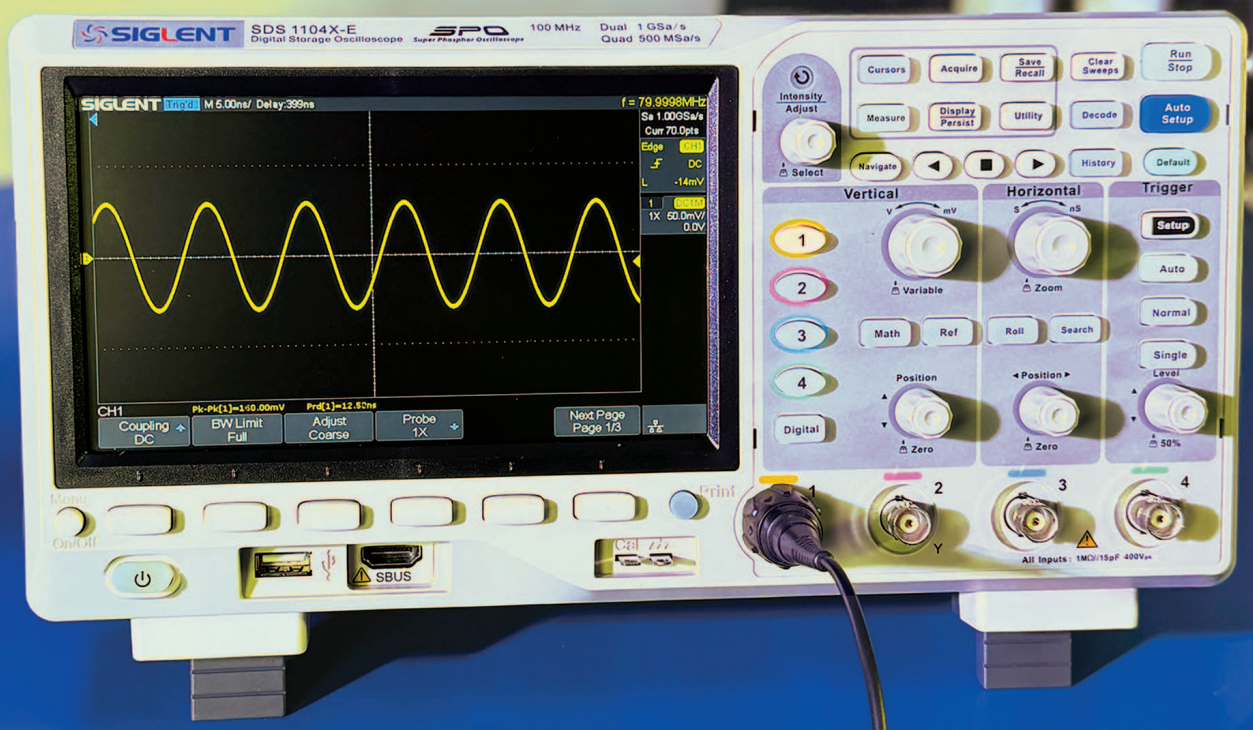
An Islands On the Air DXpedition to Fiji | 51

QST
DIGITAL EDITION
ARRL The National Association for Amateur Radio®
August 2024 www.arrl.org
DEVOTED ENTIRELY TO AMATEUR RADIO

Delving Into Digital Scopes



QST Reviews

BG2FX FX-4CR Portable Transceiver

Xiegu VG4 Four-Band HF Vertical Antenna

JNCRadio Chelegance MC-750 HF 40 – 6-Meter Antenna

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  - Pop-up Menus for quick and easy operation
  - Large Transmit/Receive indicator
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- Especially designed FC-50 External Antenna Tuner (option)

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- **Powerful RF Front-End & Low Noise Oscillator Enable Phenomenal Multi-Signal Receiving Characteristics***
  - RMDR : 113dB+
  - BDR : 127dB+
  - 3rd IMDR : 102dB+
  - TX Phase Noise : −143dBc/Hz
- **Band-Pass-Filters dedicated for the amateur bands to eliminate out-of-band unwanted signals**
- **Built-in High-speed Automatic antenna tuner**
- **Effective QRM rejection by Dual-core DSP**

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

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

FT-710 AESS

- Includes External Speaker SP-40

FT-710 Field

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

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

* Photo shows the FT-710 AESS

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

FT-710 Aess

Acoustic Enhanced Speaker System

HF/50MHz 100W SDR TRANSCEIVER

FT-710 Field

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Contents

August 2024 ♦ Volume 108 ♦ Number 8

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

Columns

Departments

Our Cover
As digital oscilloscopes become more widely used, it's important to understand how their specs differ from those of analog scopes, so we can better understand the data digital scopes provide. Paul Danzer's, N1II, article "Digital Oscilloscope Specifications" shares the results of Paul's tests on five different models. [Sierra Harrop, W5DX, photo]

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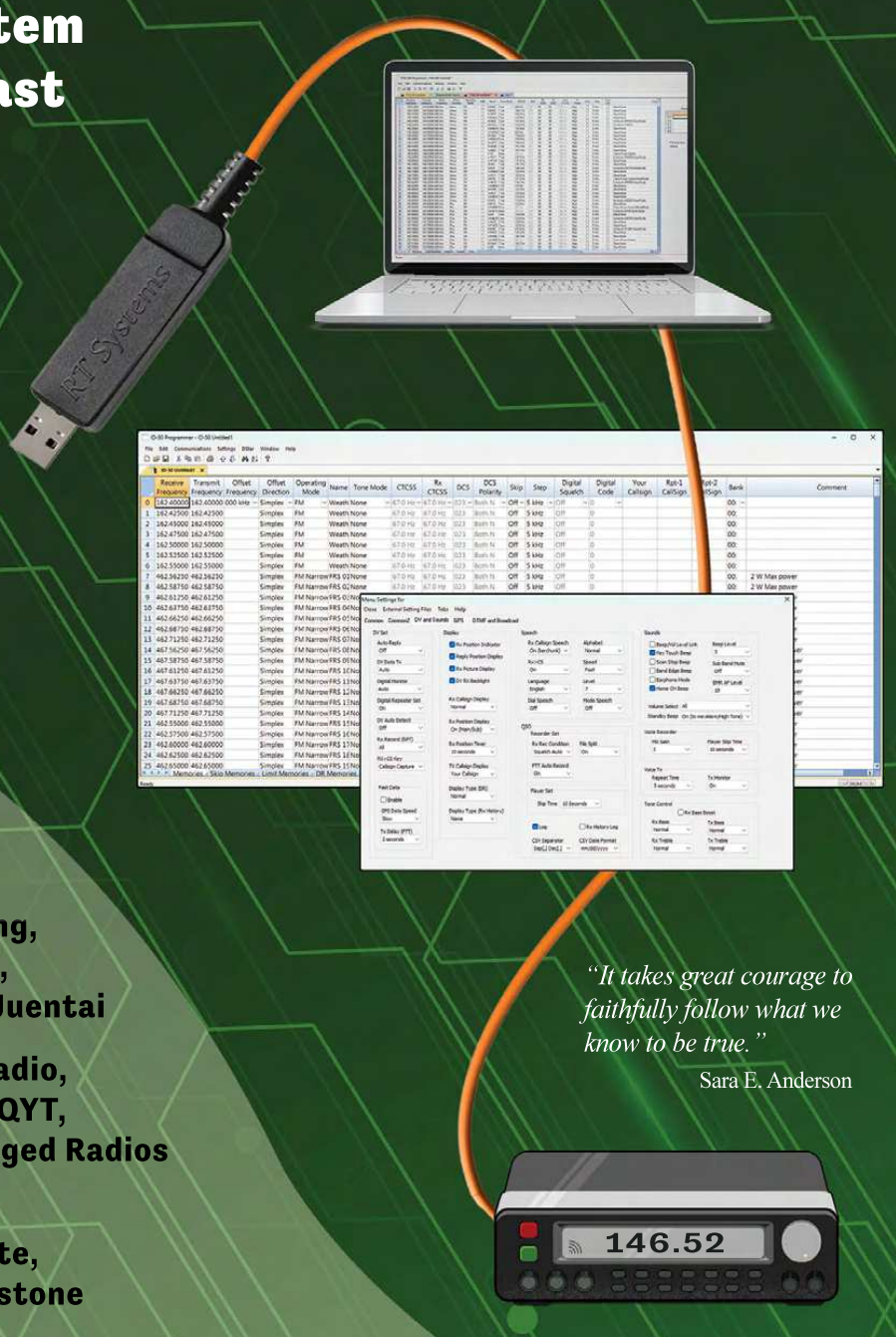

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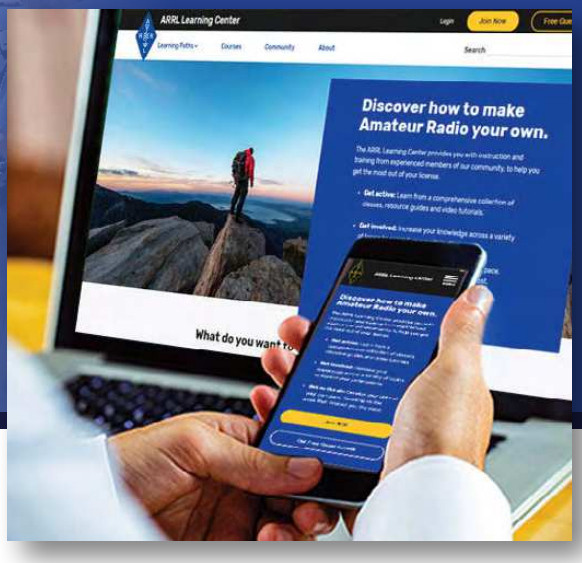

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X300A (2 Section)	2m/70cm	10	200	UHF or N
X200A (2 Section)	2m/70cm	8.3	200	UHF
X50A (1 Section)	2m/70cm	5.6	200	UHF or N
X30A (1 Section)	2m/70cm	4.5	150	UHF
Monoband Base Station/Repeater Antennas				
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F22A (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
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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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David A. Minster, NA2AA, ARRL Chief Executive Officer, na2aa@arrl.org

Second Century

The Ecosystem of Becoming a Ham

If you were licensed before the FCC created the Volunteer Examiner Coordinator (VEC) system (in 1983) to conduct license exams, your experience was probably similar to mine. I used the gray Ameco Amateur Radio Theory Course *book to learn the material, and then made my way to an FCC Field Office to take the exam. In northern New Jersey, that meant taking the PATH train into New York City and walking to the Federal Building at 201 Varick Street. As a high school student, this was very intimidating. But heading home knowing that a new license would be showing up in the next month or 2 was exhilarating.*

Today it is quite a bit different. All the questions have been published, many test takers opt for rote memorization, and finding a test location is extremely easy — ARRL alone has nearly 30,000 Volunteer Examiners. This path to licensing is, unfortunately, fraught with failure. There is a significant percentage of people who become licensed and then never progress within amateur radio. The hard work, exhilaration, and even support systems are lacking or altogether missing, and we lose these new licensees shortly after they earn their ticket.

We have recognized that and have been building out mechanisms — an ecosystem — that will reduce that attrition rate. ARRL started by building out a destination, the Learning Center (**learn.arrl.org**), for members to take curated courses on myriad topics. For our licensing videos, we partnered with YouTube celebrity Dave Casler, KEØOG, to host his training videos. These videos correspond to our *ARRL License Manuals* so that potential hams or hams who are upgrading can actually learn the material to pass their test.

On the publishing side, ARRL produces three levels of training materials for each exam. *The ARRL License Manuals* are really intended to function much like student textbooks aimed at teaching the material. We also publish Q&A guides for each exam, which are easy to carry and refer back to in the weeks and days leading up to exam time to reinforce the questions and answers. ARRL now also publishes the license preparation book series by Gordon West, WB6NOA, which is quite popular with instructor-led classes.

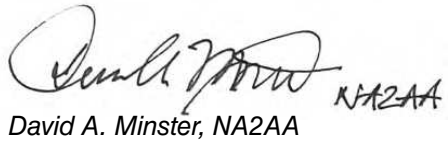
Within the core of this ecosystem is the ARRL VEC. Unlike other VECs, ARRL has full-time support staff who can help the examiners and the potential test takers with any issues they have. Now that the FCC requires payment for licenses, the ARRL VEC's support has extended to helping people navigate creating an account and paying for their newly issued license or renewal. Beyond that, staff is also able to help members with their licensing questions, and navigate the difficulties some people have with the FCC systems.

In the past few years, ARRL has been focused on clubs. Local clubs are an absolute necessity in helping new hams navigate from getting their ticket to becoming radio active. In partnership with ARDC, we are now onto our second $500,000 grant program to help clubs grow and accomplish great things with their members. One program that received funding is called MARCONI: Motivating Amateur Radio Clubs to Open New Initiatives. MARCONI is a program of the Meriden Amateur Radio Club in Connecticut, and can be used by any club to involve its members in giving new amateurs the inspiration and motivation to get active in one or more areas of the hobby.

ARRL is also looking to the future by developing live virtual classroom licensing courses for those who would benefit from interacting with an instructor. This will help many newcomers who do not live near an active radio club or where classes are being taught. We're also looking at creating our own virtual MARCONI program, and even expanding it, to cover myriad hands-on exercises to educate and inspire new hams. Watch also for our announcement of a coding competition to get students involved in designing new licensing practice apps, allowing them to contribute to the design and even gaming aspects of how these apps would work.

The future is exciting as we look to take greater advantage of technology to refine and expand the ecosystem that we have built: recruitment, instruction, licensing, and training. We are constantly looking at new ways to attract the next generation of hams, get them licensed, help them get active and involved, and inspire them to upgrade, giving them even greater opportunities in our hobby.

Of course there is plenty of room for you in this space. Be radio active! Keep on top of the new activities and technologies in amateur radio. Be a connector! Keep an eye out for new hams in your town or area, and make sure they're getting to club meetings and that their interest in the hobby is being addressed. And if you're active in a club, look at pursuing a club grant to grow your club or to add new capabilities for all of your members!



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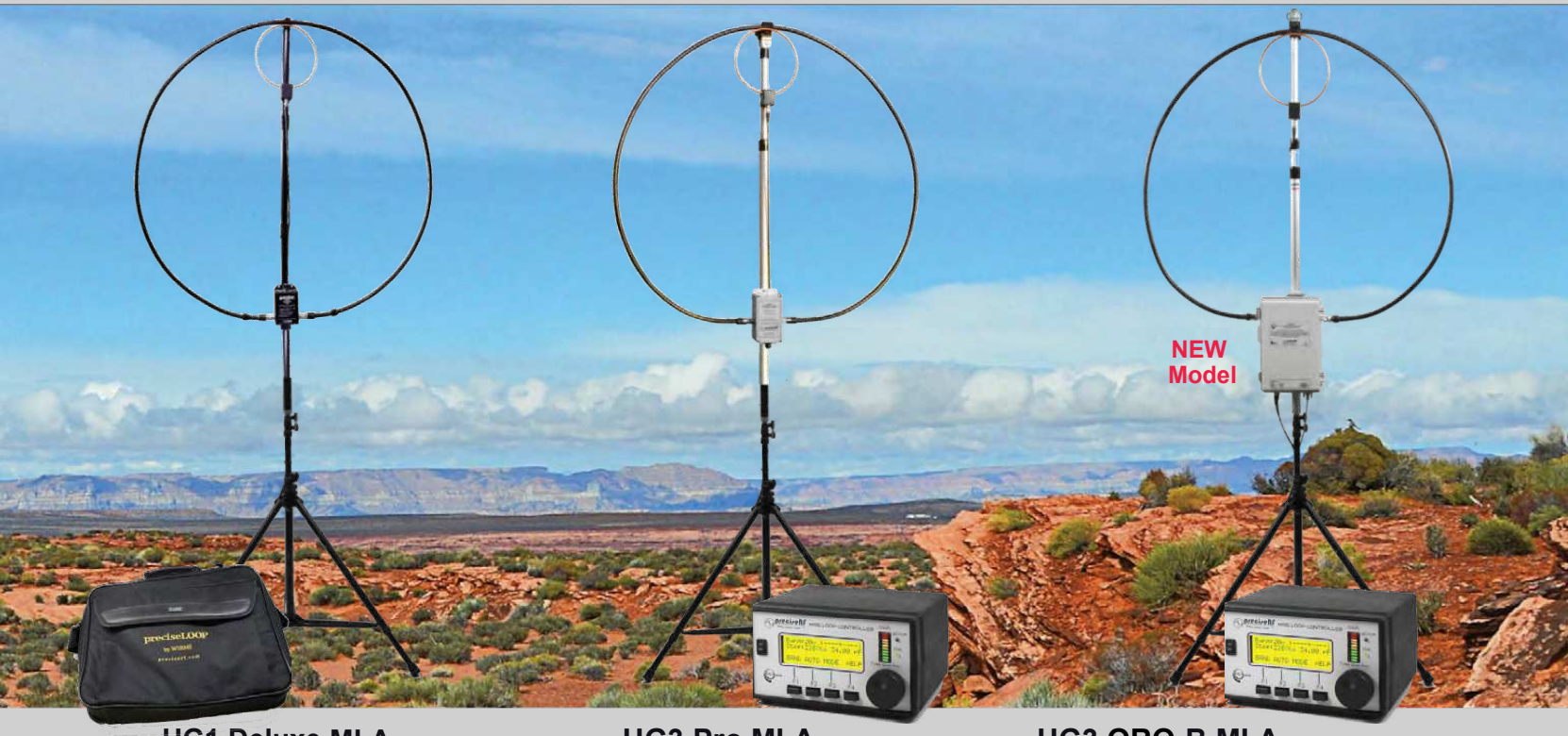

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Member Spotlight

Paul Pawel Chominski, WA6PY

Paul Pawel Chominski, WA6PY, of San Diego, California, will be 73 in September 2024. He stays away from the spotlight but deserves some attention from the amateur radio community.

The Early Years

Paul was born in Warsaw, Poland, and lived behind the Iron Curtain until his late twenties. His parents were acclaimed musicologists; he had inherited their perceptive minds.

Paul's fascination with radio and radio astronomy started before he became a teenager. At age 12, he built complex radio receivers and fiddled with small transmitters on the sly. Paul received his first ham radio license in 1967 at the age of 16. His call sign was SP5CIC. Later, he enrolled at the Warsaw University of Technology, where he earned his MS in electrical engineering. Ten years later, he earned his PhD.

The end of the 1960s was a period of increased interest in amateur radio in Europe. In eastern Europe, hams had to build nearly all their equipment on their own. Paul learned to build electronic measuring instruments, accessories, and crystal quartz filters. He quickly gained the reputation of a wizard who could fix problems in homebrewed and modified military surplus rigs of both Russian and US origin. Paul helped others free of charge but was not a traditional mentor. He primarily assisted those who already knew a lot — but he knew more.

HF radio soon became trivial for Paul, and inspired by his elder brother Michael, SP5CJT, they jointly embarked on a VHF quest in the early 1970s. They found space to assemble an array of four 18-foot-tall Yagi antennas to successfully hear their own 144 MHz echoes off the moon.

Moving to Sweden and California

Paul's professional future in Poland looked bleak, and at the end of the 1970s, he moved to Sweden and settled down there. His appetite for VHF moonbounce was getting stronger because of better access to the latest technology.

Now, in a new country with a new language, new employment opportunities (first with a start-up company developing cash-handling equipment for banks and then with a telecommunications company working on base station transmitters for 900, 1800, and even 1900 MHz), and a new call sign, SMØPYP, it took a few years to adjust to Sweden. He eventually built a multiband station in a Stockholm suburb.

Paul was one of the very few participants in the ARRL International EME Contests on three bands (144 MHz, 432 MHz, and 1.3 GHz) in 1985, and 3 years later on four bands (additional 2.3 GHz). Sweden was well represented in the amateur EME technique, and soon, experienced and prospective moonbouncers turned to Paul for advice, hints, and tips. He shared his knowledge, attended national and international EME conferences, and persistently developed his setup. In the mid-1990s, Paul decided to look over the pond for a change and a chance to do better. In 1996, he landed in San Diego, California, and started a new chapter of his life.

Things were easier in the US, and his professional talent was quickly recognized. The EME community in the US is smaller than in Europe, so Paul is virtually unknown to an average radio amateur in North America, but he is a recognized global authority among the advanced aficionados of reflecting microwaves off the moon, experimenting, contriving, and technically advancing our hobby.

His other interests include searching for extraterrestrial intelligence, off-road car racing, and medicine. Amateur radio has entered the era of hard-to-grasp "black boxes," and we need more user-friendly educators such as Paul, who has been an ARRL member since 1996.

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ARRL The National Association for Amateur Radio® in the United States: supports the awareness and growth of Amateur Radio worldwide; advocates for meaningful access to radio spectrum; strives for every member to get involved, get active, and get on the air; encourages radio experimentation and, through its members, advances radio technology and education; and organizes and trains volunteers to serve their communities by providing public service and emergency communications *(ARRL's Vision Statement, adopted in January 2016).*

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ARRL is noncommercial, and no one with a pervasive and continuing conflict of interest is eligible for membership on its Board.

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Officers

Founding President 1914-1936
Hiram Percy Maxim, W1AW

President
Rick Roderick, K5UR*
P.O. Box 444, Vilonia, AR 72173
501-988-2527; **k5ur@arrl.org**

First Vice President
Kristen McIntyre, K6WX*
900 Golden Wheel Park Dr., #85
San Jose, CA 95112
510-703-4942; **k6wx@arrl.org**

Second Vice President
Mike Ritz, W7VO
33643 Burma Rd.
Scappoose, OR 97056
503-987-1269; **w7vo@arrl.org**

International Affairs Vice President
Rod Stafford, W6ROD
5155 Shadow Est.
San Jose, CA 95135
408-238-4671; **w6rod@arrl.org**

Chief Executive Officer and Secretary
David A. Minster, NA2AA*
225 Main St.
Newington, CT 06111
860-594-0404; **dminster@arrl.org**

Treasurer
John Sager, WJ7S

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Atlantic Division

www.atldiv.org
Robert B. Famiglio, K3RF
P.O. Box 9, Media, PA 19063
610-359-7300; **k3rf@arrl.org**

Vice Director: **Marty Pittinger, KB3MXM**
4 Pegram Rd., Owings Mills, MD 21117
410-356-7899; **kb3mxm@arrl.org**

Central Division

www.central.arrl.org
Carl Luetzelschwab, K9LA
1227 Pion Rd., Fort Wayne, IN 46845
260-637-6988; **k9la@arrl.org**

Vice Director: **Brent Walls, N9BA**
2151 E. Bomar Ln., Greenfield, IN 46140
317-557-7224; **n9ba@arrl.org**

Dakota Division

www.arrldakota.org
Bill Lippert, AC0W*
2013 6th Ave. SE, Austin, MN 55912
507-993-9181; **ac0w@arrl.org**

Vice Director: **Lynn Nelson, W0ND**
3204 Willow Ln. SE, Minot, ND 58701
701-833-1000; **w0nd@arrl.org**

Delta Division

www.arrldelta.org
David A. Norris, K5UZ
1200 Becky Ln., Redfield, AR 72132
870-613-1606; **k5uz@arrl.org**

Vice Director: **Ed B. Hudgens, WB4RHQ**
1441 Wexford Downs Ln., Nashville, TN 37211
615-630-2753; **wb4rhq@arrl.org**

Great Lakes Division

www.arrl-greatlakes.org
Scott Yonally, N8SY
258 Valley Hi Dr., Lexington, OH 44904
419-512-4445; **n8sy@arrl.org**

Vice Director: **Roy Hook, W8REH**
6611 Steitz Rd., Powell, OH 43065
w8reh@arrl.org

Hudson Division

www.hudson.arrl.org
Nomar Vizcarrondo, NP4H
P.O. Box 245, Tenafly, NJ 07670
917-443-2664; **np4h@arrl.org**

Vice Director: **Ed Wilson, N2XDD**
P.O. Box 483, Shirley, NY 11967
631-484-8826; **n2xdd@arrl.org**

Midwest Division

www.arrlmidwest.org
Art Zygielbaum, K0AIZ*
6601 Pinecrest Dr., Lincoln, NE 68516
402-421-0840; **k0aiz@arrl.org**

Vice Director: **Dave Propper, K2DP**
747 Old Bonhomme Rd., University City, MO 63132, 314-225-5167; **k2dp@arrl.org**

How to Contact ARRL Staff

To send an email to any ARRL Headquarters staff member, put his or her call sign (or first initial and last name) in front of **@arrl.org**. For example, to send to Hiram Maxim, First President of ARRL, use **w1aw@arrl.org** or **hmaxim@arrl.org**.

New England Division

https://nediv.arrl.org
Fred Kemmerer, AB1OC*
39 Baldwin Ln., Hollis, NH 03049
603-413-5400; **ab1oc@arrl.org**

Vice Director: **Phillip E. Temples, K9HI**
125 Coolidge Ave. #803
Watertown, MA 02472-2875
617-331-0183; **k9hi@arrl.org**

Northwestern Division

www.arrlnwdiv.org
Mark J. Tharp, KB7HDX
P.O. Box 2222, Yakima, WA 98907
509-952-5764; **kb7hdx@arrl.org**

Vice Director: **Michael A. Sterba, KG7HQ**
212 Laurel Dr., Sedro Woolley, WA 98284
425-931-8525; **kg7hq@arrl.org**

Pacific Division

www.pacific.arrl.org
Anthony Marcin, W7XM
6836 Boulder Canyon St., North Las Vegas, NV 89084, 702-984-9589; **w7xm@arrl.org**

Vice Director: **John Litz, NZ6Q**
1434 Douglas Rd., Stockton, CA 95207
209-687-0774; **nz6q@arrl.org**

Roanoke Division

www.arrl-roanoke.com
Dr. Jmes Boehner, N2ZZ*
525 Barnwell Ave. NW, Aiken, SC 29801-3939
803-641-9140; **n2zz@arrl.org**

Vice Director: **Bill Morine, N2COP**
101 Windlass Dr., Wilmington, NC 28409
910-452-1770; **n2cop@arrl.org**

Rocky Mountain Division

www.rockymountaindivision.org
Jeff Ryan, K0RM*
9975 Wadsworth Pkwy. K2-275
Westminster, CO 80021
303-432-2886; **k0rm@arrl.org**

Vice Director: **Dan Grady, N2SRK**
8706 S. Buchanan Way, Aurora, CO 80016
720-236-7397; **n2srk@arrl.org**

Southeastern Division

www.facebook.com/ARRLSoutheasternDivision
Mickey Baker, N4MB
14764 Black Bear Rd., West Palm Beach, FL 33418, 561-320-2775; **n4mb@arrl.org**

Vice Director: **Jeff Beals, WA4AW**
P.O. Box 1584, Loxahatchee, FL 33470
561-252-6707; **wa4aw@arrl.org**

Southwestern Division

www.kkn.net/n6aa
Richard J. Norton, N6AA
21290 West Hillside Dr., Topanga, CA 90290
310-455-1138; **n6aa@arrl.org**

Vice Director: **Edward Stearns, AA7A**
7038 E. Aster Dr., Scottsdale, AZ 85254
480-332-8255; **aa7a@arrl.org**

West Gulf Division

www.westgulfdivision.org
John Robert Stratton, N5AUS
P.O. Box 2232, Austin, TX 78768-2232
512-445-6262; **n5aus@n5aus.com**

Vice Director: **Lee H. Cooper, W5LHC**
2507 Autrey Dr., Leander, TX 78641
512-658-3910; **w5lhc@arrl.org**

ARRL Section Managers

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Atlantic Division DE, EPA, MDC, NNY, SNJ, WNY, WPA

Delaware: Steven Keller, KC3DSO, 803 Meadow Brook Ln., Milford, DE 19963-3000 240-515-0620; **kc3dso@arrl.org**

Eastern Pennsylvania: Bob Wilson, W3BIG, 2223 West Helms Manor, Upper Chichester, PA 19061-3325; 484-836-9367; **w3big@arrl.org**

Maryland-DC: Chris Van Winkle, AB3WG, 24 Tattersaul Ct., Reisterstown, MD 21136-2431; 240-755-4257; **ab3wg@arrl.org**

Northern New York: Rocco Conte, WU2M, 152 W. Bush Rd., Gloversville, NY 12078-6405; 518-848-9028; **wu2m@arrl.org**

Southern New Jersey: Tom Preiser, N2XW, 177 Bowsprit Rd., Manahawkin, NJ 08050-5001; 609-618-0224; **n2xw@arrl.org**

Western New York: Laura Mueller, N2LJM, 2011 E. Main St., Falconer, NY 14733 716-338-3122; **n2ljm@arrl.org**

Western Pennsylvania: Joe Shupienis, W3BC, P.O. Box 73, Falls Creek, PA 15840-0322; 814-771-3804; **w3bc@arrl.org**

Central Division IL, IN, WI

Illinois: Thomas Beebe, W9RY, 3540 Market Rd., Marion, IL 62959-8940 618-534-6282; **w9ry@arrl.org**

Indiana: Bob Burns, AK9R, P.O. Box 808, Brownsburg, IN 46112 317-520-1188; **ak9r@arrl.org**

Wisconsin: Jason Spetz, KC9FXE, E5910 490th Ave., Menomonie, WI 54751-5644 715-231-7722; **kc9fxe@arrl.org**

Dakota Division MN, ND, SD

Minnesota: Bill Mitchell, AE0EE, 7412 Colfax Ave. S., Richfield, MN 55423 510-529-5658; **ae0ee@arrl.org**

North Dakota: Ralph Fettig, N0RDF, 6650 County Rd. 12 W., Minot, ND 58701-3003 701-822-3467; **n0rdf@arrl.org**

South Dakota: Chris Stallkamp, KI0D, P.O. Box 271, Selby, SD 57472-0271 605-848-3929; **ki0d@arrl.org**

Delta Division AR, LA, MS, TN

Arkansas: James D. Ferguson, Jr., N5LKE, 1500 Lauren Dr., Searcy, AR 72143-8477 501-593-5695; **n5lke@arrl.org**

Louisiana: Houston Polson, N5YS, 309 Arkansas St., Winnfield, LA 71483 318-209-8843; **n5ys@arrl.org**

Mississippi: Malcolm Keown, W5XX, 64 Lake Circle Dr., Vicksburg, MS 39180 601-636-0827; **w5xx@arrl.org**

Tennessee: David Thomas, KM4NYI, 205 Linford Rd., Knoxville, TN 37920 865-654-5489; **km4nyi@arrl.org**

Great Lakes Division KY, MI, OH

Kentucky: Charles O'Neal, KE4AIE, 301 Autumn Ridge Rd., Glasgow, KY 42141-9699 502-680-0539; **ke4aie@arrl.org**

Michigan: Larry Camp, WB8R, 71 Oakdale Ln., Coldwater, MI 49036-1200 517-617-4883; **wb8r@arrl.org**

Ohio: Tom Sly, WB8LCD, 1480 Lake Martin Dr., Kent, OH 44240-6260 330-554-4650; **wb8lcd@arrl.org**

Hudson Division ENY, NLI, NNJ

Eastern New York: John K. Fritze, Jr., K2QY, 4 Normanskill Blvd., Delmar, NY 12054-1335; 401-261-4996; **k2qy@arrl.org**

NYC-Long Island: Jim Mezey, W2KFV, 38 Appletree Ln., Carle Place, NY 11514-1336 516-315-8608; **w2kfv@arrl.org**

Northern New Jersey: Bob Buus, W2OD, 8 Donner St., Holmdel, NJ 07733-2004 732-946-8615; **w2od@arrl.org**

Midwest Division IA, KS, MO, NE

Iowa: Lelia Garner, WA0UIG, 145 Front St., Robins, IA 52328-9718 319-213-3539; **wa0uig@arrl.org**

Kansas: Ronald D. Cowan, KB0DTI, P.O. Box 36, La Cygne, KS 66040 913-757-4456; **kb0dti@arrl.org**

Missouri: Cecil Higgins, AC0HA, 27995 County Rd. 220, Hermitage, MO 65668-8493 417-493-8208; **ac0ha@arrl.org**

Nebraska: Matthew N. Anderson, KA0BOJ, 14300 NW 98th St., Raymond, NE 68428-4254; 402-480-5515; **ka0boj@arrl.org**

New England Division CT, EMA, ME, NH, RI, VT, WMA

Connecticut: Bud Kozloff, W1NSK, 223 Gallows Hill Rd., Redding, CT 06896-1413 203-939-3708; **w1nsk@arrl.org**

Eastern Massachusetts: Jon McCombie, N1ILZ, 75 Northwest St., Eastham, MA 02642 508-246-4982; **n1ilz@arrl.org**

Maine: Philip Duggan, N1EP, 195 Kansas Rd., Milbridge, ME 04658-3120 207-598-5397; **n1ep@arrl.org**

New Hampshire: Peter Stohrer, W1FEA, 9 Gladstone St., Concord, NH 03301-3130 603-345-1470; **w1fea@arrl.org**

Rhode Island: Nancy Austin, KC1NEK, P.O. Box 4941, Middletown, RI 02842-0941 401-935-3070; **kc1nek@arrl.org**

Vermont: Paul N. Gayet, AA1SU, 11 Cherry St., Essex Junction, VT 05452 802-878-2215; **aa1su@arrl.org**

Western Massachusetts: Raymond Lajoie, AA1SE, 245 Leominster Rd., Lunenburg, MA 01462-2031; 978-549-5507; **aa1se@arrl.org**

Northwestern Division AK, EWA, ID, MT, OR, WWA

Alaska: David Stevens, KL7EB, 8521 Golden St., Apt. 4, Anchorage, AK 99502 907-242-6483; **kl7eb@arrl.org**

Eastern Washington: Jo Whitney, KA7LJQ, P.O. Box 2222, Yakima, WA 98907 509-952-5765; **ka7ljq@arrl.org**

Idaho: Dan Marler, K7REX, 6525 W. Fairfield Ave., Boise, ID 83709 208-914-8939; **k7rex@arrl.org**

Montana: Kevin Kerr, W1KGK, P.O. Box 69, Plains, MT 59859-0069 406-242-0109; **w1kgk@arrl.org**

Oregon: Scott Rosenfeld, N7JI, 3662 Vine Maple St., Eugene, OR 97405-4473 541-684-9970; **n7ji@arrl.org**

Western Washington: Bob Purdom, AD7LJ, P.O. Box 65171, University Place, WA 98464-1171; 253-691-2388; **ad7lj@arrl.org**

Pacific Division EB, NV, PAC, SCV, SF, SJV, SV

East Bay: Mike Patterson, N6JGA, P.O. Box 30627, Walnut Creek, CA 94598 925-200-8300; **n6jga@arrl.org**

Nevada: John Bigley, N7UR, 2420 Palora Ave., Las Vegas, NV 89121-2157 702-498-5829; **n7ur@arrl.org**

Pacific: Alan Maenchen, AD6E, 2164 Kamaile St., Wailuku, HI 96793-5458 408-382-1008; **ad6e@arrl.org**

Sacramento Valley: Dr. Carol Milazzo, KP4MD, P.O. Box 665, Citrus Heights, CA 95611-0665; 916-259-3221; **kp4md@arrl.org**

San Francisco: Dr. Antonis Papatsaras, AA6PP, 48 Bayo Vista Ave., Larkspur, CA 94939-1006; 415-861-5053; **aa6pp@arrl.org**

San Joaquin Valley: Steven Hendricks, KK6JTB, P.O. Box 630, Inyokern, CA 93527-0630; 760-977-2590; **kk6jtb@arrl.org**

Santa Clara Valley: James Armstrong, NV6W, 2048 Paseo Del Sol, San Jose, CA 95124-2048; 408-679-1680; **nv6w@arrl.org**

Roanoke Division NC, SC, VA, WV

North Carolina: Marvin K. Hoffman, WA4NC, P.O. Box 2208, Boone, NC 28607 828-964-6626; **wa4nc@arrl.org**

South Carolina: Matthew Crook, W1MRC, 220 Star Hill Lane, Lexington, SC 29072-6948; 803-386-069; **w1mrc@arrl.org**

Virginia: Jack Smith, KE4LWT, 515 New Life Dr., Ruckersville, VA 22968-3045 662-523-0000; **ke4lwt@arrl.org**

West Virginia: Dan Ringer, K8WV, 18 W. Front St., Morgantown, WV 26501-4507 304-292-1999; **k8wv@arrl.org**

Rocky Mountain Division CO, NM, UT, WY

Colorado: Amanda Alden, K1DDN, 230 Glenmoor Rd., Canon City, CO 81212-7705 719-315-0434; **k1ddn@arrl.org**

New Mexico: Bill Mader, K8TE, 4701 Sombrerete Rd. SE, Rio Rancho, NM 87124 505-250-8570; **k8te@arrl.org**

Utah: Pat Malan, N7PAT, 10102 S. Redwood Rd. #95401, South Jordan, UT 84095 801-413-7438; **n7pat@arrl.org**

Wyoming: Garth Crowe, Sr., WY7GC, 2342 Sagewood Ave., Casper, WY 82601-5018 307-689-1340; **wy7gc@arrl.org**

Southeastern Division AL, GA, NFL, PR, SFL, VI, WCF

Alabama: Dennis Littleton, K4DL, 2230 Bishop Rdg., West Blocton, AL 35184-4246 205-718-4410; **k4dl@arrl.org**

Georgia: Hank Blackwood, K4HYJ, 406 Dawnville Rd. NE, Dalton, GA 30721 706-529-5647; **k4hyj@arrl.org**

Northern Florida: Scott Roberts, KK4ECR, 2361 Oak Hammock Ln., Orange Park, FL 32065; 904-759-7812; **kk4ecr@arrl.org**

Puerto Rico: Rene Fonseca, NP3O, Urb Santa Isidra 4 GB Calle 6, Fajardo, PR 00738-4145; 939-579-4134; **np3o@arrl.org**

Southern Florida: Barry M. Porter, KB1PA, 14555 Sims Rd., Apt. 259, Delray Beach, FL 33484; 561-499-8424; **kb1pa@arrl.org**

Virgin Islands: Fred Kleber, K9VV, P.O. Box 24275, Christiansted, VI 00824-0275 **k9vv@arrl.org**

West Central Florida: Michael Douglas, W4MDD, 2527 Apple Blossom Ln., Wauchula, FL 33873; 863-585-1648; **w4mdd@arrl.org**

Southwestern Division AZ, LAX, ORG, SB, SDG

Arizona: Rick Paquette, W7RAP, 1600 W. Sunkist Rd., Tucson, AZ 85755-9561 520-425-6877; **w7rap@arrl.org**

Los Angeles: Diana Feinberg, AI6DF, P.O. Box 4678, Palos Verdes Peninsula, CA 90274-9618; 310-544-2917; **ai6df@arrl.org**

Orange: Bob Turner, W6RHK, P.O. Box 973, Perris, CA 92572 951-236-8975; **w6rhk@arrl.org**

San Diego: Bruce Kripton, AG6X, 5755 Castleton Dr., San Diego, CA 92117-4058 619-813-5505; **ag6x@arrl.org**

Santa Barbara: John Kitchens, NS6X, P.O. Box 178, Somis, CA 93066 805-216-2569; **ns6x@arrl.org**

West Gulf Division NTX, OK, STX, WTX

North Texas: Steven Lott Smith, KG5VK, 125 Contest Ln., Ben Franklin, TX 75415-3830 318-470-9806; **kg5vk@arrl.org**

Oklahoma: Mark Kleine, N5HZR, 2651 84th Ave. SE, Norman, OK 73026 405-410-6756; **n5hzr@arrl.org**

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

West Texas: H. Dale Durham, W5WI, P.O. Box 375, Buffalo Gap, TX 79508 830-719-9000; **w5wi@arrl.org**

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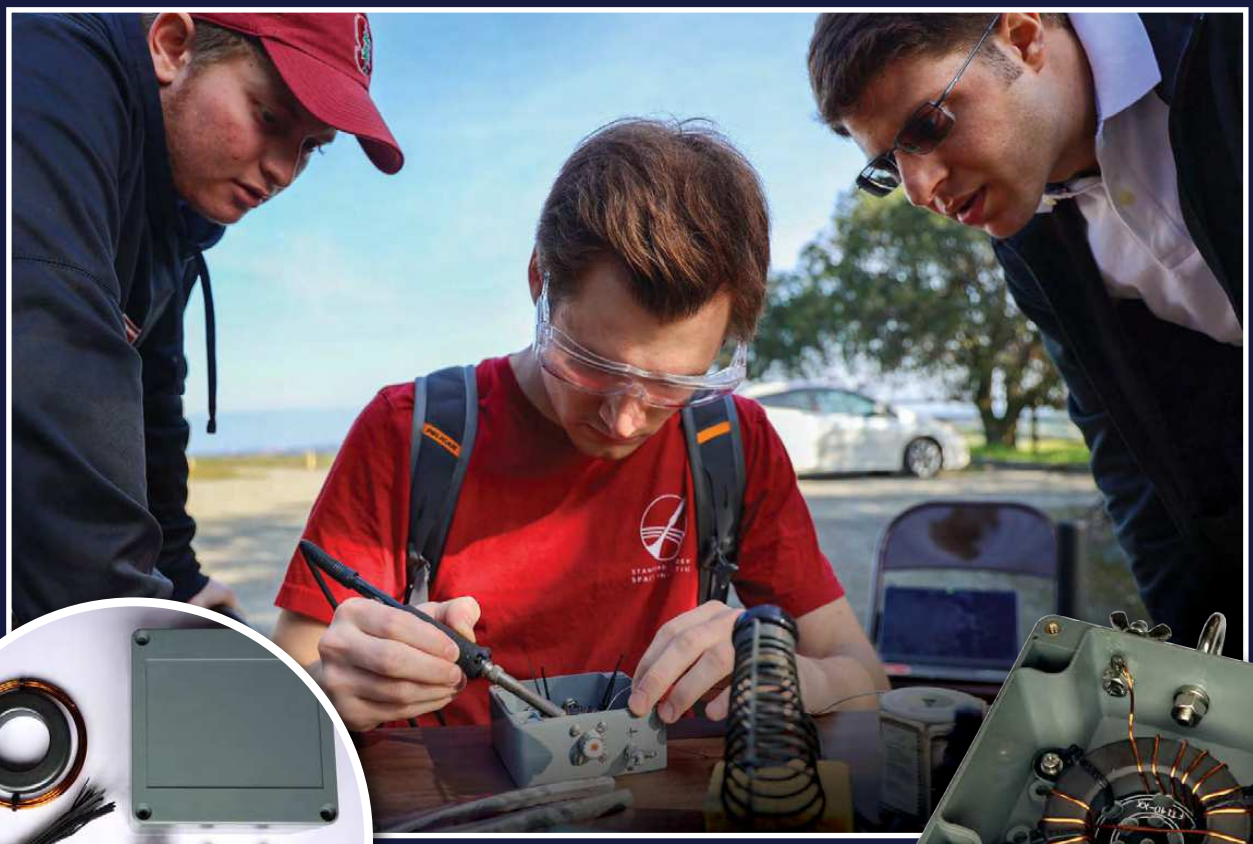

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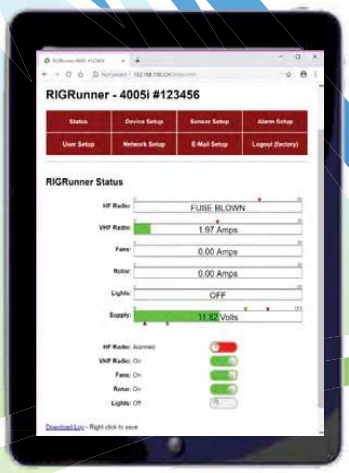

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The basic K4 covers 160-6 m, with dual receive on the same or different bands. The K4D adds diversity receive, with a full set of band-pass filters for the second receiver. (Thanks to direct RF sampling, there's no need for crystal filters in either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

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

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Up Front

A Little North of Center

Packing the car for a family trip, Jim Danielson, AC9EZ, was able to smuggle aboard some ham gear (his Yaesu FT-818ND HF transceiver and a few Hamsticks) before heading off to the Peace Garden State — North Dakota.

