and is a symbol of excellence.

As the largest VEC in the nation, the ARRL VEC and our VEs have had a positive effect on our community's growth and have truly made a difference in the future of amateur radio.

To give you an idea of what the ARRL VEC and our VEs have accomplished, here are some statistics. In the first 40 years, we have accredited more than 81,000 licensees as VEs. These VEs have conducted more than 183,000 test sessions. At these sessions, approximately 1.1 million individuals have taken 1.4 million examinations.

We would like to thank our VEs for playing an important role in the success of the ARRL VEC and for their contributions to the amateur radio community.

Serving the Amateur Radio Community

There are approximately 30,000 VEs currently accredited in our program. More than 5,800 of those VEs have been accredited for 20 years or more. ARRL VEs generously devote their time, energy, and skills to help expand our community. They support us around the country by offering exam opportunities for our community and by helping exam candidates fulfill their amateur radio aspirations.

Visit the ARRL VEC VE session counts web page (www.arrl.org/ve-session-counts) to view your ARRL VE accreditation start date.

The regular VE Honor Roll will return in December 2024.

Become an ARRL VE

If you haven't already, we hope you will embark on this rewarding journey and become an ARRL Volunteer Examiner. If you are interested in becoming an ARRL VE, it's easy! Visit www.arrl.org/VE for more information.

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 June 2024 activity report of the VM Program.

◆ Two licensees in Florida received notices to stay off repeaters in Boca Raton, and the case was referred to the FCC for further enforcement action as appropriate.

◆ Uncoordinated repeater licensees in Virginia and New Jersey received advisory notices concerning interference to coordinated repeaters in their areas. The owners are taking steps toward resolution.

◆ A licensee in New York received an advisory notice about SSB operation below the permitted frequency of 14.150 MHz.

◆ A licensee in New Jersey received an advisory notice concerning interference to an HF net and his refusal to comply with the net control directive to cease using the net. He was also warned that his license renewal date was imminent and that administrative review of his license application, if filed, would be recommended to the FCC.

The totals for hours of monitoring by Volunteer Monitors during April and May 2024 will be reported in the July VM report upon full restoration of our website. —
Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH

Congratulations

June 2024
QST Cover Plaque Award Winner

*Joe Reisert,
W1JR*

In his article, "Simple, Small 2- and 6-Meter Yagis," Joe provides construction details for a remarkable Yagi antenna that has a proven design with a very simple match and outstanding performance.

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!

Simple, Small 2- and 6-Meter Yagis

Gain, pattern, and an easy, wide-band match.

Joe Reisert, W1JR

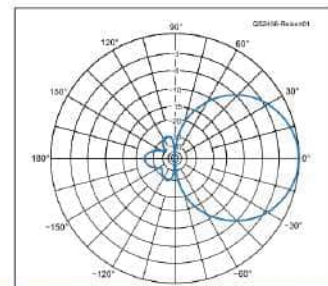
Sometimes a ham needs a small, efficient handheld 2-meter antenna with moderate performance, especially for emergency communication. They may also need an entry-level 6-meter antenna, especially for chasing DX and utilizing F2 propagation as we approach the peak of Solar Cycle 25.

The basic Yagi is still a good choice for a compact and efficient antenna. Radiation pattern and impedance are determined by the number of elements, the length and diameter of the elements, and the spacing between the elements. Many trade-off studies were conducted 25 years ago on Yagis with 0.1 – 1.0-wavelength booms. The results, which you can read at www.arrl.org/qst-in-depth, were published in the winter 1998 issue of *Communications Quarterly*. For a visual representation of these concepts, see the sidebar, "Yagi Gain."

A three-element Yagi on a 0.35-wavelength boom can have a gain of 5 dBi. Inserting an additional director between the driven element and the existing director, and readjusting the element lengths and spacing, can improve the radiation pattern. A front-to-rear ratio greater than 20 dB is possible, and the gain will increase to about 6 dBi with a direct 50 Ω match increased bandwidth. The lead image shows this Yagi as built, and its radiation pattern is shown in Figure 1. It uses a 3/4 × 3/4-inch square boom that is at least 36 inches long, but similar round tubing can be used. Booms with square tubing tend to have improved symmetry and better, long-lasting contact between the elements and the boom.



The 2-meter Yagi mounted in the vertical polarization. [Joe Reisert, W1JR, photo]



Field Organization Reports — June 2024

Public Service Honor Roll

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

391 KE8BYC	220 N0DMP	170 WA2BBS	148 KY2MMM	127 W3YVQ	110 W9GRG KM4WHO	WB8SIQ N8MRS KL7RF	93 KV8Z WB2VUF	K8KRA KN4AAG W4KX	86 AA4XZ N8OD	80 AE2EY KR4ST	75 W7MIN WB3FTQ
370 WA3EZN	209 KT5EM WV5Q	168 N3KRX	145 KT4WX	125 WA3QLW KE5YTA	125 KF5IOU KB2QO	W4EDN KA5AZK K3YAK	92 K4NWX N0JAR	KA2GQQ W2QMI N1CVO	84 K6JT	KG5AOP KA8BJA	KB3MXK
330 AD8CM	200 KE8ANW N4CNX KK4PUX	165 KC9FXE WK4WC	141 N2DW W4CAC	124 KC1HHO	124 N1IQI W1RVY N1ILZ	KA2HZP N1LAH KC1KVY W1TCD	N3SW WB8R KB1NMO WV3S	N3SW WB8R KB1NMO WX2DX AB9ZA	83 K4FHR	78 KB1NAL	74 KD2TDG W2OOD W3ZR
310 N9VC	164 KE8HKA	140 W2PAX WO2H	122 KV2J	109 K1XFC	107 W9BGJ	K8ED K2MTG	90 KB9GO KC9UC KT5SR WA3QPX	88 W5WMC KF7GC	82 W5XX	77 W7FSC K1STM	72 KB0DTI
290 WM5N	195 ND8W W4DNA	163 KC8T	135 AG9G KD0HHN	120 WA4VGZ N4NOA WC4FSU	105 AA3N K5ANP	95 N3GE		81 KB4OLY K2PHD	81 KB4OLY K2PHD	76 N0ET	70 KA1G
275 W7EES	191 KO4KUS	160 KK4F WM2C	133 KE8CYC	132 K5OB	119 K8RDN KV2J						
268 WB8YYS KC8YVF	190 KB8PGW	156 NI2W	131 WD8USA	118 KC3MAL	104 W8IM						
265 W7PAT	185 K9LGU	155 AC8NP KD8UUB	130 AC0KQ K8MDA KW1U N1UMJ W2OC N2JBA KB3YRU	117 KM4VXX KB5PGY	102 N8RWF						
250 N8LC	182 W9EEU	151 K3EAM	128 N3RPB	112 K3JL	101 KD8ZCM AE5MI						
245 KD2GXL	180 K8AMH N5MKY	150 KR4PI W4CMH WB9WKO N8SY			100 NX9K KZ8Q WB4RJW KE4RS W8GSR KB8GUN						
240 W0PZD	174 KA9IKK	149 KE8DON									
230 KT2D	172 KD2LPM										
225 NW3X											

The following stations qualified for PSHR in May 2024, but were not acknowledged in this column yet. W9EEU 322, KA9QWC 120, AB9ZA 90.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, AZ, CO, CT, EMA, ENY, EPA, GA, IN, KS, LA, MI, MO, MS, NC, ND, NFL, NLI, NM, NNJ, NNY, NTX, OH, OR, RI, SD, SFL, SJV, SNJ, STX, TN, VA, WCF, WMA, WPA.

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported: IN, MI, ND, NV, SCV.

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.

W2AH 1,195, NX9K 1,187, KE5YTA 935, KK3F 729, WB9WKO 687, KW1U 646, WA3QLW 575, W2PAX 502.

Strays

QST Congratulates...

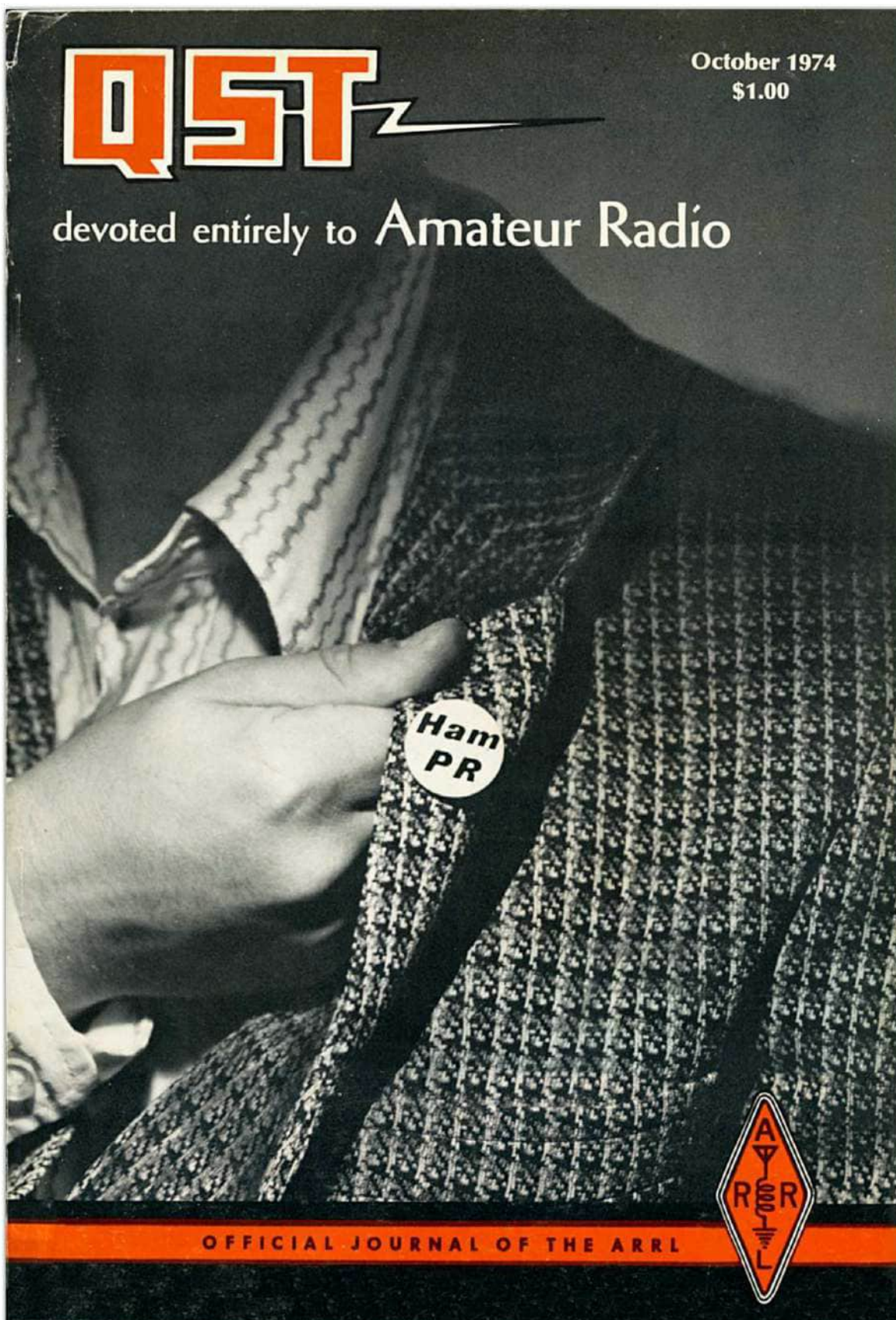
■ Meg Blubaugh, K5MEG, for earning the #26 Straight Key Century Club (SKCC) Marathon QSO Award. Out of 30 award recipients, K5MEG is the third woman to receive the award — Ai Nguyen, AI8AI, was the first, earning #15, and Teri Beard, KO4WFP, was the second, earning #23.