After a visit to the International Peace Gardens, the family stopped in the town of Rugby to see the monument at the historically claimed geographical center of North America. (Rugby is one of the contested "Center of North America" towns. The others are Center and Robinson, both in North Dakota.)

Jim thought making a contact would create a unique and memorable experience, so he pulled out his gear, attached a triple-magnet mount with a 20-meter Hamstick on the car's roof, and was ready to go. Tuning to the 20-meter CW band, he heard K1SN calling CQ POTA. Amazingly, he was able to contact POTA station K1SN in Virginia using his K9LU CW paddles and just 5 W of output.

Jim standing next to the monument, with his Yaesu FT-818ND transceiver sitting to his left. [Andrew "Jim" Danielson, AC9EZ, photo]

A Place for Hams?

You may or may not be able to take your license exam here, but we don't see any antennas. Hamming Hall is part of the North Park University campus on Chicago's north side. First dedicated as a gymnasium in 1916 (housing the Chicago-area's first indoor pool), it was later restored with contributions from local sponsors Ken and Joyce Hamming, and was renamed Hamming Hall. [Scott Childers, W9CHI, photo]

Q • R • S

These brightly designed "QRS" boxes caught Wayne Poole's, K4WFP, eye while searching through items at a local rummage sale. "There were several boxes just sitting on a shelf," said Wayne. "I almost bought them — just for the box!"

Founded in 1900, QRS Music was at one time the largest producer of high-quality player piano rolls. What the QRS stands for has long been forgotten, but one theory is that they received so many orders for rolls, their "R" files rolled over into the "Q" and "S" files. If you can't find your player rolls at a rummage sale, check out QRS Music Technologies, Inc. [Wayne Poole, K4WFP, photo]

If you see something ham-related out in the world, take a photo of it and send it to "Up Front" at upfront@arrl.org.

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Letters from Our Members

POTA Gets You On the Air

I've been aware of Parks on the Air (POTA) for many years but have only recently given it a chance. POTA has reawakened my love of radio. Specifically, it's given me a reason to get back on the air with CW after many years.

POTA is an outstanding format for beginners to wade into the world of CW operations. Because it is not a contest, other operators are keen to slow down for you to make a contact. The exchanges are generally formulaic and structured, so it is easy for the new operator to anticipate the exchange. Further, operators with spots on the POTA website allow the new operators to know what call sign to listen for before attempting the exchange.

While I live in an HOA-restricted community, I am fortunate to live close to a state forest I can easily activate. Portable operations, which POTA activation requires, have made me examine and experiment with my equipment. I have begun using my Elecraft KX2 almost daily since getting into POTA and have built three different portable wire antennas to activate parks wherever my job takes me. For fellow business travelers, POTA provides a great excuse to take your love of the hobby with you.

Hats off to the POTA community for my great (re)awakening and (maybe) yours too!

Tommy Gober, N5DUX
The Woodlands, Texas
Life Member

Reminder to Reciprocate Log Submissions

To POTA and Summits on the Air (SOTA) ops, as well as contesters, please reciprocate log submissions to Logbook of The World (LoTW) and **www.qrz.com**.

Like many, I am also chasing awards (WAS, DXCC, etc.) and have hoped that these contacts will help me reach my goals and that other activators and contesters will reach theirs. However, that does not seem to be the case. I have noticed that only a few of my POTA, SOTA, or contest chaser contacts are logged to LoTW or **www.qrz.com**. Please submit your logs so we'll all be winners!

David Mullins, K4ARP
Ocean Park, Washington

Going Digital

I was not thrilled when ARRL first announced a change from the printed *QST* to digital. I guess I've reached the age where I dislike change, but I decided to give the digital version a shot. It's been a few months, and I have to say I don't know why I didn't change sooner. Now, while I'm on a break at work or waiting for my wife while we're out somewhere, I always have something to read on my phone; it's great!

Ian Capon, GWØKRL
United Kingdom
Life Member

Chasing Parks Saved My Life

In 2016, I was diagnosed with stage 4 cancer. Being an active cyclist for 30 years, I was at a loss for how I would spend my time. The preparatory meds before the start of radiation treatments left me with little energy to get out and ride my bike.

I realized I had the perfect solution sitting in the corner of my dining room. I had a Kenwood TS-930S and a vertical antenna. Chatting with some of my ham friends via an online messenger made me aware of the ARRL activity, National Parks on the Air (NPOTA), that was taking place at that time. I quickly became addicted and found myself sitting at the radio for hours. It was a great activity, and I made a ton of friends. There were some great park activators; sometimes, the pileups resembled DX pileups. Sadly, NPOTA ended.

Then came the World Wide Flora and Fauna (WWFF) activity. WWFF was a European-based park activity with a US contingent known as KFF. The KFF activity proved to be perfect for me. As a CW operator, I found myself in heaven as I chased parks on all the continents. There were excellent CW activations going on almost 24 hours a day. Once again, I made friends across the globe in Europe, Japan, Australia, and other places. What I loved about WWFF was that you had to work for the awards; there were no giveaways. You needed 44 contacts to qualify as an activation. The great thing was that you didn't need to make all the contacts in one sitting. You could take several activations to reach 44 contacts. My most memorable activation was with Kenneth Hahn State Recreation Area, KFF-3451, in Los Angeles, California, when I called CQ once and was immediately inundated with very strong European stations calling.

The WWFF park activity was a godsend during the COVID-19 lockdown. Even though I couldn't go anywhere, I didn't miss a beat chasing parks. I will forever be grateful to the NPOTA and WWFF activities for being there during one of the most trying times of my life.

Jess Guaderrama, W6LEN
Huntington Beach, California

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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.

♦ Morse code 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.

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

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

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

During 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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Digital Oscilloscope Specifications

If you're moving from an analog to a digital oscilloscope, and are confused by the new terms and specifications, this article will help resolve your questions.

Just one of many digital oscilloscopes on the market today. [Paul Danzer, N1II, photo]

Paul Danzer, N1II

While digital oscilloscopes have been around since the early 1980s, it is only in the last 10 – 15 years that we have seen a major shift away from analog oscilloscopes. Along with this technology change, a new set of performance terms are required because digital oscilloscopes use sampled data. Therefore, we need to know how often the samples are taken, how accurate (in amplitude) the samples are, and how much memory is needed to store the data samples. A reminder of time units used in this article is shown in Table 1.

Key Performance Numbers

Bandwidth is often the first specification looked at. This is the frequency where the displayed gain drops 3 dB, or about 30%, for a single frequency sine wave. All repetitive complex waveforms consist of a number of harmonically related sine waves. For example, a symmetrical square wave of frequency F_1 consists of the addition of several odd numbers of sine waves (F_3, F_5, F_7, etc.), as shown in Figure 1. Each term has its own multiplying coefficient. Each waveform set in Figure 1 shows how progressively adding appropriately scaled odd harmonics together ultimately makes a more ideal-looking square wave.

The generally accepted bandwidth rule is that an oscilloscope should have a single sine wave frequency bandwidth of five times the frequency of the highest waveform component. This rule limits the rise time error to approximately 2%. Again, keep in mind that you need to have a frequency response that includes the harmonics needed to comprise any complex waveform. Otherwise, the viewed waveform may be distorted. The analog input circuitry on some oscilloscopes is designed to emphasize the harmonics. Additionally, digital oscilloscopes often use digital signal processing to flatten and extend the frequency response so that you can often relax the five-time rule a little.

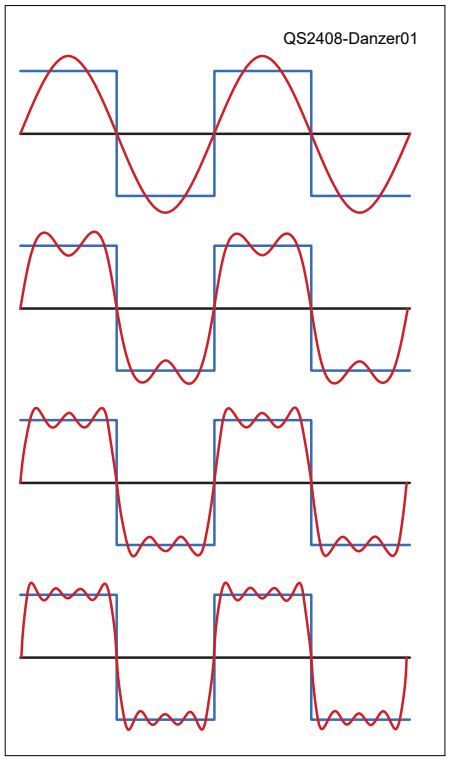
Another rule states that rise time = 0.35/bandwidth. As an example, a 100 MHz oscilloscope would have a 3.5 ns rise time. A higher bandwidth means more energy is included in the sine wave harmonics. However, because the Total Rise Time =

$$\sqrt{(\text{oscilloscope rise time}^2 + \text{signal rise time}^2)},$$

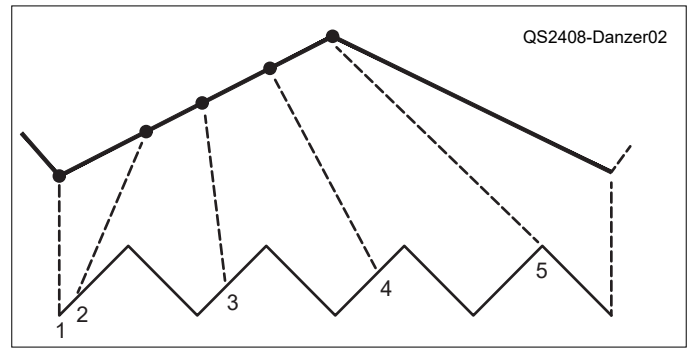
the observed rise time may be modified by the oscilloscope specification. For example, selecting a 100 MHz bandwidth oscilloscope to observe a TTL output with a rise time of 2 ns will result in an observed rise time of approximately 4 ns.

Table 1 Time Units

Abbreviation	Unit	Measurement
ms	millisecond	10^{-3} seconds
µs	microsecond	10^{-6} seconds
ns	nanosecond	10^{-9} seconds
ps	picosecond	10^{-12} seconds



◀**Figure 1** — Constructing a square wave from a sine wave and its odd harmonics.



▶**Figure 2** — For a repetitive waveform, a low sample capability may be compensated with a longer acquisition time.

Impact of Memory

Several parameters related to memory size provide another measure of an oscilloscope's capabilities. The input waveform is converted into a set of samples, or *sample points.* One or more sample points may be combined to make up a waveform point. A *waveform record* consists of a set of these waveform points, and the number of samples used to create a record is called the *record length.* When samples are stored in sequence, the sample rate shows how long it takes to make a record length limited by memory size.

An oscilloscope's sample rate is determined by its hardware. If a complex signal requires a sample rate higher than the hardware allows, signal processing can generate interim artificial samples by interpolation. Interpolation is typically used to reconstruct the waveform for viewing, but not to create samples in the acquired record. This makes the displayed voltage input look more realistic. However, these generated samples usually are not stored and so do not use up any memory (usually specified in mega points, or Mpts).

Figure 2 illustrates a technique called equivalent-time (ET) sampling, which is sometimes used to improve display accuracy or to compensate for an A/D that, for whatever reason, cannot sample fast enough. The bottom trace is a set of triangular waves. When samples cannot be taken often enough, a new copy of the repetitive wave is generated by taking a sample from one wave, a second sample next to it from the next wave, etc. This tends to "fill in the gaps" for display purposes. The penalty is time. If you need 20 samples to build up the synthesized wave, you must wait until 20 of the original waves come through, thus costing the process time to build up the synthesized wave.

In modern oscilloscopes, the sample memory almost always exceeds the display resolution — so various techniques are used to combine multiple adjacent waveform samples into each display point. The most common is to create an intensity graded "cloud" of all of the sample points contributing to each display pixel column, thus emulating the intensity grading of the old phosphor-based analog oscilloscope displays.

Although often not explicitly stated, the memory available may or may not be per channel. Some oscilloscopes share or split the memory or sample rate among multiple channels. However, many maintain the same available memory regardless of the number of channels used. For example, an oscilloscope with a 10GS/s sample rate and a 46 M memory can store only 46 ms of a waveform. Any waveform longer than this cannot be stored in its entirety. In these cases, the waveform sample rate is typically decimated. The oscilloscope usually samples at full rate. Then, the user-selected horizontal scale and record length will dictate the amount of sample decimation used to create the stored waveform record (use 1 of 2, 1 of 4, 1 of 10, etc.).

Usually, parameters are stated assuming the sampling rate is sufficient to display the waveform with a

smooth curve. Some specifications do state that interpolation is used and the smoothing function is given. There are limits to the sampling rate that can be used. First, there is the familiar Nyquist rule, whereby a repetitive waveform must be sampled at least twice the frequency of the waveform. Because only two samples per waveform are available, you must wait the time necessary while a large number of waveforms are sampled before the smooth input waveform can be assembled. If only two samples per waveform are taken, a *brick wall filter* must be applied to the result. If not, spurious results, called *aliasing*, will be generated. The net result of this two-sample requirement may limit the maximum horizontal sweep time.

Vertical Channel Characteristics

The primary input element is the analog-to-digital converter (ADC). Those used in most oscilloscopes are either 8-bit (2^8 or 256) digitizing levels, or 12-bit (2^{12} or 4096) levels. The quantization error for an 8-bit ADC is Vin/256, and for a 12-bit ADC it is Vin/4096. For the specified sampling rate and a two-channel oscilloscope, if both channels cannot be sampled simultaneously, the effective sampling rate is actually half of the specified value. Again, not all scopes split the sample rate when additional channels are enabled, as many have multiple digitizers to avoid this issue. Finally, current sample rates are fast enough that techniques such as ET sampling are typically not required, even for high-frequency signals — a huge improvement from just a few years ago.

Preceding the oscilloscope ADCs are the probes. Though not generally specified, they are assumed to be compatible with the bandwidth limits of the oscilloscope. It is extremely important to compensate the 10X probes, as the effects of improper compensation can show up at frequencies as low as 10 – 20 kHz. Most, if not all, current digital oscilloscopes have a test port for compensation. The actual compensation adjustment location is usually in the probe itself, or in the shell around the BNC connector.

The analog circuitry between the probe input jack and the ADC may be a source of several types of error. Manufacturers supply error information in several ways. The most common specified value is *gain accuracy.* This is usually given in a percentage, and it often depends on the vertical gain setting, which may include an input attenuator. It may be given as a single number, such as 3% with no explanation, or as a number within a range, such as 2% if the vertical range is set from 5 mV/cm to 1 V/cm, and 3% if the vertical range is set from 1 V/cm to 10 V/cm. The vertical setting (voltage per centimeter) may also be given as a single range, such as 3 mV – 30 V. Alternately, it may be given as "selectable" from 3 mV – 300 mV, 300 mV – 3 V, and so on.

Another value that may or may not be specified is dc offset. This front-end error is the difference between where the oscilloscope shows you a waveform vertical location and the actual location. For example, if the probe is connected to ground (0 V) and the oscilloscope face shows a value of 3 mV, this is the dc offset.

The front-end numbers, when supplied as a single number, can be very misleading. Suppose the full-scale reading of a waveform is 20, and the vertical accuracy is 2%. If the actual value is half the full scale of 10, then the accuracy can be 4% depending on how the manufacturer decided to publish it. The front-end errors can be fixed, not dependent on actual signal input, dependent on actual input, dependent on oscilloscope control settings, or partially all of these. Thus, to compare the specific performance of an oscilloscope, the conditions of the error specified must be known.

Triggers Can Be Important

In analog oscilloscopes, the trigger is what kicked off the sweep. In digital oscilloscopes, the oscilloscope is acquiring all of the time, and the trigger is used as a kind of bookmark to decide what samples to keep and display. This makes it easy to see both pre- and post-trigger activity. Also, depending on the type of information to be displayed, trigger jitter may be very important. Most oscilloscope specifications provide the names of the various trigger modes available. These are often the same trigger capabilities that were available in analog oscilloscopes, but with new names.

The primary trigger need for low jitter applies to repetitive waveforms, where each occurrence of the waveform is superimposed on the screen of previous waveform(s). The result of too much jitter can be a smeared and fuzzy horizontal waveform.

Jitter specifications vary between manufacturers. Some supply a full-page, hard-copy equivalent, some specify a single time measurement, and some

provide no specification at all. The trigger jitter is also important when the digital oscilloscope uses a sampling technique, as discussed around Figure 2. Here, when short samples (in ns or ps) are used, jitter in the same order of magnitude will result in distortion of the final composition of the trace.

Stable trigger generation is also when used with an offset selection. If, for example, there is a 500 µs long waveform containing a 30 ns section to be examined, the trigger starting the long waveform must have a jitter of less than the section you wish to examine. In this case, a fraction of an ns jitter (perhaps 6 – 10 ps) is needed to allow the 30 ns section to be clearly seen.

Other Specifications

Although not numerical specifications, the following could be of interest if comparing several oscilloscopes for possible purchase:

Basic Math: Most often included are basic math functions, which use inputs from two channels. These functions include addition, subtraction, multiplication, and division. Operations are performed on a point-by-point basis, and the results are plotted as a new waveform.

Other Math: This list can be quite extensive and often includes automatic measurement. On a single waveform frequency, period, pulse width, average amplitude, rise time, average, mean, rms, and many others are included in the oscilloscopes. One oscilloscope advertisement lists 30 such operations. Of particular interest is the fast Fourier transform function, which permits viewing the signal in the frequency domain.

Further Capabilities

Because the digital oscilloscope includes memory and a processor, other features are often included. These may consist of a frequency counter and/or a frequency generator. An arbitrary waveform that fits in the memory depth can be stored and repetitively put out as a fixed waveform. The input or output of some of these auxiliary functions is often the input jack or connector for an external oscilloscope trigger input.

Source of Material

Five different digital oscilloscopes were purchased and initially functionally tested for descriptions in the November and December 2023 *QST* Product Reviews. Attempts to provide a one-to-one numerical comparison of capabilities were not successful, for the reasons stated previously: the specifications given were often not complete enough, so there was no assurance that the numbers were given under similar conditions. Several manufacturers have tutorials that include definitions. Others have tutorials on how some of the specification numbers were measured, especially the range over which the given numbers are valid.

Acknowledgments

While retaining responsibility for all of the contents of this article, I want to thank both Alan Wolke, W2AEW, and Phil Salas, AD5X, for their contributions and suggestions.

Click here to watch ARRL Lab Digital RF Engineer John McAuliffe, W1DRF, provide general information about digital oscilloscopes.

Paul Danzer, N1II, an electronics engineer, started out as a teenage radio amateur in 1953. He spent 33 years working in the defense industry on radars and digital equipment and was awarded 11 patents. After leaving these positions, he edited several ARRL books and wrote several articles for *QST*. Paul then embarked on a second career for 18 years as a college professor, teaching computer-related electronics and PC applications. Now retired, he spends his time writing and testing various amateur-related kits and equipment, fishing, and dog-walking. ARRL has twice awarded him with the Bill Orr, W6SAI, Technical Writing Award. You can reach Paul at **n1ii@arrl.net**.

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

Certificate of Code Proficiency Recipients

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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, KØCWC	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, KFØQS	20

April 2024

Joseph P. Kononchik, KS1I	10
Bill Durham, KG5ZCI	15
Joseph P. Kononchik, KS1I	15
Glenn R. Barr, Jr., WBØKFC	20
Daryl I. Hammond, WØBZ	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, WØBZ	25

June 2024

Robin L. Zinsmaster, N6PHP	25

Congratulations to all of the recipients.

August 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.

August 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 K9JM on Wednesday, August 28, at 9 PM PDT (0400 UTC on August 29) on 3950 and 7047.5 kHz. Unless indicated otherwise, sending speeds are from 10 to 40 WPM.

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

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

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

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

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

Monday	Tuesday	Wednesday	Thursday	Friday
	8/6 4 PM – 2000Z 10 – 35 WPM	**8/7** 7 PM – 2300Z 35 – 10 WPM	**8/8** 10 PM – 0200Z **(8/9 – UTC)** 10 – 40 WPM	**8/9** 9 AM – 1300Z 10 – 35 WPM
8/12 4 PM – 2000Z 10 – 35 WPM		**8/14** 7 PM – 2300Z 10 – 40 WPM	**8/15** 9 AM – 1300Z 35 – 10 WPM	**8/16** 10 PM – 0200Z **(8/17 – UTC)** 10 – 35 WPM
	8/20 7 PM – 2300Z 10 – 35 WPM	**8/21** 10 PM – 0200Z **(8/22 – UTC)** 35 – 10 WPM	**8/22** 9 AM – 1300Z 10 – 35 WPM	**8/23** 4 PM – 2000Z 10 – 40 WPM
8/26 10 PM – 0200Z **(8/27 – UTC)** 10 – 40 WPM	**8/27** 9 AM – 1300Z 10 – 35 WPM		**8/29** 4 PM – 2000Z 35 – 10 WPM	**8/30** 7 PM – 2300Z 10 – 35 WPM

Pascal Villeneuve, VA2PV, va2pv@arrl.org

Product Review

BG2FX FX-4CR Portable Transceiver

Reviewed by Phil Salas, AD5X
ad5x@arrl.net

I've used many QRP radios over the years. My favorite radios are the ones that provide up to 20 W of output power. While 5 W is adequate for CW (which, incidentally, is my favorite mode), 5 W is often inadequate for single sideband (SSB) operation. However, I've found that 20 W on SSB is a very effective power level, as the received signal at the other end is just a bit less than one S-unit below the typical 100 W transceiver output. Enter the FX-4CR 80 – 6-meter 20 W (5 W on 6 meters) SDR transceiver, designed and sold by Yu Hongbo, BG2FX. Table 1 lists the advertised specifications of the FX-4CR, along with the ARRL Lab measurements.

Overview

The FX-4CR transceiver is a compact and attractive transceiver that covers the 80 – 6-meter ham bands, along with a general-coverage receiver that tunes continuously from 3.5 to 54 MHz. The cast aluminum metal case has an excellent solid feel to it. And even though the FX-4CR can output up to 20 W of power, it literally fits in the palm of your hand. A tiny microphone rounds out the unit. The FX-4CR also includes a built-in microphone for portable operation. And besides normal AM, FM SSB, and CW modes, the FX-4CR is designed for digital modes. A USB cable provides computer interfacing for digital modes as well as for firmware updates. And besides displaying all normal operating parameters, the bright TFT 2-inch diagonal color display also provides spectrum and waterfall displays. A nice feature is that the FX-4CR package includes a padded plastic case with a perfectly cut foam insert for the radio and accessories (see Figure 1). Finally, while the FX-4CR does come with a manual, it is worth downloading the latest user manual from **www.bg2fx.com**, as features are being added through firmware updates and the online manual reflects the latest additions.

The FX-4CR operational features include split-frequency operation, RIT, receiver attenuator, noise blanker, digital noise reduction, and multiple fixed-bandwidth digital signal processing (DSP) filters tailored to each operating mode. It is externally powered only and does not include an internal automatic antenna tuner (ATU).

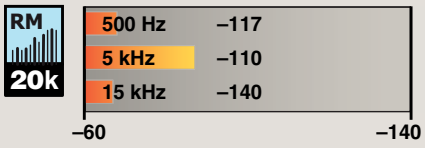
Figure 1 — The FX-4CR and accessories in the included padded case.

Bottom Line

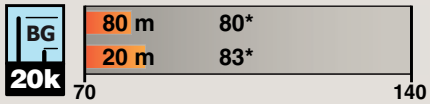
The FX-4CR is an amazing radio, especially considering its size and power output. It's a rugged, compact, 20 W transceiver that should satisfy any portable operator.

BG2FX FX-4CR
Key Measurements Summary

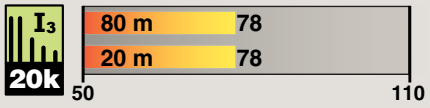
20 kHz Reciprocal Mixing Dynamic Range (dB)



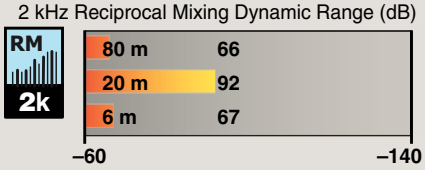
20 kHz Blocking Gain Compression (dB)



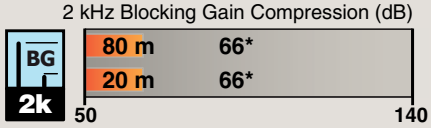
20 kHz Third-Order IMD Dynamic Range (dB)



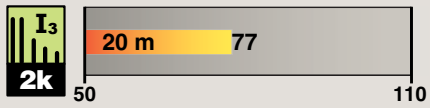
2 kHz Reciprocal Mixing Dynamic Range (dB)



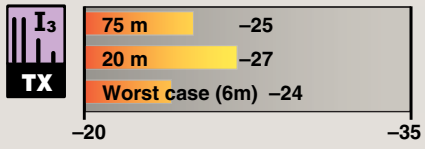
2 kHz Blocking Gain Compression (dB)



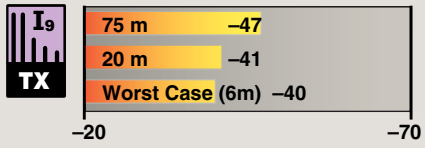
2 kHz Third-Order IMD Dynamic Range (dB)



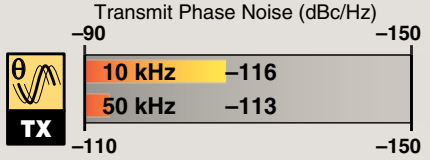
Transmit Third-Order IMD (dB)



Transmit Fifth-Order IMD (dB)



Transmit Phase Noise (dBc/Hz)



TX-RX Turnaround Time (ms)

KEY: QS2408-PR174
* Noise Limited
** Measurements with MGC set to 1.

Table 1
FX-4CR QRP Transceiver, Firmware Version V1.5 23-08-25

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive: 0.465 – 50 MHz; Transmit: 3.5 – 4.0 MHz; 60 meters, five channels; 7 – 7.3 MHz; 10.1 – 10.15 MHz; 14 – 14.35 MHz; 18.068 – 18.168 MHz; 21 – 21.45 MHz; 24.89 – 24.99 MHz; 28 – 29.7 MHz; 50 – 54 MHz.	Receive: 0.5 — 54 MHz continuous. As specified.
Power requirement: 9 – 16 V dc; Transmit: ~2 A Receive: ~220 mA.	At 13.8 V dc: Transmit: 3.01 A Receive: 221 mA, (no signal, max. volume, max. lights); 218 mA (backlight off).
Modes of operation: SSB, CW, AM, FM.	As specified.

Receiver

SSB/CW sensitivity:
Noise floor (MDS): –120 dBm.

Receiver Dynamic Testing[3]

Noise floor (MDS), 500 Hz bandwidth:

MGC[1] Level	1 — dBm/µV	32 — dBm/µV	63 — dBm/µV
3.520 MHz	–124/0.14	–131/0.06	–128/0.16
7.020 MHz	–122/0.19	–132/0.05	–132/0.05
14.02 MHz	–123/0.16	–133/0.05	–134/0.05
28.02 MHz	–120/0.22	–125/0.12	–126/0.11
50.02 MHz	–114/0.45	–115/0.41	–108/0.89

AM sensitivity: Not specified.

For 10 dB (S+N)/N, 1 kHz tone, 30% mod. 6 kHz BW:

MGC[1] Level	1 — dBm/µV	32 — dBm/µV	63 — dBm/µV
3.885 MHz	–97/3.20 µV	–102/1.80 µV	–104/1.50 µV
50.40 MHz	–76/34.40 µV	–84/14.60 µV	–84/14.60 µV

FM sensitivity: Not specified.

For 12 dB SINAD, 3 kHz deviation, 10 kHz BW:

MGC[1] Level	1 — dBm/µV	32 — dBm/µV	63 — dBm/µV
29 MHz	–95/4.0 µV	–96/3.40 µV	–96/3.40 µV
52 MHz	–91/6.10 µV	–90/7.40 µV	–90/7.40 µV

Blocking gain compression dynamic range: Not specified.

Blocking gain compression dynamic range: 500 Hz BW:

	20 kHz offset	*5/2 kHz offset*
MGC[1] Level	1/32/63	MGC — 1
3.5 MHz	$80^2/81^2/70^2$ dB	$62^2/66^2$ dB
14 MHz	$83^2/84^2/63^2$ dB	$64^2/66^2$ dB
50 MHz	$83^2/72^2/58^2$ dB	$64^2/68^2$ dB

Reciprocal mixing dynamic range: Not specified.

3.5 MHz, 20/5/2 kHz offset: (MGC — 1) 68/64/66 dB;
14 MHz, 20/5/2 kHz offset: (MGC — 1) 87/91/92 dB;
50 MHz, 20/5/2 kHz offset: (MGC — 1) 67/64/67 dB.

Two-Tone Intermodulation Distortion (IMD) Testing (500 Hz Bandwidth)

Band/MGC Level	*Spacing*	*Measured IMD Level*	*Input Level*	*Measured IMD DR*
3.5 MHz/1	20 kHz	–124 dBm	–46 dBm	78 dB
14 MHz/1	20 kHz	–123 dBm	–45 dBm	78 dB
14 MHz/32	20 kHz	–133 dBm	–49 dBm	84 dB
14 MHz/63	20 kHz	–134 dBm	–67 dBm	67 dB
14 MHz/1	5 kHz	–123 dBm	–43 dBm	80 dB
14 MHz/1	2 kHz	–123 dBm	–46 dBm	77 dB
50 MHz/1	20 kHz	–114 dBm	–51 dBm	63 dB
50 MHz/32	20 kHz	–115 dBm	–53 dBm	62 dB
50 MHz/63	20 kHz	–108 dBm	–53 dBm	55 dB

Second-order intercept point: Not specified.	MGC[1] Level 1/32/63: 14 MHz, +43/+43/+43 dBm 50 MHz, +3/+3/+3 dBm.
FM adjacent channel rejection: Not specified.	MGC[1] Level 32: 29 MHz, 59 dB 50 MHz, 58 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	MGC[1] Level 32: *20 kHz offset* 29 MHz, measurement noise limited to adjacent channel rejection value indicated; 52 MHz, measurement noise limited to adjacent channel rejection value indicated. *10 MHz offset* 29 MHz, measurement noise limited to adjacent channel rejection value indicated. 52 MHz, measurement noise limited to adjacent channel rejection value indicated.
S-meter sensitivity: Not specified.	For S-9 signal, MGC[1] Level 1/32/63: 14 MHz, 50.0/50.0/50.0 µV; 50 MHz, 115.0/115.0/115.0 µV.
Squelch sensitivity: Not specified.	At threshold: MGC[1] Level 32, FM: 29 MHz, 0.68 µV; 52 MHz, 0.97 µV. At threshold, MGC[1] Level 32, SSB: 14 MHz, 0.65 µV.
Receiver processing delay time: Not specified.	6 ms.
First IF rejection: Not specified. Image rejection; upper/lower: Not specified.	14 MHz, 121 dB; 14 MHz, 102/51 dB.
Audio output: 1 W.	0.85 W into 8 Ω at 2% T.H.D.
IF/audio response: CW: 50, 100, 200, 300, 500, 800 Hz; SSB: 1.5, 1.8, 2.1, 2.4, 2.7, 3.0 kHz; FM: 5, 10 kHz; AM: 6, 9 kHz.	As specified for all filters and modes.

Transmitter

Transmitter Dynamic Testing

Power output: 0 to 20 W continuously adjustable (54 MHz 5 W).	At 13.8,10 V dc: As specified.
Spurious and harmonic suppression: –43 dB (second and third harmonic).	HF: 30 meters (worst case), –45 dBc; 50.2 MHz: –50 dBc; meets the FCC limits for spurious emissions.
Third-order IMD products: Not specified.	3rd/5th order, 20 W PEP: 3.5 MHz; –25/–47 dBPEP; 14 MHz; –27/–41 dBPEP; 50 MHz, –24/–40 dBPEP (worse case); 10 W PEP: 14 MHz; –34/–41 dBPEP.
CW keyer range: Not specified.	Tested at 5 – 133 WPM, default = 45 WPM.
CW keying characteristics: Not specified.	See Figures A and B.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	SSB and CW, CW DLY 10, AGC fast, 347 ms, AGC slow, 361 ms.
Receive-transmit turnaround time (TX delay): Not specified.	SSB, 200 ms; FM, 29 MHz, 200 ms.
Transmit phase noise: Not specified.	See Figure C.

Size (height, width, depth): 2.6 × 4.2 × 1.7 inches

Weight: 1.0 pound

[1]MGC stands for manual gain control and ranges from 1 to 63. No discrete pre-amps on the unit.
[2]Measurement is noise limited at values indicated.
[3]A and B receivers identical.

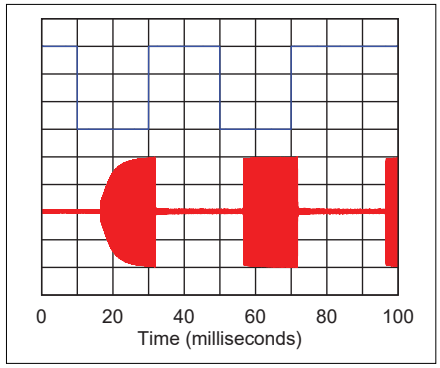


Figure A — CW keying waveform for the FX-4CR showing the first two dits using external keying. Equivalent keying speed is 60 WPM. The upper trace is the key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 20 W output on the 14 MHz band, using CW DLY set to 100 ms. The first-dit rise time is 7.1 ms; the fall time is 0.1 ms. The second-dit rise time is 0 ms; the fall time is 0 ms. The first-dit on delay is 8.5 ms; the off delay is 1.7 ms. The second-dit on delay is 6.7 ms; the off delay is 1.7 ms.

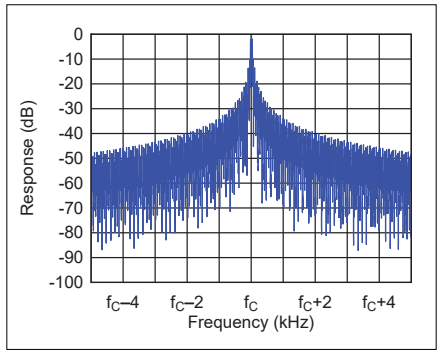


Figure B — The spectral display of the BG2FX FX-4CR transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying and the default rise time setting. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 20 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

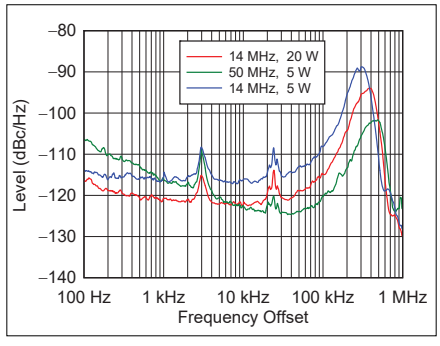


Figure C — The spectral display of the BG2FX FX-4CR transmitter output during phase-noise testing. Power output is 20 W on the 14 MHz band (red trace), 5 W on the 14 MHz band (blue trace), and 5 W on the 50 MHz band (green trace). The carrier, off the left edge of the plot, is not shown. This plot shows phase noise 100 Hz to 1 MHz from the carrier. The reference level is –80 dBc/Hz, and the vertical scale is 10 dB per division.

Figure 2 — The FX-4CR left-side interfaces.

Figure 3 — The FX-4CR right-side interfaces.

Interfaces and Controls

The I/O connectors are located on the left and right sides of the FX-4CR. On the left side (see Figure 2), you'll find the BNC RF connector, a separate external speaker jack, separate headphone jacks, and a microphone jack. On the right side (see Figure 3), you'll find jacks for a USB interface, a CW key jack, a push-to-talk (PTT) output for controlling an external amplifier, and a dc power jack. A fused dc power cable and an extra fuse are included.

At the time of this review, the PTT output is active only for voice modes. It is not active upon CW keying, though pressing the microphone PTT button when in the CW mode does operate the PTT output. I contacted BG2FX, and he said he would be implementing this for CW in an upcoming firmware update. He also said he will probably include two PTT-to-RF output delays — one for QSK amplifiers, and one for non-QSK amplifiers — to preclude hot switching. To interface the PTT output to an amplifier, I've made a "Keying an Amplifier DIY Interface." For more information, visit **www.arrl.org/qst-in-depth**.

As you can see in the lead photo, two variable controls provide audio frequency (AF) gain and tuning. These two controls are multi-function, based on selected parameters. Besides volume, the AF control is also used for selecting the different parameters, most of which are easily accessed without having to enter the menu. The menu is used for some of the less-used parameters, such as transmit filter bandwidth, break-in delay, transmit compression level, side tone frequency, and AGC settings. Within the menu, you can also enable Bluetooth for interfacing your Android phone with Android-based FT8 software. The tune control adjusts the tuning step when tapped, and band selection when the **F** key is tapped. All the buttons are backlit for about 10 seconds when any button is pushed, though they can be set to be on at all times. All of the buttons are large and easy to push, and they have an excellent tactile feel. The two knobs feel solid and are wobble-free.

A Bit More Testing

Because the specified voltage range is 9 – 18 V dc, I wanted to check the maximum output power at 9, 13.8, and 16 V dc. Table 2 shows the results of these tests. Note that the output power doesn't suffer much, even at 9 V dc.

Next, because the FX-4CR doesn't have an internal auto tuner, I wanted to see how it would do with some reasonable mismatches. Table 3 shows the output power when transmitting into high-impedance and low-impedance 2:1, 3:1, and 4:1 standing wave ratio (SWR) resistive loads.

As you can see in Table 3, the FX-4CR can put out pretty substantial power even into a moderately high SWR. However, the manual cautions you to avoid high power with high SWR at high dc input voltage, espe-

Table 2 — Output Power and Current Draw vs Input Voltage
Tested by Phil Salas, AD5X

Band	V dc	Max Pwr	Current	V dc	Max Pwr	Current	V dc	Max Pwr	Current
80 m	9	15.1 W	4.2 A	13.8	20.3 W	3.1 A	16	20.9 W	3.3 A
40 m	9	18.6 W	3.8 A	13.8	20.9 W	3.4 A	16	21.5 W	3.6 A
20 m	9	14.3 W	2.5 A	13.8	20.6 W	3.2 A	16	20.6 W	3.4 A
10 m	9	16.3 W	3.2 A	13.8	20.2 W	3.5 A	16	20.5 W	3.7 A
6 m	9	5.6 W	3.2 A	13.8	6.1 W	3.1 A	16	6.2 W	3.3 A

Table 3 — SWR Impact on FX-4CR Transmit Power

Measurements made on 20 meters at 13.8 V dc Tested by Phil Salas, AD5X

SWR	Forward TX Power
1:1	20 W
2:1 Hi-Z	17.5 W
3:1 Hi-Z	14.5 W
4:1 Hi-Z	12.4 W
2:1 Lo-Z	18.8 W
3:1 Lo-Z	16.0 W
4:1 Lo-Z	13.6 W

Table 4 — FX-4CR S-Meter Measurements

Band	tinySA	FX-4CR	tinySA	FX-4CR	tinySA	FX-4CR
20M	–73 dBm	–73 dBm/S9	–85 dBm	–84 dBm/S7	–97 dBm	–95 dBm/S5
6M	–73 dBm	–73 dBm/S9	–85 dBm	–86 dBm/S7	–97 dBm	–97 dBm/S5

cially when running high duty cycle digital modes.

Finally, I checked the signal level reading against my tinySA Ultra using its signal generator mode at levels of –73 dBm (S9), –85 dBm (S7), and –97 dBm (S5) on 20 and 6 meters. Besides an S-meter bar graph display, the FX-4CR also gives a level measurement in dBm. The FX-4CR S-meter and level measurement results are shown in Table 4. As you can see, the FX-4CR S-meter levels drop 6 dB per S-unit as it should, and the level measurements track within 1 – 2 dB of the tinySA Ultra.

General Operation

The first thing you'll need to do is add your connector of choice to the included power cable. This will connect to a 9 – 18 V dc battery pack or power supply capable of sourcing up to 4 A. This input voltage range is nice in that the radio can be powered from an RC 4S LiPo battery, which has a fully charged voltage of 16.8 V dc. However, as mentioned earlier, it is best to keep the voltage below 16 V dc, especially when operating high duty cycle modes into less-than-perfect loads.

I found the FX-4CR's controls and buttons to be mostly self-explanatory and well thought out. Reading through the manual once was all I needed to operate the radio. Tapping the **POWER** button turns on the radio, and pressing and holding the **POWER** button turns off the radio. Tapping the **POWER** button when the radio is on permits you to adjust the transmit power with the **AF** gain control. I particularly liked the ease with which you can change some parameters without having to go into the menu. For example, press and hold **SSB** to turn DSP noise reduction on or off. When DSP noise reduction is on, press and hold the **AF** gain knob until DSP is highlighted on the display, and then adjust the DSP level with the **AF** gain control. In the CW mode, you can change from straight key to iambic-A and to iambic-B by tapping the CW mode key, making it easy to put out a carrier if you have an external antenna tuner. And you can easily change your CW speed by tapping the **AF** gain knob and then changing speed with that knob (the CW speed is displayed on the screen). And in all modes, you can easily cycle through the available filters by tapping the **FILTER** key.