To qualify, one must engage in 100 contacts, each 60 minutes or longer, and each with a different SKCC member using their assigned call, SKCC member number, and SKCC-qualified keying devices; there is no time limit. The Marathon QSO Award was designed to be a demanding achievement for operators by creating a challenge that involves the fundamental ideals of ham radio as celebrated by SKCC: operating skill, a good station, conversational ability, and a consistent, quality fist.

Feedback

In the August 2024 issue, the first sentence in the second full paragraph of “The Challenge and the Beauty of IOTA from Yanuca Island, Fiji” contains an error. In “...the only inhabited island among the seven that form the Ringgold Islands...” the “seven” should be “17.” Also, in the first paragraph under the “Yanuca On the Air” subhead, the “3Y2LYC” call sign should be “3D2LYC.” These errors have been corrected in the digital edition.

A Look Back



Celebrating Our Legacy

A Life-Changing Toy

When I was eight or nine, I got a Rocket germanium radio for Christmas. This toy changed my life. I was amazed at how many Boston radio stations I could hear. A few years later, my dad bought a National SW-54 receiver. I found listening to shortwave broadcast stations and hams even more interesting. I heard them talking and wanted to do that, too.

In 1963, when I was 16, I got my Novice license and worked CW exclusively. After graduating high school, I attended the Massachusetts Radio and Telegraph School in Boston. I got my associate degree as an electronics technician. I made a career out of my interest in radio, which still amazes me today.

Domenic Correggio, WA1AYY
Saugus, Massachusetts



Domenic Correggio, WA1AYY, in his shack.
[Domenic Correggio, WA1AYY, photo]

An Amazing Contact

Most of us have probably had at least one contact that stands out above the rest. For the 53 years I have been in this hobby, one contact of mine stands out above all the others.

It was a Saturday morning in 1969. I was still a relatively new ham, having been licensed the year before at age 16. My radio was on, tuned to the CW band on 15 meters. A weak station came on the frequency and started

calling CQ. His call sign was DL5BA, a German station. He was weak, so I was surprised when he returned my call sign.

We exchanged RST, name, and location. After he received my report, there seemed to be excitement in his CW as he told me that, at that moment, he had a friend in his shack from my hometown, Columbus, Mississippi. I asked him if his friend's name was Hank, and he said, "Yes!" What makes this so amazing is that Hank and I never met or spoke to each other before. I didn't know of Hank until the night before.

One of my best friends and his girlfriend had come to my house for supper the previous evening. My friend's girlfriend was Hank's daughter. During dinner, she told us that she rarely saw her dad because he was in the service and stationed in Germany.

After telling Hank, through DL5BA, that his daughter and her boyfriend were at my house the previous evening, we spent the next several minutes talking about his family and he asked me to relay his love.

After the contact ended, I gathered my notes, took them to Hank's family, and told them about it. A few months later, when Hank was home, he called me, and we had a nice chat. He said that day was special, and we remarked about the odds of that contact taking place, and we were certainly glad that it did.

George R. Winship, Jr., NC5G
Gallatin, Texas
Life Member

Radio in the Military

One day in 1964, while browsing the electronics books at my local library, I came across the little black and red books published by ARRL describing amateur radio, how to get started, and how to learn Morse code, all while building your equipment.

I didn't have a Morse code oscillator, so I built one with one transistor and

a few parts. The earphone kept falling out of my ear, and while I didn't have a telegraph key, I started learning Morse code by touching the two battery wires together. Later, I bought a straight key.

When I joined the Air Force, that put a damper on ham radio. While stationed in Biloxi, Mississippi, for my aircraft radio career, I became a member of the Keesler Amateur Radio Club, K5TYP. Watching the various members communicate with other stations around the world made me wish I had a license to join them.

Then, I was stationed in the Panama Canal Zone, and finally, in December 1967, I took the Novice exam. A few weeks later, I received my license from the FCC. I was permitted to operate the military's Collins KWM-2/2A linear amplifier. Operating on 20 SSB and talking to various countries was a pleasure. I had the most fun on the 15-meter Novice band in cross-band operation on SSB. I managed to contact several hams in and around Moscow.

Later, I found out about a Spektrum DX20 Tx and Heathkit HR-10 Rx that someone was selling and got them. One Saturday evening, I wandered down to my radio shop where I used to work on radio equipment. I pulled out the trusty BC-348 receiver and started scanning the AM broadcast band, and the first station I heard was WCKY in Cincinnati, Ohio. That station was extremely strong that evening, perhaps 50,000 dB over S9. Later on, I calculated that Cincinnati was roughly 2,100 miles from Panama.

Theodore Turk, WB8ADA
Euclid, Ohio
Life Member

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

Classic Radio

A Comprehensive Review of the Hammarlund HQ-110 Family

The ham band receivers in the Hammarlund HQ-110 family were often thought of as being poor receivers because they shared a cabinet with the not-so-great Hammarlund HQ-100 and HQ-100A, but they were surprisingly good. They were dual conversion with a first IF of 3045 kHz and a second IF of 455 kHz; the receivers were single conversion on 80/75 and 160 meters using only the 455 kHz IF. The HQ-110 and HQ-110A covered 160 to 6 meters without the World Administrative Radio Conference bands, and the HQ-110A VHF added the 2-meter band.

The HQ-110 entered the ham radio market in 1957. It was discontinued 5 years later because of its upgrade to the HQ-110A, which was available until 1969. The HQ-110 followed the introduction of the mediocre single-conversion general-coverage HQ-100, which was introduced in 1956. Hammarlund sold the larger and more expensive HQ-170, HQ-170A, and HQ-170A-VHF receivers from 1958 to 1967. All Hammarlund HQ receivers looked similar, except for the HQ-215. They all had two tuning dials, an S-meter (often in the center), and the option to include a clock in the left corner. Below the dials were two large knobs, and the one on the left was the main tuning knob. On most general-coverage receivers, the left dial was used for general coverage and the right dial tuned the ham bandspread. However, on the HQ-110 family of receivers, the right knob was the function switch. The two large front dials on the HQ-110



The HQ-215 had a different look than most of the Hammarlund HQ receivers. [Photo courtesy of www.rigreference.com]

and HQ-170 families of ham band receivers were both for ham radio bands and moved together.

Circuitry Design and Power Supply

The HQ-110 and HQ-110A were similar in design, as they both used the same tubes. But other than similarities in size, the HQ-110 family of receivers weren't like the HQ-100 and HQ-100A. The design of the HQ-110 family was much more like that of the larger Hammarlund HQ-145 and HQ-145A dual-conversion general-coverage receivers. One odd difference was that the HQ-110 family had a first IF of 3045 kHz, while most other Hammarlund receivers with a first IF around 3 MHz had an IF of exactly 3035 kHz — a difference of 10 kHz. I have found no reason for this difference.

All the receivers in the HQ-110 family used a type 6BZ6 pentode tube as the RF amplifier. A 6BE6 pentagrid mixer was used as the first mixer, and a separate 6C4 triode was used as the tunable first conversion oscillator. I assume that a separate tube was used in hopes that this design

might improve stability. A second 6BE6 was used as the second mixer and was also the oscillator for the conversion from 3045 to 455 kHz. A 6BA6 pentode was used as the first IF amplifier at 455 kHz, and a 6AZ8 was used as the second IF and the beat frequency oscillator (BFO); the BFO was completely separate from the Q-multiplier circuit, unlike with the HQ-100. The Q multiplier operated at 455 kHz and used a 12AX7 tube. A 6BJ7 served as the diode detector, automatic noise limiter (ANL), and automatic gain control (AGC) diode. A common 6AQ5 was used in the audio output stage, providing about 1 W root mean square of audio power to a 3.2 Ω external speaker.

The AGC and ANL built into the HQ-110 family of receivers only operated when receiving AM signals (they didn't work on SSB or CW). Sadly, the HQ-110 receivers didn't include a product detector for better performance on SSB and CW. The similar but larger general-coverage HQ-145 and HQ-145A also didn't have a product detector. For only about \$100 more, the ham band

HQ-170 and HQ-170A and the general-coverage HQ-180 and HQ-180A were supplied with a product detector and variable-speed AGC on SSB and CW. The HQ-110 family did have an RF gain control with a very wide gain control range that allowed SSB and CW to be well received by setting the RF gain low enough to avoid distortion of SSB or CW.

All of the receivers in the HQ-110 family used a 5U4GB vacuum tube as the B+ rectifier. The HQ-110A didn't switch to solid-state silicon diodes when advancing to the later-upgraded A models, like the HQ-145, HQ-170, and HQ-180 models did when they were upgraded. All models, except the HQ-200, used gas-filled voltage regulator tubes; the HQ-110 family used a 0B2 voltage regulator tube, regulating at about 108 V dc.

Receiver Options

None of the Hammarlund communication receivers had built-in speakers, so they sold two speakers with similar styling — the S-100 and S-200. All the speakers and outputs were rated at 3.2 or 4.0 Ω but worked fine with 3.2 to 8 Ω speakers. All receivers had a ¼-inch monophonic phone jack, which was located on the rear panel of most of the receivers and muted the speaker when a headphone plug was inserted. All had provisions to mute the receivers when an amateur station was transmitting.

Many models of Hammarlund receivers had the option to include clocks. In general, a 12-hour clock was supplied with the original offerings, and 24-hour clocks were supplied for the models with A suffixes. A timer could be set on



A New Dimension in Amateur Radio

The Hammarlund HQ-110A looks like the 110—but basic design changes create the subtle difference between excellent and exquisite! A joyful performer as the HQ-110, the new HQ-110A reaches new heights of operating pleasure by including such extras as:



- Significantly tighter mechanical and electrical stability
 - Accessory socket for pre-amp or converter application
 - Expanded dial—with 144-148 MC calibrations for use with 2 meter converters
 - Separate 6 meter coax input for rapid shift from VHF to LF operation
- This 12 tube, dual conversion superheterodyne receiver covers all amateur bands, from 160 to 6 meters—with optimum reception of CW and SSB signals through a separate linear detector. You have to try this receiver to see just how good it really is—but if you can't—send for the new, informative brochure on the HQ-110A—or pick one up at your local Hammarlund distributor.