On the Air

I operated CW and SSB on 40, 20, and 17 meters, and CW on 30 meters, using my 43-foot vertical. I did not test the FX-4CR on digital modes as I am primarily a CW and SSB operator. But for those interested, the FX-4CR can be operated with a computer for RTTY, PSK, JT65, or any of the other popular digital modes. Select **USB-DIG** or **LSB-DIG** modes for digital mode operation. This mutes the speaker and sets the filter bandwidth to 3.0 kHz. The manual recommends keeping the maximum output at 5 W for high duty cycle modes.

CW Operation

The FX-4CR internal keyer speed range is 5 – 50 WPM. CW pitch is adjustable from 500 to 1000 Hz (750 Hz default). You can select either **CWL** (lower) or **CWU** (upper) depending on interference conditions. The available CW filter bandwidths are 800, 500, 300, 200, 100, and 50 Hz. The break-in delay setting varies from 5 to 500 ms in 5 ms steps (readings of 1 – 99 in the menu are multiplied by 5). Transmit/receive switching uses an internal relay, but it is very quiet. As expected (based on my experience), CW contacts were always easy, even at the 5 W level. However, operating at 20 W was a real pleasure. I did notice that after about 30 minutes of CW operation at 20 W, the radio was noticeably warm — but not hot.

Voice Operation

I found SSB operation to be very satisfying at 20 W. I could normally make contacts with minimal problems, especially on 20 and 17 meters. The audio reports were all quite good. The microphone gain and compression level adjustments are in the menu; however, the default settings work fine with the supplied microphone. You may need to change these settings if you change to a different microphone. The available SSB filter bandwidths are 3, 2.7, 2.4, 2.1, 1.8, and 1.5 kHz. You can adjust the transmit filter bandwidth from 1.5 to 3 kHz (default is 2.4 kHz). For AM and FM operation, receive bandwidth settings are 6 and 9 kHz, and 5 and 10 kHz, respectively.

Firmware Updates

Firmware updates via the supplied USB cable are easily performed as new features and bug fixes become available. The latest firmware can be found on the manufacturer's website. The firmware version shows on the screen for a few seconds when you turn on the unit. As this particular FX-4CR's firmware was out-of-date, I went through the update procedure, which is detailed in the user manual. I found the firmware update procedure to be easy. However, you must first download and install the free *STM32Cube Programmer* (see **www.st.com**). Once you have this on your computer, the firmware update process will take less than 30 seconds. So future updates will go quickly.

Conclusion and Final Thoughts

The FX-4CR is an amazing radio, especially considering its size and power output. While I see this as being used most often in portable operations, fixed station use is certainly in the picture. BG2FX now has a cooling assembly available, which includes a small internal fan and new side plates — one of which has vents for the warm air exhaust. The new side plates extend past the knobs on the front panel, thus providing some front panel protection. The cooling assembly is probably a good idea for those who operate digital modes. For more information, you can download the FX-4CR user manual on the manufacturer's website.

Manufacturer: BG2FX, **www.bg2fx.com**. Price: FX-4CR, $550; cooling package for existing units, $55; FX-4CR with cooling package installed, $585. All prices include shipping.

Xiegu VG4 Four-Band HF Vertical Antenna

Reviewed by Richard Lawn, W2JAZ
w2jaz@arrl.net

I have been enjoying the amateur radio hobby for 58 years, and while I've built various pieces of gear, including kits and scratch builds, my real interest lies in building and testing new antennas, both homebrew and commercially manufactured. Recently I tried a new four-band HF vertical antenna by Xiegu, the VG4, available in the US from Radioddity. It caught my eye because of its relatively affordable price and the fact that it requires no ground radials. While I have lots of real estate at my QTH, ground radials are a challenge because of trees and roots, and I know that many other hams are starved for space and might find this antenna of interest.

Unpacking

The antenna came well packaged in a 47-inch box, each part clearly labeled with a number corresponding to a diagram on a one-page instruction sheet. You

Bottom Line

The Xiegu VG4 is an affordable and well-built four-band vertical HF antenna. The fact that it does not require any ground radials provides an alternative for locations where this constitutes a challenge.

will also find on the Radioddity website an improved manual with color photos (see **https://radioddity.s3.amazonaws.com/Xiegu_VG4_Manual_EN_20220111.pdf**).

I was impressed with the quality of workmanship of all components. The antenna is made out of aluminum alloy, and all hardware is stainless steel. After a quick parts inventory, I found that all the parts were present and accounted for. Most of the tools necessary for assembly are also included, making the build process a snap.

Some components such as traps and connecting tubes are preassembled, but be careful to measure everything and compare it to the bill of materials, as the shorter joining tube between two traps was actually the wrong size in my antenna. Radioddity and Xiegu were quick to send me a replacement part once I informed them of the error.

Assembling the Antenna

Using the diagram provided in the instructions, which are pretty minimal (unless you download the improved manual from the Radioddity website), I found the build went very quickly and easily following the numbered parts and the diagram. It took about 55 minutes working slowly with a friend to assemble the antenna to its full height. We used sawhorses to support the long antenna horizontally (see Figure 4). All parts except the drooping radials fit perfectly; however, the instructions did not specify any measurements in terms of assembling the various aluminum tubes to achieve approximate desired frequency resonant points for each band. We decided to make measurements as long as possible, tightening the hose clamps after inserting the inner tube to the length of the slot on the matching tube. We found the need to rotate the aluminum collar on the base insulator slightly in order to align the counterpoise radials with the threaded holes while not interfering with the matching box. There is no Allen wrench provided to loosen these two set screws. It is recommended that the six counterpoise radials be assembled after the antenna is moved to an upright position.

Figure 4 — The Xiegu VG4 base section with balun box.

Tuning the Antenna

At this point, things became more complicated and time-consuming than we expected. The SWR readings were taken with a RigExpert AA-600 when the antenna was about 3 feet off the ground, supported on sawhorses and attached to a 10-foot galvanized pipe and tilt-over bracket. The tilt-over bracket was attached to a chain-link fence post. Even with the aid of the bracket we found that hoisting the antenna was a two-man job, at least for two "older" men! After making several adjustments with the antenna horizontal to the ground, we raised the antenna to a height suggested as a minimum height above ground by Xiegu (about 10 feet). I then took new SWR readings, expecting to see a slight rise in resonant frequencies compared to the readings when the antenna was horizontal to the ground. The new SWR readings were unfortunately horrible, showing no usable frequency dips on any band. Could it be a bad coax line, or perhaps we were located too close to the chain-link fence? We then tested the coax line with a dummy load and a RigExpert, and it was perfectly flat, so that wasn't the problem. After several additional attempts at tuning the antenna without any positive result, we gave up and I sent an email to Radioddity support. They responded very quickly, suggesting that I follow the tuning measurements provided in a user review found on their website. Several days later we followed the reviewer's suggestions to no avail. Once again we could only conclude that the proximity of the chain-link fence was a problem, but that didn't make sense either.

Matt, N2IDW, joined me for a third attempt at finding resonant points, and when we arrived at the same results, he began to suspect the coax jumper was the culprit. We tried three more jumper cables only to find the same results — when the antenna was tilted to its vertical position, the reasonably good SWR readings at the horizontal position went haywire! It was then that we discovered that no matter how tightly the outer threaded shell of the PL-259 was tightened on the SO-239 at the bottom of the matching box, there was play where the inner shield (ground portion) of the PL-259 connected to the mating toothed section of the SO-239. On closer examination we found that the teeth on the female connector provided by Xiegu were unusually widely spaced and therefore did not mesh

Figure 5 — Close view of a Xiegu VG4 trap.

Performance on the Air

The antenna performs very well on all bands, offering, of course, the smallest usable bandwidth on 40 meters, though that can be extended with a good antenna tuner and trial and error in adjusting the bottom- and topmost section of the antenna. The antenna is fairly broad across all of 10 meters and most of 15 and 20 meters. The surprising finding was that, with a tuner, the antenna can be used effectively on other

properly for a tight connection with the PL-259 on the jumper cables. When the coax hung perpendicularly to the connector on the match box, the SWR was fine as a good connection was made, but when the antenna was mounted vertically, the coax hung straight down. The loose play was just enough to break the connection of the shield part of the coax connector!

Surgery was required to correct this problem. We removed the matching box from the antenna and disassembled it by removing the screws that hold the black box together. We found it was well sealed from weather, as are the traps incidentally (see Figure 5 for a close look at one of the traps). The faulty SO-239 was removed and a substitute made with one I found in my shop. After reassembling the matching box and mounting it on the antenna again, we hoisted it to its vertical position, crossing our fingers that the SWR curves would be at least close to proper resonant points on each of the four bands of operations. While they were initially not perfect, they were very close to the operating frequencies I frequent. The mystery was finally solved, and Radioddity seemed grateful to learn of my finding, which they passed on to Xiegu! Apparently, based on the few user reviews I've seen, not all customers have experienced the SO-239 problem, so I suspect that the manufacturer at some point changed suppliers and was unaware of the problem.

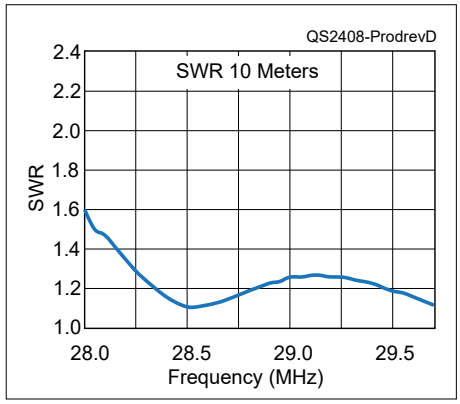


Figure D — SWR chart for the 10-meter band.

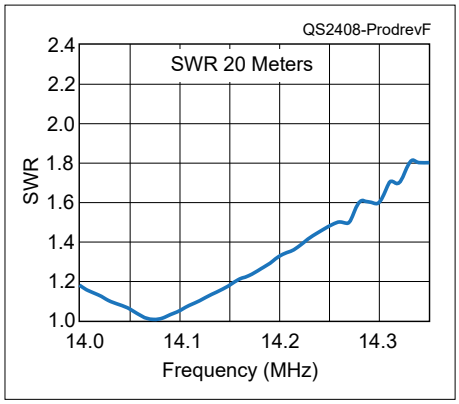


Figure F — SWR chart for the 20-meter band.

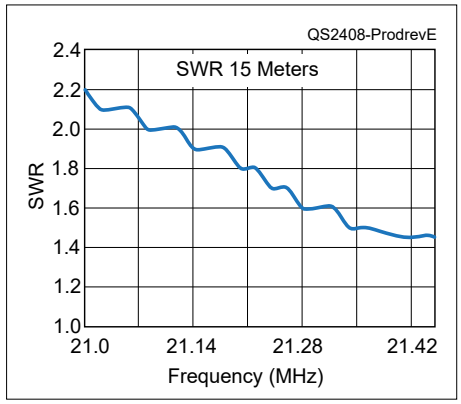


Figure E — SWR chart for the 15-meter band.

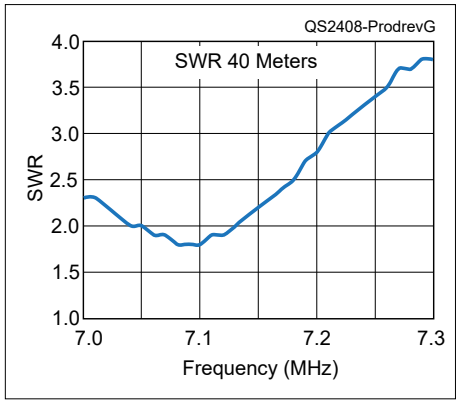


Figure G — SWR chart for the 40-meter band.

Table 5 — Xiegu VG4 Four-Band HF Vertical Antenna

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

Operating frequencies	40, 20, 15, and 10 meters
Usable bandwidth	40 meters, 150 kHz; 20 meters, 450 kHz; 15 meters, 800 kHz; 10 meters, 1000 kHz
Height	Approximately 7.8 meters (25.6 feet)
Widest point	2.69 meters (8.8 feet)
Weight	7 kg (15.4 pounds)
Power handling	1000 W PEP (500 W CW, 300 W RTTY)
Rated wind speed	35 meters/second, approximately 78 mph
Minimum height	3 meters (10 feet)
Package size	13 × 13 × 120 centimeters (0.4 × 0.4 × 3.9 feet)

bands — 30, 17, and 12 meters, giving users a seven-band antenna for a modest investment! I enjoyed a number of SSB, CW, and FT8 QSOs on all of these additional bands. The antenna does not seem to accept power well on 6 meters, however. I used only 100 W output, but the matching coils appeared robust enough to handle the higher power as advertised.

You will find the manufacturer's specifications in Table 5 and my SWR measurements for 10, 15, 20, and 40 meters in Figures D to G. I did notice that the point of resonance changed in wet weather.

In terms of gain, of course, it doesn't match my hex beam, but at times it hears better than a Carolina Windom at 40 feet. And surprisingly, the antenna is extremely quiet, by comparison, to either of these other antennas. With an improved signal-to-noise ratio, signals often seem louder on the VG4.

The good news is that I also seem to be heard as well, with QSOs from my New Jersey QTH as distant as Australia on a day when conditions were labeled as "disturbed" on 20 meters!

Conclusion

If you are looking for an easy-to-build antenna (as long as the SO-239 doesn't need replacing) that takes up very little space and requires no ground radials, then the Xiegu VG4 deserves some consideration. Just be aware that you will need to spend some time adjusting lengths of the first and last few sections of the antenna to achieve desired resonance.

I could not have accomplished this review without the help of South Jersey Radio Association members Tony Canuso, N2ATB; Brian Gross, KD2FJX, and Matt Grohgans, N2IDW.

Manufacturer: Xiegu Technology Co. Ltd., **www.cqxiegu.com**. Available online via **www.radioddity.com**. Price: $299.

JNCRadio Chelegance MC-750 HF 40 – 6-Meter Antenna

Reviewed by John Leonardelli, VE3IPS
jleonardelli@arrl.net

As a dedicated portable field operator, I am always interested in antennas that seamlessly balance ease of setup with high-performance signal propagation. Most portable antenna designs are center-loaded vertical antennas usually about 7 – 8 feet in length. While these antennas may be labeled as "compromise" solutions due to their radiating length falling short of a quarter wave, they offer operational convenience in outdoor scenarios. I have made hundreds of contacts with no concern, but when operating low power at 5 W, every gain in efficiency by using a better antenna will be rewarded with more contact possibilities.

Bottom Line

The JNCRadio Chelegance MC-750 is a great choice for amateur radio enthusiasts seeking a multiband antenna that is easy to deploy and provides good performance in a relatively compact size.

Table 6 — JNCRadio Chelegance MC-750

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

Frequency range	7 – 50 MHz
Power handling	100 W PEP
Counterpoise	4 × 3.5 meters (11.5 feet)
Weight	1.8 kg (4 pounds)
Carry case dimensions	65 × 9 × 7 centimeters (25.5 × 3.5 × 2.8 inches)

I decided to get the JNCRadio Chelegance MC-750 antenna, and it has exceeded my expectations. Designed by JNCRadio in collaboration with Chelegance, this antenna offers versatility, performance, and convenience for amateur radio enthusiasts. In this review, I will delve into its features, construction, and performance to give you a comprehensive overview of its capabilities.

Description

The Chelegance MC-750 antenna is a lightweight, solidly built, compact multiband antenna tailored for portable operations (see the manufacturer's specifications in Table 6). Its foundation is based on a quarter-wave design using a telescopic whip for 20 to 6 meters and a base coil for operation on 40 and 30 meters. The antenna kit is safely stashed in a rugged carrying case with pockets to keep everything secure. It includes a base unit with an SO-239 connector and counterpoise hub, a hefty stainless-steel spike rod that screws into the base unit, a base rod (with a red knurled hand grip) that also screws into the base unit, a 5.2-meter (17-foot) telescopic whip, and the four (11.5-foot) counterpoise wires securely held on a plastic nylon line winder. There is also the 40-meter coil packaged in a protective pouch. All the components demonstrate high-quality craftsmanship, and the assembly process provides simplicity, ensuring swift setup and deployment.

The MC-750 antenna truly shines when it comes to performance. With a power rating of 100 W PEP, it is capable of handling the demands of high-power portable operations. It is designed to be used in situations where you have a park, field, beach, or grassy area where you can use the spike rod.

The antenna's clever adjustment approach sparked my initial interest. It features engraved band positions on the telescopic whip, eliminating the need for whip length measurements. Merely extending the whip to the marked point resulted in SWR levels consistently below 2:1, rendering cumbersome tuning practices unnecessary. This innovation benefits novices and guest operators alike. Moreover, for portable setups reliant on transceivers lacking an integrated antenna tuner, deploying the MC-750 antenna brings a smile.

Figure 6 — The JNCRadio Chelegance MC-750 installed in a park.

On the Air

I always have several use cases that align with my operating style. I grabbed the antenna bag and my Icom IC-705 backpack, and I drove out to the park and found a place to operate under a shady tree. The process of installing the ground spike onto the base unit and affixing the lower rod was seamless. The base rod, aided by its red hand grip, found its place in the grass, while the telescopic whip was attached and extended to the 14 MHz mark. The counterpoise wires were laid out and connected to the base unit counterpoise hub (see Figure 6). I used 25 feet of RG58 coax, and a quick SWR check returned a reading of 1.8. A slight whip adjustment dropped the SWR to a reading of 1.1 (see Figure 7), and I was ready to make some contacts. Afterward, I adjusted the antenna to 18 MHz to see if I could work the HF Pack hams on 18157.5 kHz. The SWR was 1.6, and I was on the air on that band within a minute.

I always collapse the telescopic whip starting with the lower elements first. I have used the telescopic whip more than 40 times, and it has proven to be well built. Nonetheless, I advise against prolonged outdoor exposure in rain and snow, and suggest prompt drying after exposure to moisture. With any antenna, proper care extends its lifespan. Like many portable antennas, this one is not waterproof.

Days later, my focus shifted to 40 meters to take advantage of somewhat favorable band conditions, to see if the longer radiating length over a shorter compromise antenna would make a difference. Setting up shop in my backyard, I conducted a face-off between the MC-750 antenna and a typical compromise antenna using an A/B switch. Employing the 40-meter coil and adhering to the instruction manual's guidelines, I found the SWR was fine and ran 50 feet of RG8X coax. I used my Yaesu FTDX3000 at 100 W to also test power-handling capability on SSB. I noticed that the antenna was very stealthy, making it an ideal antenna in a low-profile setting. Adding some orange flash tape would enhance visibility, particularly in a campsite or public park scenario. As expected, the MC-750 provided a 1 – 2 S-unit advantage over the other compromise antenna into the east coast.

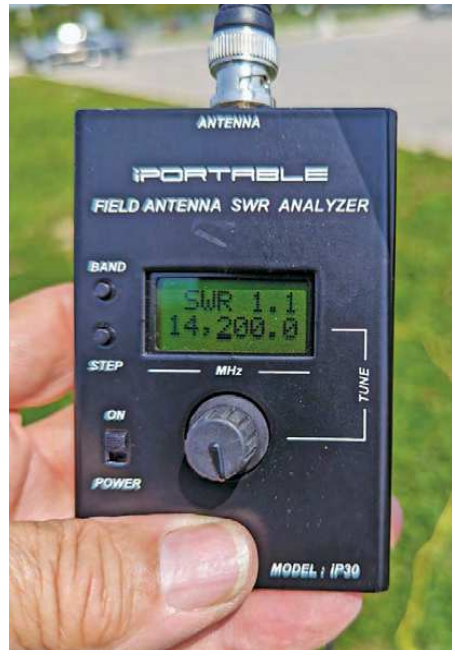


Figure 7 — The JNCRadio Chelegance MC-750 SWR on 20 meters.

Reception was about the same. I continued to use the compromise antenna until QSB dips brought me to a 55 level, while the MC-750 offered 56 peaking to 57. Thus, the more efficient MC-750 proved itself to be useful when conditions became worse. I noticed no heating of the base coil using high power.

One afternoon, I noticed 40 meters had good propagation and I heeded the call for a POTA activation. With the radio propped up on the passenger seat, I set up the antenna on the grass beside the corner parking spot. SWR was fine. I added 31 contacts to the log, and then it was time to get home for dinner. It was easy to pack up the antenna and put everything in its place in the carry bag. On the way home I realized that I had no problem making contacts and never even gave thought to what I was using, as the chasers were frantic in adding a new park to their logs. I worked everyone who called me across the 13 colonies with great signal reports using 20 W.

ARRL Field Day 2023 provided for experimentation with antennas, transceivers, and power options. I embarked on the Friday with a clear agenda of tests. By employing an A/B antenna switch, I toggled between my 40/20-meter dipole and the MC-750 vertical. Unsurprisingly, the dipole excelled in engaging regional stations on 40 meters, while the vertical was best in reaching single-hop DX stations into Florida and Alabama. For Field Day I chose the MC-750 set up for 20 meters and switched it against my portable beam pointed to the east coast. This worked out very well. I used the beam for directed contacts, and the vertical gave me contacts everywhere else. The on-the-fly antenna swapping using the radio's A/B switch allowed me to use the best antenna while managing the logbook and contact exchanges.

The other advantage for my operating style is the ability to use this antenna on 6 meters. Having a single antenna to do that is a bonus.

My analyst friend asked to see some data points. So, this time I tested using the SOTABEAMS WSPR transmitter (100 mW output) and their DXplorer reporting system. The comparison for the MC-750 antenna was a shorter 7-foot antenna on 20 meters using four radials. The MC-750 got 23 reports,

and the shorter one got 14. The MC-750 was heard the farthest: KPH (3,705 miles), KP4MD (3,545 miles), and GMØUDL (5,216 miles). The shorter antenna was heard by VE6PDQ (2,738 miles), VE6JY (2,699 miles), and WDØE (2,170 miles). The MC-750 was better by 2 – 8 dB in SNR readings. It was better at WDØE by 4 dB and at KG5FNU by 9 dB, which heard both transmissions. Longer antennas are more efficient. The MC-750 performed better and was heard farther. The MC-750 showed reports from California, Nova Scotia, and Scotland, but the compromise antenna did not. Longer antennas radiate more signal, but the shorter one is more portable due to its smaller packed size. Receive comparisons with WWV at 15 MHz showed similar levels with the MC-750 better, but not consistently.

I did come up with a simple hack for the spike rod that has a very sharp tip. I used a small pill bottle that covered the tip nicely and then found a 3D-printed version for a similar design. There is no need to fiddle around with the antenna because it's designed to work with its supplied counterpoise wires. I did try it with longer 25-foot counterpoise wires that I had in my antenna bag, so there is room for experimentation, and I noticed signals did improve by an S-unit or two.

One improvement could be to use the ⅜-inch – 24 fine threading instead of the Asian metric threads so it can be used with other antenna products.

My practical experimentation has proven that the MC-750 antenna is more efficient than the typical compromise antenna due to its longer length. The antenna bandwidth is also wider, as the antenna has a lower Q factor, thus not having to adjust it for every frequency change within the band (*The ARRL Antenna Book* is your reference guide, with information in Chapters 1 and 19). Its fast deployment means I have more radio time instead of back-and-forth antenna adjustment time.

I also gave thought to a couple of concepts I wanted to investigate. If I have a second one, can I use it as a phased vertical, allowing some directivity and gain? The other idea is to use this antenna for field operations, where I can use my 40/20-meter linked dipole that's set up as an inverted **V** and use the A/B antenna switch to switch to the MC-750 vertical, and use whatever antenna is best.

Because the deployment is quick and easy, there is little effort required to do this all the time when operating outdoors. The antenna carry bag is more than 2 feet long, which makes it less able to fit in a backpack or carry-on suitcase than, say, a compromise antenna that can be anywhere from 12 to 18 inches long. If your budget allows only one antenna, then this one could be the one you need.

Conclusion

In conclusion, the JNCRadio Chelegance MC-750 antenna has proven itself as a remarkable choice for amateur radio enthusiasts seeking a high-performing multiband antenna. Its relatively compact size, ease of assembly, and reliable performance make it a valuable addition to any radio kit. Whether you're a portable operator, a POTA/SOTA enthusiast, or looking for a stealth option, the MC-750 antenna delivers on its promises.

Manufacturer: Chelegance JNCRadio, **www.chelegance.com**. Price: $179; add $48 for the optional 80-meter coil.

Dave Casler, KEØOG, askdave@arrl.org

Ask Dave

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

Antennas Keep Us Busy!

Antenna for a Shortwave Listener

Q Ray Gibson, an active shortwave listener (SWL), asks: I use an SDRplay RSP1A software-defined radio to listen to the ham bands and other shortwave signals. I'm looking for a portable antenna and have been considering some of the ones from Wolf River Coils. I want something easy to set up and take down.

A If you want to do SWLing over the entire HF band, the RSP1A (now available as the RSP1B) is certainly a good choice. I use mine with SDRplay's house-brand software, *SDRuno*. SDRplay has recently introduced a new multi-platform software, *SDRconnect*.

The Wolf River Coils antennas can resonate on any HF frequency, but only one at a time, and they do not auto-adjust while you're listening. You want a broadband, non-resonant, low-Q antenna. A long wire (random length) fits the bill perfectly, so that's what I suggest. It can be as simple as 30 or 40 feet of wire up in the air.

The input impedance of the RSP1A is 50 Ω (give or take) at all the frequencies it covers. However, the long wire's impedance varies wildly with frequency. In a receiving situation, that's not usually a problem. If you want to tweak the match between the long wire and the radio you can use any inexpensive tuner. Tune the inductance knob for max noise, then the capacitor for max noise. This will peak the antenna for the band you're listening to. You can retune easily after a significant frequency change. After a while, you'll get used to settings for your favorite frequencies. Note that the long wire can be plugged into the tuner's center conductor. You should probably have coax between the tuner and the RSP1A (see Figure 1). You'll get better results if the tuner is grounded.

If you want to build your own random-wire preamp, see the Pacific Antenna Active Antenna Kit reviewed in the June 2024 issue of *QST*.

If you just want to get the ham bands, then get an antenna that's resonant on all the bands without tuning, such as the DX Commander CLASSIC, which receives all HF ham

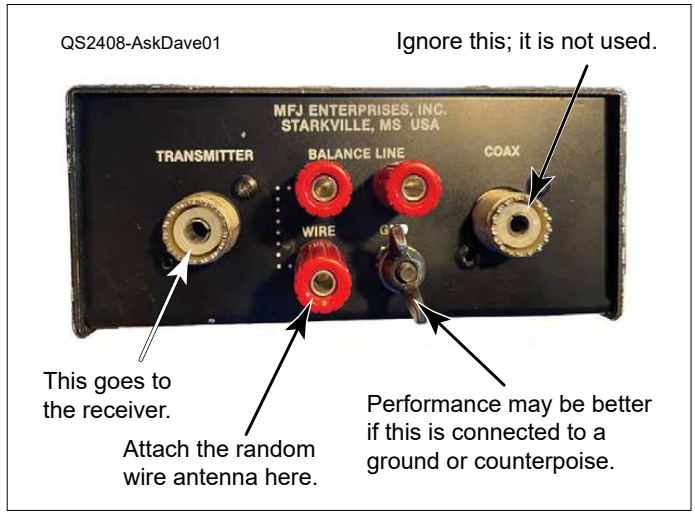


Figure 1 — This photo shows the "wire" input at the back of the MFJ-901B Versa Tuner, where you attach your random wire. The coax connector marked "transmitter" is connected to your receiver. The connector marked "coax" is not used. Connecting the "gnd" connector to a random wire on the ground may improve reception. This wire is called a "counterpoise."

Figure 2 — Dave Casler's, KEØOG, W6LVP receive-only antenna. The shield of the loop of coax is the actual antenna. The preamp box is located where the ends of the coax loop come together at the bottom. Twelve V dc is supplied via the antenna-to-receiver coax to the preamp via a bias T that comes with the antenna. Do not try to transmit through this antenna, as doing so will ruin the preamp.

bands equally well on 40 – 10 meters. Eighty meters can be added with a modification. Another ham-bands-only antenna available in kit form is the ARRL End-Fed Half-Wave Antenna Kit (**https://home.arrl.org/action/Store/Product-Details/productId/133267**).

Another option is the broadband receive-only loop antenna made by several manufacturers (see Figure 2). This is a simple 3-foot-diameter loop with a preamplifier. Although this looks like one of the many "mag loop" antennas on the market, note the lack of the coupling loop. These receive-only loops are powered devices, so you'll need to accommodate that at your listening site. I have tested examples from three manufacturers — MFJ, Chameleon, and W6LVP, and they all work as intended. These antennas are designed to mount on a mast, but that mast only needs to be 3 or 4 feet tall. You can attach this to a tabletop outside at a portable location — the antenna does not need to be high up in the air to work. No tuner is required, and it covers 500 kHz to 30 MHz or more.

One option that you may find attractive is the smaller MLA-30 antenna. It's available through Amazon (search for B085ZSXF8Z), and many versions of this inexpensive (less than $50) device are available. I reviewed one some time ago, and it works fairly well. The attractive feature of this antenna is that it is much less expensive than the 3-foot antennas mentioned above.

Can't Hear Anything to the West

Q Blake Burnette, W8LB, asks: I live on the east side of a ridge in Chattanooga, Tennessee. My off-center-fed dipole for 80 – 10 meters is about 20 – 25 feet above my back patio. I receive and transmit well up the east coast into Canada and have received signals from South Africa and England, though I cannot seem to contact them. I'm running an Icom IC-7300. I cannot receive anything due west of me — for example, from California to Alabama and Missouri up to Washington. I'm assuming the antenna below the top of the ridge is the culprit. Will I need to get an antenna above the peak of the ridge and houses, or is there another solution?

A I think your issues with working stations to the west have more to do with the band selection and the time of day. I live in a mountainous area, so I had to satisfy my curiosity as to whether the mountains would block my signal. Using a protractor to create a rough theodolite, I measured the angular height of the mountains all around me. To my surprise, none were higher than 3 degrees above the horizon. Any antenna that I can put up has a takeoff angle higher than that. In other words, those mountains don't get in the way of my signal propagation. I suspect if you took a similar measurement from the roof of your house, you might find the same thing.

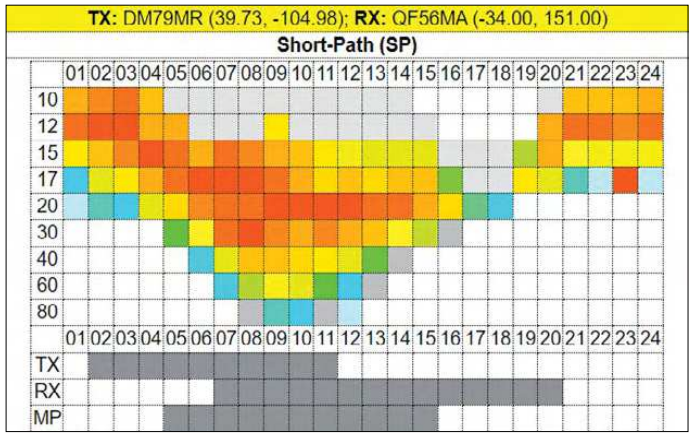


Figure 3 — A sample *VOACAP* prediction chart. *VOACAP* can give you propagation forecasts between any two locations on Earth. This sample chart shows a path between Denver, Colorado, and Sydney, Australia. It shows the time of day versus which band to use. These charts are a forecast, not a guarantee.

Also, the orientation of your off-center-fed dipole will have a minor effect on where your signal goes. I've always treated dipoles as essentially unity gain antennas in any direction. You can try restringing your antenna north to south, but it will make little difference.

As your operating skills grow, you will work more of the stations that you can hear. To make those long distances to the west, try 15 or 10 meters during the day and maybe 40 or 20 meters after dark. I recall having a hard time working anybody in the UK. Finally, after several years, I snagged one. There's nothing wrong with visiting an experienced contester or DX hound to see how they operate. It's amazing what you can learn just by watching an expert at work.

There is one more thing that I approach with caution. If you can hear people from a certain area regularly but can't work them, it may be time to look at an amplifier in the 500 W range. But if you receive no signals from the desired direction, try listening on several different bands at different times during the day and night. There is also propagation software online. You tell it when and where you want to work a station, and it will give you frequency suggestions. One popular computer program is *VOACAP*, found at **https://voacap.com** (see Figure 3).

I think the best advice is simply to persevere. Keep working toward your Worked All States Award. It's amazing how much better we get with learning about propagation by spending time on the bands.

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

Technical Correspondence

PVC and CPVC Sizes; Revisiting the Antenna Tuner Trick

PVC and CPVC Sizes

In reading articles regarding the use of "plastic" pipe for antennas, it's easy to see the confusion between polyvinyl chloride (PVC) and chlorinated polyvinyl chloride (CPVC) pipe sizes. As several authors have previously pointed out, PVC and CPVC sizes don't match.

Aluminum and PVC pipe are *pipe* (see Figure 1), whereas aluminum tubing and CPVC "pipe" are actually *tubing*. Pipes and tubing conform to different standards. Aluminum, iron, and PVC pipe are all made to pipe standards whereas common CPVC "pipe" (see Figure 2) and aluminum tubing are made to tubing standards. The problem is further complicated by the fact that aluminum tubing size delineations are literal, whereas copper tubing/CPVC sizes are not.

CPVC more commonly equates to copper tubing sizes (CTS), and these are the sizes of CPVC typically found in big-box and hardware stores for residential water distribution. Although round-drawn aluminum tubing such as T6061-T6, which is typically used in antennas, comes in various wall thicknesses depending on size and usage, the outer diameter (OD) equates to CTS and CPVC nominal "size" nomenclature.

Figure 1 — Polyvinyl chloride (PVC) pipe, a popular building material for antennas and other projects. [Grainger photo]

PVC, on the other hand, conforms to the iron pipe sizes (IPS) for iron, steel, and aluminum pipe. Unlike CTS, with size designations based on the OD, IPS are based on a fluid-flow formula (and thus inner diameter, or ID), not nominal pipe OD. PVC has no equivalent to CTS, CPVC, or aluminum tubing other than trial and error or perhaps by cutting kerfs and using hose clamps. For example, ½-inch PVC pipe (nominal OD = 0.840 inch and nominal ID = 0.618 inch) won't match ½-inch CPVC (OD = 0.625). However, ½-inch PVC pipe will fit loosely into a ¾-inch CPVC coupling (ID = 0.875).

There are a few special transition fittings (see Figure 3) made specifically to allow smooth transition between the two different types. For example, CPVC transition fittings designed to thread onto copper or brass fittings with IPS threads will also thread onto IPS standard pipe such as PVC. — *William Wornham, NZ1D,* **nz1d@arrl.net**

Revisiting the Antenna Tuner Trick

In the March 2016 issue of *QST*, "Technical Correspondence" included an item titled "Antenna Tuner Trick" by Mike McAlister, KD6SF. It was a well-written piece and has given me food for thought ever since. In the article, Mike contended that placing an inductance in parallel with a circuit is equivalent to placing a capacitance in series with the circuit at the same point.

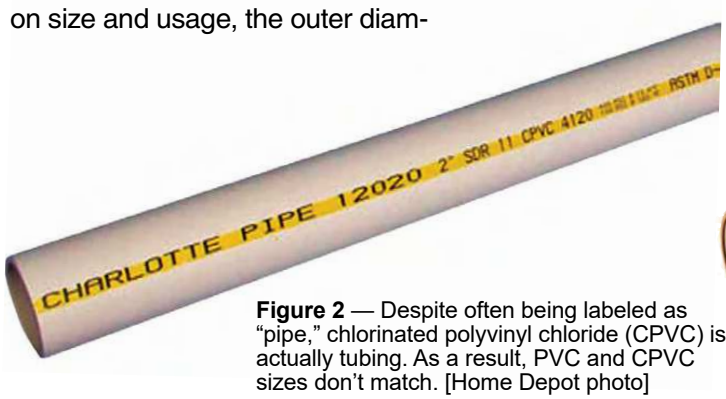


Figure 2 — Despite often being labeled as "pipe," chlorinated polyvinyl chloride (CPVC) is actually tubing. As a result, PVC and CPVC sizes don't match. [Home Depot photo]

Figure 3 — An example of a CPVC transition fitting used to adapt to copper pipe. [Metpure photo]

Revisiting the idea prompted me to conclude that while there is a similarity between the two in that both techniques produce decreasing effects with increasing frequency, there are dissimilarities between them. First, from the viewpoint of the input to the circuit, the series capacitance affects only the reactive part of the impedance of the circuit to which it is connected. The parallel inductance changes both the resistive and reactive components. Also, the series capacitance can bring an inductive reactance down to zero or to any desired negative (capacitively reactive) value. The parallel inductance cannot bring an inductive reactance to as low as zero or to any negative value. This may not be intuitively apparent, so let's have a closer look.

We'll assume that the antenna/transmission line impedance includes an inductive reactance; otherwise, no series capacitance would be needed for matching. We therefore have a load that consists of a series connection of a resistance and an inductive reactance along with a parallel inductive reactance for matching purposes.

The resistive component of the antenna impedance = $R1$

The reactive component of the antenna impedance = $jX1$

The reactive component of the parallel inductor = $jX2$

The impedance of the antenna = $Z1 = R1 + jX1$

The impedance of the parallel inductor = $Z2 = jX2$

$$Z_{in} = Z1 \times Z2 / (Z1 + Z2)$$

$$= (R1 + jX1) \times jX2 / (R1 + jX1 + jX2)$$

$$= (-(X1 \times X2) + j(R1 \times X2)) / (R1 + j(X1 + X2))$$

(Some parentheses have been included for clarity in distinguishing the real and imaginary parts of the numerator and denominator.)

If we convert both the numerator and the denominator to polar form, the angle of the numerator is in the third quadrant, between 90° and 180°, because the real component is negative and the imaginary component is positive. The angle of the denominator is, by like considerations, in the first quadrant between 0° and 90°. We obtain the angle of Z_{in} by subtracting the angle of the denominator from the angle of the numerator.

Such an angle must fall in either the first or second quadrant between 0 and 180° and can therefore never fall into the third or fourth quadrants, as would be required for such an impedance to include a capacitive (negatively reactive) component. The addition of a parallel inductance, therefore, regardless of value, cannot duplicate a capacitance large enough to completely overcome the inductive reactance of the load. This means that, although a parallel inductance may be of significant value in matching an antenna to a transmitter (see below), it cannot duplicate exactly the functionality of a capacitance. A series capacitive reactance can be supplied to pull the positive imaginary component of the antenna impedance down to any desired positive value, to zero, or into the negative range. As we've seen above, a parallel inductive reactance cannot do that.

If we restrict our network to linear, passive components, the angle of Z_{in} must be in the first quadrant, but such a restriction is not necessary to prove the point that the parallel inductance cannot produce a capacitive result.

It's instructive to assign values to the variables above and run the expression in *GNU Octave*, *Python*, or another math utility or on a programmable calculator to see that, regardless of what numerical values are used, the result is always in the first quadrant if we restrict the signs of the values to those of physically realizable components and use a parallel inductance and a series inductance in the load. We can let $X1 = 0$ and we'll get the same result for a resistive load.

A similar case can be made for using series and parallel capacitors. They cannot be made to produce an inductive reactance.

It is often convenient, though, to use a capacitor where an inductive reactance is required, especially in integrated circuit applications where winding an inductor is difficult and/or impossible, but to do so requires a gyrator, an active circuit that usually includes the capacitor, an op amp, and some resistors.

This doesn't mean that it would never be useful to use a parallel inductor in impedance matching. It just means that the range of impedances produced is restricted, as discussed above, and that those limitations restrict the correspondence between a series capacitance and a parallel inductance. — *Maynard Wright, W6PAP,* **w6pap@arrl.net**

The Challenge and the Beauty of IOTA from Yanuca Island, Fiji

This experienced DXpeditioner details his Islands on the Air operation from sought-after OC-189.

Cezar Trifu, VE3LYC

Islands on the Air (IOTA, **www.iota-world.org**) is a demanding, high-performance program that divides the open-sea islands of the world into 1,200 "IOTA groups," 1,137 of which have been activated to date. Many of these islands are difficult to reach, drastically limiting the choice of rigs, power, and antennas, while activators face challenges such as the local geography obstructing propagation paths.

In May 2019, I started to look into the logistics of a short operation from Yanuca Island (pronounced "yanuda" in Fijian), the only inhabited island among the seven that form the Ringgold Islands, a volcanic island group located in the northeast of Fiji. The group is known as OC-189 for the IOTA program, where it ranks #48 on the most-wanted list, needed by 88.7% of island chasers. There have been two operations from Yanuca — in 1993 and 2007. However, by early 2020, COVID-19 pandemic travel restrictions made it impossible to reach Fiji for more than 2 years.

Next, I thought of traveling to Yanuca in fall 2022, but I decided to postpone the trip because I considered that it could sidetrack me from tasks I was assigned to as part of Team Bouvet, 3YØJ. Four weeks after returning from that voyage, I finally decided to reschedule a trip to Yanuca. With the help of Antoine, 3D2AG, I quickly obtained the license and importation documents from Telecommunications Authority of Fiji. I subsequently confirmed through Mr. Aloesi, the assistant to the Chief of Taveuni, Fiji's third-largest island, that the Chief of Yanuca gave me permission to visit, and the logistics were in place.

A view of the village from the guest accommodations on the southern hill.

I arrived in Suva, the capital of Fiji, in the morning on Friday, April 28, 2023, and spent the weekend with Antoine and his 12-year-old son Robert. This offered me a chance to visit parts of the city, help Antoine install some sea and air monitoring equipment on a mast, go grocery shopping, and purchase electrical components for my operation. Antoine is extremely passionate about radio, but rarely operates SSB due to high local noise. Thus, Fiji ranks #58 DXCC in this mode in Europe.

I flew to Taveuni early in the morning on May 1. Upon arrival, I went to the local administration office in Somosomo, a village a few kilometers south of the airport. Mr. Aloesi was there, joined by Henry Bukarau — one of the sons of the previous Chief of Yanuca — and their headman, who came over that morning to drive me to their small island by motor canoe.

At the administration office of Taveuni, with Mr. Aloesi (right) and Henry (left).

Setting Up on Yanuca

Yanuca is located 25 kilometers north of Taveuni, and it took us about 90 minutes to get there under a 20-knot wind. As we drove past other islands in the group, the rocky outcrops, dense vegetation, and sandy beaches underscored their stunning beauty. By the time we reached the village, I was completely soaked from the continuous ocean spray, even though I was wearing a waterproof jacket, as we drove mostly against the wind. My luggage, however, was well protected by double plastic bags. Once we arrived, I was greeted by Henry's brother Willy, a bright, entrepreneurial individual and an excellent communicator.