Still only
\$249.00

24 hour clock timer \$10 optional



This August 1962 QST advertisement for Hammarlund detailed the HQ-110's upgrade to the HQ-110A.

the clock to automatically turn on the receiver before the operator planned to use it, thus allowing the unit to fully warm up and minimizing the amount of frequency drift. If a factory-supplied clock was included, a C was added to the model number. A clock could also be purchased as an accessory to be installed by the owner. For units sold in areas where the power voltage was 220 to 240 V ac, Hammarlund marketed a version that could operate from 110 to 120 V ac or 220 to 240 V ac; these radios had an E added to their model number to signify provisions for export power. The Hammarlund HQ-110 family of receivers came with built-in 100 kHz crystal calibrators.

2- and 6-Meter Coverage

When the HQ-110 was upgraded to the HQ-110A, it gained a dial

scale for use with a 2-meter converter having a 6-meter output. It also gained a separate antenna input for 6 meters that was separate from the input for 160 to 10 meters. The separate 6-meter antenna input was a great benefit, as a different antenna was virtually always used for 6 meters. The HQ-110A-VHF included two additional features: a 2-meter converter with an output of 6 meters and the 2-meter tuning dial scale that was added to the HQ-110A. The converter used four RCA 6DS4 Nuvistor triode tubes. A 6-meter preamplifier was also provided with the HQ-110A-VHF using two 6DS4 Nuvistor tubes. The separate input for the 6-meter antenna aided Hammarlund in adding the 2-meter converter and 6-meter preamplifier. In order to select the 2-meter converter, the receiver was set up for 6-meter reception.

The 2-meter converter was selected by pulling out the RF gain control and putting relays in front of the 6-meter input — a separate 2-meter antenna input fed the converter.

Market Competitor

While the Hammarlund HQ-110 family was on the market, R. L. Drake Company released the 2A and the well-known 2B and 2C. The HQ-110 family covered 160 and 6 meters, with the option of 2 meters — Drake's receivers did not. They used a crystal-controlled first-conversion and tunable IF, plus product detectors, which really boosted the SSB and CW operation and improved stability and frequency readout.

100, 50, and 25 Years Ago

September 1924

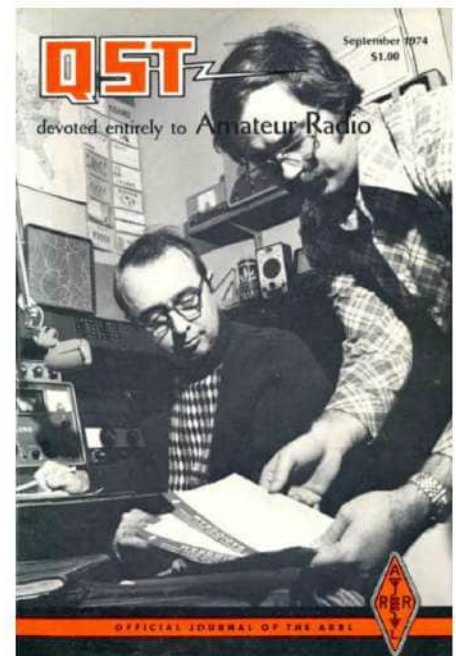
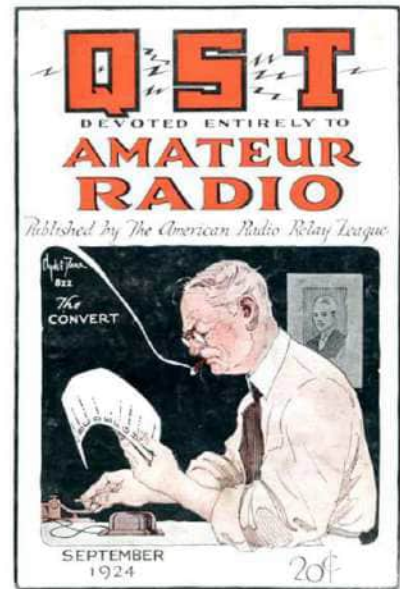
- The cover illustration, titled "The Convert," shows an aspiring ham practicing with a straight key, buzzer, and Morse code alphabet list.
- After a year of hard work, Amateur Radio, through the efforts of A.R.R.L., has been given five bands of short waves. Regulations are outlined in "Editorials: The New Short Waves."
- The first meeting of the recently elected A.R.R.L. Board of Directors was held in Hartford, Connecticut on July 25 and 26. Highlights appear in "The Annual Board Meeting" by K.B. Warner, 1BHW.
- Proper construction for a good wavemeter is discussed in "Wavemeters for the New Ranges" by S. Kruse, 1OA.
- What useful information should be on a QSL card? Howard S. Pyle, 8FT, follows up with a study of the international fad that 8UX started in "The Amateur DX Report Card."
- A review of the work that's been done regarding an aggravating case of radio interference by power lines in Augusta, Georgia, is presented in "The Augusta Case," by P.C. Herault.
- H.F. Mason, 1ID, describes "A Five Watt Sending Set for \$25" in "The Amateur Builder."

September 1974

- The cover photo shows WA3ODQ and K3ULJ inspecting radiograms from backup communications. The related story with details on an emergency test with Oscar appears in "Simulated Emergency to Demonstrate Amateur Satellite Capabilities: Tremor Hits Alaska."
- The impact of rapid inflation, rising costs, and financial losses is discussed in "It Seems to Us...Membership Dues."
- Martin Davidoff, K2UBC/WA3VCI, describes a simple, effective 146-MHz antenna suitable for amateurs using, or planning to use, Oscars 6 and 7 in "A Simple 146-MHz Antenna for Oscar Ground Stations."
- Instructions for reusing ball-point pens to make test prods is presented in "Gimmicks and Gadgets: Ball-Point Pen Test Prods" by Thomas G. Socci, W2RUK.
- An address by Richard E. Wiley before the ARRL National Convention in New York City, on the occasion of ARRL's 60th Anniversary, is retold in "FCC Chairman Speaks..."
- A story of how amateur radio and Sister Cities International came together is told in "The Oaxaca Experience" by John Troster, W6ISQ, and M.C. "Chuck" Towns, K6LFH.

September 1999

- The cover photo shows the mist-enshrouded WB1GQR contest operation at the summit of Mount Equinox in Vermont during the 1997 ARRL September VHF QSO Party.
- Casual operation in small sub-band portions of popular VHF/UHF bands can wreak havoc on weak-signal transmissions. David Sumner, K1ZZ, voices options in "It Seems to Us...Regulation or Education?"
- A look at the first DXpedition to the newest country on the DXCC list, as seen by a first-time DXpeditioner, is shared in "E44DX, Palestine Calling!" by Bernie McClenny, W3UR.
- Most of this 2-meter transceiver is in the software. Bob Larkin, W7PUA, describes "The DSP-10: An All-Mode 2-Meter Transceiver Using a DSP IF and PC-Controlled Front Panel."
- Rick Palm, K1CE, takes us on a journey through the history of NTS in "Golden Anniversary: A Look at Fifty Years of the National Traffic System."
- Lyndel Thiesen, N7LT, lets us in on the fun from the remote 10,000-foot mountains near Yellowstone National Park in "VHF Contesting Without a Hitch?"
- Randy Pirtle's, N6GN, "Op-Ed: A Farewell to HF?" expresses that technology will improve, but HF communications will remain a welcome challenge.



Silent Keys

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

KB1FGF	Wood , David M., Scarborough, ME	VW4NTG	Woodbridge, VA	WA9BR	West Palm Beach, FL
K1GUG	Jolls , Richard W., Braintree, MA	WA4OMR	McNutt , George R., Trinity, NC	♦W9CHD	Rossetter , Brad J., Lafayette, IN
VK1GZL	Morgan , Charles L., Lancaster, NH	VW4QMT	Tarpley , Clarence L., Roanoke, VA	KD9CXN	Merten , Charles, Waukesha, WI
N1HLI	Mullin , Patricia S., Rutland, VT	AB4RJ	Tomblin , Otis M., Cumming, GA	VW9EIL	Reynolds , David J., Marion, IN
W1JLA	Heck , Robert L., Sutton, MA	AF4RK	Morgan , Ernest E., Henderson, KY	WD9FQW	Davis , Timothy R., Franklin, WI
WA1KPA	Tufts , Robert B., Victor, NY	K4RLZ	Dalnes , John R., North Miami, FL	W9ILA	Behlen , Michael J., Grafton, WI
•KA1LLW	Flood , Richard E., Pittsfield, MA	VN4UI	Wilmoth , George K., Hamilton, VA	VKD9ISV	Frederick , Robert A., Greenfield, IN
V♦♦KA1SAW	Swenor , Neal H., Westborough, MA	KI4UNV	Mallard , Brian J., Hilton Head Island, SC	W9LME	Detommaso , Richard F., Fort Wayne, IN
V♦WA1SDJ	Rooney , John G., Sunapee, NH	VW4VR	Eagle , Bonnie L., Trenton, TN	VW9MAL	Laird , Michael E., Logansport, IN
VKL1VQ	Lewellen , Robert, Wasilla, AK	V♦N4WSP	Grandmaison , Ronald J., Fredericksburg, VA	V♦WB9PKM	Lunsford , Malcolm A., Merrillville, IN
VN2AIZ	Mayes , Alfred I., Bellmawr, NJ	♦N4XM	Pace , Steve S., Florence, AL	WB9QAA	Yackey , Allan L., Avon, IN
VW2LID	Gagne , Donald J., Lakewood, NJ	♦N4YMU	Schrader , Paul D., Louisville, KY	♦K9QED	Smith , Steven Rocky, Frankfort, IN
NY2NY	Buscemi , Jay R., Laurel, NY	KE5BR	Hartley , Ernest B., Boone, NC	VW9RYV	Rider , Philip A., Mundelein, IL
•WB2OMS	Kuhlthau , Leston R., Milltown, NJ	VK5CT	Maberry , Robert A., III, Olathe, KS	K9SAL	Hamann , Howard H., Manitowoc, WI
♦N2QDQ	DiLucchio , Robert F., Havre de Grace, MD	W5DDR	Winter , John W., Wichita, KS	VKA9VQU	Lunsford , Shirley, Merrillville, IN
KW2T	Pedtke , Dan, Fitchburg, MA	VW5DFN	Rush , David D., Clovis, NM	K9VXW	May , Bob, Muncie, IN
WB2TGN	Leavenworth , David J., Knoxville, TN	VW5DHD	Norman , David F., Fountain, FL	KD9WLW	Bergstedt , Carleton R., Wheeling, IL
KA2VYY	Magarelli , Nicholas J., Fair Lawn, NJ	VN5EXY	Beadles , Tony G., Santa Fe, NM	VN9XRH	Creemeens , Michael J., New Douglas, IL
K2WA	Andreychik , Wayne T., Flemington, NJ	KI5FNH	Doughtie , Charles T., Austin, TX	WD0AFJ	Robinson , Robert W., South Bend, IN
W2WDD	Dallessandro , David M., Tonawanda, NY	N5HCH	Almaguer , Mike A., Richmond, TX	K0BZK	Holesovsky , Florence M., Loveland, CO