The village of 22 households and fewer than 100 people is on the east side of the island, close to its southern edge. It is protected against the cyclones, which hit from the north, by hills 120 meters high. Those hills, however, obstruct the short-path HF radio propagation to Europe and most of Asia. Furthermore, the cabin that Willy and his wife, Betty, prepared for me didn't have sufficient flat land around it to allow me to install the multiband vertical with radials.

I knew from Antoine that the village school was on the north side of the island, which offers clear paths to Europe, Asia, and North America. Consequently, I aimed for that location, but with the sunset approaching fast, there was nothing I could do that night. I had to settle in and find a solution the next morning.

After a good night's sleep, I first had to follow the local tradition and meet Chief Isoa for the *sevusevu* welcoming ceremony. Willy helped me tie a *sulu*, a Fijian sarong, around my waist, after which I presented the Chief with half a kilogram of *yaqona* (kava) roots, from which a drink would be later prepared. The Chief was well traveled as a former member of the Fijian UN peace corps, and we had a nice chat.

I later approached the school manager, who was very receptive to my request, but indicated that it would be up to the teachers to reach a decision. Thus, Willy and I walked to the school, about 1 kilometer away, first along the reef, then through the dense tropical forest. The primary school was established there in 1993, due to the presence of the only natural spring on the island. It enrolls 18 students and a few preschoolers. I explained my project to the teachers and the importance of that location, and they agreed to allow me to set up the station there. Mrs. Teresia Qiri, the head teacher, invited me to use one of the two rooms she occupied nearby with her husband, Tomasi, while Betty brought me a mat to rest on.

Yanuca On the Air

We brought my luggage from the village by boat, and I installed my equipment very quickly. I operated that entire night, May 2, as 3Y2LYC. Propagation was great, with many European stations logged on 20-meter CW, as well as stations from other continents.

The next day, I fell sick with gastroenteritis and was feverish and in pain. I operated from time to time, but I couldn't stay on for long. This lasted for 30 hours, during which I didn't eat anything. I rested well at night, though, and woke up the next morning ready for action on the air. During each of the following days, I operated most of the nighttime, first on 15 meters, moving to

Table 1 Continental Distribution of Contacts Made from Yanuca OC-189

Continent	20 m	17 m	15 m	12 m	Total	%
AF	5	6	4	1	16	0.3
AS	310	334	576	104	1324	25.8
EU	572	1037	1461	1	3071	60.0
NA	241	113	246	28	628	12.3
OC	30	20	24	2	76	1.5
SA	1	–	5	1	7	0.1

17 meters, and then back to 15. This included many hours on SSB, contacting lots of European stations, as well as many in Japan and North America.

I rented a 3.8 kW gas generator from Willy, but he preferred that I use the school's solar power system instead. However, the latter would not allow me to operate with the amplifier during the entire night, as the system was used for the school's freezer. Consequently, starting on the third day, the generator was on and it ran smoothly for the rest of my operation.

Operation Stats

My log includes 5,122 contacts with 3,338 unique stations in 80 DXCC entities on six continents. About 22.6% of the contacts were on 20 meters, 29.5% on 17 meters, 45.2% on 15 meters, and 2.7% on 12 meters. The breakdown of modes was 55% CW and 45% SSB. The top DXCC entities by number of contacts/stations were JA (1177/707), K (552/436), DL (465/277), I (462/326), and UA (308/205). The continental distribution is shown in Table 1.

The weather was calm when I left the island the morning of May 8. The boat drive to Taveuni took just 1 hour, under very little wind. After a short stop at the International Date Line monument, I went to the airport and the rest of the voyage back was long and tiring, but otherwise uneventful.

Making It All Possible

I am grateful to my hosts in the village and near the school for their amazing hospitality, understanding, and cooperation. Willy and Betty frequently checked to see that I was fine and things were progressing well. To ensure ventilation, the room I occupied at the home of my hosts, Teresia and Tomasi, was open near the ceiling. The room was next to theirs, and my SSB operation must have been pretty loud!

North American foundations, associations, and clubs currently aren't funding IOTA expeditions unless they are part of rare DXCC entities. Island Radio Expedition Foundation (IREF, now closed down) was a notable exception, fully dedicated to funding such operations. Thus, the funding of these challenging activities is mainly left to European groups such as the German DX Foundation (GDXF), the Radio Society of Great Britain (RSGB), the Swiss DX Foundation (SDXF), CDXC: The UK DX Foundation, and the Clipperton DX Club. A number of avid IOTA chasers keenly support such projects individually, but the overall level of support limits re-occurring expeditions.

To increase the overall funding, the administrators of the IOTA program, IOTA Ltd., have recently set up an annual budget for expedition grants. Nevertheless, attracting some of the North American groups to join in the IOTA challenge would be a major step forward in shortening the delay associated with revisiting many of the rare island groups.

I would like to thank RSGB, IREF, GDXF, SDXF, the Clipperton DX Club, the European DX Foundation, and DX News for their sponsorship of this project. I am also indebted to Bob, KD1CT, for his exceptional support, as well as to the top donors K9RR, OE3SGA, VE3ZZ, VE7DP; large donors HB9JOE, JF7RJM, K1HT, N4WW, N6NO, OE3EVA, OE3KKA, OE3RPB, OE3WWB, ON4IZ, W1NG, W5PF, WB2YQH, WB5JID, and many others for their generous assistance.

Click here to view a slideshow of additional photos from this DXpedition.

All photos provided by the author.

Cezar Trifu, VE3LYC, was inducted into the CQ DX Hall of Fame on May 17, 2024. He is the IREF 2018 IOTA Expeditioner of the Year and the Russian Robinson Club 2017/2018 Expeditioner of the Year. He can be reached at **ve3lyc@hotmail.com**.

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

HF/VHF/UHF from a Sport Boat

Planning and ingenuity result in a dream marine mobile setup.

John Turner's, KG6ODI, journey with his boat includes designing and installing a radio setup to meet many needs.

John Turner, KG6ODI

Our family loves the ocean, so when we purchased our new Sea Ray (which we keep in a slip in San Diego Bay), I was eager to design and install HF, VHF, and UHF ham radio capabilities to give us a fully equipped marine mobile station to enjoy when we spend weekends and vacations on the boat.

Installing ham equipment on a fiberglass boat presents many challenges, including working in a harsh, wet environment, grounding issues, RF noise, RF interference affecting other electronics on the boat, antenna mounting issues, and generally making everything fit nicely within limited space. My goal was to add complete HF, VHF, and UHF ham radio capabilities without affecting the aesthetics of the boat.

What's On Board

The Sea Ray installation uses an Icom IC-7100 radio, which provides HF, VHF, and UHF capabilities, with a separate transceiver and control head that can be used anywhere on the boat, supported by an Icom AH-4 remote HF tuner. At the helm, there's a Yaesu FTM-400 VHF and UHF radio mounted in a waterproof "glove box." In addition to working on HF, 2 meters, and 70 centimeters, the FTM-400 and IC-7100 also receive marine HF, VHF, FRS, GMRS, etc. A Uniden SDS100 handheld digital trunking scanner monitors harbor police, lifeguards, aircraft, and other services. An Icom IC-M400BB VHF marine radio with a remote-controlled microphone provides traditional marine VHF ship-to-shore capability.

Antenna Considerations

Because the Sea Ray is a sport boat, a typical 23-foot marine HF vertical antenna was not an option. I decided against a screwdriver antenna, because the salty marine environment would likely, in time, degrade the antenna's electrical and mechanical parts. Plus, screwdriver antennas are a bit bulky and may be too obtrusive with the aesthetics of the boat.

After a lot of consideration and research, I opted to go with MFJ hamstick-style antennas that could easily be screwed on and changed with a custom mount/mast fabricated to fit on a standard marine stainless-steel antenna ratchet mount on the side arch of the boat.

The Icom IC-7100 can be used anywhere on the boat.

Although the hamstick antennas are, for the most part, resonant for the selected band, I did have that Icom AH-4 remote tuner. The MFJ hamsticks can be used over the entire band — or in many cases, on another band (with the tuner) — without further mechanical or standing wave ratio (SWR) adjustment.

For the VHF and UHF ham bands, I selected the Comet CA-2X4SR VHF and UHF wideband antenna, which offers an SWR of less than 1.5:1 for all the ham frequencies, as well as 2:1 or less at 140 – 160/435 – 465 MHz with a gain of 3.8/6.2 dBi.

The HF antenna is mounted on the topside of the boat roof/arch with a standard marine ratchet mount. The antenna is connected to the Icom AH-4 tuner. The tuner, located in the side panel of the boat, is connected to the Icom IC-7100 transceiver's separate base unit inside the cabin of the boat.

With my son's help, we modified a Shakespeare Marine antenna extension and fabricated a custom mast/mount that would screw on to a standard stainless-steel marine ratchet mount that the MFJ hamsticks screw on to, supporting various MFJ hamstick antennas for 80, 40, 20, 15, and 6 meters.

Because the remote tuner could not be mounted at the base of the HF antenna as it is normally configured (the sidewall arch on the boat was not big enough inside to hold the tuner), the AH-4 had to be mounted about 36 inches away from the antenna base. Because there is a bit of a misconfiguration between the Icom tuner (it's normally configured to work with an end-fed wire or a direct connection to the antenna, and the hamstick is normally used with a base-mount 50 Ω coax connection), we used shielded RG-8/U coax with a specified minimum breakdown voltage of 2800 V dc to connect the custom hamstick mount to the tuner. In the design stage, there was some concern about connecting the antenna in this manner, but after some trial and error, it ended up working very well.

SWR and tuning, via the Icom tuner, worked great and clamp-on chokes did a good job of controlling stray RF. For HF grounding, braided copper wire connects to the boat's lightning/electrical ground system (which grounds out to the motors, railing, etc.). I have always found that using a generous number of clamp-on chokes on antennas, power, audio, and other connecting wiring works great in mitigating stray RF, especially in unique installs like this one.

For VHF/UHF on the Yaesu FTM-400 and Icom IC-7100 we used two Comet CA-2X4SR antennas. The antennas were mounted on the roof, accessed by temporarily removing the ceiling lights inside. Custom mounts had to be fabricated to mount the antennas vertically on the slanted roof. With the fiberglass roof of the boat not providing any ground plane for the VHF and UHF antennas, 125 feet of insulated #14 copper wire radials were run in all the open areas inside the roof and support pillars to provide a ground plane/counterpoise for the antennas, as well as to connect to the boat's common RF ground. It worked very well, with no noticeable problems with SWR or stray RF, and provided great access to all the local San Diego and southern California repeaters we normally access.

Cabling, Power, Accessories, and Connectivity

The coaxial cables, counterpoise wires, and copper braided ground wire (for the HF radio and Icom AH-4 tuner) all terminate inside the helm-side service panel. Because the Icom and Yaesu ham radios are not specifically built for a ruggedized, wet marine environment, the transceiver units were installed in a dry cabinet located in the back salon of the boat.

The radio cabinet is home to handhelds, accessories, and other necessities.

The Yaesu FTM-400 VHF and UHF radio mounted in a waterproof "glove box."

The hamstick-style antennas for VHF and UHF, custom mounted on the roof of the boat.

Coaxial cables, separation connecting cables for the radio to base, the tuner control cable, the copper braided ground wire, and other wires pass through gray plastic tubing to the radios in the cabinet.

Also in the radio cabinet is an auxiliary 30 A 12 V dc power supply, a 2 F filter capacitor, a USB hub, and other handheld radios and accessories.

The Icom IC-7100 control head connects to the base transceiver via RJ45 connectors/Cat6 cable and can be used anywhere in the boat cabin or cockpit. The IC-7100 with a remote control head was a great choice for HF, VHF, and UHF, as the unit can be used at the helm or in the cockpit of the boat on nice days, and in inclement weather it stays in the dry cabin. It's also nice that with the extended RJ45/Cat6 cable the radio can be used at the cabin dining table in the boat or in the front berth for late-night contacts.

After using the Yaesu FTM-400 at the helm for a few weeks, we learned the radio does not have enough audio output (the Yaesu specs say 8 W audio) when used with our West Marine external 6-inch speakers. We added a two-channel Pyle 90 W audio amplifier so we could crank up the volume and hear the FTM-400 when the boat was under way with a lot of engine and wind noise. We also interfaced the Pyle amplifier to the Uniden SDS100 scanner, providing plenty of loud audio output in the noisy marine environment.

Cabin electronics include a Verizon MiFi 5G hotspot and wireless router that offers very fast broadband for streaming video from the various streaming services, as well as high-speed internet and web connectivity for our personal devices. The hotspot also allows, for example, the boat's navigation displays to mirror our laptop and iPhone screens, and allow the Icom IC-7100 remote control, weather, internet weather radar, marine tracking, and other applications to be displayed at the helm or any of the four TVs on the boat.

It's also cool that, using the 5G wireless high-speed connectivity and *Parallels* remote access software, I have access to my work and home computers, as well as my home location's radio control computer that's connected to my ham radios and scanners at home, with the ability to listen to and operate them remotely from the boat.

The boat install required some creativity in building custom antenna mounts, creating counterpoises, grounding, wiring, and making sure the system would not affect other electronics on the boat. With a lot of up-front planning and hard work on the installation, we were very happy with the results. After all, having the Pacific Ocean as a ground plane is a pretty good environment for getting the most from 100 W on HF.

The Pang Jin transmitter survived a shipwreck on the way to the 1939 New York World's Fair, and it's still functional with the crystal that let sailors call for help. Click here to listen to Stan Wood, WA4NFY, share this fascinating tale, along with more details about the transmitter.

All photos by the author.

John Turner, KG6ODI, graduated from the Communications Electronics program at GASC Technology Center in Flint, Michigan, in 1972. His career started in the manufacturing and computer industry. John and his wife, Patty, moved to San Diego, California, in 1981, founding a company that developed and sold telecommunications products. He sold his company in 2003 to make time for family and hobbies, including ham radio, desert off-roading, and boating. Now that his kids are grown up, John returned to manufacturing as a Sales Program Manager in the electronic manufacturing services industry. He can be reached at **john@turnersandiego.com**.

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

An All-Band EmComm Go-Kit

This portable station is housed in a surplus steel instrument case and takes very little time to deploy.

Randy Richmond, W7HMT

In deciding which equipment to include in this go-kit for compactness, I knew I wanted an all-band radio. For the sake of having a reasonable communications range, I wanted a 100 W radio. Additional factors helped narrow my options to the Yaesu FT-857D; the first was its best-in-class idle current consumption of 0.6 A, and the second was its chassis size, which allowed the base chassis to reside in the bottom of the case. Thirdly, the remote-control head could be placed wherever it is convenient to operate.

The FT-857D lacks a built-in antenna tuner, but built-in tuners typically can only tune to a 3:1 impedance mismatch. For EmComm deployment, an antenna tuner capable of tuning a 10:1 impedance mismatch would give me greater flexibility, so I added the LDG Electronics YT-100 tuner designed specifically for the FT-857D. It also lacks a built-in USB audio/sound interface, so I included the Tigertronics SignaLink USB interface, which enables the station to send and receive data using software modems running on the host PC.

Because much of today's EmComm communication relies on Winlink for text and data communications, I wanted to fit a small laptop in the case, and my Dell Inspiron P25T fit this bill. The laptop's built-in battery is only good for less than 4 hours, so I added a small 120 V inverter to the equipment powered by the station's 13.4 V battery. Modified sine wave inverters are very compact, but because the waveform is essentially a square wave, the harmonic RF emission can interfere with HF communications. Therefore, I selected a sine wave inverter.

This all-band go-kit includes a radio, antenna tuner, laptop, battery management system, accessories, safety features, and more.

I also wanted the station to have a self-contained power source. I selected lithium iron phosphate (LiFePO4) for compactness and weight reduction. I wanted to run the equipment in voice receive mode from the batteries for more than 24 hours, which dictated a capacity of 15 Ah or more. I chose to use eight 38120 (aka "Headway") cylindrical cells of 8 Ah each, arranged in two parallel strings of four series-connected cells with a total capacity of 16 Ah. I also needed a battery management system because I did not use an off-the-shelf 12 V LiFePO4 battery. I selected one that allowed configuring set points and monitoring cell voltage and battery state of charge using a Bluetooth app.

EmComm Station Go-Kit Contents

The steel case houses the following:

- Yaesu FT-857D 100 W all-band, all-mode radio with detachable faceplate
- LDG Electronics YT-100 100 W antenna tuner capable of tuning up to 10:1 impedance mismatch
- Tigertronics SignaLink USB radio interface
- USB CAT cable for PC control of the FT-857D
- A small-footprint Windows 10 laptop/tablet for running digital modems and *Winlink Express* software

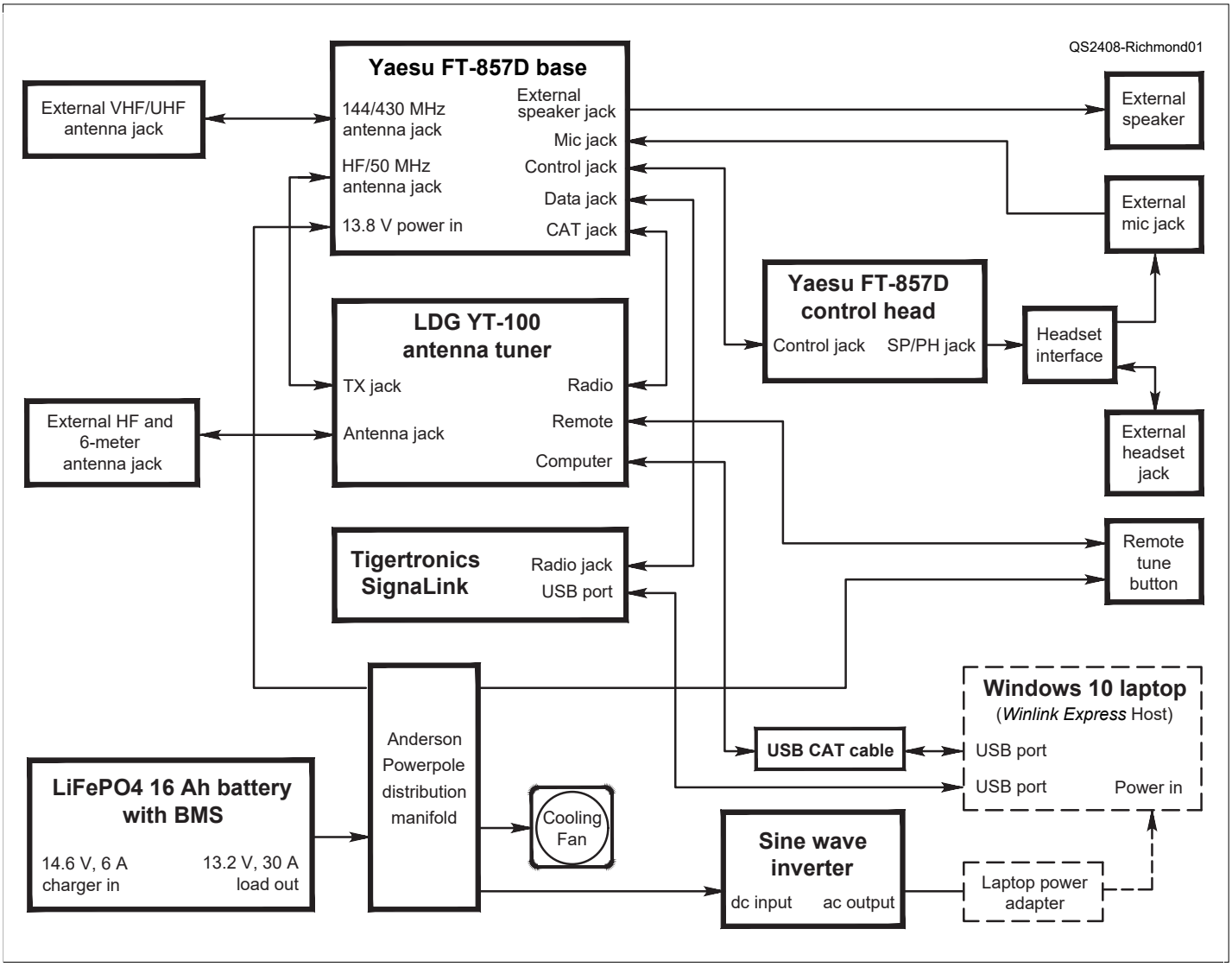


Figure 1 — Block diagram of the author's all-band go-kit.

- A small sine wave inverter for extending the duration of the laptop's battery
- 12 V fan to circulate air within the case
- 16 Ah 13.4 V LiFePO4 battery pack with Bluetooth-enabled battery management system

Two separate plastic cases carry the following:

- Dual-band VHF/UHF handheld and spare battery
- Microphone and headset for use with the FT-857D
- Laptop 120 V power supply/charger
- LiFePO4 battery charger (for recharging the station's battery pack from 120 V ac)
- USB-powered LED workspace lighting
- NMO mag-mount base with dual-band mobile VHF/UHF antenna
- RAM® X-Grip® mount for mounting the steel case when deployed, to give easy access to the handheld
- Coax, wire, and ground stakes for a double inverted-**V** 80/40-meter NVIS antenna (15-foot collapsible mast is carried separately)
- A pack of ICS and other forms, clipboard, pens, and pencils used for EmComm recordkeeping
- Vest, hat, and badge to identify myself as an EmComm volunteer

Construction

One of my primary goals was to operate the equipment with minimal setup. EmComm volunteers seldom control their operating environment, so being able to operate either standing or seated, with easy access to the radio's control head, speaker, and microphone, and the CAT and Signalink USB cables, was desirable. To achieve this, I 3D-printed a hinged mag-mount "nest" and bracket for holding the detachable control head at various angles and orientations.

When not deployed, the go-kit is compact and weighs 36 pounds.

The radio equipment could fit within the larger of the two compartments of the steel case. However, with interconnecting cables, it was a challenge. I fabricated 3D-printed PETG brackets to hold the radio base and antenna tuner, which helped.

Having experienced the dangers of high-current batteries, I wanted to ensure that the batteries would be well insulated from the steel case. Fortunately, a half-size plastic ammo box fit nicely into the smaller compartment. I 3D-printed PETG spacers and covers to hold the cells, battery management system, Anderson Powerpole connectors, combined voltmeter and USB power outlet, and 30 A circuit breaker that also serves as the main power switch.

The FT-857D comes with a hand mic, which works fine when the station operates in quiet environments. But in a noisy environment, a headset with a noise-canceling mic is preferred, so I added a Kenwood-style headset jack adjacent to the mic connector to accept a Heil HTH-K headset and built an interface to adapt it to the FT-857D's mic and speaker jacks. Adjacent to the mic and headset jacks are a remote button and LED for the antenna tuner, allowing me to initiate tuning more easily.

A hinged aluminum plate covers most of the main compartment and its wiring. A 12 V fan is mounted to the plate to help ventilate the case and dissipate heat during operation, and I also drilled ventilation holes in the top of the case near the handle.

The FT-857D has two antenna ports: one for VHF/UHF and one for HF and 6 meters. Two short coax jumpers terminated in UHF female panel connectors are secured to holes drilled at the bottom of the case, where they can be accessed more easily for deployment. Caps cover these external connectors when they're not in use.

The case's lid comes in handy as a base for the mag-mount dual-band VHF/UHF antenna. The inside of the lid is padded to protect the laptop that sits under the lid when the case is closed. Also stowed in the lid are small magnetic signs attached to the case showing my EmComm team affiliation and call sign. The case dimensions are 17.5 × 11.5 × 7.5 inches. It weighs a hefty 36 pounds, but the weight helps keep it stable for operation.

Deployment

Upon arriving at a deployment site, I remove the lid and set the laptop and case on a table. I then attach the detachable control head to the adjustable hinge, adjust it to face me, and secure it with a bracket. The mag-mount VHF/UHF antenna is attached to the lid, coax is secured to the case's external VHF/UHF antenna connector, and the lid/antenna is placed in a suitable location. I place the double inverted-**V** 80/40-meter NVIS antenna outdoors and attach the center peak to the 15-foot telescoping mast with a coax balun at the top. The Signalink and CAT USB cables are connected to the laptop, and the laptop is turned on (for extended operation, the laptop's power adapter is plugged into the inverter inside the case). I turn on the battery circuit breaker switch, which activates the radio's power button. Finally, I attach magnetic mount signs with our team's name and my call sign to the case. The go-kit is ready for operation.

All photos by the author.

Randy Richmond, W7HMT, grew up in the land mobile radio (LMR) industry. His father, the original owner of the W7HMT call sign, owned a two-way radio service shop. It wasn't until 1986, when Randy was established as an electrical engineer working for the LMR manufacturer Zetron, that he got his ham license. Later he received his Extra-class license and began designing off-grid power systems for telecom applications. Now in his retirement, Randy is the Team Lead and Assistant Emergency Coordinator for the North Bend, Washington, ARES Team (NBAT). He can be reached at **w7hmt@arrl.net**.

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

ARRL National Convention at 2024 Hamvention®

Highlights from ARRL's exhibits, programs, and activities.

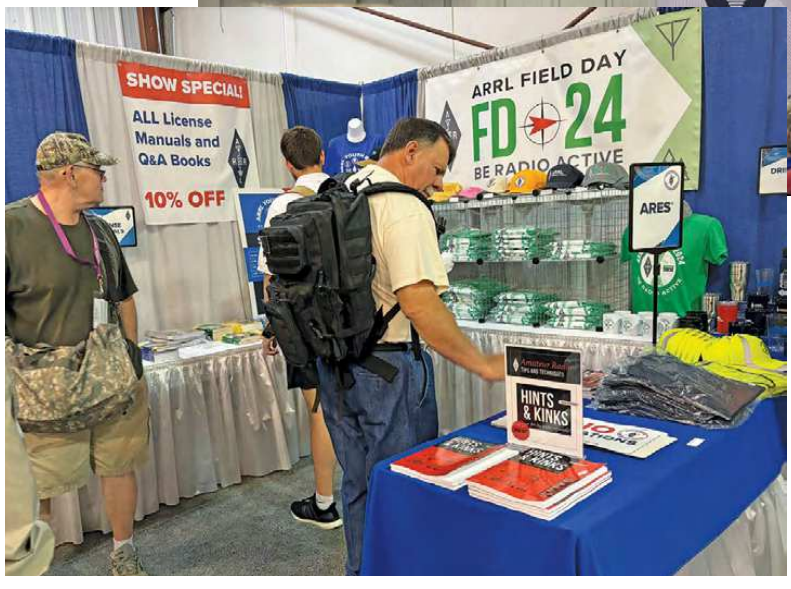
Sam Shaner, KE1SAM

The 2024 ARRL National Convention hosted by Dayton Hamvention®, May 17 – 19, at the Greene County Fairgrounds and Expo Center in Xenia, Ohio, is a wrap.

The ARRL National Convention primarily celebrated and encouraged growing numbers of young people in ham radio with a Youth Rally, and related activities and designated booths for the Collegiate Amateur Radio Program, Education and Learning, and the ARRL Youth Lounge. These spaces welcomed youth in attendance. Additional booths featured the Amateur Radio Emergency Service® (ARES®), ARRL Development and Foundation, Field Volunteers, the ARRL Great Lakes Division, the ARRL Laboratory, and Radiosport and DXCC® representatives. The ARRL National Convention offered a wide variety of activities, exhibits, and social opportunities for hams of all ages.

Thousands of event-goers descended on the large ARRL exhibit area in the Tesla building. In the ARES booth, ARRL Director of Emergency Management Josh Johnston, KE5MHV, met and greeted those already involved in their local ARES groups as well as those interested in getting involved. This informative exhibit was flanked by that of the ARRL Great Lakes Division and the Field Volunteers. The Great Lakes Division booth, which represented the Ohio, Kentucky, and Michigan Sections, was headed by ARRL Great Lakes Division Director Scott Yonally, N8SY. The Field Volunteers booth was supported by ARRL Field Services Manager Mike Walters, W8ZY, who spoke with individuals curious about volunteer opportunities at the Section and/or Division levels, as well as club involvement.

ARRL-sponsored forums at the National Convention attracted big audiences. Pictured here is ARRL First Vice President Kristen McIntyre, K6WX, presenting "Ground is a Myth!" [Sam Shaner, KE1SAM, photo]



ARRL books and Field Day merchandise were popular items to browse and shop for. [Sam Shaner, KE1SAM, photo]

Students participated in many hands-on activities during the ARRL Youth Rally at the 2024 ARRL National Convention. [Bob Inderbitzen, NQ1R, photo]

The ARRL Collegiate Amateur Radio Program was well represented at the 2024 ARRL National Convention. [Bob Inderbitzen, NQ1R, photo]

Another major attraction at the ARRL National Convention was the array of sponsored forums held throughout Hamvention weekend.

The first forum was "ARES, SAFECOM, and Building Relationships." As the title suggests, Johnston discussed ARRL's ongoing cooperation with SAFECOM, the US Cybersecurity and Infrastructure Security Agency's program for improving national public safety communications. ARRL was elected to SAFECOM in 2023, giving the organization a seat in national emergency communications policymaking. This partnership represents, on a broader scale, the relational nature of ARES. During the presentation, Johnston also touched on the new Basic and Intermediate EmComm courses available via the ARRL Learning Center. The new Advanced course is still in development.

ARRL National Instructor Gordon West, WB6NOA, presenting "Instructor Academy with Gordon West." [Bob Inderbitzen, NQ1R, photo]

Immediately following this was "Instructor Academy with Gordon West." Earlier this year, ARRL became the publisher of Gordon West, WB6NOA (**www.arrl.org/news/arrl-is-new-publisher-of-gordon-west-wb6noa**), and named him the ARRL National Instructor. "Gordo" kept spectators highly engaged as he provided an overview of the new ARRL Instructor Program, which is aimed at current and aspiring ham radio mentors/instructors. The Program can be found in the ARRL Learning Center, and it offers various tools for teaching ham radio concepts to prospective licensees. He demonstrated the effectiveness of his own teaching methods throughout the presentation.

Another popular forum as part of the National Convention slate was Kyle Krieg's, AAØZ, "How to Control Your Ham Shack with a Node-RED Dashboard." This programming language has many uses; Krieg focused on how it allows for browser-based ways to operate radio setups. All you have to do to start is install Node-RED on a Raspberry Pi and follow the remaining steps detailed on his YouTube channel, "Kyle - AA0Z."

A playlist of many of the ARRL-sponsored forums is available at **www.youtube.com/@ARRLHQ/playlists**. The programs were produced in HD and include the "ARRL Membership Forum," "Five Steps to a Successful POTA Activation," "Ground is a Myth!," "Beyond Repeaters: See How Far Your Technician Class License Will Take You," and many more.

"The content and programming are just too good to not share with ARRL members who couldn't make it to Hamvention," said ARRL Public Relations and Outreach Manager Sierra Harrop, W5DX. "There's something for every interest and experience level. I learned a lot while we were recording them! I hope our members find the playlist to be a valuable reference for years to come," she said.

Youth Focus

This year's ARRL National Convention put major emphasis on youth and collegiate amateur radio. This effort has been headed largely by ARRL Education and Learning Manager Steve Goodgame, K5ATA, who presented "Youth Outreach Through Amateur Radio STEM Education." Audience members learned how to successfully discuss amateur radio and wireless technology with school leaders and educators to help them see that radio provides the perfect learning platform for science, technology, engineering, and math (STEM) education. As a former school educator himself, Goodgame further discussed what schools are looking for as they attempt to blaze their own trails while creating meaningful STEM/STEAM curricula.

The ARRL Youth Lounge was a great meetup location for students of all ages. The Youth Lounge also served as a center of activities focused around youth interests, including an "escape room" and a "What do you think?" board on which they were able to leave notes answering various STEM-related questions. Their answers will help ARRL create meaningful lessons designed around student interests. Within the lounge they were also able to learn about how computer science and coding relate to amateur radio while learning to create their own custom firmware and upload it to a handheld. Finally, students were engaged in hands-on activities, like building magnet wire motors under the direction of Teachers Institute instructor Wayne Greene, KB4DSF, and ARRL Model School Teacher Everton Henriques, KD2ZZT.

The ARRL Youth Rally was an all-day event on Saturday for hams aged 11 – 21. It began with a nearly 3-hour forum moderated by renowned ham radio educator Carole Perry, WB2MGP, who leads the Youth Forum each year at Hamvention. She then introduced the lineup of youth speakers, including sixth grader and Parks on the Air enthusiast Cameron Frey, KD9VGV.

After the forum concluded, participants and audience members disbanded for lunch before regrouping in Forum Room 3. Goodgame led the Youth Rally activities. But before getting settled, a satellite pass was expected to happen at any minute. Goodgame dashed outside with young hams in tow, and excited chatter fell to a hush. Youth participant and instructor Grace Papay, K8LG, discussed satellite operations with Youth Rally participants. With the assistance of the Radio Amateur Satellite Corporation (AMSAT) volunteers, using their demonstration setup, participants were able to hear hams making contacts through the TEVEL 3 satellite, while one youth attempted to make a contact. Unfortunately, it was a low pass, so there was little time to actually reach another ham on the air. After the pass concluded, Papay taught the youngest group members about what they just did, and how they can hone their technique for future passes. Many similar hands-on activities were held to show — rather than tell — attendees just how fun amateur radio can be in so many applications.

The Youth Rally participants later had the opportunity to operate an FM Sprint contest. This high-energy activity let them learn a little about ham radio contesting. Following the Sprint, Carlos Ortiz, K9OL, of the YouTube channel "LifeAtTerminalVelocity," operated an Icom IC-705 as he skydived and parachuted and made "parachute mobile" contacts with the students. Several ARRL staff and volunteers helped to serve as control operators for those without a license. A foxhunt that covered the fairgrounds was the final event that led into the "Collegiate Amateur Radio Program" forum, for which several high school-aged participants stayed to learn about amateur radio opportunities when they continue their education.

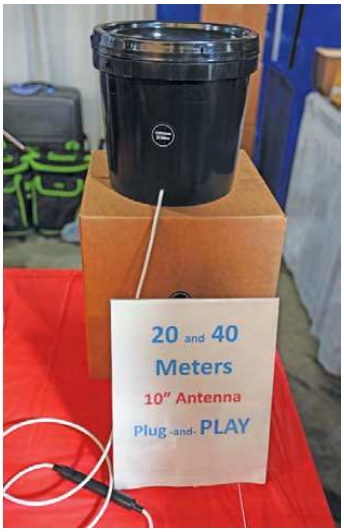
The "Collegiate Amateur Radio Program" forum was presented by collegiate volunteer Morgan Lyons, KI5SXY, and program advisors Andy Milluzzi, KK4LWR, and Tony Milluzzi, KD8RTT. Lyons is a student at the Missouri University of Science and Technology. The group discussed their successes in spreading ham radio across college campuses nationwide. By providing examples of what they've been doing to increase licensing among undergraduates, they discussed how best to reach young adults who may not otherwise be interested in radio.

Students gathered for the ARRL Youth Rally at the 2024 ARRL National Convention. [Bob Inderbitzen, NQ1R, photo]

New Products at Hamvention

FlexRadio featured the FLEX-8000 Series SDR transceivers. All four models in the series build on the success and original idea of the FLEX-6000 series. This new series has increases in CPU, FPGA, attached memory, and other capabilities, like adaptive pre-distortion for the cleanest signal possible. Shipping starts August 2024. **www.flexradio.com/products/flex-8000-deposit/?sku=FLEX-8000-Deposit-FL**. [Sam Shaner, KE1SAM, photo]

GigaParts brought the Explorer POTA20 portable handheld telescopic carbon fiber mast. Shipping has started for this item. **www.gigaparts.com/explorer-pota20-portable-handheld-20-ft-telescopic-carbon-fiber-mast.html**. [Sam Shaner, KE1SAM, photo]



COMPACtenna displayed the new omni-directional, plug-and-play 20/40 MICRO HF antenna. Made with weather- and UV-resistant materials and spiraled metal sheeting, this antenna's "magnetic field resonator" design contributes to its great performance. Shipping is estimated to start November 2024. **www.compactenna.com/#PH6**. [Pascal Villeneuve, VA2PV, photo]

ARRL introduced the Dual-band Momobeam for 6 and 10 meters. A 10-meter Moxon and 6-meter Yagi are both included in this innovative design. Shipping has started. **https://home.arrl.org/action/Store/Product-Details/productId/2018039112**. [Bob Inderbitzen, NQ1R, photo]

Expert Amps showcased their SPE Expert 1.5K-FA Taurus, a solid-state with dual LDMOS, fully automatic and remotable linear amplifier. Shipping is expected to start September – October 2024. **www.expertamps.com/products/SPE-Expert-1-5K-FA-Taurus-Coming-Soon-p653778429**. [Sam Shaner, KE1SAM, photo]

Begali Keys announced their 70th Anniversary key. Only 424 of them will be made. The key is made of AISI-316 polished stainless steel, and the lightweight arms of the paddle have a 1:1 leverage ratio. Shipping has already started. **www.i2rtf.com/70th-anniversary.html**. [Begali Keys photo]

Icom America showed their IC-R15, a versatile handheld receiver. In addition to its Dualwatch feature, users can appreciate a large in-color LCD, "Simple" mode, and much more. As of press time, shipping is expected to begin by the end of the year. **www.icomamerica.com/lineup/products/IC-R15**. [Sam Shaner, KE1SAM, photo]

DX Engineering debuted the 75 Ω High CMI Receive Feedline Choke. Covering a large RF frequency range, its CMI is typically more than 7500 Ω across 160, 80, and 40 meters. Shipping has started. **www.dxengineering.com/parts/dxe-rxfc-75#overview**. [Sam Shaner, KE1SAM, photo]

Icom America created some buzz around the mostly secret X60. A concept model was shown, but little information was discernable aside from 200 W PA and several USB and Ethernet ports. More will be revealed at the 2024 Tokyo Hamfest. [Pascal Villeneuve, VA2PV, photo]

Sierra Harrop, W5DX, sharrop@arrl.org

Happenings

Solar Activity Significantly Affecting Ionosphere, FCC Opened Docket for Comments on Impact

The sun has been busy, and it's been a mixed bag for radio amateurs. In early May, millions of people got a chance to see the aurora borealis for the first time, as the northern lights were active farther south than they had been in decades. The brilliant displays, visible as far south as Mexico, were a result of a series of coronal mass ejections (CMEs). The energy from our star interacted with particles in the upper atmosphere, causing them to glow in dancing curtains of multicolored light.

VHF aurora activity was up significantly, according to DX spotting clusters and activity heard on the air. The 2- and 6-meter bands were especially active, as the aurora acted like a reflector in the sky to enable signals to propagate much farther than they normally can on those bands.

Director of the ARRL Central Division Carl Luetzelschwab, K9LA, is a leading expert on propagation. He's provided the following analysis of the situation:

May 10, 11, and 12 of 2024 may go down as one of the greatest space weather storm periods of our lifetimes. It all started with two big sunspots in early May. These two big sunspots were identified as AR3663 (in the northern solar hemisphere) and AR3664 (in the southern solar hemisphere). AR stands for active region.

Both of these sunspot regions produced multiple M-class and X-class solar flares, which caused radio blackouts (signals were significantly attenuated) on the sunlit side of Earth. Typically, a radio blackout lasts for an hour or so, is most severe on the lower frequencies, and is due to the X-ray radiation from the solar flare increasing D-region absorption.

Not only did the big solar flares cause radio blackouts, they also caused solar radiation storms due to energetic protons that increased ionospheric absorption in the D region in the polar caps (the area inside the auroral ovals). Solar radiation storms can last for a couple of days and can result in degraded propagation on over-the-pole paths.

*But the biggest impact to propagation started on May 8, when AR3664 released multiple Earth-directed CMEs. CMEs manifest themselves as geomagnetic storms by significantly increasing the 3-hour K index. The K index indicates the activity of the Earth's magnetic field and ranges from 0 (quiet) to 9 (extremely disturbed). The image (from **www.swpc.noaa.gov**) shows the [data from May 10 – 12]. When the K index is this high for such a long time, the electron density in the F2 region of the ionosphere can be significantly depleted for days, not allowing higher frequen-*

The aurora borealis visible on May 11, 2024, from the Berkshire Mountains of Massachusetts. [Sierra Harrop, W5DX, photo]

cies to be propagated. On-the-air activity confirmed this.

In summary, early May was a very interesting period. We saw all three categories of disturbances to propagation — radio blackouts (X-ray radiation from solar flares), solar radiation storms (energetic protons from solar flares), and geomagnetic storms (elevated K indices).

The Federal Communications Commission's (FCC's) Public Safety and Homeland Security Bureau wanted to know if individuals noticed any impacts to radio communications during the storm. In a public notice, the FCC wrote:

To better understand the impacts of the geomagnetic storm on the US communications sector, the Bureau is requesting information from communications service providers and the public regarding disruptions in communications between May 7 and 11, 2024, that it believes to be a result of the storm. The Bureau is encouraging commenters to provide any available evidence, particularly electromagnetic spectrum analyses, imagery, or chronological logs relating to the storm's impacts. Where possible, the Bureau asks that commenters include the description of the impacts; make and model of affected communications equipment, which could include transmitters, receivers, transceivers, switches, routers, amplifiers etc.; make, model, and type of affected [antennas] and their composition; frequencies affected; type and composition of cable adjoining communications equipment and the antennae, if applicable; duration of the impact; and any residual effects observed in the hours following restoration.

Though the deadline for submitting comments has ended as of press time, the FCC is currently expected to be analyzing all of the received data.

Amateur Radio Connects Family Members During Utah Boating Emergency

On June 5, amateur radio operator Isaac Stiles, KJ7FAY, and his 3-year-old son were involved in a boating accident. Their canoe had tipped over at the Lost Dog Confluence to the Flaming Gorge Reservoir. The initial emergency call was made by Stiles' wife, Kendal. She had to drive to nearby campsites until she found someone with a phone, and then she made the call to the Green River Fire Department (GRFD). She told them the pair were in the water but could not be seen or found. Emergency responders rushed to the scene.

The fire crews were able to find Stiles and his son on the opposite side of the river. They were rescued by a Sweetwater County Sherriff's Department boat. Stiles' son needed ambulance transportation to a waiting Air Med Helicopter, which would then take him to Primary Children's Hospital in Salt Lake City.

Stiles said that once his son was loaded into the ambulance to meet the helicopter, he needed to call his mother to take care of his other son, but there was no cell phone service. So, he tuned his mobile ham radio to a local repeater and was able to reach Zach Gunyan, KE7WYG.

Gunyan made telephone contact with Stiles' mother and relayed critical information. He went a few steps further and stayed on the phone to help calm Mrs. Stiles and assure her that everything was going well. He took the rest of the day off from work, kept monitoring the repeater until Stiles was back in the area, and then went to the scene of the accident to help recover the boat and equipment.

After the telephone conversations with Gunyan, Mrs. Stiles thanked him for his help, to which he replied, "This is why I originally got into ham radio, to help just one person in an emergency."

Stiles had a hard time finding the words to thank Gunyan. "He's always been a dependable person and helped in many amateur events," said Stiles. "We are fast becoming good friends!"

Gunyan said he keeps his radio on most of the time, except when he is moving between locations and servicing computer networks. "I lose signal as I move from building to building," said Gunyan. "But on the day of the accident, I just happened to be at the right place, where I could hear the call for help."

Zach Gunyan, KE7WYG (left), and Isaac Stiles, KJ7FAY (right). [SARC photo]

Stiles' son is now out of the hospital and on track to make a full recovery.

Gunyan is an ARRL member and the current president of the Sweetwater Amateur Radio Club (SARC). He is an Emergency Management volunteer with the Sweetwater County Sheriff's Office. Stiles, secretary of SARC, is now working on a way to recognize Gunyan for his efforts during the accident.

ARRL Teachers Institute Kicks Off Summer Cohorts

In mid-June, teachers gathered from around the US to learn about amateur radio and how to use it in their classrooms as part of science, technology, engineering, and mathematics education. The 2024 cohorts of the ARRL Teachers Institute (TI) on Wireless Technology have begun.

The first group members for the year were each returning teachers participating in the second round of learning, TI-2. "TI-1 was an amazing, immersive experience that broadened my knowledge of wireless technology, electronics, and amateur radio. I implemented ideas and applications from the very first day of the workshop within the first week of my return to school," said Everton Henriques, KD2ZZT, a teacher from Staten Island, New York. "Attending TI-2 would further invigorate my teaching practice and allow us to do more cool projects," he continued.

TI-2 takes things a step further from basic radio principles. "It builds on what they learned the previous year and really exposes these teachers to advanced remote-sensing technologies," said ARRL Education and Learning Manager Steve Goodgame, K5ATA.

TI-2 also includes a demonstration of telemetry data gathering from amateur satellites, basic amateur satellite operation, and a discussion of applications of the satellite data to math and science topics. TI-2 participants will also learn how to do Arduino programming and remote sensing.

"The ARRL Teachers Institute is easily one of the best classes I have ever taken. The hands-on projects were phenomenal, and everything I learned in TI-1 was useful with my club and in the classroom. TI-2 is raising the bar, and I already have a ton of ideas for things I will do next year based on this course. I am deeply grateful to ARRL for this opportunity," said Dr. Chris Brown, W9SBS, of the Alabama School of Cyber Technology and Engineering.

The ARRL Teachers Institute on Wireless Technology is funded entirely by donors through the ARRL Education and Technology Program. Learn more at **www.arrl.org/ti**. There are seven TI cohorts this summer. It costs teachers a $100 application fee to attend. All travel, lodging, and other costs are covered by the generous donors.

Section Manager Nomination Notice

To all ARRL members in Eastern Massachusetts, Missouri, Nebraska, NYC-Long Island, Northern New York, South Carolina, Southern New Jersey, West Central Florida, and Western Pennsylvania. You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

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

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

We suggest the following format:

(Place and Date)

Field Services Manager, ARRL
225 Main St.
Newington, CT 06111

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

(Signature _____ Call Sign _____ City _____ ZIP _____)

Any candidate for the office of Section Manager must be a resident of the Section, an amateur radio licensee of Technician class or higher, and a full member of ARRL for a continuous term of at least 2 years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4:00 PM Eastern Time on September 6, 2024. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters no later than October 1, 2024, to full members of record as of September 6, 2024, which is the closing date for nominations. Returns will be counted November 19, 2024. Section Managers elected as a result of the above procedure will take office January 1, 2025.

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

Call for Nominations for ARRL Director and Vice Director

Attention: Full ARRL members in the Central, Hudson, New England, Northwestern, and Roanoke Divisions. You have the opportunity to choose a Director and Vice Director to represent you for a 3-year term beginning January 1, 2025.

ARRL is governed by its Board of Directors. A voting Director is chosen by ballot by the full (licensed) ARRL members in each of its 15 Divisions. Vice Directors who serve in the absence of the Director at a Board meeting and succeed to the position of Director should a vacancy occur are chosen at the same time. Elections are held in five Divisions per year. It takes only 10 full members in a Division to nominate a candidate for either office.

Qualifications

The eligibility of nominees for the positions of ARRL Director and Vice Director will be reviewed by the Ethics & Elections Committee, composed of three Directors not subject to election this year: Mickey Baker, N4MB; Jeff Ryan, KØRM, and Scott Yonally, N8SY. A nominee must be at least 21 years old and must have been licensed and a full member of ARRL for a continuous term of at least 4 years immediately preceding nomination. Each nominee must provide information concerning their employment, ownership, investment interests, and other financial arrangements to ensure compliance with the Conflict of Interest Policy (see Article 12 of the ARRL *Articles of Association and Bylaws* 18 – 24), available at **www.arrl.org/general-information**. The qualifications for Director and Vice Director are identical. All the powers of the Director are transferred to the Vice Director in the event of the Director's resignation, recall, removal outside the Division, inability to serve, or death.

Nomination Procedure

Step 1: Obtain official nominating petition forms. Starting July 1, any full member residing in a Division where there is an election may request an official nominating petition package in writing, either by letter or via email, to **execadmin@arrl.org**. The request must reach the ARRL Secretary *no later than noon EDT on Friday, August 9, 2024*. If you are seriously considering running or nominating someone to run, please don't wait until the last minute to request the forms; the deadline for submitting a completed petition form is just 1 week later.

Step 2: Complete the questionnaire and obtain signatures. Only the official form may be used. The candidate must complete page one, providing the information required to determine eligibility, certifying its accuracy, and agreeing to assume the office if elected. To be valid, a nominating petition must name the candidate and must bear the signatures of 10 full members of the Division.

Step 3: Submit the petition form. The completed form must reach the Secretary *no later than noon EDT on Friday, August 16, 2024*. The submission may be made by electronic transmission of images (i.e., a PDF or JPEG attachment to an email) or facsimile provided that upon request, the original documents are received by the Secretary within 7 days of the request. A person who is nominated for both Director and Vice Director may choose to decline the nomination for Director; otherwise, the nomination for Director will stand and that for Vice Director will be void.

On Monday, August 19, 2024, the Secretary will notify each candidate of the name and call sign of each other candidate for the same office. Candidates will then have until Friday, August 30, 2024, to submit a 300-word statement and a photograph if they desire those to be made available to voters in accordance with instructions that will be supplied.

Balloting

If there is only one eligible candidate for an office, he or she will be declared elected by the Ethics & Elections Committee. If there is more than one eligible candidate for an office, the full members in that Division who are in good standing as of September 10, 2024, will have the opportunity to cast ballots. Official voting documents will be mailed to members who are eligible to vote no later than October 1, 2024. Votes must be electronically cast, or completed paper ballots must be received at the designated PO Box in the envelope provided, by noon Eastern Time on Friday, November 15, 2024. The candidate receiving the most votes will be declared the winner that day.

Absentee Ballots

A full member who is residing temporarily outside his or her home Division, including overseas, may arrange to vote in the home Division by notifying the Secretary before September 6, 2024, giving their current mailing address as reflected in the ARRL membership records (i.e., *QST* mailing address) and the reason that another Division is considered home. Members with overseas military addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal addresses.

The Incumbents

The incumbent Directors and Vice Directors, respectively, in the five Divisions in which elections will be held this year are:

Central: Carl Luetzelschwab, K9LA, Director, and Brent Walls, N9BA, Vice Director

Hudson: Nomar Vizcarrondo, NP4H, Director, and Ed Wilson, N2XDD, Vice Director

New England: Fred Kemmerer, AB1OC, Director, and Phil Temples, K9HI, Vice Director

Northwestern: Mark J. Tharp, KB7HDX, Director, and Michael Sterba, KG7HQ, Vice Director

Roanoke: Jim Boehner, N2ZZ, Director, and Bill Morine, N2COP, Vice Director

For the Board of Directors:

David A. Minster, NA2AA, Secretary/ Chief Executive Officer

Steve Ford, WB8IMY, wb8imy@arrl.net

Cuban Club Gatherings

To keep activity and interest high, members of the municipal radio club of the city of Morón, Cuba (CO9IHA), met to hold their first semiannual assembly for 2024. According to club president José Ángel Iraola Rivero, CM7JI, the gathering was devoted to exchanging ideas about recruiting new amateurs, and discussing what new activities can be devised to get current hams more active on the air.

Yasmany Amador Quiroga, CO7GQ, spoke of the need for colleagues in the Technical Group to support amateurs who have difficulties with their equipment, which is a common challenge for clubs throughout the world. José Rivero called on those present to join efforts to reinvigorate on-air activities aimed at remembering the most important anniversaries in radio in general and Cuban history in particular. As an example, José highlighted the announcement issued early this year by the Provincial Executive of Ciego de Ávila that had invited the entire membership to participate in the celebration of World Radio Amateur Day.

The gathering also recognized the work of Junior Valdés, CO7JV, by presenting him with the "Panchito" Distinction, awarded by the Provincial Executive of the Federacion de Radioaficionados de Cuba of Villa Clara.

José Ángel Iraola Rivero, CM7JI, president of the municipal radio club of the city of Morón, Cuba. [Federación de Radioaficionados de Cuba photo]

Cyprus in CQ World Wide

The Cyprus Amateur Radio Society reports that numerous amateurs on the island were active in the CQ World Wide SSB contest earlier this year. Team P33W was active from the western portion of the island, taking part in the multi-operator two-radio, high-power category. With a total of 12,409 contacts, 1,927 prefixes, and a score of 77,943,296 points, the team is claiming the first-place position worldwide. Team P33W was comprised of Dmitry Guskov, R3DCX; Andrei Suzdalev, R4FO; Harry Buklan, RA3AUU; Sandy Orlov, RW4WR, and Igor Korolkov, UA4FER.

Team C49C was active from the capital Nicosia, taking part in the multi-operator single-radio, low-power category. With a total of 3,128 contacts, 1,046 prefixes, and a score of 10,830,032 points, the team is claiming third position worldwide, and first position in Asia. The team has also broken the previous Asia record held by TC7G since 2021 with a total score of 4,435,743 points. Team C49C was comprised of Stavros Tsiakkouris, 5B4AFM; Nestor Jacovides, 5B4AHZ; Panos Efstathiou, 5B4AJO; Antreas Liasi, 5B4AQA; George Mappouras, 5B4KH, and Spyros Stavrinides, 5B4MF.

Marios Nicolaou, C4W (5B4WN), took part from Nicosia. With a total of 4,103 contacts, 1,258 prefixes, and a score of 16,776,688 points, Marios is claiming second position in Asia, and seventeenth position worldwide.

Konstantinos Kepolas created a highlight video of the CQ World Wide operation at C49C, and it is available for viewing at **https://youtu.be/h3PsnFtTAbw?si=cSOycUA1U8efOtYT**. [Konstantinos Kepolas photo]

Roman Thomas, P35A (5B4AQN), took part from the southwest part of the island. He earned a total of 2,621 contacts, 1,018 prefixes, and a score of 7,377,446 points.

It's worth mentioning that while the C49C operation was conducted by a seasoned group of contesters, it was open to local club members who had never participated in a contest and wanted to experience the thrill of on-air competition firsthand.

The newest member of the club, Konstantinos Kepolas, from Kepolas Productions, surprised the C49C team by making a highlight video that can be viewed online at **https://youtu.be/h3PsnFtTAbw?si=cSOycUA1U8efOtYT**. Konstantinos is looking forward to taking the test and obtaining his amateur license soon.

World Amateur Radio Day in Iceland

An open house was held in the social facilities of Islenskir Radioamatorar in Skeljanes, Iceland, on World Amateur Radio Day, April 18. Twenty-seven members and two guests attended.

There was a station on the air with the special event call sign TF3WARD. Favored with good propagation conditions, the station remained active for 10 hours, making a total of 1,177 contacts, primarily on 20-meter SSB. Three members took turns keeping the station on the air: Hrafnkell Sigurðsson, TF8KY; Sigurður R. Jakobsson, TF3CW, and Jónas Bjarnason, TF3JB.

Hrafnkell Sigurðsson, TF8KY, operating TF3WARD on World Amateur Radio Day. [Islenskir Radioamatorar photo]

A Repeater for Outjo

Members of the Namibian Amateur Radio League, along with several German amateurs, installed an FM repeater at Outjo, about 40 miles from Otjiwarongo and the Etosha National Park. The installation team consisted of Martin Wieland, V51ZU; Olaf Bucking, V51OB; Robert Schenk, V51RS; Karsten Scholz-Weigl, V5\DK1SW, and Silvia Schenk, V51YL. The repeater is designed to expand coverage throughout the sparsely populated area and extend communications all the way to Windhoek, the capital of Namibia.

Olaf Bucking, V51OB, works on the tower to secure the antenna feed line. [Namibian Amateur Radio League photo]

Olaf Bucking, V51OB, and Robert Schenk, V51RS, begin work on the antennas for the Outjo repeater. [Namibian Amateur Radio League photo]

After a successful installation, it was time to test the repeater. Seen here is Olaf Bucking, V51OB, speaking with Angela Schenk, V51SA, in Windhoek, the capital of Namibia, and Derek Moore, V51DM, via EchoLink from Cape Town, South Africa. [Namibian Amateur Radio League photo]

Rick Palm, K1CE, k1ce@arrl.net

Public Service

An In-Depth Look at the NTS

We all have our favorite nets. Mine is the ARRL Northern Florida ARES Net on 40 meters. I enjoy checking in to the net every morning at 9 AM — it goes well with my coffee. The net is managed by Northern Florida Section Emergency Coordinator (EC) Arc Thames, W4CPD, with Leo Nadeau, Jr., N4MRJ, as net control operator.

Leo calls the net, reads the roster, and checks in members. But first, he calls for any stations that are holding emergency, priority, or routine traffic, such as radiograms, which are formatted messages that follow ARRL protocol and are destined for delivery locally or outside of the net's coverage area. Depending on the destination of the messages, the traffic representative receives them off the net frequency for delivery or for entering into the National Traffic System (NTS), which has seen a resurgence in popularity lately due to the efforts of the ARRL Board of Directors and the NTS 2.0 Steering Committee that's studying and updating the nearly 75-year-old system.

Unfortunately, traffic is seldom listed on the net for handling. The lack of traffic to process hasn't been good for the health of the system over the decades. There are solutions to consider, but first, let's explore a bit of NTS history to put the system into perspective.

Bill Schrock, NØET, serves as the ARRL Missouri Section Traffic Manager and is an active participant and contributor with the NTS 2.0 working groups.

The Beginning

In the early 1950s, staff at ARRL Headquarters made an effort to consolidate the Amateur Radio Emergency Corps (AREC) — the forerunner of today's Amateur Radio Emergency Service® (ARES®) program — and the National Traffic System (NTS), which had been conceived in 1949 from the prior trunk lines relay system that had been employed (this system also led to the creation of the American Radio Relay League in 1914). Under one ARRL-sponsored umbrella, which was to be called the Amateur Radio Public Service Corps (ARPSC), the goals were to have the NTS operate daily, 365 days of the year, handling routine radiogram traffic.

The AREC would occasionally conduct drills to develop operating acumen and maintain a state of readiness. Once a year, a nationwide simulated emergency test — in which the AREC nets would become active at local levels to handle simulated emergency messages — and the NTS would provide local and long-distance record message handling support. This required close cooperation between these two divisions of ARPSC.

When the Radio Amateur Civil Emergency Service (RACES) was launched, ARRL planned on adding it as a third division of the ARPSC, but ultimately, the organization chart was constructed to show that the connection between RACES and ARPSC was one of support, not sponsorship. The responsible civil defense staff wanted to use amateur radio operators to fulfill their emergency communications needs and plans as a separate service. ARRL proposed that ARPSC and RACES overlap so that AREC would be the principal emergency communications system during peacetime and RACES during wartime or other periods of national emergency.

ARRL was to recommend that local AREC groups participate in their local RACES organizations but also maintain their AREC identity to support other agencies involved in peacetime emergencies. The benefit of this arrangement was that they would be prepared to participate in RACES whenever it was activated, switching hats as indicated. ARRL saw the ideal situation as

having the local AREC EC and RACES Radio Officer be the same person, or at least have a good working relationship between these two key leadership officials. Ideally, each group would be composed of the same radio amateurs. Over the years, this arrangement worked well in some cases, and in other cases, only partially or not at all. But the ultimate goal was for a relationship between the two organizations that promoted the greatest efficiency and effectiveness overall for an amateur radio response in any emergency, disaster, or wartime event.

ARPSC never really took hold for several reasons, most of which involved innate human and organizational behavior, but NTS, ARES, and RACES still exist today, and ARRL still works hard to promote and upgrade these programs for the benefit of all public service-minded radio amateurs and the agencies they serve. ARPSC was committed to the annals of ARRL history.

The System Today

It's time to bring these programs back together. Trained and experienced NTS traffic handlers can once again serve as water carriers for emergency communication systems and programs like ARES. They can provide for competent, accurate, and efficient message handling across the country via multiple modes including digital. Professionalism and quality control are the goals. The ARRL Board of Directors' NTS 2.0 Steering Committee (**https://nts2.arrl.org**) is working hard to reinvigorate and raise the standard of operation of NTS traffic handlers.

The NTS operates every day, even continuously, with advanced digital links. The personnel consist of operators who participate a few times a week, and some who are active daily. The NTS is an organized effort to handle traffic in accordance with a plan that is easily understood and employs modern methods of network traffic handling in general acceptance today.

The NTS is not intended as a deterrent or competition for the many independently organized traffic networks. When necessitated by overload or lack of outlet for traffic, the facilities of such networks can function as alternate traffic routings where indicated and in the best interest of efficient message relay and/or delivery. One of the most important features of the NTS is the system concept — NTS nets aren't independent entities that can conduct activities without concern for or consideration of the other NTS nets. Each one only performs its function in the overall organization. If nets fail to do so or they perform functions intended for other nets, the overall system may be adversely affected.

Finding Solutions

Of course, if there isn't any traffic to handle, the system is put at risk. You can't get water from a stone, and you can't keep volunteers idle for too long before they give up. A simple solution could be that each check-in to a traffic or ARES net originates a radiogram (it doesn't have to be lengthy or elaborate — a few words will do) and gets brought to the net, listed, and then sent. Think of the amount of messages that would be generated if every traffic handler followed this easy protocol!

Additionally, net control stations (NCSs) can grow nets and promote traffic handling by adding signal reports. One of the most important pieces of information that an NCS for any kind of net could convey is a simple signal report to the stations checking in. All stations want to know how strong and readable their signal is. If you're a net manager and want to grow your net roster, adopt a protocol of having your NCSs give a speedy, brief signal report to every check-in. They'll relish the report and come back every day to receive it. Here's a sample:

Checking-in station transmits, "KC1RMP, with traffic."

Net control replies, "KC1RMP, S9, please list your traffic."

Adding a quick signal report will help get your checking-in stations coming back day after day.

Fun and Camaraderie

Often overlooked in the discussion of these types of programs is the fun factor. Traffic handling is pure, unadulterated enjoyment and comes with the camaraderie of fellow passionate hams. You can find out how to originate, send, receive, and deliver radiogram-formatted messages, find your area's traffic handling nets, read complete and up-to-date discussions, and find a host of other resources at **www.arrl.org/nts**.

Feedback

- In the June 2024 issue, the Figure 1 photo credit in Jim Peterson's, K6EI, and Jim DeLoach's, WUØI, "Field Day — Safety First!" should be attributed to Steve Elstad, AJ6PV. This has since been corrected in the digital edition.
- In the July 2024 issue, the "Securing Equipment on Inclined Surfaces" entry in "Hints & Hacks" contains a duplicate image in Figure 4. To see the correct Figure 4 image, visit the digital edition at **www.arrl.org/qst**.

Contest Corral

August 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
1	0000	2	0300	7	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name	**qrpcontest.com/pigwalk40**
1	1800	1	2200	28	NRAU 10m Activity Contest	CW Ph Dig	RS(T), 6-char grid square	**nrau.net/nrau-contests-in-general**
2	0100	2	0130	(see rules)	NCCC FT4 Sprint	FT4	4-char grid square	**ncccsprint.com/ft4ns.html**
2	0230	2	0300	(see rules)	NCCC Sprint	CW	Serial, name, QTH	**ncccsprint.com/rules.html**
3	0000	4	2359	3.5-28	Batavia FT8 Contest	Dig	4-char grid square	**batavia-ft8.com**
3	0001	4	2359	28	10-10 International Summer Contest, SSB	Ph	Name, mbr or "0," SPC	**www.ten-ten.org**
3	1200	3	2359	1.8-28	European HF Championship	CW Ph	RS(T), 2-digit year first licensed	**euhf.s5cc.eu/euhfc_rules**
3	1400	3	1800	144	WAB 144 MHz Low Power Phone	Ph	RS, serial, WAB square or country	**wab.intermip.net/144MHz QRP Phone.php**
3	1800	4	0559	1.8-28	North American QSO Party, CW	CW	Name, state/DC/province/country	**www.ncjweb.com/NAQP-Rules.pdf**
3	1800	4	1800	222 and up	ARRL 222 MHz and Up Distance Contest	CW Ph Dig	6-char grid square	**www.arrl.org/222-mhz-and-up-distance-contest**
4	0600	4	1359	144	Hemus VHF Contest — 144 MHz	CW Ph	RS(T), 6-char grid square	**radioclub-troyan.bg**
4	1400	4	1700	3.5-14	SARL HF Phone Contest	Ph	RS, serial	**www.sarl.org.za**
6	0000	6	0200	3.5-28	ARS Spartan Sprint	CW	RST, SPC, power	**arsqrp.blogspot.com**
10	0000	10	2359	3.5-28	FISTS Saturday Sprint	CW	RST, first name, mbr or "0," SPC	**fistsna.org**
10	0000	11	2359	3.5-28	WAE DX Contest, CW	CW	RST, serial	**www.darc.de**
10	1200	10	1300	7	SARL Youth QSO Party	Ph	RS, age	**www.sarl.org.za**
10	1400	10	2200	3.5-28	Kentucky State Parks on the Air	CW Ph Dig	KY park abbr, SP or "DX"	**k4msu.com/kypota**
10	1400	11	0400	1.8-28	Maryland-DC QSO Party	CW Ph	MDC county/city or SPC	**www.w3vpr.org**
10	1800	10	2200	50	50 MHz Fall Sprint	CW Ph Dig	4-char grid square	**www.packratvhf.com**
10	2200	12	2159	144	MMMonVHF/DUBUS 144 MHz Meteorscatter Sprint Contest	CW Ph Dig	Signal report	**www.mmmonvhf.de**
11	1300	11	1600	3.5-14	SARL HF Digital Contest	Dig	RST, serial	**www.sarl.org.za**
12	0000	12	0200	1.8-28	4 States QRP Group Second Sunday Sprint	CW Ph	RS(T), SPC, mbr or pwr	**www.4sqrp.com**
13	1900	13	2000	3.5	DARC FT4 Contest	FT4	RST, 4-char grid square	**www.darc.de**
14	0030	14	0230	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or pwr	**naqcc.info**
14	1300	15	1300	3.5,7,28	YB Bekasi Merdeka Contest	Ph	RS, YB section or "DX"	**orari-kotabekasi.com**
15	0000	16	0300	14	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name	**qrpcontest.com/pigwalk20**
15	1900	15	2000	3.5-14	NTC QSO Party	CW	Max 25 WPM, RST, mbr or "NM"	**pi4ntc.nl/ntcqp**
17	0000	18	1600	3.5-28	SARTG WW RTTY Contest	Dig	RST, serial	**www.sartg.com**
17	0800	18	0800	1.8-28	Russian District Award Contest	CW Ph	RS(T), RU district code or serial	**rdaward.org/rdac1.htm**
17	0900	19	0759	10 GHz to light	ARRL 10 GHz and Up Contest	CW Ph Dig	6-char grid square	**www.arrl.org/10-ghz-up**
17	1200	18	1200	1.8-28,50	Keyman's Club of Japan Contest	CW	RST, JA prefecture/district code or CQ zone	**kcj-cw.com/contest/rule/2024_45_kcj_dx_.pdf**
17	1600	17	1759	1.8-28,50	Feld Hell Sprint	Dig	See rules	**sites.google.com/site/feldhellclub**
17	1800	18	0559	1.8-28	North American QSO Party, SSB	Ph	NA: name, state/DC/province/country	**www.ncjweb.com/NAQP-Rules.pdf**
17	2100	18	2100	1.8-28	CVA DX Contest, CW	CW	RST, type/UF	**cvadx.org/regulamento-cvadx-2023**
18	0000	18	2359	3.5-28	FISTS Sunday Sprint	CW	RST, first name, mbr or "0," SPC	**fistsna.org**
18	1700	18	2100	3.5-28	NJQRP Skeeter Hunt	CW Ph	RS(T), SPC mbr or power, "W"	**www.qsl.net/w2lj**
18	1800	18	2359	3.5-28	ARRL Rookie Roundup, RTTY	Dig	Name, 2-digit year first licensed, SPC or XE provience	**www.arrl.org/rookie-roundup**
18	2300	19	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, (mbr/pwr)	**qrpcontest.com/pigrun**
23	2200	25	2359	1.8-28	SCRY/RTTYOps WW RTTY Contest	Dig	RST, 4-digit year license first issued	**rttyops.com**
24	0000	25	2359	2.3 GHz and Up	ARRL EME Contest	CW Ph Dig	See rules	**www.arrl.org/eme-contest**
24	0400	26	0400	1.8-28	Hawaii QSO Party	CW Ph Dig	RS(T), HI district, or SP	**www.hawaiiqsoparty.org**
24	0600	25	0559	3.5-28	ALARA Contest	CW Ph	RS(T), serial, name	**www.alara.org.au/contests**
24	1200	25	1200	3.5-28	YO DX HF Contest	CW Ph	RS(T), YO county, or serial	**www.yodx.ro**
24	1200	25	0300	1.8-28,50	US Islands QSO Party	CW Ph Dig	RS(T), island designation or SPC	**usislands.org/qso-party-rules**
24	1200	25	1200	1.8-28	World Wide Digi DX Contest	Dig	4-char grid square	**ww-digi.com**
24	1400	25	2000	3.5-28,50	Kansas QSO Party	CW Ph Dig	RS(T), KS county, SP or "DX"	**ksqsoparty.org**
24	1600	25	0400	1.8-28	Ohio QSO Party	CW Ph	RS(T), OH county, SP or "DX"	**www.ohqp.org**
24	2100	25	2100	1.8-28	CVA DX Contest, SSB	Ph	RST, type/UF	**cvadx.org**
25	1400	25	1700	3.5-14	SARL HF CW Contest	CW	RST, serial	**www.sarl.org.za**
31	0000	31	2359	1.8-28,50	Feld Hell Sprint	Dig	See rules	**sites.google.com/site/feldhellclub**
31	1200	1	1159	1.8-28	Russian WW MultiMode Contest	CW Ph Dig	RST, 2-char oblast or serial	**www.rdrclub.ru**
31	1200	1	1200	3.5-28	UK/EI DX Contest, SSB	Ph	RS, serial, UK/EI district code (if UK/EI)	**www.ukeicc.com**

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

Jeff Stai, WK6I, wk6i.jeff@gmail.com

2024 ARRL RTTY Roundup Results

This year's ARRL RTTY Roundup was held January 6 – 7, 2024.

As this was the second year that the ARRL RTTY Roundup was RTTY only, there were 1,953 logs submitted. That's 160 more than last year! This puts the activity back on par with what we've seen in the years before the FT modes impacted the contest. If you exclude the years between 2019 and 2022 (the FT years), 2024 saw the highest number of log submissions in the event's history!

ARRL RTTY Roundup Logs Received by Year: 2018 – 2024

Year	Number of Logs Received	Mode
2018	1,620	RTTY Only
2019	2,642	RTTY and FT
2020	2,087	RTTY and FT
2021	2,353	RTTY and FT
2022	2,350	RTTY and FT
2023	1,793	RTTY Only
2024	1,953	RTTY Only

Where did these new entries come from? Let's begin by taking a look at the category choices.

2024 RTTY Roundup Logs Received by Category

Category	2023	2024	Change
Single Operator, High Power	255	274	19
Single Operator, Low Power	762	826	64
Single Operator, QRP	57	45	–12
Total Single Operator	1,074	1,145	71
Single Operator Unlimited, High Power	340	379	39
Single Operator Unlimited, Low Power	298	346	48
Single Operator Unlimited, QRP	12	18	6
Total Single Operator Unlimited	650	743	93
Multioperator, Single Transmitter, High Power	29	28	–1
Multioperator, Single Transmitter, Low Power	21	23	2
Multioperator, Two Transmitter	14	8	–6
Multioperator, Multitransmitter	5	6	1
Total Multioperator	69	65	–4
Total	1,793	1,953	160

Unlike last year, which showed a lot of growth in the entries for the Multioperator categories, this year's majority of growth was in the Single Operator Unlimited categories, with an increase in Single Operator non-assisted as well.

Mark Johnsen, NB1U (left), supervises Tim Brooks, W6WWW (right), during the 2024 RTTY Roundup. The Fort Myers Amateur Radio Club held a RTTY workshop concurrent with the contest at their club station, W4LX. [Bob Lewis, N8GU, photo]

In looking at the geographic distribution of entries, almost all the growth came from DX stations, led by stations from Europe and Asia. Even South America and Oceania saw an increase, which is definitely healthy and encouraging! After a little more digging, the leading countries in Europe were Italy (more than 100 entries), followed by Germany, Netherlands, Poland, Russia, Spain, and the United Kingdom.

As you might expect, Japan was responsible for the bulk of the logs in Asia. Over in Oceania, Indonesia and Australia led the way, while in South America, Brazil had the highest number of logs submitted.

This year, 590,435 contacts were reported, an increase of 74,197 from last year. All bands saw an increase in activity from last year. One might have expected 40 and 80 meters to decline with all the sunspot activity lately, but there was an increase in activity on both of those bands.

Affiliated Club Competition

Club	Score	Entries
Unlimited		
Potomac Valley Radio Club	3,043,991	74
Society of Midwest Contesters	2,894,516	58
Medium		
Northern California Contest Club	2,846,876	50
Minnesota Wireless Assn.	1,936,860	50
Yankee Clipper Contest Club	1,782,019	31
Frankford Radio Club	1,747,057	40
Arizona Outlaws Contest Club	1,483,605	22
Contest Club Ontario	986,702	25
Florida Contest Group	792,445	24
Kansas City Contest Club	683,816	7
Central Texas DX and Contest Club	582,626	6
Western Washington DX Club	513,067	4
Willamette Valley DX Club	425,437	10
DFW Contest Group	424,742	11
Grand Mesa Contesters of Colorado	411,616	6
Kentucky Contest Group	409,539	10
Niagara Frontier Radiosport	382,582	13
Tennessee Contest Group	369,908	14
Swamp Fox Contest Group	327,084	9
Carolina DX Assn.	313,346	9
South East Contest Club	298,390	6
Spokane DX Assn.	286,683	6
Saskatchewan Contest Club	275,765	3
Orca DX and Contest Club	251,678	5
Northeast Maryland Amateur Radio Contest Soc.	238,215	6
Big Sky Contesters	222,190	4
Alabama Contest Group	129,505	6
Southern California Contest Club	100,926	12
New Providence ARC	97,451	3
Maritime Contest Club	85,718	4
Idaho Mountain ARS	81,512	3
Hudson Valley Contesters and DXers	70,603	3
Bay Area DXers	69,366	3
Texas DX Soc.	68,282	3
Heartland DX Assn.	58,512	5
Mad River Radio Club	54,664	6
Oklahoma City Autopatch Assn.	46,165	3
Rochester (NY) DX Assn.	34,566	4
North Coast Contesters	33,847	4
Silver Comet ARS	17,820	4
Local		
Orleans County ARC	637,566	8
Bristol (TN) ARC	98,182	5

Sponsored Plaque Winners

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

Winner	Plaque Category	Plaque Sponsor
AC0C	W/VE Single Operator, High Power	Brian Moran, N9ADG
W4AAA (KK9A, op)	W/VE Single Operator, Low Power	Doug Faunt, N6TQS
AA5AU	W/VE Single Operator Unlimited, Low Power	Doug Faunt, N6TQS
TM3Z (F4DSK, op)	DX Single Operator Unlimited, Low Power	Dimitri Cosson, F4DSK
JA6GCE	DX Single Operator, QRP	Doug Faunt, N6TQS
G4ZFE	DX Single Operator Unlimited, QRP	Doug Faunt, N6TQS
9A5Y	DX Multioperator, Single Transmitter, High Power	Paolo Cortese, I2UIY, memorial by WØYK
K3RWN	Atlantic Division Single Operator, Low Power	Mike Jacoby, N3MA
AI9T	Central Division Single Operator, High Power	Society of Midwest Contesters
K9WX	Central Division Single Operator, Low Power	Society of Midwest Contesters
K9CT	Central Division Single Operator Unlimited, High Power	Society of Midwest Contesters
WT9U	Central Division Single Operator Unlimited, Low Power	Society of Midwest Contesters
NØAT	Dakota Division Single Operator, High Power	Minnesota Wireless Assn.
WØAAE	Dakota Division Single Operator, Low Power	Minnesota Wireless Assn.
WØBM	Dakota Division Single Operator Unlimited, High Power	Minnesota Wireless Assn.
NØHJZ	Dakota Division Single Operator Unlimited, Low Power	Minnesota Wireless Assn.
K9UC	Delta Division Single Operator, Low Power	Charles Anderson, KK5OQ
NØLLH	Midwest Division Single Operator, Low Power	Jeff Blaine, AC0C
W7YAQ	Northwestern Division Single Operator, Low Power	Brian Moran, N9ADG
K7QA	Northwestern Division Single Operator Unlimited, High Power	Brian Moran, N9ADG
KA6BIM	Northwestern Division Single Operator Unlimited, Low Power	Brian Moran, N9ADGZ
W7RN (WK6I, op)	Pacific Division Single Operator, Low Power	Doug Faunt, N6TQS
KA4RRU	Roanoke Division Single Operator Unlimited, Low Power	Larry Dennis, KS3H
NØYY	Roanoke Division Single Operator Unlimited, Low Power, Limited Antenna Overlay	Larry Dennis, KS3H

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.

Continental Winners

Africa		
Single Operator, High Power	D4L (IK2NCJ, op)	53,312
Single Operator, Low Power	EA8AQV	10,664
Single Operator Unlimited, High Power	EA8DIG	94,962
Asia		
Single Operator, High Power	JA1OVD	44,704
Single Operator, Low Power	JS1OYN	32,718
Single Operator, QRP	JA6GCE	20,510
Single Operator Unlimited, High Power	P3X	216,111
Single Operator Unlimited, Low Power	JG1LFR	21,842
Single Operator Unlimited, QRP	JH3DMQ	756
Europe		
Single Operator, High Power	F6AGM	129,696
Single Operator, Low Power	EA4AOC	99,283
Single Operator, QRP	SP4LO	16,940
Single Operator Unlimited, High Power	UW1M (UR5MW, op)	232,029
Single Operator Unlimited, Low Power	TM3Z (F4DSK, op)	222,732
Single Operator Unlimited, QRP	G4ZFE	11,774
Multioperator, Single Transmitter, High Power	9A5Y	249,375
Multioperator, Single Transmitter, Low Power	OL1Z	53,268
Multioperator, Two Transmitter	DP7D	294,032
Multioperator, Multitransmitter	DP9A	256,100
North America		
Single Operator, High Power	AL7LO	24,000
Single Operator, Low Power	WP3C	144,425
Single Operator Unlimited, High Power	ZF2SS	227,968
Single Operator Unlimited, Low Power	KP2B (WP3A, op)	129,753
Multioperator, Single Transmitter, Low Power	K6VHF/HR9	63,075
Oceania		
Single Operator, High Power	KH6ZM	94,350
Single Operator, Low Power	YB2MM	9,686
Single Operator, QRP	YC4SIZ	660
Single Operator Unlimited, High Power	VK4SN	7,590
Single Operator Unlimited, Low Power	YB9ELS	16,870
Multioperator, Multitransmitter	7E3E	24
South America		
Single Operator, High Power	P49X (WØYK, op)	357,313
Single Operator, Low Power	ZW2N (PY2MNL, op)	104,976
Single Operator, QRP	YW6CQ	3,750
Single Operator Unlimited, High Power	PV2K (PY2KNK, op)	104,410
Single Operator Unlimited, Low Power	PY5AMF	46,368
Multioperator, Single Transmitter, Low Power	PP1WW	53,963

Top Ten — US and Canada

Single Operator, High Power

AC0C	321,625
AA3B	320,256
NN1SS	285,894
K7RL	237,207
AI9T	205,410
N3QE	163,856
K5XH	152,856
AD5XD	146,387
NØAT	145,310
N7GP	144,243

Single Operator, Low Power

W4AAA (KK9A, op)	228,903
W7RN (WK6I, op)	185,948
WØAAE	126,720
VE3DZ	125,350
W7CXX (WA7LNW, op)	111,360
K9WX	107,712
WA1FCN	94,570
W7YAQ	88,266
K3RWN	87,400
N8CWU	87,305

Single Operator, QRP

WDØT	49,800
K2YG	34,710
KO1H	28,674
WA3LXD	27,650
AA5KD	26,530
VE9AA	17,496
WDØBGZ	16,832
KA1CJI	10,614
W5RJJ	9,145
KG2U	7,854

Single Operator Unlimited, High Power

N8OO	377,292
K3MM	291,810
NØXR (@NØNI)	250,698
K9CT	240,992
K6LL	222,768
WØLSD	215,280
N2WK	208,915
N6IE	179,860
K1MK (@K1TTT)	173,475
WY7FD	170,240

Single Operator Unlimited, Low Power

AA5AU	259,419
KI1G	207,616
NØHJZ	134,809
WT9U	125,204
K9PW	114,128
K6EI	111,228
K1DC	109,434
VE3MGY	93,942
W9ILY	79,080
AD1C	77,490

Single Operator Unlimited, QRP

KG9X	89,369
W7RY	69,972
WQ6X	33,086
N6MA	22,425
N8URE	14,755
K2AL	13,041
KZ5DX (K2FF, op)	4,606
K8ZT	4,212
K5ND	3,822
NC1A	1,833

Multioperator, Single Transmitter, High Power

WØSD	293,531
N7AT	263,310
K5RZA	232,458
KY7M	232,050
K3AJ	209,385
N4SS	195,360
AD4ES	194,834
KIØF	183,644
ND2T	176,512
AB5EB	173,877

Multioperator, Single Transmitter, Low Power

W5YD	123,178
KT7E	107,957
N7GCO	91,530
NC1CC	83,410
W1QK	60,812
WA1F	59,452
WD4LBR	51,415
KOØZ	47,520
WSØZ	33,225
KG5VK	13,398

Multioperator, Two Transmitter

NJ4P	413,420
K7RU	246,340
K3CCR	134,031
WB9TFF	84,151
WA3EKL	50,838
W4TA	38,270
AK2S	27,936

Multioperator, Multitransmitter

WD6T (@N6RO)	390,450
W3GH	244,280
K5MXG	67,850
WX4E	9,342

Top Ten — DX

Single Operator, High Power

P49X (WØYK, op)	357,313
F6AGM	129,696
DL3BQA	96,616
KH6ZM	94,350
PZ5RA	81,507
YO3RU	61,074
DF8XC	59,278
IC8SQS	55,360
D4L (IK2NCJ, op)	53,312
KH6TU (AD6E, op)	49,713

Single Operator, Low Power

WP3C	144,425
HI3T	106,212
ZW2N (PY2MNL, op)	104,976
EA4AOC	99,283
F5BEG	69,488
TI2OY	60,480
CO2JD	55,936
J35X	44,640
YO9BCM	40,014
DN4TG	36,696

Single Operator, QRP

JA6GCE	20,510
SP4LO	16,940
EA3F	15,687
IP3O	10,017
SP4NKJ	9,359
ON4BHQ	6,656
G2B	6,256
RT6DI	5,712
JH7UJU	5,418
DK1AX	4,851

Single Operator Unlimited, High Power

UW1M (UR5MW, op)	232,029
ZF2SS	227,968
P3X	216,111
S53M (S51FB, op)	205,270
KL7SB	155,364
DQ9Y (DF2SD, op)	128,712
LY5W	107,420
IK3ORD	105,676
PV2K (PY2KNK, op)	104,410
EA4HPY	103,486

Single Operator Unlimited, Low Power

TM3Z (F4DSK, op)	222,732
EA4GOY	136,884
KP2B (WP3A, op)	129,753
S57AW	98,615
UT4LW	85,140
IP9A (IT9ZMX, op)	84,000
PA3DUU	71,248
LX1ER	51,051
SP2R	49,875
YT2U	49,632

Single Operator Unlimited, QRP

G4ZFE	11,774
PE2K	7,590
JH3DMQ	756
7L4IOU	480
SP3EMA	450
DDØVS	200

Multioperator, Single Transmitter, High Power

9A5Y	249,375
EI7M	237,716
OK7O	200,720
IQ9RG	119,462
MW2I	112,887
G2L	62,721
SD3T	45,900
YT6T	33,777
OK1KKI	350

Multioperator, Single Transmitter, Low Power

K6VHF/HR9	63,075
PP1WW	53,963
OL1Z	53,268
9A2EU	42,800
9A7B	15,540
UR3UW	2,970
DP6K	1,782

Multioperator, Two Transmitter

DP7D	294,032

Multioperator, Multitransmitter

DP9A	256,100
7E3E	24

Grant Willis, VK5GR, operated portable during the 2024 ARRL RTTY Roundup. He operated using his Australian contest call sign, VJ5W. [Grant Willis, VK5GR, photo]

The next ARRL RTTY Roundup will be held January 4 – 5, 2025.

Strays

Jacques Boone's, ON4CS (SK), book *MN 7: The Belgian Military Wireless Station at Baarle-Duc (Baarle-Hertog), World War I* relates an unknown episode in the Great War. It was right under the noses of the Germans that Lieutenant Paul Goldschmidt, engineer, and his team installed this Belgian military station of wireless radiotelegraphy and goniometry at Baarle-Duc (Baarle-Hertog), a small Belgian village enclave in the neutral Netherlands. The goniometric station would identify the origin of enemy signals. The book can be ordered from Amazon or by emailing **mn7radio@gmail.com**.

In November 2018, 100 years after Armistice Day (Veterans Day), enthusiastic Belgian radio amateurs revived the military station MN7 at the exact location in Baarle-Hertog (Belgium), using the special call sign OP187MN. There were thousands of contacts made.