KC2YKV	Schreffler , Roger, Hudson, NY	VKD5IBT	Alexander , Leone S., Hendersonville, NC	♦♦K0CA	Stanard , Robert L., Kansas City, KS
♦W3HL	Lacey , Herbert, Cary, NC	VN5KQA	Palacios , Juan P., Big Spring, TX	KC0CUV	Ahrens , Cliff, Hannibal, MO
KA3IKW	Brennan , Sarah, Bensalem, PA	KI5UHA	Boline , Rodney J., San Antonio, TX	VNK0H	Lewis , Albert M., Topeka, KS
VWA3IRG	Kiehlmeier , Robert R., Jr., Wilmington, NC	♦K5XG	Boyle , Gary L., Rogers, AR	K0HNC	Fiala , La Verne F., Kearney, NE
KB3LBB	Bliss , Ralph, Kingston, PA	♦K5ZG	Essary , Larry L., Sachse, TX	VW0IXQ	Meisinger , Charles W., Hillsboro, KS
VW3NRL	Lerro , Nicholas R., Sr., Woodlyn, PA	VKC5ZTN	Hudson , Wayne R., Lamar, CO	VW0KEN	Tietbohl , Frederick J., III, Green Lake, WI
KB3ORG	Kiehlmeier , Robert R., Jr., Wilmington, NC	V♦KB6ERG	Beevers , Larry D., Clovis, NM	VKE0LCK	Kendall , Oliver F., Florence, CO
N3ZVK	Willans , Steven H., Morrisville, PA	V♦W6GDP	Meigs , Arthur C., Long Beach, CA	W0QPX	Ring , John Michael, Windsor, CO
KB3ZWM	Delhez , Frans, York, PA	K6KAP	Kimball , Pleasant P., Arvada, CO	VN0SD	Nelson , Jerome L., Richfield, MN
VAB4AO	Souders , Julian M., Hollywood, MD	KB6KBA	Myovich , Mach L., Merced, CA	KD0TWH	Waltner , John R., Hurley, SD
•KB4BOL	Hatch , Earl R., Melbourne, FL	KI6POY	Shaw , Robert H., Fairfax, VA	VN0VJH	Haynes , Gregory D., Hermantown, MN
V♦K4CMY	Hall , William E., Jr., Charlotte, NC	♦K6QIP	Larkin , Laura K., Waltham, OR	WB0VNL	Miller , Robert J., Saint Paul, MN
VKG4DJM	Wolfe , Thomas E., Hixson, TN	♦N6RTD	Pierce , Lisa M., Lamont, CA	N0WAR	Doorneweerd , Fay A., Port Richey, FL
KC4DTP	Bryson , William H., Sadieville, KY	KK6YK	Dickinson , Richard T., Apple Valley, CA	•N0WCM	Cathcart , Aaron S., Princeton, IL
W4EPF	Findley , William J., Cordele, GA	K7AIL	Seale , Patrick H., Galesville, WI	KC0WUD	Begley , Mason E., Maryland Heights, MO
AB4ET	Faiver , Edward P., Mooresville, NC	AF7BU	Benedict , Jeffrey E., Chimacum, WA	WN0WWY	Bartlett , Charles R., Licking, MO
VW4FHC	Weatherley , John Leonard, Melbourne, FL	VK7DPM	Rampton , Dennis T., Gilbert, AZ	KE0Y	Feldhausen , Dale E., Manhattan, KS
•KM4G	Crosby , Fredrick H., Goldsboro, NC	N7DRW	Mohr , Daniel, Orlando, FL	♦ Life Member, ARRL	Elliott , Ben A., Raymond, NE
WB4GSE	Wenger , Paul L., Sarasota, FL	NK7L	Hamby , Horace, III, Aiken, SC	♦ Current Diamond Club	
V♦KQ4HS	Jackson , Rodney D., Grovetown, GA	W7MOY	Madison , Thomas D., Washougal, WA	V Veteran	
N4ICK	Gossman , Nick C., Evansville, IN	V♦♦♦K7VC	Humpherys , Boyd V.N., Logan, UT	• Former call sign	
KD4IJS	Hester , Ronald L., Thurmond, NC	KC7WET	Chastain , Steven C., Medford, OR		
VKI4IRG	Weltman , William C., Baltimore, MD	KA8AUQ	Flanagan , Dick, Minden, NV		
K4ISB	Aust , Milton N., Draper, VA	VW8CFO	O'Dea , Thomas M., Miles City, MT		
N4JAR	Rackley , Julius A., Elizabethtown, NC	WD8CRL	Zemke , George P., Clare, MI		
K4JB	Johnson , Walter R., Lawrenceville, GA	KF8D	Hinkle , Charles W., Columbus, OH		
N4JCL	Coffey , Lloyd L., Waynesboro, VA	VK8HLB	Bugg , Mary J., Massillon, OH		
W4KEZ	Forston , Richard L., Lexington, KY	W8JEE	Williams , Dan L., Clarksville, TX		
V♦KD4LBJ	Barger , Harrison, Harriman, TN	KD8JKN	Burkhardt , Howard, Mentor, OH		
VWB4LMH	Youngblood , Curtis, Greensboro, NC	N8KBC	Brehmer , William T., Farmington Hills, MI		
KF4LPL	Reese , Steven, Catawba, NC	K8MHC	Kren , William W., Warren, OH		
V♦K4NGC	Bennett , Donald H., Jr.,	VK8NNV	Kaltenborn , David, Chula Vista, CA		
		WB8OFU	Angle , Alvin A., Jr., Buckhannon, WV		
		•KB8POK	Allen , William L., West Branch, MI		
		VWB8TAR	Reed , Gary A., Southfield, MI		
		KB8YDK	Kirkpatrick , Matthew B., Circleville, OH		
		V♦KD8YL	Martin , Francis W., Ludington, MI		
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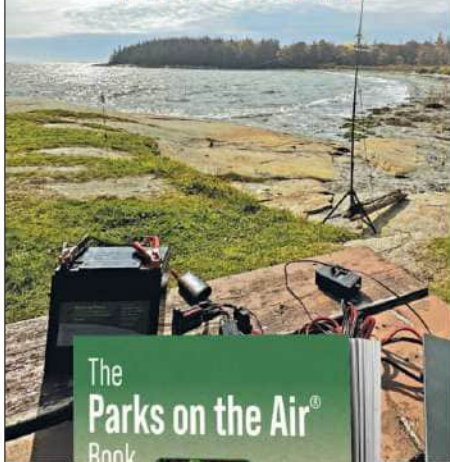