The author's nephew, Idesbald Boone, recently came across Jacques' collection of about 700 QSL cards from 1935 through 1977. He would like to find out more about his uncle's amateur radio activities, so if your call sign is in one of the photos at **https://photos.app.goo.gl/8T1vjyXrcVxP8CEN6**, please contact Idesbald at **mn7radio@gmail.com**.

Mark Beckwith, N5OT, n5ot@arrl.net

2024 ARRL International DX CW Contest Results

This year's ARRL DX CW Contest was held February 17 – 18, 2024.

Top Ten — US and Canada

Single Operator, High Power

N5DX	9,909,048
K5ZD	8,553,024
ND7K (N6MJ, op @N6WIN)	8,470,332
K5GN	7,859,676
NR3X (N4YDU, op)	7,211,349
AA1K	6,852,258
N9RV	6,744,624
NA8V	6,405,120
VY2TT	6,330,120
VE3AT	6,277,809

Single Operator, Low Power

N1UR	3,915,126
K1TR	3,198,744
K1VUT	2,711,652
NAØN	2,387,376
K2PO	1,958,775
W1NN	1,873,125
K1GU	1,627,710
N9NB	1,551,396
N7VM	1,479,882
N7IV	1,294,839

Single Operator, QRP

W1FJ	1,212,720
N7IR	906,696
K1RO	789,798
NDØC	709,500
W6JTI	639,879
VA2IW	368,946
NQ2W	343,434
K8CN	324,414
WB2CPU	320,688
N7RCS	319,815

Single Operator Unlimited, High Power

AA3B	11,136,213
K1ZZ	9,100,962
N3RD	8,780,265
NY3A	8,509,644
VE3EJ	7,645,176
K1RX	7,484,706
W8FJ	7,257,540
K1AR	6,975,360
N4AF	6,931,143
WY3A	6,921,048

Single Operator Unlimited, Low Power

KI1G	7,048,278
W5MX	5,432,832
N4XL	3,499,275
NTØK (AA4LS, op)	2,763,312
W1PY	2,713,038
NS3T	2,559,927
K3QP	2,558,157
W3KB	2,483,868
KS1J	2,478,360
WA1S	2,459,457

Single Operator Unlimited, QRP

K6JS	693,405
N4AAJ	314,352
WQ6X	310,104
K2AL	252,444
W2/DL8CX	126,378
WC7S	90,675
VE3HG	74,520
K8ZT	63,756
W3EK	44,982
KR4AE	41,040

Single Operator, High Power, 160 Meters

K5UR	27,318
VE3PN	24,327
N4TZ	18,375
N4XD	8,775
NC4JP	2,187

Single Operator, Low Power, 160 Meters

WA5LFD	540

Single Operator Unlimited, High Power, 160 Meters

N3IQ (ND3F, op)	39,780
K9MMS	9,900
NJ6D	8,658
N8WS	48

Single Operator, High Power, 80 Meters

W3BGN	142,284
KØPK	17,316
KC8WH	1,386

Single Operator, Low Power, 80 Meters

K4WY	18,972
W1FP	13,311
AC8CE	3,696
N7NWL	2,664
WB5YUZ	663

Single Operator Unlimited, High Power, 80 Meters

W3NO	63,294
K4AEN	12,561
NIØK	12,084
AA1QD	3,219
KB1GKN	243

Single Operator Unlimited, Low Power, 80 Meters

N4AO (WC4E, op)	20,493
N3UA	11,808
WB2AIV	5,160
K5CAO	1,716
NU4M	1,386
KY6AA	396

Single Operator Unlimited, QRP, 80 Meters

AC2YD	13,524

Single Operator, High Power, 40 Meters

NØTT	171,615
K9CJ	98,298
N7RK	71,214
K3SV	64,251

Single Operator, Low Power, 40 Meters

WA3FAE	41,358
N9HDE	27,528
KØVW	14,916
WDØBGZ	8,424
VE2JR	3,645
WC1U	288
AE2JL	270
KD5YPH	27

Single Operator, QRP, 40 Meters

NN1DX	14,490
N2JNZ	6,105

Single Operator Unlimited, High Power, 40 Meters

KA1IS	567,672
K7NJ	371,628
K9OM	306,720
W3US	153,207
WA3C	132,696
WØCW	68,625
W9RN	53,352
W6XI	40,110
K8FC	33,075
KR4F	31,320

Single Operator Unlimited, Low Power, 40 Meters

W9XT	201,201
K3STX	119,085
AA4NP	111,618
N3CW	18,720
N1IXF	2,640
NJ9Q	1,512
W6BBD	144

Single Operator Unlimited, QRP, 40 Meters

K4XL	82,950
W7RY	14,364
KQ2RP	2,574
KK4UZK	120

Single Operator, High Power, 20 Meters

N2MF	637,905
KU2M	621,387
N7TU	376,002
WJ9B	372,204
KW9A	183,768
AI3Q	56,712
AF8C	47,652
W4JKC	41,790
N7HCN	918
WA2VIU	765

Single Operator, Low Power, 20 Meters

NG3Q	60,291
W8GOC	56,832
K1EFI	52,440
KC4WQ	44,121
W2TZ	25,155
W9WJ	9,702
AD4TJ	6,144
W3EH	5,940
K4RDU	3,864
WA1YGT	1,296

Single Operator, QRP, 20 Meters

N8ET	29,232
KS4L	4,536
KE5ES	1,980
KG5WAW	147
VA3RJ	108

Single Operator Unlimited, High Power, 20 Meters

K8CX	705,600
WA4JUK	211,848
N4PSE	183,900
KØVBU	92,736
W7CT	91,500
W4GD	61,146
KK7PW	49,374
VE7RK	18,810
N4GU	11,844
AJ3M	1,224

Single Operator Unlimited, Low Power, 20 Meters

K9RO	166,320
N2EIM	96,228
W2JV	69,192
WX2N	46,002
K5MXG	17,940
VE3ETE	11,070
KØKT	1,914

Single Operator Unlimited, QRP, 20 Meters

K9AXT	22,176
KQ6KC	10,545

Single Operator, High Power, 15 Meters

W7WA	548,379
W6YA	428,085
W6RKC	102,834
N4LZ	35,604
K7MY	26,832
VE7JKZ	19,278
AB5SS	1,386

Single Operator, Low Power, 15 Meters

W1QK	245,385
KM9R	122,145
K4AMC	100,023
VA3SP	99,330
N6RM	52,500
KA8WQL	52,065
ADØH	28,800
KS3F	28,032
VE3SKX	20,880
VE7MR	19,488

Single Operator, QRP, 15 Meters

KD9MS	113,742
N3GD	42,816
VA3IIF	9,936
K8RXB	6,156
VE2ZQ	1,995
N1AIA	720
W8NNC	420

Single Operator Unlimited, High Power, 15 Meters

WW3S	493,317
VE7ZO	472,311
N1LN	447,456
K3ZU	417,240
WF4DX (WB9Z, op)	380,688
WJ2D	344,505
KA6BIM	324,240
KC9EE	323,070
K7WP	274,965
W5TM	229,068

Single Operator Unlimited, Low Power, 15 Meters

WA1FCN	233,100
K1IM	134,316
KR2H	111,510
WU8T	81,891
K2SQS	66,240
AB1J	51,666
K3HW	36,900
WØBF	27,405
K6CTA	4,032
VE7KAJ	1,845

Single Operator Unlimited, QRP, 15 Meters

N9SE	80,127

Single Operator, High Power, 10 Meters

K2SSS	727,560
K1TO	636,030
K2UA	577,500
N5OT	523,050
K9BGL	477,420
K6AR	408,948
N7CW	403,200
N6KN	329,373
N1PGA	235,980
K8GU	198,198

Single Operator, Low Power, 10 Meters

WØUO	384,264
N8II	323,475
WB4TDH	281,688
K7SS	262,701
N4IJ	232,434
N9XX	221,445
WA5POK	150,447
WA7BNM	149,430
N6MZ	124,992
N5CO	87,822

Single Operator, QRP, 10 Meters

NØUR	134,415
K3TW	121,770
N4NM	77,454
KV8Q	74,304
WB2AMU	43,416
N6MA	36,783
N6AN	24,174
K2GMY	19,317
NØJK	18,966
N1VVV	9,990

Single Operator Unlimited, High Power, 10 Meters

K6LL	564,120
KØAP	556,416
KX7M	500,202
WO4O	440,856
K1JB	427,986
W2AW (N2GM, op)	364,680
N6SS	360,126
W9PA	357,918
K2LE	294,060
W7RG	194,832

Single Operator Unlimited, Low Power, 10 Meters

VE1ANF	229,881
W2UP	188,769
VE3GFN	164,406
KØKX	146,475
W1ZZ	121,260
W4TMO	107,877
VE5KS	92,736
VE5UF	83,472
WA3MD	75,840
KS2G	36,234

Single Operator Unlimited, QRP, 10 Meters

KG9X	275,652
K6GHA	60,480
W5GAI	49,680
K3JZD	40,596

Multioperator, Single Transmitter, High Power

W2FU	10,506,804
N4RV	10,066,836
K5TR	8,276,520
NJ4P	7,153,920
K3AJ	6,091,119
AA9A	5,819,550
K8AZ	5,200,875
KQ3F	4,967,415
K1ESE	4,199,580
K3PH	4,099,533

Multioperator, Single Transmitter, Low Power

W9SN	6,021,510
W4TG	1,896,510
KT4XA	1,730,550
W1FM	1,509,750
NJ1F	989,763
W5GAD	235,620

Multioperator, Two Transmitter

W3LPL	17,568,606
K9CT	14,321,628
VE3JM	12,839,298
N2NT	12,758,877
VA2WA	12,409,230
K9RS	12,076,680
N2AA	11,024,640
AA7A	9,143,442
NØAX	9,113,445
W4NF	9,021,696

Multioperator, Multitransmitter

K3LR	20,961,300
K1LZ	19,865,736
NR4M	17,478,147
K1TTT	14,753,097
KØRF	12,888,720
K3WW	10,748,661
N6RO	9,764,130
K1KI	7,675,317
K1KP	2,878,260

Top Ten — DX

Single Operator, High Power

8P5A	7,239,825
EF6T (EA3M, op)	5,735,925
P44W (W2GD, op)	5,417,280
MW4R (GW4XUM, op)	4,625,280
TI7W (N3KS, op)	4,376,832
II2Q (IK2PFL, op)	4,349,448
DJ5MW	4,162,950
OMØR (OM3GI, op)	4,061,304
ZD7W	4,037,247
OM2VL	3,903,603

Single Operator, Low Power

CR6K (CT1ILT, op)	5,327,400
PZ5DX (RA3CO, op)	4,297,590
CR3DX (OM3RM, op)	4,243,197
NP4Z	3,908,304
HA3NU	2,329,293
CO8ZZ	2,194,116
OR2F	1,977,831
4U1UN (KO8SCA, op)	1,969,590
DL9EE	1,943,268
OL5Y	1,918,392

Single Operator, QRP

D4L (IK2NCJ, op)	1,088,190
LY9A	641,376
DK7HA	614,016
YV6BXN	241,380
LZ2RS	211,584
JH7UJU	196,272
JR4DAH	146,304
ZS2M	131,820
ISØESG	128,817
7K1CPT	120,600

Single Operator Unlimited, High Power

TO4A (VE3DZ, op)	6,418,512
P49Y (AE6Y, op)	5,387,148
ED7W (EB7A, op)	4,467,474
E7DX	4,466,064
9A5Y (9A5DX, op)	3,813,120
OX7AM (OZ7AM, op)	3,794,328
SN7Q (SP7GIQ, op)	3,628,065
G4A (G4TSH, op)	3,609,804
G5W	3,521,736
DD2D (DK8ZB, op)	3,278,184

Single Operator Unlimited, Low Power

VP9I (AB2E, op)	3,490,395
IP3A (IK3QAR, op)	2,416,050
V26CV	1,842,591
9H6T (DF1DN, op)	1,788,150
ES7A (YL3JA, op)	1,759,068
OL9R (OK6RA, op)	1,729,560
DJ5MO	1,713,456
MI5I (GIØRQK, op)	1,623,942
S52NR	1,582,224
SN7O (SP7IVO, op)	1,577,475

Single Operator Unlimited, QRP

IZ3NVR	327,429
HG5O (HA5OB, op)	320,436
SD6F (SM6JWR, op)	267,582
DL6JF	209,145
DK1FT	170,046
G4BUE	140,454
JK7DWD	111,834
RA7C	102,606
DF1MM	77,760
EA5ICL	76,323

Single Operator, High Power, 160 Meters

NP2J (K8RF, op)	54,315
UYØZG	5,760
SP6IHE	2,220
NL8F	1,104
DL7CX	1,080
JA8NFV	690
JA9FHB	210
JH2KKW	75

Single Operator, Low Power, 160 Meters

V26OC (N3OC, op)	8,019
DL5KVV	1,479
JE1SPY	1,176

Single Operator Unlimited, High Power, 160 Meters

S56X	20,292
SP9JZU	20,265
YL3FT	16,290
DL7AT	15,159
UT6UD	11,790
UW5ZO	6,864
SP7M	4,536
JF1AMX	4,158
PA3FGA	1,350
SP6AEG	1,008

Single Operator Unlimited, Low Power, 160 Meters

TI5CDA	6,834
OL1A (OK1CW, op)	6,675
JH1BBT	189

Single Operator, High Power, 80 Meters

CS2C (OK1RF, op)	145,848
9A8M (9A3XU, op)	94,554
DL2SAX	86,598
UT5UGR	67,680
YT4T	30,666
SP4BEU	20,790
HA8BT	20,091
ON5WL	8,352
JH7XMO	1,932
JQ1TAR	144

Single Operator, Low Power, 80 Meters

OK2HBR	9,396
SP4AWE	4,830
HF5WIM	3,300
HC1MD/2	3,150
CT1BWU	1,683
DL2TOS	540
NP3CW	513
JH4CES	456
DL2HWI	300

Single Operator, QRP, 80 Meters

OK1RCX	648
OU2V (OZ1FJB, op)	216
JH1APZ	195

Single Operator Unlimited, High Power, 80 Meters

HA1TJ	113,850
9A5M	111,618
S51YI	94,605
II8K	63,648
IZ4ZZB	38,220
UT5EL	34,584
E79AA	33,138
GW9J (GWØGEI, op)	27,945
OK1DOY	23,142
DL7URH	20,172

Single Operator Unlimited, Low Power, 80 Meters

OK1DPU	20,094
YO5AVN	18,093
4Z4KX	8,814
DL8WAA	8,715
SP5ES	1,728
JP3WEL (JG1EIQ, op)	48
JH4FUF	24

Single Operator Unlimited, QRP, 80 Meters

EA5Y	3,360

Single Operator, High Power, 40 Meters

OM2XW	215,460
KP2DX (WP3A, op)	193,680
YT7A (YU7GM, op)	189,639
II2T (IZ2EWR, op)	120,204
EA5EL	118,845
HB9FBS	103,518
OH7K (OH7MA, op)	100,572
YU1RA	90,750
EA5M	89,595
M5D (G4WQI, op)	69,309

Single Operator, Low Power, 40 Meters

CO2JD	133,209
CO2AN	124,254
IC8JOH	85,212
OL2C (OK2YT, op)	51,561
VK2IG	35,880
IV3EAD	31,161
9A2M	23,760
E7ØY	19,215
OK5D (OK1DTP, op)	18,981
DL2TG	18,012

Single Operator, QRP, 40 Meters

OK6OK	12,810
IO5T (IK5TBK, op)	12,540
VK2CCC	9,486
LZ2AF	6,432
OK1CZ	2,904
JR1ABS	2,652
IZ2WYA	1,560
JM1MTE	810
YB3DXG	405
JJ1SWI	36

Single Operator Unlimited, High Power, 40 Meters

DK9PY	210,633
LZ9W (LZ5DI, op)	210,420
LZ5G (LZ5ET, op)	205,020
UW7LL	187,740
YT1A	173,652
HA7RY	170,172
HA7A	149,325
YO8DOH	140,904
DJ8VH	131,157
S53D (S57GM, op)	110,544

Single Operator Unlimited, Low Power, 40 Meters

EA5O	140,715
IK6VXO	121,974
HB9HTF	54,468
OM/UT2WW	52,650
HA6NL	48,984
OK2BFN	47,124
OK1AY	37,944
YO6FGZ	36,432
OM5ALL	33,417
R6CC	30,222

Single Operator Unlimited, QRP, 40 Meters

S58R	6,930
DK1VD	4,608
PA3CWN	900
DK3UW	336

Single Operator, High Power, 20 Meters

OH8L (OH8LQ, op)	267,180
9A7V	262,605
OM5R (OM5WW, op)	194,700
OK1FMX	144,432
IZ8GUQ	138,504
YT1T	131,334
SO7M (SP7JLH, op)	113,202
SV1ME	99,120
ON7RU	82,998
EU1DX	65,031

Single Operator, Low Power, 20 Meters

EA9ACD	149,118
XE1CT	112,689
WP4TZ	61,650
DL9ZP	55,692
IK4MTF	43,500
TA3NE	33,417
GJ2A (MJØASP, op)	31,863
YT5M	26,313
RZ3Z	23,547
IZ4OSH	21,870

Single Operator, QRP, 20 Meters

S51Z	35,052
US5VX	24,564
OE1OPW	2,277
EA2CAR	2,160
SP4NKJ	1,485
MØORY	1,458
YO4BEX	1,458
XE2MWY	468
YU7RQ	168
IU5RFA	126

Single Operator Unlimited, High Power, 20 Meters

HGØY (HA7GN, op)	276,480
OMØM (OM3CGN, op)	255,285
HG5E (HA1AH, op)	244,671
IP3X	167,973
ES2MC	163,725
RGØA	104,652
UY5ZZ	102,087
9A3ST	73,062
HA8IB	63,759
YT7X	58,344

Single Operator Unlimited, Low Power, 20 Meters

HC5CW	154,080
HG6O (HA6OA, op)	95,589
PY4XX	95,226
EA3IN	87,381
OM7LW	84,912
HZ1TT	70,620
PS8HF	64,896
UR2Y (USØYW, op)	58,482
EW1TZ	50,856
M4N (G4IZZ, op)	48,807

Single Operator Unlimited, QRP, 20 Meters

DM7AA	4,650
E74C	1,596
DL6GCE	840
ZS6WAR	216

Single Operator, High Power, 15 Meters

PJ4A	359,412
SN5X (SP5GRM, op)	217,440
HK1MW	216,282
S50R	186,120
JJØVNR	181,134
7K4XNN	137,424
JH1KRC	118,272
OK1FPG	116,325
WP4WW (KP4JRS, op)	88,245
SP9RCL	82,659

Single Operator, Low Power, 15 Meters

YV4YC	144,609
9A4BT	99,330
PY1KO	60,555
HC2AD	55,998
TF3EO	52,479
EW1TO	51,324
JA1GQC	42,900
SP2FOV	33,135
UT3QZ	29,670
JF1KML	28,800

Single Operator, QRP, 15 Meters

DL8MBS	16,731
DF3SM	7,380
OK1CBB	5,304
SQ2RH	3,120
PA5DX	2,772
JA1KPF	1,599
UT7AA	243
YC4SIZ	120
JL1NIE	36
JG1BGT	18

Single Operator Unlimited, High Power, 15 Meters

FY5KE (F6FVY, op)	381,555
V31DJ (WØCP, op)	260,043
SN3A (SQ2GXO, op)	258,945
SN2M (SP2XF, op)	248,880
S50K	248,148
9A5D (9A3VM, op)	233,325
S57Z	228,384
9A5X	218,502
SN2B (SP2MKI, op)	209,535
YTØC	202,320

Single Operator Unlimited, Low Power, 15 Meters

E7CW	144,180
HG9X (HA9AX, op)	129,630
SO4M (SQ4NR, op)	123,525
ON6NL	121,599
SP9XCN	117,540
FR8UA	100,746
JH7VHZ	95,256
JF3BFS	82,422
SP4JFR	76,779
DL5ME	73,701
ES5RY	73,701

Single Operator Unlimited, QRP, 15 Meters

EF3O (EA3O, op)	93,810
HG1S (HA1DAE, op)	73,101
SP3CYY	63,759
IK5RUN	10,500
BG3ODZ	3,300

Single Operator, High Power, 10 Meters

PW2E (PY2ZEA, op)	308,880
MW5B	291,600
LU8DPM (LU5WW, op)	269,010
PW2D (PY2BK, op)	254,736
DMØA (DK3DM, op)	248,685
S53WW	209,745
OL9Z (OK2PVF, op)	205,740
F6ARC	196,446
S50U	173,304
LW8DQ	161,253

Single Operator, Low Power, 10 Meters

PY2EX	180,900
J35X	154,056
MD2C (MDØCCE, op)	116,793
LU1AW/D	111,888
JI7NUF	103,656
IK2CKR	96,396
LU4HK	92,232
TI5/VA3RA (VE3IKV, op)	87,642
JA6WFM	74,256
OLØA (OK1CZ, op)	67,575

Single Operator, QRP, 10 Meters

KL7AC	95,778
LZ4TX	45,594
OK2VWB	28,800
SP5CTY	17,514
PQ8RS	15,360
JK1CNL	12,210
F6FTB	11,115
EA2BD	7,920
DK6YA	5,301
JK1NWD	4,758

Single Operator Unlimited, High Power, 10 Meters

NP3X (LU8EOT, op)	286,761
HA5JI	246,960
PR1T (PY1ZV, op)	236,118
9A3TR	234,900
HB9FAP	234,540
LX7I (DK9IP, op)	229,860
S53F	223,020
YT3X	202,134
YT3D	200,520
SP2PIK (SP2MKT, op)	196,560

Single Operator Unlimited, Low Power, 10 Meters

ZP6/N3BNA	222,300
HK1N	193,320
9Z4Y	147,795
MM2N	134,748
PP5RT	129,210
M5W	124,146
PY2WH	102,258
JA1MZM	98,010
Z36W	94,923
DKØMM (DJ7IK, op)	90,360

Single Operator Unlimited, QRP, 10 Meters

G4ZFE	39,450
G6M (G4BYG, op)	33,984
SP5EWX	19,458
JA6VZB	16,728
MIØI	14,640
UR7HCX	14,592
PY1CMT	12,768
JF3KQA	11,424
OK2PDT/P	7,560
YU1LM	5,427

Multioperator, Single Transmitter, High Power

ZF1A	6,251,754
VP5K	5,779,893
IO4X	4,795,740
VP2MER	4,615,776
EA5RS	4,363,632
4A7S	3,990,090
EI7M	3,965,148
OK7O	3,939,633
HG6N	3,737,670
IO5O	3,595,200

Multioperator, Single Transmitter, Low Power

ZF5T	5,246,829
V3T	5,044,512
TM6M	4,406,925
WP3C	4,320,096
C6ANM	1,591,866
9A7T	1,538,058
TF3W	975,480
3Z1K	754,509
A31DL	709,800
ED1R	703,080

Multioperator, Two Transmitter

KP2M	7,950,414
CR3W	7,445,232
CN3A	7,363,602
KL7RA	6,595,020
CR2N	5,809,860
OL3Z	5,568,636
TM7A	5,397,840
8R7X	5,148,078
OM7M	5,027,967
S53M	4,582,401

Multioperator, Multitransmitter

PJ2T	8,803,578
9A1A	6,636,201
KH6LC	6,323,496
LN8W	6,123,870
SK3W	5,211,360
F6KOP	4,446,222
JA3YBK	3,695,574
JF1NHD	1,870,446
G4IIY	1,484,406
JA1YPA	24,795

Continental Winners

Africa

Single Operator, High Power	ZD7W	4,037,247
Single Operator, Low Power	CR3DX (OM3RM, op)	4,243,197
Single Operator, QRP	D4L (IK2NCJ, op)	1,088,190
Single Operator Unlimited, High Power	ED8M	2,722,494
Single Operator Unlimited, Low Power	EA8/G4HSO	14,940
Single Operator, Low Power, 20 Meters	EA9ACD	149,118
Single Operator Unlimited, High Power, 20 Meters	EA8/IK1PMR	17,907
Single Operator Unlimited, QRP, 20 Meters	ZS6WAR	216
Single Operator Unlimited, Low Power, 15 Meters	FR8UA	100,746
Single Operator, High Power, 10 Meters	5Z4VJ	73,647
Single Operator, Low Power, 10 Meters	5X1XA (G3XAQ, op)	62,886
Single Operator Unlimited, Low Power, 10 Meters	ZS1/VE3NZ	80,640
Multioperator, Two Transmitter	CR3W	7,445,232

Antarctica

Single Operator, High Power	DP1POL (DL5XL, op)	290,427

Asia

Single Operator, High Power	JE6RPM (JH5GHM, op)	1,600,758
Single Operator, Low Power	4X7M (4Z4AK, op)	1,294,812
Single Operator, QRP	JH7UJU	196,272
Single Operator Unlimited, High Power	P3X (5B4AMM, op)	1,340,865
Single Operator Unlimited, Low Power	JH1EAQ	788,616
Single Operator Unlimited, QRP	JK7DWD	111,834
Single Operator, High Power, 160 Meters	JA8NFV	690
Single Operator, Low Power, 160 Meters	JE1SPY	1,176
Single Operator Unlimited, High Power, 160 Meters	JF1AMX	4,158
Single Operator Unlimited, Low Power, 160 Meters	JH1BBT	189
Single Operator, High Power, 80 Meters	JH7XMO	1,932
Single Operator, Low Power, 80 Meters	JH4CES	456
Single Operator, QRP, 80 Meters	JH1APZ	195
Single Operator Unlimited, Low Power, 80 Meters	4Z4KX	8,814
Single Operator, High Power, 40 Meters	JA6SHL	63,954
Single Operator, Low Power, 40 Meters	JJ1GXY	3,366
Single Operator, QRP, 40 Meters	JR1ABS	2,652
Single Operator Unlimited, High Power, 40 Meters	4Z5LA	38,493
Single Operator Unlimited, Low Power, 40 Meters	JJ1AEB	14,751
Single Operator, High Power, 20 Meters	BD4TS	27,324
Single Operator, Low Power, 20 Meters	TA3NE	33,417
Single Operator, QRP, 20 Meters	JP1JZR/1	36
Single Operator Unlimited, High Power, 20 Meters	RG0A	104,652
Single Operator Unlimited, Low Power, 20 Meters	HZ1TT	70,620
Single Operator, High Power, 15 Meters	JJ0VNR	181,134
Single Operator, Low Power, 15 Meters	JA1GQC	42,900
Single Operator, QRP, 15 Meters	JA1KPF	1,599
Single Operator Unlimited, High Power, 15 Meters	JE1CKA	177,840
Single Operator Unlimited, Low Power, 15 Meters	JH7VHZ	95,256
Single Operator Unlimited, QRP, 15 Meters	BG3ODZ	3,300
Single Operator, High Power, 10 Meters	JR3EOI	105,624
Single Operator, Low Power, 10 Meters	JI7NUF	103,656
Single Operator, QRP, 10 Meters	JK1CNL	12,210
Single Operator Unlimited, High Power, 10 Meters	JH7XGN	135,432
Single Operator Unlimited, Low Power, 10 Meters	JA1MZM	98,010
Single Operator Unlimited, QRP, 10 Meters	JA6VZB	16,728
Multioperator, Single Transmitter, High Power	JH4UYB	1,711,365
Multioperator, Single Transmitter, Low Power	JK2VOC	144,000
Multioperator, Two Transmitter	JH8YOH	2,796,444
Multioperator, Multitransmitter	JA3YBK	3,695,574

Europe

Single Operator, High Power	EF6T (EA3M, op)	5,735,925
Single Operator, Low Power	CR6K (CT1ILT, op)	5,327,400
Single Operator, QRP	LY9A	641,376
Single Operator Unlimited, High Power	ED7W (EB7A, op)	4,467,474
Single Operator Unlimited, Low Power	IP3A (IK3QAR, op)	2,416,050
Single Operator Unlimited, QRP	IZ3NVR	327,429
Single Operator, High Power, 160 Meters	UY0ZG	5,760
Single Operator, Low Power, 160 Meters	DL5KVV	1,479
Single Operator Unlimited, High Power, 160 Meters	S56X	20,292
Single Operator Unlimited, Low Power, 160 Meters	OL1A (OK1CW, op)	6,675
Single Operator, High Power, 80 Meters	CS2C (OK1RF, op)	145,848
Single Operator, Low Power, 80 Meters	OK2HBR	9,396
Single Operator, QRP, 80 Meters	OK1RCX	648
Single Operator Unlimited, High Power, 80 Meters	HA1TJ	113,850
Single Operator Unlimited, Low Power, 80 Meters	OK1DPU	20,094
Single Operator Unlimited, QRP, 80 Meters	EA5Y	3,360
Single Operator, High Power, 40 Meters	OM2XW	215,460
Single Operator, Low Power, 40 Meters	IC8JOH	85,212
Single Operator, QRP, 40 Meters	OK6OK	12,810
Single Operator Unlimited, High Power, 40 Meters	DK9PY	210,633
Single Operator Unlimited, Low Power, 40 Meters	EA5O	140,715
Single Operator Unlimited, QRP, 40 Meters	S58R	6,930
Single Operator, High Power, 20 Meters	OH8L (OH8LQ, op)	267,180
Single Operator, Low Power, 20 Meters	DL9ZP	55,692
Single Operator, QRP, 20 Meters	S51Z	35,052
Single Operator Unlimited, High Power, 20 Meters	HG0Y (HA7GN, op)	276,480
Single Operator Unlimited, Low Power, 20 Meters	HG6O (HA6OA, op)	95,589
Single Operator Unlimited, QRP, 20 Meters	DM7AA	4,650
Single Operator, High Power, 15 Meters	SN5X (SP5GRM, op)	217,440
Single Operator, Low Power, 15 Meters	9A4BT	99,330
Single Operator, QRP, 15 Meters	DL8MBS	16,731
Single Operator Unlimited, High Power, 15 Meters	SN3A (SQ2GXO, op)	258,945
Single Operator Unlimited, Low Power, 15 Meters	E7CW	144,180
Single Operator Unlimited, QRP, 15 Meters	EF3O (EA3O, op)	93,810
Single Operator, High Power, 10 Meters	MW5B	291,600
Single Operator, Low Power, 10 Meters	MD2C (MD0CCE, op)	116,793
Single Operator, QRP, 10 Meters	LZ4TX	45,594
Single Operator Unlimited, High Power, 10 Meters	HA5JI	246,960
Single Operator Unlimited, Low Power, 10 Meters	MM2N	134,748
Single Operator Unlimited, QRP, 10 Meters	G4ZFE	39,450
Multioperator, Single Transmitter, High Power	IO4X	4,795,740
Multioperator, Single Transmitter, Low Power	TM6M	4,406,925
Multioperator, Two Transmitter	CR2N	5,809,860
Multioperator, Multitransmitter	9A1A	6,636,201

North America

Single Operator, High Power	8P5A	7,239,825
Single Operator, Low Power	NP4Z	3,908,304
Single Operator Unlimited, High Power	TO4A (VE3DZ, op)	6,418,512
Single Operator Unlimited, Low Power	VP9I (AB2E, op)	3,490,395
Single Operator, High Power, 160 Meters	NP2J (K8RF, op)	54,315
Single Operator, Low Power, 160 Meters	V26OC (N3OC, op)	8,019
Single Operator Unlimited, Low Power, 160 Meters	TI5CDA	6,834
Single Operator, Low Power, 80 Meters	NP3CW	513
Single Operator, High Power, 40 Meters	KP2DX (WP3A, op)	193,680
Single Operator, Low Power, 40 Meters	CO2JD	133,209
Single Operator, Low Power, 20 Meters	XE1CT	112,689
Single Operator, QRP, 20 Meters	XE2MWY	468
Single Operator, High Power, 15 Meters	WP4WW (KP4JRS, op)	88,245
Single Operator, Low Power, 15 Meters	XE2AU	17,556
Single Operator Unlimited, High Power, 15 Meters	V31DJ (W0CP, op)	260,043
Single Operator, Low Power, 10 Meters	J35X	154,056
Single Operator, QRP, 10 Meters	KL7AC	95,778
Single Operator Unlimited, High Power, 10 Meters	NP3X (LU8EOT, op)	286,761
Multioperator, Single Transmitter, High Power	ZF1A	6,251,754
Multioperator, Single Transmitter, Low Power	ZF5T	5,246,829
Multioperator, Two Transmitter	KP2M	7,950,414

Oceania

Single Operator, High Power	KH6J (N6TJ, op)	2,847,897
Single Operator, Low Power	KH6AQ	1,473,000
Single Operator, QRP	NH6O	3,096
Single Operator Unlimited, High Power	KH7M (NA2U, op)	2,633,370
Single Operator Unlimited, Low Power	YB9ELS	59,130
Single Operator, High Power, 40 Meters	DU1EV	168
Single Operator, Low Power, 40 Meters	VK2IG	35,880
Single Operator, QRP, 40 Meters	VK2CCC	9,486
Single Operator Unlimited, Low Power, 40 Meters	YC2VOC	15,876
Single Operator, Low Power, 15 Meters	YC9FAR	25,110
Single Operator, QRP, 15 Meters	YC4SIZ	120
Single Operator Unlimited, Low Power, 15 Meters	YC0RNC/1	3,024
Single Operator, High Power, 10 Meters	YB0SAS	930
Single Operator, Low Power, 10 Meters	VK3GF	33,552
Single Operator Unlimited, High Power, 10 Meters	ZL4TT	180,180
Single Operator Unlimited, Low Power, 10 Meters	DU3LA	78,489
Multioperator, Single Transmitter, High Power	ZM4T	2,741,232
Multioperator, Single Transmitter, Low Power	A31DL	709,800
Multioperator, Two Transmitter	ZL3X	2,546,646
Multioperator, Multitransmitter	KH6LC	6,323,496

South America

Single Operator, High Power	P44W (W2GD, op)	5,417,280
Single Operator, Low Power	PZ5DX (RA3CO, op)	4,297,590
Single Operator, QRP	YV6BXN	241,380
Single Operator Unlimited, High Power	P49Y (AE6Y, op)	5,387,148
Single Operator Unlimited, Low Power	HK4RCA (KC1XX, op)	1,403,682
Single Operator Unlimited, QRP	PY2MLO	15,675
Single Operator, Low Power, 80 Meters	HC1MD/2	3,150
Single Operator Unlimited, High Power, 80 Meters	PP2BT	3,381
Single Operator, High Power, 40 Meters	CE4PS	4,116
Single Operator Unlimited, High Power, 40 Meters	PY2GTA	1,224
Single Operator Unlimited, Low Power, 40 Meters	PY2EU	2,394
Single Operator Unlimited, High Power, 20 Meters	PP5AX	53,265
Single Operator Unlimited, Low Power, 20 Meters	HC5CW	154,080
Single Operator, High Power, 15 Meters	PJ4A	359,412
Single Operator, Low Power, 15 Meters	YV4YC	144,609
Single Operator Unlimited, High Power, 15 Meters	FY5KE (F6FVY, op)	381,555
Single Operator Unlimited, Low Power, 15 Meters	PY4LH	63,030
Single Operator, High Power, 10 Meters	PW2E (PY2ZEA, op)	308,880
Single Operator, Low Power, 10 Meters	PY2EX	180,900
Single Operator, QRP, 10 Meters	PQ8RS	15,360
Single Operator Unlimited, High Power, 10 Meters	PR1T (PY1ZV, op)	236,118
Single Operator Unlimited, Low Power, 10 Meters	ZP6/N3BNA	222,300
Single Operator Unlimited, QRP, 10 Meters	PY1CMT	12,768
Multioperator, Single Transmitter, High Power	ZW5B	3,383,430
Multioperator, Single Transmitter, Low Power	HC2GRC	86,574
Multioperator, Two Transmitter	8R7X	5,148,078
Multioperator, Multitransmitter	PJ2T	8,803,578

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.

The next ARRL International DX CW Contest will be held February 15 – 16, 2025.

The 2024 ARRL 10 GHz and Up Contest

Held each year on the third full weekend of August and September.
Weekend 1: August 17 – 19, 2024
Weekend 2: September 21 – 23, 2024

New event times for 2024: There is a change in the event's start and end times. Each weekend begins at 0900 UTC on Saturday and runs through 0759 UTC on Monday. Participation is limited to 42 hours of operating time in each of the two contest weekends. Participants are reminded to log all contacts in UTC time.

The microwave bands 10 GHz and above will be active again this year during the 2024 ARRL 10 GHz and Up Contest. The objective is to work as many stations as possible from different locations, using frequencies from 10 GHz to light. Because contest scores increase over greater distances, taking your station portable will give you an advantage — the greater the distance, the higher your score. With distance point multipliers, contacts on bands higher than 10 GHz can accrue even greater distance points!

Scheduling contacts is not only permitted but encouraged in this contest. Consider getting in touch with one of the many VHF+ or microwave clubs to arrange contacts with them. To locate a club, enter the term "VHF" on the ARRL club search page at **www.arrl.org/find-a-club**.

When the event is over, be sure to upload your Cabrillo log to our web app at **http://contests.arrl.org/arrl10gscoresubmission.php**, or send paper logs to ARRL 10 GHz Contest, 225 Main St., Newington, CT 06111. All logs must be received or postmarked by 0759 UTC on October 23, 2024.

Complete rules and entry forms can be found at www.arrl.org/10-ghz-up.

High-Performance Stacked Array with Tribanders

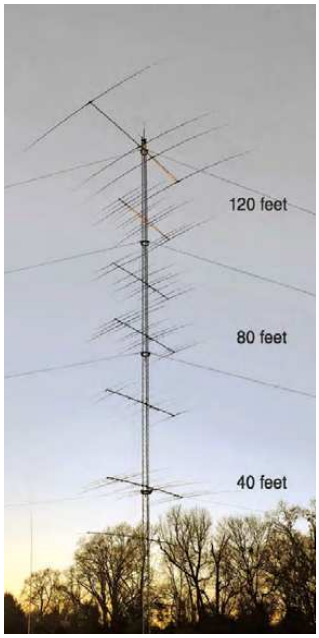
Controlling the takeoff angle of your antenna provides a big advantage.

John C. Small, W2VP

There are many different aspects of ham radio on which operators tend to focus their attention. In my case, it is chasing and working DX stations all over the world. The main challenge of working DX is being able to hear and work weak DX stations, so having a high-performance antenna system is important. When I earned my first ham radio license in 1968, I had a modest station consisting of a Mosley Electronics TA-33-JR antenna elevated 40 feet, and 90 W AM. For many years later, I worked DX using a more typical multiband antenna on top of a 60-foot crank-up tower. Since retiring, I wanted to install the antenna system of my dreams to better enjoy working DX.

In my retirement, I wanted to move to a different state, purchase a new home on a larger property, and in doing so, install a specialized, improved antenna system that is different from a multiband antenna on a 60-foot tower. I wanted to install a very tall tower and a high-performance antenna system. However, I knew that to significantly improve upon the performance of a Yagi antenna elevated 60 feet, I had to think big. There is a popular ham expression: "Get as much metal as you can as high in the air as you can." I initially wanted to buy a home on a hill in order to have a low takeoff angle (TOA), which is generally important for working DX. Local terrain can have a substantial impact on the actual antenna pattern. Fortunately, the *High-Frequency Terrain Assessment* (*HFTA*) program, written by Dean Straw, N6BV, and available for download with *The ARRL Antenna Book*, can analyze terrain's interaction with antenna patterns. Finding a home on a hill proved difficult, so in the end, I purchased one on 12 acres of relatively flat ground. This made it especially important to have an antenna system with a low TOA and plenty of gain.

The system I chose to install is a 150-foot rotating tower that covers the 40 – 10-meter bands, raises all of my antennas high off the ground, and yields plenty



The stacked Yagis and their corresponding elevations. [John Small, W2VP, photo]

The 2024 ARRL September VHF Contest

1800 UTC Saturday, September 14 – 0259 UTC Monday, September 16.

Jim Wilson, K5ND, participated in the 2020 ARRL September VHF Contest in the Limited Rover category. His rover vehicle is pictured in grid square EM 24 near Hugo, Oklahoma, on the Sunday morning of the event. [Jim Wilson, K5ND, photo]

The ARRL September VHF Contest is an opportunity to take advantage of the enhanced propagation that late summer can offer on the VHF and UHF bands. With good conditions, stations hundreds of miles away can be worked via tropospheric ducting and sporadic E. All amateur bands 50 MHz and higher can be used in this event. The exchange is your four-digit Maidenhead grid square. To find your grid square, visit **www.arrl.org/grid-squares**.

All legal modes are allowed in the contest, including CW, SSB/phone, and digital modes such as FT4 and FT8. Be sure to check the *WSJT-X* website at **https://wsjt.sourceforge.io** for the latest software updates.

Use our web app to submit your Cabrillo-formatted log at **http://contest-log-submission.arrl.org**. Paper logs can be submitted to ARRL September VHF Contest, 225 Main St., Newington, CT 06111.

10-day deadline: All logs must be submitted or postmarked no later than 0259 UTC September 26, 2024.

A complete list of rules, entry forms, and entry categories can be found at www.arrl.org/september-vhf.

The 2024 ARRL International EME Contest

There are four weekends of activity for this year's contest, occurring on 0000 UTC Saturday – 2359 UTC Sunday each weekend.

2.3+ GHz: August 24 – 25
2.3+ GHz: September 21 – 22
50 – 1296 MHz: October 19 – 20
50 – 1296 MHz: November 16 – 17

Long-distance DX contacts can be made on VHF, UHF, and above with 100 – 200 W and a medium- to long-boom Yagi antenna. Using CW, phone, or digital modes, you can bounce your signal off the lunar surface and work DX.

Spotting assistance is allowed in all categories, including but not limited to DX-alerting nets, reflectors, email, or even telephone.

Logs must be submitted or postmarked no later than 2359 UTC, December 17, 2024. Send electronic log submissions via our web app at **http://contests.arrl.org/arrlemescoresubmission.php**, or send paper logs to ARRL EME Contest, 225 Main St., Newington, CT 06111 USA.

Complete rules and entry forms can be found at www.arrl.org/eme-contest.

Mike Walters, W8ZY, mwalters@arrl.org

Club Station

Hams Supporting Less Active Clubs

The Meriden Amateur Radio Club (MARC) in Wallingford, Connecticut, developed the Motivating Amateur Radio Clubs to Open New Initiatives (MARCONI) project to support less active amateur radio clubs (LACs). In this month's column, MARC President and ARRL Foundation Board of Directors member Edward Snyder, W1YSM, as well as MARC Past Secretary Bart Toftness, N1BRL, discuss the project and how other clubs can start their own.

When Amateur Radio Digital Communications (ARDC) and ARRL announced a grant program to promote amateur radio, MARC conceived and developed the MARCONI project. Using existing MARC programs and activities, we wanted to contact LACs and act, in essence, as a club mentor. Our target audience included potential or inactive hams and nearby LACs with a goal of increasing interest in and enthusiasm for amateur radio to promote the hobby and increase involvement in on-air activities.

As we began connecting with clubs that had seen a decline in their membership involvement, we hoped MARCONI would provide them with renewed club growth and enthusiasm. It also would allow MARC to give back to amateur radio and help reinvigorate community interest in the hobby. MARCONI consists of two phases that include establishing the program infrastructure and contacting LACs.

Getting Started

When developing this project, we didn't know if we could encourage MARC members to participate. We also had to figure out a way to approach LACs so they knew we wanted to help, not poach their members.

First, we appointed MARC's president as the program director to write the grant and be responsible for assuring that each of the individual activities was organized and activated. Next, we appointed individual program managers for each activity. The managers recruited MARC members, as needed, to support their assigned project activity, and they were responsible for organizing and running their individual activities. Identifying a program manager was key to ensuring each activity would have continuity, reliability, and longevity. All who were chosen were able to successfully recruit any needed support from within MARC.

Phase One: Organizing Club Activities

Many MARC members were already doing a lot of the below activities, so they didn't need to learn new techniques or methods. This concept served as a member recruitment tool and reassured MARC members that they could pick the program in which they wanted to participate.

✓ Collaborative Outdoor Activities — MARC routinely hosts Parks on the Air (POTA) outings because several members are extremely active. We also hold weekly foxhunts. These outdoor activities encourage camaraderie between MARC members and hams from other clubs.

✓ Educational Opportunities — One of the program managers began holding daily CW practice sessions and considered starting a CW net. MARC holds FCC license exam sessions once a month, and they've been a great recruitment tool — we've gained approximately 60 new members from these sessions over the last 2 years. And our FCC license classes are held twice a year (once in the spring and again in the fall).

Hams from Middlesex Amateur Radio Society, Southington Amateur Radio Association, and Richmond Amateur Telecommunications Society joined MARC for a foxhunt. From left to right: Ted Renzoni, KC1DOY; Ray Cirmo, KC1QLS; John Bartscherer, N1GNV; Bart Toftness, N1BRL; Noah Ludecke, N1NIS; Derek Langlois, KC1EUM; Rob Cichon, K1RCT; Mike MacKennedy, K1MMK; Bob Biancur, WB1GYZ; Eric Olsson, KB1JL; Dave Tipping, NZ1J; John Rogus, WA1JKR, and Kristin Olsson, KC1ISI, with Andrew Olsson, K4AVM, and his wife and children in the front row. [G. Biancur, photo]

✓ Connecting with Served Agencies — MARCONI allowed us to enhance our contacts with the Town of Wallingford and other local organizations, such as the American Red Cross, Multiple Sclerosis Society, YMCA, Boy Scouts of America, Girl Scouts of the USA, and the Hole in the Wall Gang. We also became active in SKYWARN, Amateur Radio Emergency Service®, and Community Emergency Response Teams.

✓ Net Control Training — Having multiple repeater and SSB nets on the air every week allows us to train members who want to become net control operators.

✓ Satellite Operations — We developed a satellite operations program as a new MARC endeavor, and it's become a popular club activity, as it easily lends itself to mentoring members of other clubs.

✓ Balloon Launches and Digital Data Collections — Last year, we launched three or four balloons that had digital data transmission capabilities. A MARC member developed a digital communication program that allows anyone to monitor the balloon's activity from a computer. We plan to record the launches and share the digital data acquisition methods with local schools to show the relevance of amateur radio in the 21st century.

MARC can maintain nine activities because we have strong MARCONI program managers. Offering only a few activities can ensure your club isn't spread too thin, but keep in mind that having more opportunities and diverse activities to choose from can create more involvement and enthusiasm from members.

Modify your MARCONI project to allow your members to continue doing what they're already doing so that the addition of LAC observers simply can be viewed as other members attending activities.

Phase Two: Identifying and Recruiting LACs

This phase is currently being developed, but the plan is to have interested LACs come to MARC's venue to participate in an activity, not vice versa. We feel that if LAC members come to our shack, MARC members will be more receptive to the MARCONI concept and LAC members will be more invested in the process because they took the time to travel to our facility (LAC members can choose to participate in an event in person or via Zoom, as appropriate). A few MARC members agreed to travel to LACs to export our help.

Cold calling LACs is not recommended. Some clubs may feel embarrassed that they're being approached about their low activity level. Instead, club leaders should talk with each LAC president to see if they're willing to discuss giving your club access to their members and consider joining forces. It's a good idea to contact your Section Manager and/or Affiliated Club Coordinator for support of your club's efforts, as well as to identify LACs that might be receptive to working with a club mentor. On-site shadowing, at least to start, provides a more reliable opportunity for the transfer of technology and activity management than making phone calls or sending emails, postcards, QSL cards, or paper invitations does. This is considered essential to the success of MARCONI.

In Conclusion

We've developed a set of operational guidelines that describe what's needed to develop a specific activity — how to start one; the necessary materials; how to set up, run, and maintain it; how to identify pitfalls, and potential budget issues to consider.

These guidelines are a work product of the ARDC and ARRL grant program. Our grant budget was driven primarily by the need for equipment that was separate from MARC's and could be lent to clubs to help them determine if they wish to start their own MARCONI project. Some of the activities — VE sessions, FCC classes, net control training, and served agency activities — require minimal infrastructure, hardware, and financing, while others — satellite operations, CW training, foxhunts, and POTA operations — may require more gear.

What makes MARCONI unique is the use of an active club's existing skills and enthusiasm to help LACs. Remarkable things can be achieved by helping others!

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 June 7, 2024.

Renewing SSCs

Mount Diablo ARC, W6CX Pleasant Hill, CA

Steve Goodgame, K5ATA, sgoodgame@arrl.org

Ham Media Playlist

Darren N4VFR — Sharing Ham Projects

People find their way into amateur radio in a variety of ways. Some of us find it through a teacher at school, others through a family member. Darren Golez, N4VFR, discovered amateur radio through CB radio.

Ham Radio Roots

Darren fondly recalls the moment when he discovered DX while operating CB radio. Darren had an old RadioShack 40-channel mobile radio, as well as a Ranger RCI-2950. He and a group of friends regularly met on the air every morning and evening. In his CB radio days, Darren's handle was "Friendship 7," a nod to the movie *The Right Stuff*.

Darren was bitten by the DX bug while operating on channel 37 LSB. Propagation (or "skip," as he knew it then) was just right, and he managed to make a contact with someone in South Africa. That brief contact over such a long distance sealed the deal for Darren, and he immediately started studying to become a ham.

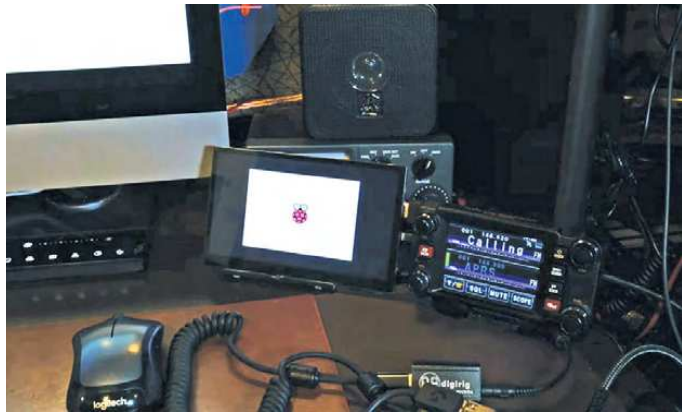
The Beaches Amateur Radio Society in Florida had regular testing sessions at Fletcher Senior High School, where Darren was a student. After studying, he took the Novice exam and successfully became KB4QCF. Darren later joined the US Navy and became a radioman stationed in Spokane, Washington. He decided then that he would pursue his Advanced-class license and was issued a new call sign, KI7JM. Darren has since retired from the US Navy and become a flight instructor. As a nod to his career, he requested the vanity call sign N4VFR, with VFR standing for "visual flight rules."

Amateur Radio Channel

Darren created his YouTube channel in 2020, but it was not then centered around amateur radio. He had an interest in sports cars, so he made videos about detailing a Porsche GT4 and did some unboxing videos. He considered making videos about flying, but most airline social media policies prohibit publishing that sort of content.

One day after getting a new Yaesu FTDX101MP, he decided to make an unboxing video. That video, "New Yaesu FTDX101MP Unboxing with Sceptre External Monitor!" (**https://tinyurl.com/unboxing-FTDX101MP**), took off, amassing more than 18,000 views. Seeing that people were possibly interested in his amateur radio content, he started filming more videos of common tasks hams need to do, such as pounding grounding rods into the earth, assembling his ZeroFive HF antenna, among others. These videos also showed promise for his channel, so Darren narrowed his focus to amateur radio on YouTube.

Darren, N4VFR, unboxes the Yaesu FTDX101MP.



Darren, N4VFR, shows viewers the process of setting up an APRS digipeater and IGate.

APRS, RFI Hum, and More

Darren enjoys sharing his projects on his YouTube channel. One area of interest for him is the Automatic Packet Reporting System (APRS). Darren decided to build an APRS digipeater and IGate. In his video titled "How to build an APRS Digipeater and iGate | RaspPi4 | Yaesu FTM400 | Digi Rig | Dire Wolf" (**https://tinyurl.com/n4vfr-aprs**), Darren shows a completed setup, giving viewers a look at what they will end up with when the project is complete. In this video, Darren steps viewers through the entire process of getting this project completed and on the air, taking time to show them exactly what to click and type throughout the process of installing software. By the end of the video, users should have a grasp on how to get their own system up and running.

Many hams struggle with the presence of radio frequency interference (RFI) in the shack. Darren is no different, and has allowed viewers to witness his struggle to overcome something many hams have dealt with — speaker hum when transmitting. In his video titled "RFI Hum/Buss/Noise coming out of my Powered Speakers while Transmitting on HF | Torroids and Ferrite" (**https://tinyurl.com/n4vfr-rfi**), Darren shares that he recently had to relocate his sky loop antenna, and since then, has experienced an increase in RFI. Darren steps viewers through his process of attempting to eliminate speaker buzz in his shack. Darren is not afraid to show when his efforts did not work as he had hoped. Such is the case in this video. He was unable to eliminate the speaker hum, and took time at the end of the video to explain what he learned and what he suspects might still be the problem. The ability to learn from failure is critical, and Darren understands this.

Darren, N4VFR, shows viewers the cables at the back of his operating position, which he works with to attempt to eliminate the RFI problem.

Darren, N4VFR, tests to see if he has successfully removed the speaker hum when transmitting on HF.

"Darren N4VFR" is a great channel with videos to satisfy most people's interests in amateur radio. His presentation style is a welcome one — very straightforward and to the point. He creates videos about topics he is interested in, with no concern about what will feed the YouTube algorithm. Visit his channel at **https://youtube.com/@DarrenN4VFR** and you will see that he records what he loves, as is evident by the smile on his face.

Strays

Typing Tip

There is a way to reduce the hindrance of inexperienced or slow typing skills in JS8Call and *fldigi* modes. If you have Windows 11, use the **VOICE ACCESS** mode to dictate text into the transmission panels of JS8Call and *fldigi*. The resulting text is treated as though you had just typed it in. *Tip courtesy of Douglas Strong, KJ5CLX.*

QST Congratulates...

Randy Wayne White, KM4PON, on the publication of his most recent book, *One Deadly Eye: A Doc Ford Novel*. Ham radio is featured prominently in the story, and its inclusion will undoubtedly introduce the hobby to many of his readers. The book is available to purchase from Amazon and other retailers.

Bernie McClenny, W3UR, w3ur@arrl.org

How's DX?

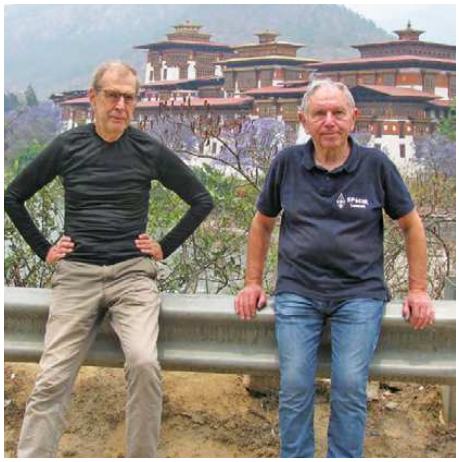
A5 — Bhutan Wrap-Up

In the April 2024 "How's DX?" column, I wrote about the history of Bhutan, aka the "Land of the Thunder Dragon." After the A52P and A52CI DXpedition by Janusz Wegrzyn, SP9FIH, and Leszek Przybylak, SP6CIK, we have some news of the success of their 2-plus-week DXpedition. They found an excellent location and had some of the best Solar Cycle 25 propagation so far. This gave them excellent conditions to work the most difficult areas from Bhutan to the Americas.

Their adventure began around 3:00 AM (local time) on April 16 as they departed Wrocław, Poland, heading for Munich, New Delhi, and eventually the airport in Paro, Bhutan. I say "eventually," as they were scheduled to land at 7:00 AM on April 18; however, due to a low cloud ceiling, they ended up flying around the dangerous mountains for close to an hour. Paro Airport is in a deep valley some 2,235 meters (7,332 feet) above sea level, with the mountains peaking at 5,500 meters (18,000 feet) above sea level.

After arriving and collecting all of their bags, equipment, and antennas, they departed to the Dochula Eco Retreat hotel located at the Dochula Pass at 3,150 meters above sea level. The 2-hour journey was along winding mountain roads that took them through the clouds along the way.

Once at the hotel, they immediately began assembling several antennas, including loops for 10, 12, 15, and 17 meters, along with a two-element vertical for 30 meters. The following day they assembled and mounted a five-element Yagi for 6 meters, and a two-element vertical for 40 meters. Space was limited and made it difficult to erect low-band antennas.

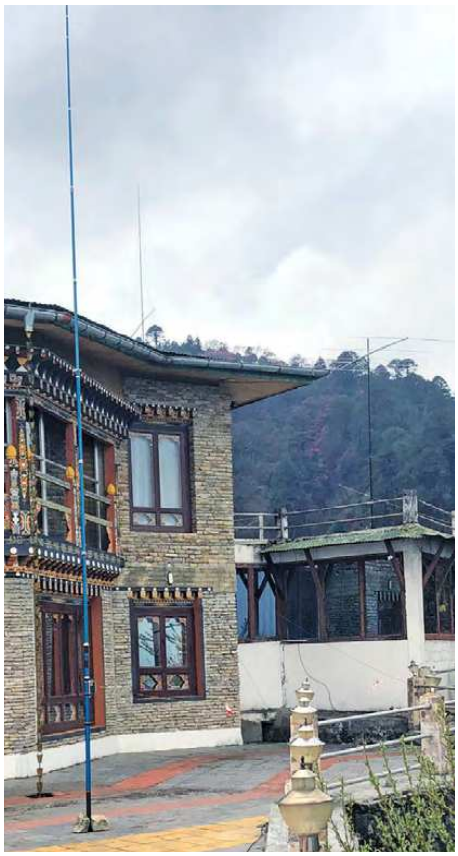


Janusz Wegrzyn, SP9FIH, and Leszek Przybylak, SP6CIK, activated Bhutan as A52P and A52CI, respectively, in April. [Janusz Wegrzyn, SP9FIH, photo]

The loops for 10 and 15 meters, and the sloper for 20 meters. [Janusz Wegrzyn, SP9FIH, photo]

The two-man team split the bands between themselves with Les, A52CI, taking 30, 17, 12, and 6 meters while Janusz, A52P, handled 40, 20, 15, and 10 meters. FT8 and FT4 modes were "very desirable" among their listeners. Les also did some CW while both did SSB, but often the signals were quite weak, with only the stations with better antennas making it on this mode.

After their local sunrise and sunset, propagation was best to North America, especially on 17 and 15 meters, but also on 10, 12, 20, 30, and 40 meters. Unfortunately, there was no magic to North America on 6 meters. After 17 days on the air, A52CI and A52P managed some 58,000 contacts. They thank everyone for all of



Antennas set up at the Dochula Eco Retreat hotel, 3,150 meters above sea level. [Janusz Wegrzyn, SP9FIH, photo]

the contacts and for the donations. As of press time, the QSL cards have been designed and are being printed, so hopefully by the time you are reading this, paper confirmations will be in the hands of those who worked A52CI and A52P. You can see many photos of Les and Janusz's DXpedition at **https://a5.dxpeditions.org**. Next stop for Janusz will be the Pacific, so watch your favorite DX information outlet for details.

Dayton Recap

There were a few highlights from the 2024 Dayton Hamvention® held in Xenia, Ohio. During the Southwest Ohio DX Association (SWODXA) DX Dinner, several awards were announced and presented. The SWODXA DXpedition of the Year Award was given to W8S for the October 2023 DXpedition to Swains Island. It should be noted this was the second time DXpedition of the Year was awarded to a Swains Island DXpedition. Several of the W8S team members were on hand to accept the award. SWODXA also announced FT8WW (Thierry Mazel, F6CUK) was the DXpeditioner of the Year. He was not on hand, but the plaque will be mailed to him. Also announced were three inductees into the CQ DX Hall of Fame: First was to Cezar Trifu, VE3LYC; second was to yours truly, and finally to the late Dick Ross, K2MGA. Another announcement was for the new Super Fox mode for *WSJT-X*, which is expected to be used during the August N5J DXpedition to Jarvis Island.

The following night at the Contest Dinner, it was announced that Steve London, N2IC; Sergio Almeida, PP5JR, and again Dick Ross, K2MGA (SK), were all inducted into the CQ Contest Hall of Fame.

KH5 — Palmyra and Jarvis Islands

Palmyra and Jarvis are one DXCC entity, as defined by the Geographic Separation Entity criteria. Unfortunately, they are just under 800 kilometers apart from each other. If they were 800 kilometers apart, they would qualify under Rule 2(b)iii as two separate entities. Currently, KH5 ranks number 18 on Club Log's DXCC Most Wanted List. The last time KH5 was on the air was by K5P in January 2016. That operation took place thanks to The Nature Conservancy on Cooper Island. The last time Jarvis Island was activated was some 34 years ago by AH3C/KH5J in April 1990.

In early March of this year, the Dateline DX Association announced plans for the N5J DXpedition to take place from Jarvis Island on August 5 – 20. Complete details can be found on their website at **https://jarvisisland2024.com**. Watch your favorite DX information outlet for details on this one.

Accepting the 2023 SWODXA DXpedition of the Year Award were W8S (Swains Island) team members Adrian Ciuperca, KO8SCA (left); Evert Bakker, PA2KW (middle), and Johannes Hafkenscheid, PA5X (right). [Bernie McClenny, W3UR, photo]

This year's inductees into the CQ DX Hall of Fame included longtime *QST* "How's DX?" columnist Bernie McClenny, W3UR (left), and Cezar Trifu, VE3LYC (right). *CQ* magazine publisher Dick Ross, K2MGA (SK), was also inducted. [Alex Yakovlev, UT5UY, photo]

DX Gatherings

As a reminder, the Pacific Northwest DX Convention this year will be hosted by the Western Washington DX Club and will take place at the Delta Hotel in Everett, Washington, on August 9 – 11. Complete details can be found at **www.pacificnwdxconvention.com**. Also note the W9DXCC Convention will again be sponsored by the Northern Illinois DX Association and will take place at the Chicago Marriott Naperville on September 13 and 14. More details can be found at **www.w9dxcc.com**. I'll be on hand for that one.

Wrap-Up

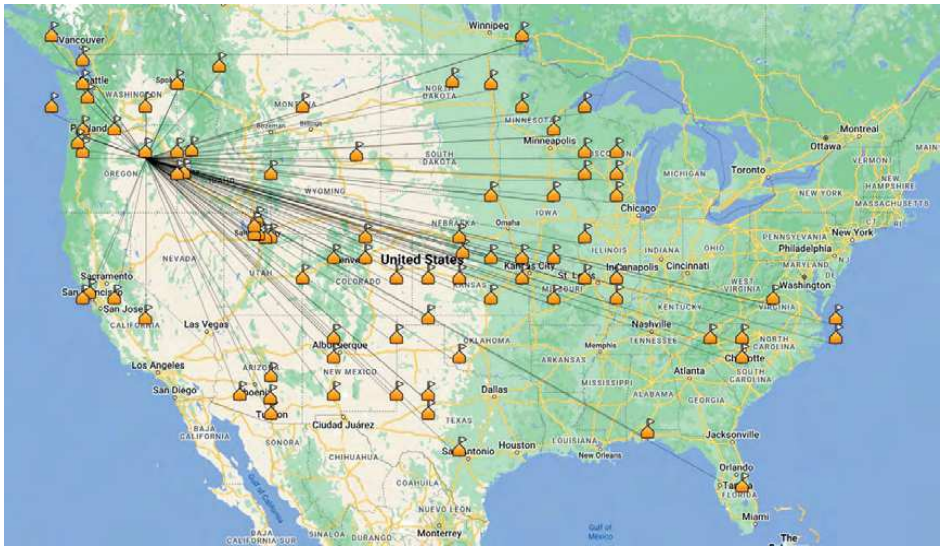
That's it for this month with thanks to K7AR, SP9FIH, and W9AP for helping to make this month's column possible. If you have any DX, IOTA, or contest expedition news, photos, or newsletters, please send them to me at **bernie@dailydx.com**. Until next month, see you in the pileups!
— *Bernie, W3UR*

Jon Jones, NØJK, n0jk@arrl.org

The World Above 50 MHz

"Carrington-Class" Sunspot Creates Extreme Geomagnetic Storm

Sunspot 3668/3664 was huge. Visible to the naked eye (with eclipse glasses) the first week of May, its size rivaled that of the infamous Carrington sunspot of 1859. On September 1, 1859, English astronomer Richard Carrington witnessed a strong solar flare from that sunspot. A day or so later, the coronal mass ejection (CME) from that flare reached Earth, causing a widespread and severe geomagnetic storm. At least five Earth-directed CMEs were observed from sunspot 3668/3664 in early May 2024, with the first predicted to arrive in the afternoon on May 10. Unlike prior predictions, this was a direct hit. It may have been one of the strongest geomagnetic storms of our lifetimes. The K index was more than 7 for the next 24 hours, and strong aurora was observed starting around 2000 UTC. Sam Whitley, K5SW (EM25), said, "I had just put together a three-element 50 MHz beam on a short pole to test Friday afternoon. I was doing other things in the shack and noticed there was SSB on 6 meters. It was not sounding right, and then I figured out the SSB was on aurora!" I, NØJK, observed strong aurora SSB on 6 meters from W4HLR (EM55) and KZ4TT (EM60) on my mobile whip from west of Topeka, Kansas. I worked K3PA (EM29) on aurora CW by keying the microphone. A short while later, F2 appeared on 6 meters with strong signals from the Caribbean and northern South America. I logged KP4JRS (FK68) on FT8. I listened to the audio; I could hear clear tones of the F2 DX stations and the aurora hiss when stateside stations called them. Most of the stateside stations did not decode. W5WP (EM00) worked J3 and V26. WØMU (DM79) logged KP4, J35X, HI7S, 9Y4D, HI8OTA, and YV1GIY on FT8. Lance, W7GJ (DN27), worked HP2AT on FT8. F2 in North America is very rare in May. The intense geomagnetic storm briefly boosted the F-layer maximum usable frequency above 50 MHz. The F2 quit abruptly around 2345 UTC, and the aurora also faded. The aurora came back later that evening.



Ed Sershon's, N7PHY, contact distribution map from when he operated on the DN04/DN05 grid line on May 29 – 31. [Ed Sershon, N7PHY, image]

Mike, KMØT, noted that CW was "king" during the aurora. Some people worked SSB as well, but FT8 did not decode. On 2 meters, K5SW worked stations as far east as W3XTT (FN01), who was "strong." K1TR (FM09) worked N1BUG (FN55) to the east and W9EWZ (EN52) to the west. Kelley Sprout, KB3LR, made his first 2-meter aurora contact with W1VD (FN31). On 6 meters, WB2AMU (FN30) worked N9XG (EN60) to the west. KØBJ (DM99) picked up KA7PNH (DN72) for a new Fred Fish Memorial Award (FFMA) grid. Rich, K1HTV (FM18), made 78 aurora contacts on 6 meters west to WØLGQ (EN21) using CW, SSB, and Q65C. Peter, WA2GFN, worked K1MIZ (FN42) in New Hampshire for his 47th state on 6 meters via aurora. Bill, WTØDX (DM79), worked stations as far as VE6TA on 6-meter aurora Q65-30C. Dan, K7SMA, said his friend W6GY in Nampa, Idaho, made many 2-meter aurora contacts and one on SSB with K7ULS.

The 222 MHz band was busy. Ron, WZ1V (FN31), put K9MRI (EN71) in his log. John Lock, KFØM (EM17), worked KMØT (EN13) and NØLL (EM09) on aurora. NØLL (EM09) worked W5LUA (EM13), K5UR (EM35), and KMØT. Larry noted that it was the best aurora in

20 years. Dave Olean, K1WHS, made 29 222 MHz aurora contacts and said, "I turned on the 222 [MHz] gear in the shack and got started at about 2100 UTC on May 10. Some notable [contacts] include KMØT in EN13 at a distance of 2,037 kilometers, which puts it on the list for the second longest aurora contact on 222 MHz." W5LUA holds the record for the longest.

The *WSJT-X* Q65-30C mode can decode aurora signals well. Ron Todd, K3FR (FM18), noted that he decoded a number of stations using that mode, including W4IMD (EM84). Lauren Libby, WØLD (FM05), worked VE1SKY using Q65-30C. John Price, WA2FZW, made 19 Q65-30C contacts on 6 meters and one on 2. Hasan, NØAN, had these comments regarding Q65-30C and aurora:

> Q65-30C is very good for decoding auroral distorted (and spread) signals if — and only if — you increase the **F TOL** [more than] 300 Hz.
>
> 50.275 MHz cannot support more than three contacts at a time while running Q65-30C because it is more than 400 Hz wide. It will support only three contacts if the DFs are chosen strategically. Keep in mind there is auroral spreading beyond the actual bandwidth of the transmitted signal. The actual transmitted bandwidth of 30C mode is more than 400 Hz, without spreading. So Larry, KØTPP, proposed, and I agree, that for future aurora openings, 50.275 MHz should be avoided for aurora, and 50.280 and 50.285 MHz should be used when you want to run Q65-30C or other modes.

Later, aurora E_s appeared. Mike, K7ULS (DN41), logged KL7J (BP40) at 0749 UTC on FT8. Aurora E_s has clear tones, and FT8 usually will decode. After the geomagnetic storm subsided, the HF and VHF bands were dead for a few days. Carl Luetzelschwab, K9LA, noted, "When the K index is this high for such a long time, the electron density in the F2 region of the ionosphere can be significantly depleted for days. On-the-air activity confirmed this."

NØLL/P DN91 during the Eta Aquariid Meteor Shower

Larry Lambert, NØLL, operated during the peak of the Eta Aquariid meteor shower on May 4 – 5. He did this from rare grid DN91 in western Nebraska on 6 meters. The shower this year was enhanced by extra debris from Halley's Comet, which had been affected by Jupiter's gravity, directing it closer to Earth. This shower's radiant was located in an optimal position for radio several hours before and after 0800 local time. This, coupled with the normal daily morning meteors, made for great meteor-scatter conditions. Larry made 57 MSK144 and 30 FT8 contacts on 6 meters.

On the Bands

50 MHz. On May 1, Mario, K2ZD, worked 3D2AG at 2146 UTC. Al Helfrick, K2BLA (EL99), worked PZ5RA, and then D4L for his DXCC #98 and #99 on 6 meters. On May 7, Glenn Johnson, WØGJ (EN43), was beaming west on a quiet band when 3D2AG "popped up at –11 dB," and he worked him. He noted that Antoine called CQ for another 20 minutes but had no more contacts. Roger, VE1SKY, logged ZP9HTL on May 8. On May 12, John, KL7HBK (BP40), worked VK9DX at 2306 UTC. On May 13, K1HTV worked CE2SV, CE3DWB, CE2EP, and PY2XB via E_s to transequatorial propagation. Mike, KMØT, logged VK9DX the next day. On May 15, Ken Reecy, AC4TO (EM70), and Steve Sacco, NN4X (EL98), worked VK8AW (PH57). VK8AW had PSK flags from coast to coast. I, NØJK, got a PSK flag from ZL1RS at 0152 UTC on May 16. NN4X picked up VP6MW "for a new one" on May 16. NØKQY (DM98) worked FK8HA (RG37), and I copied two decodes of FK8HA calling CQ that afternoon. Bernie, KFØQS (DM79), worked CE3SX and XQ7UP/3 (FF46) using a halo antenna elevated 25 feet.

Ed, N7PHY, operated from DN16 in mid-May, making 191 contacts on FT8, MSK144, and Q65. Mario, K2ZD, had a "strong opening" to Japan on May 22. He worked 16 stations in all JA call districts, with signals up to "+2 dB" on FT8. Fred, KH7Y (DM62), got a PSK flag from S57RR on May 24. Fred is using a loop antenna elevated 20 feet. Ed, N7PHY, operated from the DN04/DN05 grid line on May 29 – 31. On May 31 at 1727 UTC, Ed worked Jim, K4XO (EM55), for Jim's last grid needed for FFMA! On June 1, Matt, AF2F, who was active as K4H from Cape Hatteras (FM25), IOTA-067, had a strong opening to Europe spotted as far east as UT2XQ. Earlier, I copied Matt working W7EW (CN84).

432 MHz Aurora. VE3DS (FN03) worked K9MRI (EN70) and K2DH (FN13) on 432.1 MHz aurora on May 10. KMØT (EN13) logged WØLGQ (EN21).

Here and There

The Perseid meteor shower is the most popular meteor shower of the year for both visual observers and amateur radio operators. With fast meteors striking the E layer at a speed of 60 kilometers per second, you can make contacts on 50, 144, and 222 MHz. The shower will peak this year on August 11 – 12. Note that the best paths and times based on the Perseids' radiant location are northeast to southwest at 0900 – 1100 local time and southeast to northwest at 0100 – 0300 local time, both at path midpoint.

Special Event Stations

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

July 20 – July 27, 0000Z – 2359Z, WØR, Durham, NC. AF4ZE. **RAGBRAI 51**. 14.074 21.074; FT8 CW SSB. QSL. John Swartz, AF4ZE, 6203 Chesden Dr., Durham, NC 27713. *Biking across Iowa; operating bike-mobile, QRP as time permits*. **af4ze@arrl.net**, **LoTW**, or **www.qrz.com**

July 26 – Aug. 9, 0000Z – 2359Z, TM2024JOP, Lillers, France. Union des RadioClubs. **Jeux Olympiques de Paris 2024**. 7.000 14.000; all bands will be activated. Certificate & QSL. Union des RadioClubs, 3 rue Saint Lugle, Lillers 62190, France. **https://log-et-qsl.associations-radioamateurs.org/wp**

July 31 – Aug. 3, 1300Z – 1200Z, W8W, Bryan, OH. Williams County Ohio Amateur Radio Association. **127 Yard Sale/ Newhope Community Church Mission to Uganda**. 146.820 MHz PL 107.2 3.900 7.230 14.250. QSL. Williams County Amateur Radio Association, 3440 County Road 9, Bryan, OH 43506. **wmscoarc@gmail.com**

Aug. 1 – Aug. 11, 0000Z – 2359Z, W8LKY, Alliance, OH. Alliance Amateur Radio Club. **Carnation Festival Special Event**. 7.050 7.220 14.050 14.250. Certificate. Alliance Amateur Radio Club, P.O. Box 3344, Alliance, OH 44601. **w8lky.radio@gmail.com**, **www.w8lky.org**, or **www.qrz.com/db/w8lky**

Aug. 1 – Aug. 4, 1200Z – 1800Z daily, KD3KA, Wexford, PA. Allegheny Valley Radio Association. **KDKA Shortwave Broadcasting Centennial**. 7.040 7.240 14.040 14.240. QSL. Allegheny Valley Radio Association, P.O. Box 550, Wexford, PA 15090. **www.qrz.com/db/kd3ka** or **https://www.kdka100.org**

Aug. 1 – Aug. 5, 0400Z – 0400Z, W8AL, Canton, OH. Canton Amateur Radio Club. **Pro Football Hall of Fame Enshrinement Festival**. 7.200 14.285 21.320. Certificate. Canton Amateur Radio Club, P.O. Box 8673, Canton, OH 44711-8673. *On-air times, bands, and modes subject to operator availability; watch for spots and digital modes*. **https://w8al.org**

Aug. 2 – Aug. 18, 2200Z – 2359Z, W9ISF, Indianapolis, IN. Indiana State Fair Amateur Radio Club. **Indiana State Fair**. 14.240 18.150 7.240 28.400. QSL. Ken Bandy, 7405 E. County Road 900 N., Brownsburg, IN 46112. **ken.kj9b@gmail.com**

Aug. 3, 1400Z – 1900Z, W9EBN, Van Buren, IN. Grant County Amateur Radio Club. **Popcorn Festival**. 7.250 14.250 D-STAR Ref #24 DMR TG 3100 / DMR TG 31656. Certificate & QSL. L.B. Nickerson, K9NQW, P.O. Box 1786, Marion, IN 46952. **www.grantarc.net**

Aug. 4 – Aug. 8, 0000Z – 2359Z, KØC, Bridgeton, NJ. New Jersey Knights of Columbus Amateur Radio Club. **Knights of Columbus Supreme Convention**. 7.185 14.250 18.140 21.350. Certificate & QSL. Thomas M. Perrotti, N2JIE, 785 Vineland Ave., Bridgeton, NJ 08302-4822. **www.nj2kc.org**

Aug. 9 – Aug. 12, 0000Z – 2359Z, NW7US, worldwide. Olivia Digital DXers Club. **Summer Olivia Digital Mode QSO Party**. 7.071 14.071 21.071 28.121. Certificate. Tomas Hood, P.O. Box 110, Fayetteville, OH 45118. *This is an operating event*. **https://OliviaDigitalMode.org**

Aug. 10, 1000Z – 1700Z, W1W, Alna, ME. Lincoln County Amateur Radio Club. **Wiscasset, Waterville, and Farmington Railway Museum Annual Picnic Special Event Station**. 14.260 21.280. QSL. Jose P. Douglas, 254 Elliott Hill Rd., Round Pond, ME 04564. **www.qrz.com/db/k1lx** or **www.k1lx.org**

Aug. 10 – Aug. 24, 1200Z – 2359Z, K1B, Bennington, VT. **247th Anniversary of the Battle of Bennington**. 18.100 21.070 24.915 28.074; all modes in the General band. QSL. Ed Landry, N2HX, 50 Jayne Ln., Bennington, VT 05201.

Aug. 10, 1600Z – 2300Z, NI6IW, San Diego, CA. USS *Midway* Museum Ship. **Commemorating the First Deployment of USS *Midway* with Angled Flight Deck (8/16/58)**. 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/ni6iw**

Aug. 11 – Sep 8, 0000Z – 2359Z, TM2024JPP, Lillers, France. Union des RadioClubs. **Jeux Paralympiques de Paris 2024**. 7.000 14.000; all bands will be activated. Certificate & QSL. Union des RadioClubs, 3 rue Saint Lugle, Lillers 62190, France. **https://log-et-qsl.associations-radioamateurs.org/wp**

Aug. 12 – Aug. 14, 0000Z – 2359Z, KØC, Bridgeton, NJ. New Jersey Knights of Columbus Amateur Radio Club. **Knights of Columbus Blessed McGivney Birth, Death, and Feast Days**. 7.1850 14.2500 18.1400 21.3500. Certificate & QSL. Thomas M. Perrotti, N2JIE, 785 Vineland Ave., Bridgeton, NJ 08302-4822. **www.nj2kc.org**

Aug. 15 – Aug. 30, 0001Z – 2359Z, N4V, Memphis, TN. NRV Veterans. **US Coast Guard Radio Station Guam/NRV 80th Anniversary**. 7.030 7.185 14.030 14.235. Certificate & QSL. Jim Pogue, 699 Dickinson St., Memphis, TN 38107. **kh2ar@comcast.net**

Aug. 16 – Aug. 17, 1020Z – 0920Z, WØDBQ, Dubuque, IA. The Great River Amateur Radio Club. **Field of Dreams**. 7.282 14.282; 17 and 15 meters. QSL. GRARC, P.O. Box 12384, Dubuque, IA 52004. **w9upk@arrl.net** or **www.w0dbq.org**

Aug. 17, 1300Z – 2100Z, K3S, Baltimore, MD. Nuclear Ship *Savannah* Amateur Radio Club. **Nuclear Ship *Savannah* Maiden Voyage Anniversary**. 7.1 14.110 21.1 28.1. QSL. K3LU, 980 Pat Patuxent Rd., Odenton, MD 21113. *Check spotting networks for frequencies*. **www.qrz.com/db/k3s**

Aug. 17, 1500Z – 2100Z, W8GNM/8, Port Clinton, OH. Port Clinton Lighthouse Conservancy. **Port Clinton, Ohio Lighthouse Activation**. 7.235 14.335 21.440 28.615. QSL. Geoff Mendenhall, 4720 E. Terrace Cir., Port Clinton, OH 43452. QSL via LoTW only to W8GNM/8 *(ARLHS USA-922). Grid Square: EN81mm. Check web clusters for specific frequencies*. **https://portclintonlighthouse.org** or **http://arlhs.com/events**

Aug. 17 – Aug. 18, 1500Z – 0300Z, K3K, Camp Hill, PA. South Mountain Radio Amateurs. **Shiremanstown Sesquicentennial**. 7.290 14.290 21.290 28.390. QSL. E-QSL by email and/or eQSL.cc. Fill out form on **n3twt.org** to get email with electronic QSL card. **www.n3twt.org** or **www.qrz.com/db/k3k**

Aug. 21 – Aug. 26, 0001Z – 2359Z, K2D/K2D/x, Melville, NY. Caryn Eve Murray, KD2GUT. **International Dog Day 2024**. 7.045 14.050 21.030 28.050; CW and SSB. Certificate. Caryn Eve Murray, 2 Wallingford Dr., Melville, NY 11747. *Check spotting clusters. Downloadable certificate will be available after the event is over.* **www.qrz.com/db/k2d**

Aug. 24, 0000Z – 2359Z, K3IEC, Mechanicsburg, PA. Cumberland Amateur Radio Club. **Radio & National Railway Historical Society**. 7.250 14.250 21.300 28.400; CW, SSB, digital. QSL. Frank Mellott, 1010 Good Hope Rd., Mechanicsburg, PA 17050. **www.radioclub-carc.com**

Aug. 24 – Sep. 2, 0000Z – 0000Z, W3B, Sharon, PA. Mercer County Amateur Radio Club. **2024 Buhl Day**. 7.074 7.240 14.074 14.245. QSL. Mercer County Amateur Radio Club, P.O. Box 673, 32 Shenango Ave., Sharon, PA 16146. **www.w3lif.org**

Aug. 31, 1200Z – 1800Z, W9EBN, Marion, IN. Grant County Amateur Radio Club**. 33rd Annual Fly/In Cruise/In Festival**. 7.260 14.250 21.350; DMR TG 3100 / DMR TG 31656; D-STAR Ref. #24B. Certificate & QSL. L.B. Nickerson, K9NQW, P.O. Box 1786, Marion, IN 46952. **www.grantarc.net**

Aug. 31 – Sep. 2, 1600Z – 2200Z, N7KGS, 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 Ave., Ellensburg, WA 98926. **www.qsl.net/kcarcs/rodeo.html**

Aug. 31 – Sep 2. 1700Z – 1700Z, K7RDG, Sierra Vista, AZ. Cochise Amateur Radio Association. **Return to Paradise, 46th Anniversary**. 7.225 14.074 14.285 21.225. Certificate. Cochise ARA, P.O. Box 1855, Sierra Vista, AZ 85650-9340. **www.k7rdg.org**

Aug. 31 – Sep. 7, 1323Z – 1323Z, K9A, Auburn, IN. Northeastern Indiana Amateur Radio Association. **Auburn Cord Duesenberg Festival Special Event Station**. 40, 20, 10 meters; 7.180 14.250 28.350. Certificate & QSL. Northeastern Indiana Amateur Radio Association, P.O. Box 145, Auburn, IN 46706-0145. **www.w9ou.org**

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 **November** *QST* would have to be received by **September 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**.

Field Organization Reports — May 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**.

640
AD8CM

405
N9VC

370
WA3EZN

330
N2LC

285
NW3X

283
W7EES

276
KE8BYC

275
WM5N

270
KD2LPM

255
KD8UUB

240
KT2D

225
K8AMH
WO2H

210
KK4PUX

205
KB9PGY

198
KC8YVF

197
KE8DON

185
KF5OMH

180
AC8NP
N8SY

178
WØPZD

177
KD2GXL

175
ND8W

170
KK3F
N4CNX
W4DNA

167
KB3YRU

165
K9LGU
KE8CYC

162
KE8HKA

160
KC9FXE

155
K7OED

154
ACØKQ

150
WA3QLW
N1ILZ

145
KO4KUS
KR4PI
WM2C
WD8USA

143
WV5Q

140
K5ANP
KF5IOU

139
KT5SR

137
NI2W

136
K4NWX
KV2J

135
AG9G
WB9WKO

130
W2PAX
KE5YTA
KE4RS
K8MDA
N2JBA
WK4WC

KW1U
WZØC

129
W5WMC

126
KA9IKK

123
W3YVQ
KC8T

121
WB8YYS

120
WC4FSU
WA4VGZ
N2DW
W4CMH
NØDMP
K3JL
W2AH
KY2D

119
KDØHHN

117
N8KRX

115
KO4OL
W4CAC
N3GE

113
K5OB

112
W9GRG
KG5VSR

110
AD4DO
N5RH
KC8WH
KB2QO
WB8TQZ
WA1URS
N1IQI

108
K8RDN

105
W8GSR
W1RVY

104
KV8Z
KC3MAL

100
KZ8Q
WB4RJW
NX9K
KA5AZK
KE8ANW
KB8GUN
WB8SIQ
N8MRS
W2OOD
KB8PGW
K8ED
K2MTG
K3YAK

KA2HZP
W4EDN
W1KX
N1LAH
KC1KVY
W1TCD

96
KB1NMO

95
KL7RF

94
W4TTO

93
KT4WX
WB2VUH

92
W8IM
KT5EM

91
NØJAR

90
KA1G
KM4WHO
AA4XZ
KB9GO
KC9UC
W8MAL
K8KRA
KB8HJJ
N8OD
N3SW
WA3QPX

W2QMI
AA3N
W4KX
WX2DX
N1CVO

89
WB4ZDU

88
KF7GC

K6JT

86
K1XFC

85
K4FHR
KB3MXK

84
WB8R

83
NT1N

81
N3RPB

80
KG5AOP

AE2EY
KR4ST
AA7BM
WB3FTQ
KA8JBA
NØET

79
WB8RGE
KN4AAG

77
KD2TDG

76
W4NHO
W7MIN

74
W3ZR

73
N2TSO
AE5MI
N2GS

72
W5XX

71
KA2GQQ

The following stations qualified for PSHR in previous months, but were not acknowledged in this column yet. (Apr.) NT1N 185, K1CFI 139, W1INC 120, K1UAF, W1FEA 110. (Feb.) KD2GXL 109.