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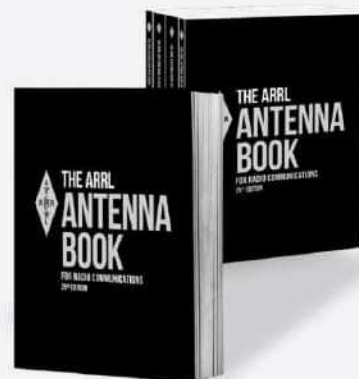
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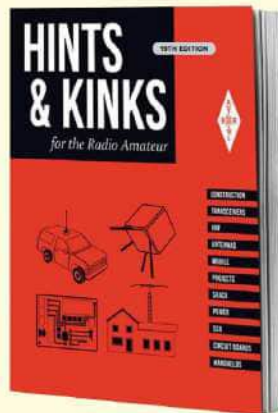
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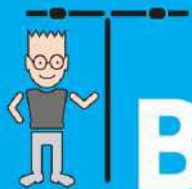
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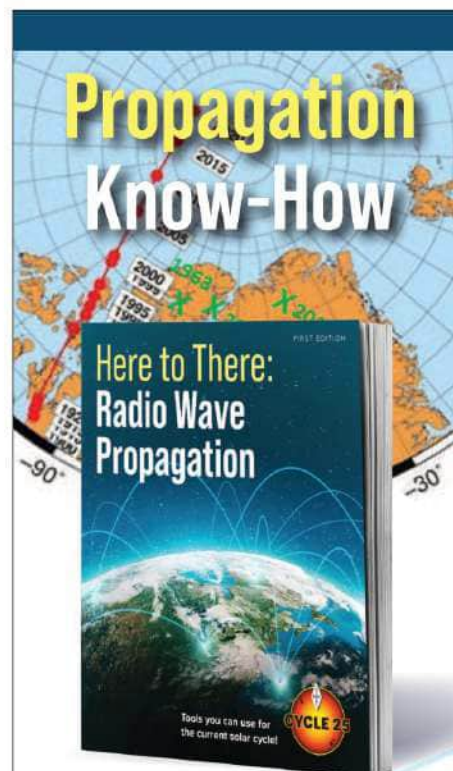
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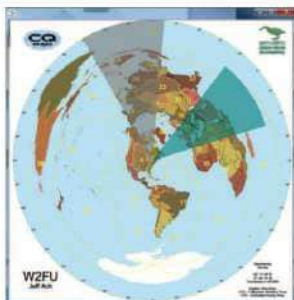
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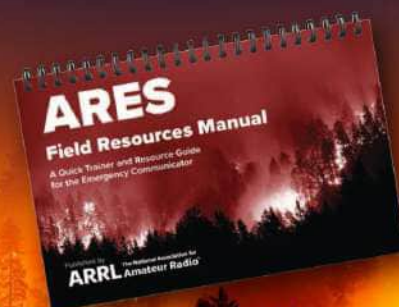
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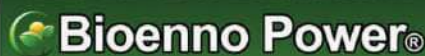
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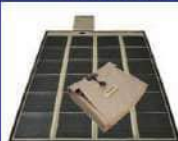


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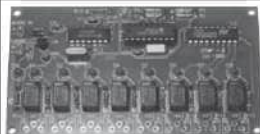
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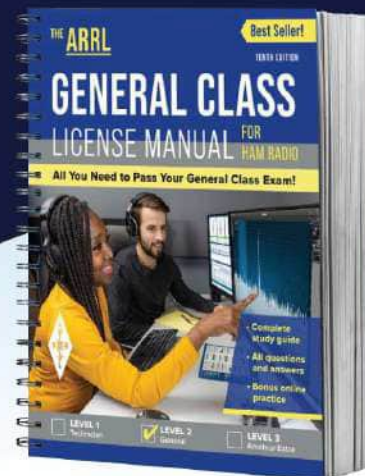
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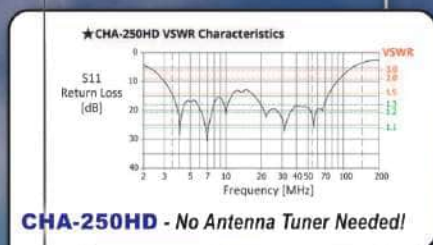


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Power Rating	1.5KW (1.8~60MHz) 1KW (144MHz)	2KW (1.8~60MHz) 1KW (144MHz)	200W (140~525MHz)
Tolerance	±10% at Full Scale	±10% at Full Scale	±10% at Full Scale
SWR Measurement	1:1~1:∞	1:1~1:∞	1:1~1:∞
SWR Detection Sensitivity	4W MIN	4W MIN	4W MIN
Input/Output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

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

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VSWR: Below 1.2:1
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Isolation: 60 dB 600 MHz
Connector: SO 239
Output Port: 2



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