Section Traffic Manager Reports

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

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported: KY, MI, ND, NLI, SCV, WNY.

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.

NX9K 2,512, KY2D 2,110, W2AH 1,466, WB9WKO 687, KK3F 676, N9CK 651, KE5YTA 544, N9VC 542, KW1U 525.

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
Tl = Talk-in frequency
Adm = Admission

ARRL SOUTHEASTERN DIVISION CONVENTION

August 17 – 18, Huntsville, Alabama

D F H Q R S V

Sat. 9 AM – 4:30 PM, Sun. 9 AM – 3 PM. *Spr:* Huntsville Hamfest, Inc. Von Braun Center South Hall, 700 Monroe St. SW. *Tl:* 146.94 (100 Hz). *Adm:* $12 Advance, $15 door. **www.hamfest.org**

Arizona (Heber-Overgaard) — Sept. 7 D R T V

8 AM – 1 PM. *Spr:* Rim Country ARC. All Season Lodge/ Ranch, 2365 Bison Ranch Trail. *Tl:* 146.80 (162.2 Hz). *Adm:* Free. **www.w7rim.com**

ARRL SANTA BARBARA SECTION CONVENTION

August 31, Camarillo, California

H R S V

8 AM – 4 PM. *Spr:* The Bored Net. California State University Channel Islands, 1 University Dr. *Tl:* 147.915 – 127.3. *Adm:* Free. **www.theborednet.net**

Florida (Tampa) — Aug. 24 F H Q R T V

7 AM – noon. *Spr:* Tampa ARC. 7801 N. 22nd St. *Tl:* 147.105 (146.2 Hz). *Adm:* $5. **www.hamclub.org**

Indiana (Lake Village) — Aug. 11 D F H R S T V

8 AM – 3 PM. *Spr:* ARANCI. Lake Village Community Center, 9728 N. 300 W. *Tl:* 145.33 (131.8 Hz). *Adm:* $8 Advance, $10 door. Email: **ka9e@yahoo.com**

Iowa (Sioux City) — Sept. 7 F H Q R S V

9 AM – 1 PM. *Spr:* Sooland ARA. Morningside Lutheran Church (lower gym), 700 S. Martha St. *Tl:* 147.060 (110.09 Hz). *Adm:* $5. **www.facebook.com/groups/591123127614974**

Kentucky (Shepherdsville) — Sept. 7 D F H Q R S T V

8 AM – 2 PM. *Spr:* Greater Louisville Hamfest Association. Paroquet Springs Conference Centre, 395 Paroquet Springs Dr. *Tl:* 146.70 (79.7 Hz). *Adm:* $8 Advance, $10 door (cash only). **www.louisvillehamfest.com**

Maine (Windsor) — Sept. 7 D F H R T V

8 AM – noon. *Spr:* Augusta ARA. Windsor Fairgrounds, 82 Ridge Rd. *Tl:* 146.67 (100 Hz). *Adm:* $10. Email: **k1nit@arrl.org**

ARRL NEW ENGLAND DIVISION CONVENTION

August 22 – 25, Marlborough, Massachusetts

D F H Q R S T V

Variable times. *Spr:* FEMARA. Best Western Royal Plaza Hotel, 181 Boston Post Rd. *Tl:* See website. *Adm:* $18. **www.hamxposition.org**

Michigan (Coldwater) — Sept. 7 F H T

8 AM – noon. *Spr:* Branch Co. ARC. Kilgore International, 595 W. Chicago St. *Tl:* 443.30 (123 Hz). *Adm:* Free. **www.branchcountyarc.org**

Michigan (Wyoming) — Sept. 7 D F H R T V

8 AM – 11 AM. *Spr:* Grand Rapids ARA. The Home School Building, 5625 Burlingame Ave. SW. *Tl:* 147.26 (94.8 Hz). *Adm:* $8. **www.w8dc.org/2024/02/05/grand-rapids-area-hamfest**

Minnesota (Rush City) — Sept. 7 H R T

9 AM – noon. *Spr:* East Central Minnesota ARC. Rush City High School, 51001 Fairfield Ave. *Tl:* 145.33 (146 Hz). *Adm:* Free. **www.qrz.com/db/?callsign=K0ECM**

Mississippi (Biloxi) — Sept. 6 – 7 D H R S V

Fri. noon – 8 PM, Sat. 8 AM – 3 PM. *Spr:* Jackson Co. ARA. St. Martin Community Center, 15008 Lemoyne Blvd. *Tl:* 145.11 (123 Hz). *Adm:* $7. **www.jcmsara.org**

Missouri (Joplin) — Aug. 23 – 24 D F H Q R S V

Fri. noon – 7 PM, Sat. 8 AM – 2 PM. *Spr:* Joplin ARC. Joplin Family Worship Center, 5290 E. 7th St. *Tl:* 147.210 (91.5 Hz). *Adm:* $8 Advance, $10 door. **www.joplinhamfest.org**

Missouri (O'Fallon) — Aug. 11 D F H R S T V

7 AM – noon. *Spr:* St. Charles ARC. O'Fallon Elks Lodge, 1163 Tom Ginnever Ave. *Tl:* 146.70. *Adm:* $7. **www.wb0hsi.org**

Nebraska (Omaha) — Sept. 7 D F H R V

9 AM – 2 PM. *Spr:* Ak-Sar-Ben ARC. Metro Community College South Omaha Campus CAM Bldg. Room 120. *Tl:* 146.94. *Adm:* $5. **www.aksarbenarc.org**

New Jersey (Fair Lawn) — Sept. 7 D F H Q R T

6 AM – 1 PM. *Spr:* Fair Lawn ARC. Fair Lawn Memorial Pool, Bellair Ave. at Dewey Pl. *Tl:* 147.47 (167.9 Hz). *Adm:* $5. **hamfest.fairlawnarc.org**

ARRL SOUTHERN NEW JERSEY SECTION CONVENTION

September 8, Mullica Hill, New Jersey

D F H R S T V

8 AM – 1 PM. *Spr:* Gloucester Co. ARC. Glouceser Co. 4H Fairgrounds, 235 Bridgeton Pike (Rte. 77). *Tl:* 147.18 (131.8 Hz). *Adm:* $10. **www.w2mmd.org**

New Jersey (Spring Lake) — Sept. 7 D F H R T V

7:30 AM – 1 PM. *Spr:* Ocean Monmouth ARC. Spring Lake Heights Volunteer Fire Co. No. 1, 700 6th Ave. *Tl:* 145.110 (127.3 Hz). *Adm:* $5; kids 12 and under, free. **www.n2mo.org**

New Mexico (Alamogordo) — Aug. 31 D F H Q R S V

7 AM – 3 PM. *Spr:* Alamogordo ARC. Otero Co. Fairgrounds, 401 Fairgrounds Rd. *Tl:* 146.80 (127.3 Hz). *Adm:* Free. **www.qsl.net/k5lrw/hamfest.htm**

New York (Avoca) — Aug. 17 D F H R S T V

7:30 AM – 11:30 AM. *Spr:* Keuka Lake ARA. Howard Community Center, 7481 Hopkins Rd. *Tl:* 145.190 (110.9 Hz). *Adm:* $5. **www.klara.us**

New York (Ballston Spa) — Sept. 7 D F H R S T V

7 AM – 1 PM. *Spr:* Saratoga Co. ARA. Saratoga Co. Fairgrounds, 162 Prospect St. *Tl:* 147.00 (91.5 Hz). *Adm:* $10. **www.k2dll.org**

New York (Lockport) — Sept. 7 D F H R T

7 AM. *Spr:* Lancaster ARC. Transit Drive In, 6655 S. Transit Rd. *Tl:* 147.255 (107.2 Hz). *Adm:* $10. **www.w2so.org**

New York (Macedon) — Aug. 24 D F H R T V

6 AM. *Spr:* ROC City Net. Log Cabin Restaurant/ Grounds, 2445 W. Walworth Rd. *Tl:* 144.11. *Adm:* Free. **www.roccityhamfest.com**

ARRL NORTH CAROLINA STATE CONVENTION

August 30 – September 1, Shelby, North Carolina

D F H R S T V

Fri. 9 AM, Sat. and Sun. 8 AM. *Spr:* Shelby ARC. Cleveland Co. Fairgrounds, 1751 E. Marion S. *Tl:* 146.88. *Adm:* $10. **www.shelbyhamfest.org**

Ohio (Cortland) — Aug. 18 D F H Q R S T V
8 AM – 3 PM. *Spr:* Warren ARA. Trumbull Co. Fairgrounds, 889 Everett Hull Rd. *Tl:* 146.97 (100 Hz, normally off). *Adm:* Free. **www.w8vtd.com**

Ohio (Findlay) — Sept. 8 D F H R S T
8 AM – 1 PM. *Spr:* Findlay Radio Club. Hancock Co. Fairgrounds, 1017 E. Sandusky St. *Tl:* 147.15 (88.5 Hz). *Adm:* $10. **www.w8ft.org**

Pennsylvania (New Kensington) — Aug. 25 D F Q R S T
8 AM – 1 PM. *Spr:* Skyview Radio Society. 2335 Turkey Ridge Rd. *Tl:* 146.64 (131.8 Hz). *Adm:* $5. **www.skyviewradio.net**

Pennsylvania (Phoenixville) — Aug. 11 D F H Q R T V
8 AM. *Spr:* Mid-Atlantic ARC. Kimberton Fair Grounds, 762 Pike Springs Rd. *Tl:* 145.13 (131.8 Hz), 147.06 (131.8 Hz). *Adm:* $10. **www.marc-radio.org/hamfest2.htm**

Tennessee (Lebanon) — Aug. 24 D T
8 AM – 2 PM. *Spr:* Short Mountain Repeater Club. Cedars of Lebanon State Park, 328 Cedar Forest Rd. *Tl:* (146.91 Hz). *Adm:* Free. **www.smrclub.com**

Wisconsin (Baraboo) — Aug. 24 F H R
8 AM – noon. *Spr:* Yellow Thunder ARC. Badger Steam and Gas Engine Club Property, S3347 Sand Rd. *Tl:* 147.315 (123.0 Hz). *Adm:* $5. **www.yellowthunder.org**

Wisconsin (Cedarburg) — Sept. 7 F H R T
6 AM – noon. *Spr:* Ozaukee Radio Club. Firemen's Park, W65N796 on Washington Ave. *Tl:* 146.97 (127 Hz). *Adm:* $5; under 12 years old, free. **www.ozaukeeradioclub.org**

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 and handouts. 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 **September 1** to be listed in the **November** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's website for possible late changes, driving directions, and other event details. Please note that postal regulations prohibit mention in *QST* of games of chance, such as raffles or bingo.

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

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*.

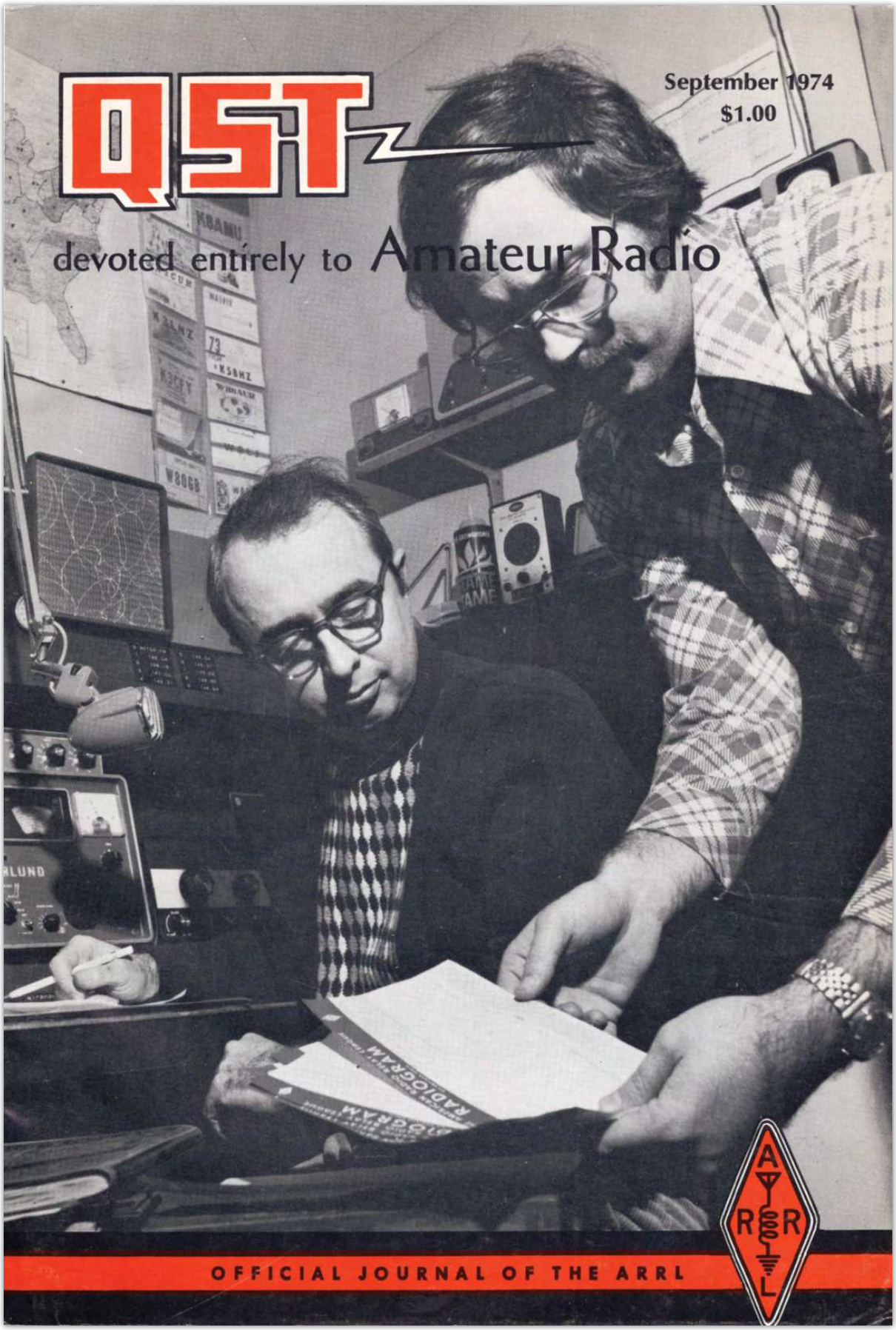
Technical articles outline a construction project or a technical concept. General interest articles are "everything else" that's not technical: recaps of DXpeditions, grid expeditions, or public service activities; personal accounts of trying a new mode or style of operating — anything relating to operating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

A Look Back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OFFICIAL JOURNAL OF THE ARRL

Sister Cities

"Communication is the Key"

THE OAXACA

BY JOHN TROSTER,* W6ISQ AND
M. C. "CHUCK" TOWNS, ** K6LFH

This is a story about how amateur radio got together with the Sister City program in Oaxaca,

IT WAS a great day in the south central Mexican city of Oaxaca (pronounced Wah-hocka). Bands played, citizens cheered and fiesta was in the air. The Governor of the State of Oaxaca cut the ribbon stretched across newly-paved Copernicus Road and then, with the band playing, led an entourage of mayors, civic leaders and other dignitaries on a delightful walk up the hill to a new observatory which was then properly dedicated.

Any casual radio amateur observer moving along with that holiday crowd would have to reflect that perhaps this day marked the beginning of a potentially new productive and exciting area of involvement for amateur radio – because in a new building adjacent to the observatory was a new amateur antenna, and inside the building was a specially built room housing an amateur station. The entire celebration, together with the observatory and amateur station, was a direct result of the cooperative Sister Cities International program which linked Oaxaca, Mexico, with Palo Alto, California.

The Sister Cities program is sponsored by the private, non-profit Town Affiliation Association which is headquartered in Washington, D.C.[1] The purpose of this group is to further international understanding through the affiliation between cities of the U.S.A. and cities in other countries, each pair dedicated to the exchange of cultural things, ideas and people.

* 82 Bellbrook Way Atherton, CA 94025.
** President, Project Oscar, 1305 Regan Lane, Saratoga, CA 95070.

Oaxaca and Palo Alto have been Sister Cities some 12 years. Until this dedication, however, the extent of the civic exchanges between the two cities had been principally those of town leaders and the annual north-south migration of high school students of both cities during the summer. However, in March 1970, Marvin Vann, Observatory Manager and Technical Director of the Space Science Center at Foothill College led an expedition of astronomers to a small town near Oaxaca to witness solar eclipse. Upon Mr. Vann's return, he was invited to show his pictures at the annual meeting of the local Sister Cities program. This was his introduction to the Sister Cities idea, and he was impressed.

Mr. Vann re-visited Oaxaca and offered to construct and equip an observatory if that city would provide the architecture, labor and location. The offer was accepted and the cooperative planning and construction began.

At about the same time the idea of using amateur radio in Sister Cities started. The Project OSCAR Board of Directors authorized purchase of amateur equipment which was to be used in a special radio room at the new observatory and Chuch Towns, K6LFH, was named as project coordinator. In due course, the observatory was constructed as a civic project and Mr. Vann emplaced his astronomical equipment. Two days before the dedication, the radios were set up with the help of several local Oaxaca amateurs who had been located by the Oaxaca Sister Cities people.

EXPERIENCE

Amateur Radio and Sister Cities International
A chance to help each other

Mexico. Some ideas are discussed about possible Sister Cities Communications Nets and how the potential goodwill generated could work for the benefit of both the cities and amateur radio.

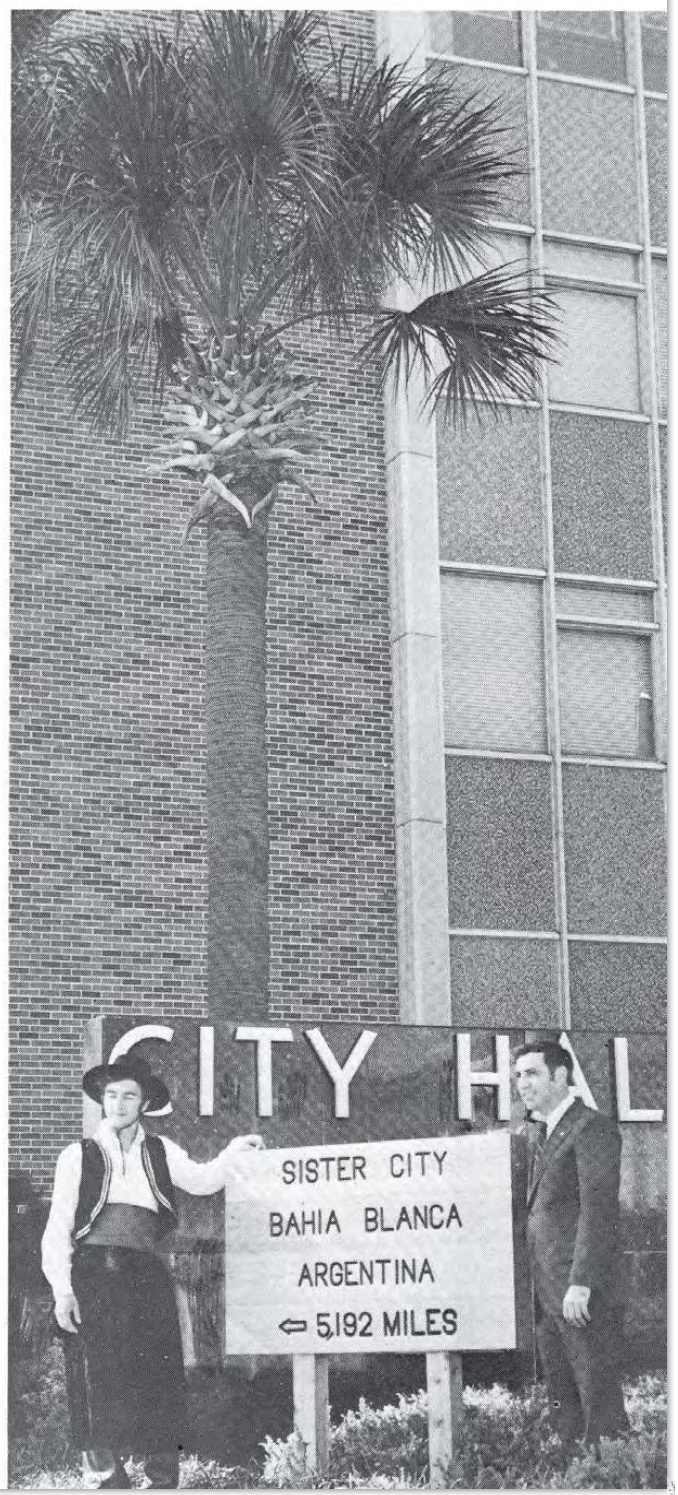
For amateur radio, the entire Oaxaca experience created a new and exciting vehicle – a city-to-city radio link which could now furnish a service for international goodwill between neighbors.

If you, the reader, are intrigued with the Sister Cities idea for your home town, and the potential role of amateur radio in sustaining and complementing the friendship, and you would like to do something about it, contact City Hall to find out if your town has a Sister City or contact the Town Affiliation Association[1] they will be happy to send you a list by state and foreign country of all Sister Cities.

Getting Involved

You can then present your radio club with the idea that they work with your local Sister City group to give direct amateur communications. A good way to start is to get the local DXers involved. Ask them to write a ham in your Sister City and take it from there. If the other station does not have all the required equipment (or whatever) or even if there is a language barrier, do not pull the switch. There are ways to overcome these obstacles which an imaginative and resourceful group can conjure up. If your Sister City does not have amateurs, you might work through your own school to see if some local high school hams

[1] Town Affiliation Association, Suite 206 City Building, 1612 "K" St. NW Washington, D.C. 20006.



Long-time Sister Cities enthusiast Ernie Bracy W1BFA. *(Far left.)*

◀ Guests of the Town Affiliation Association discuss amateur radio participation. L. to r Vic Clark, W4KFC, ARRL First Vice President; L. Arthur Minnich, Bureau of Educational and Cultural Affairs, Department of State; M. C. "Chuck" Towns, K6LFH, Project Oscar President; ARRL General Manager John Huntoon, W1RW.

A number of U.S. cities have active programs of Sister City cooperation, Jacksonville, Florida and Bahia Blanca, Argentina, are examples. ▶

would undertake the project of introducing students in the other city to amateur radio and to help and encourage them to get licensed. In short, don't be limited just because nothing in the way of amateur radio exists there now Take it on as a challenge, and club project, to work through your Sister Cities group to develop two-way communication. You might even consider a visit there on vacation to develop personal acquaintance and to survey the needs. Once the avenue is opened, the entire civic program should unfold easily and those resulting warm, rewarding results will begin to flow

It is important that the operator on the other end be a national of that country Although this may not be possible in the beginning stages where there are a limited number of licensed operators, one of the objects of the entire exercise is to help train your friends in your neighbor city

Before attempting any third party communication on behalf of a Sister Group, be sure to find out if such third party traffic is allowed in the other country Many countries do not allow this sort of communication at this time, in which case you will be limited to amateur-to-amateur contacts only However, don't let that deter you. Much goodwill can be generated by the amateurs themselves. Perhaps successful amateur participation in handling worthwhile communication between Sister Cities (where third party traffic is allowed) can be used to show the non-participating countries that it would be to their advantage to allow such communications.

Amateur radio communication within the Sister Cities program need not be limited to civic and cultural exchanges. For example, a group of amateur operators and technical people might be trained to establish life-saving communication for your Sister City in times of emergency or disaster. Not only could they handle the usual generalized communications needs at such a time, but they could also tie in with the Medical Amateur Radio Council (MARCO) which offers the possibility of giving immediate and continuing on-the-air medical advice through this active group of hams in the medical profession.

Regardless of how you and your Sister City get together on the air remember to stay rigorously within the amateur regulations of that country (and your own too, of course). For example. do not supply your counterpart operators with equipment that will operate at higher power levels than allowed. If your Sister City is within a country which does not allow third party traffic, you will hardly impress them about your good intentions if you encourage your counterpart to operate illegally And be assured that the other country will know what its amateurs are doing.

Advantages to Amateur Radio

There is potentially some very beneficial "fall out" from any such cooperative program between amateur radio operators of the world and Sister Cities. In 1979 there will convene a World Administrative Radio Convention (WARC).

Suppose that amateur radio can expand its work with the Sister Cities concept as a vehicle. Beginning in countries where third party traffic is permitted, amateurs could demonstrate their ability to fill a communities communications needs. Surely a country which witnesses first hand what the amateur can do to fill a civic even national – need will be much more favorably disposed to cast its vote for the amateur position at the WARC. The goodwill which the amateur can generate via Sister Cities could, just possibly be reflected someday by a "thank you" vote from some country And let there be no doubt about it amateur radio will need every kind thought and vote they can muster at that conference.

The annual meeting of the Sister Cities International will take place September 18-21 in Phoenix, Arizona, with the appropriate theme, "Communicating For World Peace." About 500 delegates from over 12 countries are expected to attend. And this year for the first time amateur radio will be there. There will be a symposium by amateurs, led by ARRL Vice President V Clark, W4KFC to discuss the potential role for the amateur in the Sister Cities program, and, in addition, there will be an amateur booth where delegates may ask questions. Barry Goldwater K7UGA, who lives in Phoenix, will be principal speaker. He will also put his station on the air from the convention headquarters so delegates can observe amateur radio in action. Maybe some of them could even talk home! And the delegates who come from countries who do not allow third party traffic will perhaps begin to ask, "why not?"

It may appear that there is not much in common between a radio station in an observatory in Oaxaca, Mexico and a World Administrative Radio Convention in 1979 However, if the friendship and exchanges of ideas which that little Oaxaca station can provide could be multiplied by many pairs of Sister Cities throughout the world, the case for amateur radio could be greatly strengthened amongst those who now lack understanding.

Both ARRL and the Sister Cities headquarters group in Washington believe wholeheartedly that amateur radio can provide a significant and vital communications role by way of giving that personal touch so important to international understanding. And in so doing, the amateur can gather tremendous good will for his own cause. You can help. QST

Strays

W7SLZ claims Utah is a "rare" state because most of its urban areas are separated from the east by a mountain range which blocks low angle radiation headed east. We think it's those wide, open spaces and just plain not enough ham-type people.

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Remember the "Let's Talk Transistors" series by Robert E. Stoffels, WB9ESH? We've put together a reprint booklet of this 9-part transistor primer and it is available from ARRL for $1 including postage.

Celebrating Our Legacy

The Benefits of Mentorship

When I was growing up, my neighbor was Karl Miles, K1KQJ (SK). I visited his ham shack and was hooked. His son and I, along with some other kids from school, began studying for our Novice license. I passed and got my license in 1963 as KN1UIO.

I found an old Hallicrafters S-20R receiver and bought a KnightKit T-60 transmitter. As it turned out, Karl had worked at Hallicrafters and helped design the S-20R.

I obtained *The ARRL Handbook* and discovered a 6146-based 6-meter transmitter design. I collected parts and went to work building it. Karl helped me figure out how to use the AM modulator in the T-60 to modulate the 6146. I got a 50 to 30 MHz converter and used the S-20R as my receiver. I got a six-element 6-meter antenna and mounted it on the roof outside my bedroom with a TV antenna rotor.

I got accepted to the New Hampshire Technical Institute (now NHTI — Concord's Community College). After graduating, I began working at Sanders Associates (now BAE Systems). Then I joined the National Guard. Upon my return from Vietnam, I applied to the University of New Hampshire, received a BS and MS in electrical engineering, and returned to Sanders Associates. My work revolved around RF systems, and I got to work on many different types of VHF and UHF receivers and transmitters. As I could not do much with ham radio through all this, I let my license lapse.

Recently, I attended a local hamfest and decided to study for the Technician license, and I passed. I was offered a chance at the General test for free and was lucky it was mostly technical questions, and I passed. A couple of months later, I passed the Extra-class test.

Without Karl's mentorship, I would have never chosen RF engineering as a career.

Oliver Holt, K1UIO
Amherst, New Hampshire

Honoring My Mentor

I met my mentor, John Maggitti, W3IRL (SK), at the bookshop he owned. I walked into the shop one day when I was affronted by the jovial question, "What are you doing that's fun today?" This is a greeting I would hear John say frequently in the years of our friendship that followed. I became a regular at the shop. So much so that John seemed to think I needed a hobby that would challenge me. He began nudging me toward ham radio.

John Maggitti, W3IRL (SK). [Ann Schranz, KK6KTX, photo]

Finally, I caved and began my ham radio journey. John was an enthusiastic teacher. As a Johns Hopkins University-trained physicist with electrical engineering experience, he was able to break down the challenging concepts. I received my Technician license, and 9 months later, I earned my Extra-class license.

John had a deep love for ham radio. He helped me set up my first rig and taught me the art of QSO etiquette. We built antennas, chased satellites, competed for the farthest DX contacts, and participated in Field Day together every year.

John touched many lives in the radio community and the community he lived in. I was not his only student, but I had the privilege of being his last. He gave me the gift of this hobby and his knowledge and time. I am forever grateful.

Britain O'Connor, KD9PEZ
Sturgeon Bay, Wisconsin

Old Rigs and the Old Days

In 1950, my neighbor helped me build a crystal radio set with a galena cat whisker detector. AM radio and transmitter projects were my favorite. It wasn't long before I found out about shortwave radio and requested a Heathkit AR-3 all-band receiver for the following Christmas.

The radio bug bit me hard. In the fall of 1960, I mastered Morse code at 5 WPM and passed the Novice test, and my call sign was KNØEJV. I upgraded to a National RAS-5. My first transmitter was a Globe Chief Deluxe with 807 tubes. Four months later, I passed the General exam and then earned the Extra-class license in 1969 after college and earning a degree in electrical engineering.

Over the years, I have purchased more old radios, some Hallicrafters and Hammarlunds, a Drake R-4C and T-4X, and I still have the AR-3, RAS-5, and Globe Chief. I occasionally use them to make contacts. They are like old friends; spending time with them is enjoyable. They bring back good memories and the feelings of my early days. Modern radios and digital modes are superior, but to me, they lack the thrill of old radios and the time when all we had was the ionosphere. I suppose with age, every generation feels the same about their early days.

Don Becker, KØEJV
Republic, Missouri

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

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

Classic Radio

Similarities between the Hallicrafters HT-32 Family and HT-37

The Hallicrafters HT-32 transmitter appeared on the amateur radio market in 1957, replacing the HT-30. In 1959, the HT-37 came on the market. The HT-32 was updated to the HT-32A in 1959, and was updated again in 1961 to the HT-32B. The HT-37 was a similar transmitter for operation on the same bands and modes, but it used the phasing method of sideband generation, while the HT-32 family used a crystal-lattice filter to generate single sideband (SSB). These transmitters were big and heavy. It wasn't until 1962 — 4 years after the Collins S-line came on the market — that Hallicrafters transitioned to smaller and lighter equipment.

The HT-32B came on the market in 1961. [Photo courtesy of **www.rigreference.com**]

Transmitter Characteristics

The HT-32 and HT-37 weighed around 80 to 85 pounds, and both could be mounted on a 19-inch rack. They used a pair of 6146 final amplifier tubes in parallel to run a conservative 144 W peak envelope power (PEP) on SSB and 144 W on CW. The ac power supply was built in. The high voltage for the pair of 6146s was rectified by a 5R4. A 5V4 tube supplied the lower voltage for the signal-generating stages. Neither transmitter had an internal antenna relay to transfer the antenna from the transmitter to the receiver.

The HT-37 and the HT-32 (before being updated to the HT-32A) didn't offer push-to-talk (PTT) operation; only voice-operated exchange and a front panel switch could enable transmission.

The HT-32 cost $675, and the HT-32B cost $725. The somewhat lower-priced HT-37 was $495, because a lower-cost cabinet and internal electronics could be used with the use of phasing SSB generation (as opposed to a crystal-lattice filter).

Signal Generation Methods

Both transmitters used a variable frequency oscillator (VFO) that covered 5.000 to 5.500 MHz on all bands. To achieve 80/75- and 20-meter coverage, the VFO was subtracted or added to the 9.0 MHz final IF that was common to both transmitters. This provided 4.000 to 3.500 MHz coverage on 80/75 meters and 14.000 to 14.500 MHz on 20 meters.

Other than SSB and AM signal generation, the HT-32 family and HT-37 are quite similar. To reach 40 meters on both transmitters, the 9.0 MHz last IF was mixed with a 21.5 MHz crystal. The 12.5 MHz output was mixed with the VFO to produce an output of 7.000 to 7.500 MHz. On 15 meters, the crystal oscillator was 25.0 MHz, giving an output of 16.0 MHz to mix with the VFO. Adding the VFO produced an output of 21.0 to 21.5 MHz. Neither transmitter covered the full 10-meter band. In the US today, the phone portion of the 10-meter band starts at 28.3 MHz, rather than 28.5 MHz, and CW activity on 10 meters is mostly between 28.0 and 28.1 MHz, which wouldn't be covered by either transmitter. The one supplied crystal for 10 meters was 32.5 MHz, which combined with the 9.0 MHz signal to provide 23.5 MHz, and adding the VFO would result in 28.500 to 29.000 MHz. Hallicrafters offered three optional crystals to cover the whole 10-meter band and 32.0, 33.0, and 33.5 MHz. Sadly, neither transmitter could accommodate more than one crystal, so the operator had to choose between the CW and phone portions of the band.

Sideband Generation

The HT-32 generated a double sideband (DSB) signal internally at 4.95 MHz. The crystal lattice filtered out the lower sideband (LSB) part of the signal, leaving an upper sideband (USB) signal with a suppressed carrier. This was heterodyned with 4.05 MHz for USB emission or 13.95 MHz for LSB, yielding a USB or LSB suppressed carrier signal at 9.000 MHz. From this point, the HT-32 and HT-37 were very similar, and the signal was heterodyned with the band-defining crystal oscillator and the internal VFO to produce a signal output on the desired frequency.

The HT-37 used the phasing method of sideband generation, while the HT-32 family used a crystal-lattice filter to generate SSB. [Photo courtesy of **www.rigpix.com**]

The HT-37 could directly generate an SSB signal at 9.000 MHz using the phasing method of sideband generation. The 9.000 MHz carrier signal was split into two 9.0 MHz signals that were 90° apart. Each signal was applied to a balanced modulator circuit. The microphone audio was also split into two audio signals that were 90° apart by a packaged network in the shape of an octal metal vacuum tube. The two audio signals were applied to the two balanced modulators. Both balanced modulators fed a single output circuit. One sideband added constructiveness, resulting in an output signal of one sideband with a suppressed carrier, while the other sideband output from the two balanced modulators were 180° out of phase and canceled when added together, resulting in an SSB suppressed carrier signal. To generate the other sideband, the two audio inputs were reversed by the mode switch. No expensive crystal-lattice filter was needed; the only difficult item needed was the network to make the two audio outputs phase shift by 90°. The Hallicrafters HT-44 SSB transmitter uses a network made of about 10 components, rather than a packaged network. I believe the 90° phase shift network was the model 350 made by Barker & Williamson — I couldn't find the phase shift network unit on the parts list in the manual.

Similarities in Balance

Both transmitters were quite similar, other than their appearance and SSB generation method. They used a pair of 6146 tubes in parallel with a Pi network output circuit, matching to at least a range of 50 to 75 Ω; a 12 BY7 driver stage was driven by a 6AH6 voltage amplifier stage, and the units were rated at 144 W PEP and 144 W input on CW. Transceiving inputs or outputs weren't provided on either unit. The SX-101 or SX-111 receivers couldn't be used to transceive with good results; the SX-115 could've been designed to transceive with the HT-32 family, because it had a fixed-range VFO on all bands (as did the HT-32), but their IF frequencies were different and couldn't easily be made to transceive like the Collins S-line, Drake 4-line, Heathkit SB-line, and Hallicrafters SX-117/HT-44 and SX-146/46.

Both used a 9.0 MHz IF; the HT-32 family also used a first IF of 4.95 MHz and the conversion to 9.0 MHz was where the selectable sidebands were created. The band-defining crystals were the same frequency for both. Neither unit covered more than 28.5 to 29.0 MHz of the 10-meter band.

Covering 28.0 to 28.5 MHz would be helpful for today's operators, because the US phone band on 10 meters now starts at 28.3 MHz, and CW activity has been between 28.0 and 28.1 MHz for many years. I wish both transmitters included the necessary antenna relay, as neither transmitter was inexpensive, and the ability for PTT would've been a nice touch, too.

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 May 2024 activity report of the VM Program.

- Two operators in Virginia and Florida received advisory notices concerning wideband operation of 6 to 7 kHz wide on 40 meters, contrary to FCC rules. Section 97.307(a) provides that "no amateur shall occupy more bandwidth than necessary for the information rate and emission type being transmitted, in accordance with good amateur practice."
- A GMRS operator received an advisory notice for operating on an amateur repeater in Tennessee after being requested by the repeater owner to stay off the repeater. Any further operation will be referred to the FCC.
- An operator in South Carolina received a commendation for activities on the Grand Strand Amateur Radio Club repeater operating on 147.100 and 441.775 MHz. The operator participated as net control for the first time, on short notice, and managed all check-ins in a timely and efficient manner.
- An operator in Louisiana received an advisory notice for operation with an expired license.
- Technician-class operators in Indiana, Idaho, and Mississippi received advisory notices for operating FT8 on 40 meters. Technicians may operate only CW on 40 meters.
- An operator in Maine received an advisory notice for failure to identify during an hour-long transmission on 75 meters. Section 97.119(a) requires amateur stations to transmit the assigned call sign at the end of each communication and at least every 10 minutes during a communication.
- A glider pilot club in Clermont, Florida, received an advisory notice for operation on amateur frequencies without a license. Any further operation will be referred to the FCC.
- The FCC issued a Notice of Unlicensed Operation to a skydiving organization in Lake Elsinore, California. The organization must cease operation and respond to the FCC within 30 days.
- In May, there was one meeting with the FCC. A VM program presentation was given at Dayton Hamvention on May 18.

The totals for hours of monitoring by Volunteer Monitors during April 2024 will be reported in the June VM report. — *Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH*

100, 50, and 25 Years Ago

August 1924

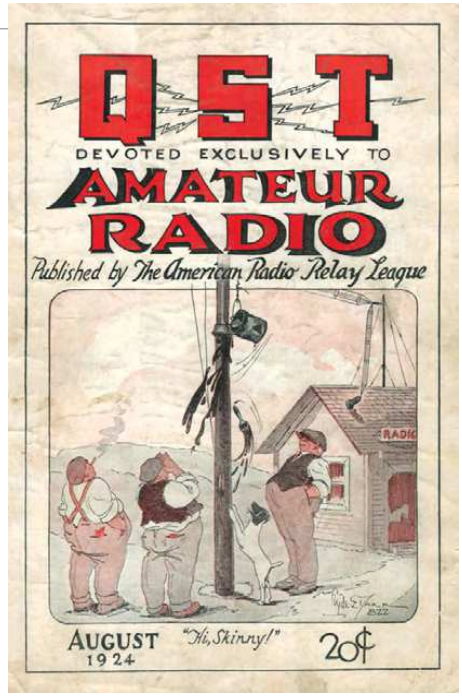
- The cover shows three slightly rotund hams standing on the ground, calling up the antenna mast to their helper, "Hi, Skinny!"
- With the movement for a world-wide amateur organization, the "Editorial: Showing the World" reminds us of our duty to demonstrate the usefulness of the amateur and to encourage amateurs in other counties, by our example, to do the same.
- Simplifying the operation of a complex receiver affectionately called "The Super Calamityplex" is explained in "A One-Control Neutrodyne" by J.L. McLaughlin.
- How to build an oscillator that will really hold calibration is discussed in "An Accurate Wavemeter" by Edwin Lee White, 3XD.
- Photos of the radio installation at Christ Church Mission in Anvik, Alaska, appear in "An A.R.R.L Job in the Far North." The station was designed and assembled by A.R.R.L. members.
- Stanley M. Mathes, ex-7ØE, shares some constructive suggestions for the improvement of radio clubs in "With the Affiliated Clubs: Hamanalysis."
- "The Amateur Builder," by H.F. Mason, 1ID, discusses "Fixed Condensers for Sending Sets."

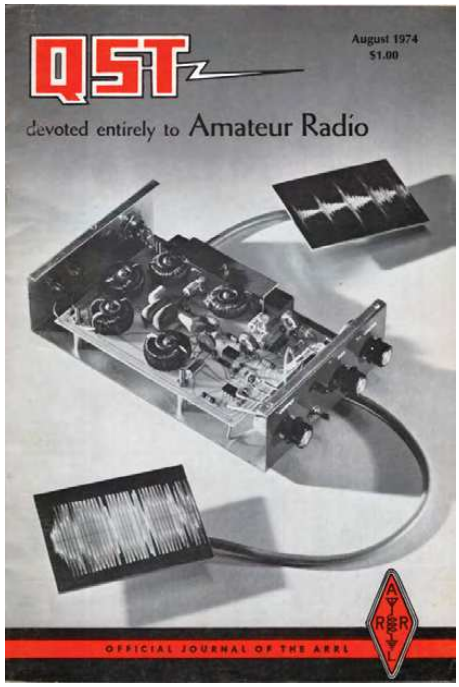
August 1974

- Robert Myers, W1FBY, explains the benefits of a correctly operated speech processor in "A Quasi-Logarithmic Analog Amplitude Limiter With Frequency-Domain Processing." The cover features a picture of the audio processor.
- "It Seems to Us…FCC's 40th Anniversary" relates radio accomplishments throughout the years, and extends sincere appreciation to the many individuals and staff who have worked in our interest.
- "New Symbology for Digital-Logic Diagrams," by Kirk V. Dahl, WAØRTD, presents the basics for reading these diagrams, together with an introduction to a new logic symbology destined to become the international standard.
- A neat high-accuracy alternative to the paint-and-etch method is described in "Making Two-Sided Circuit Boards by the Photoetching Process" by Michael Rathbun, WAØPZI.
- George Hart, W1NJM, presents some background on the Official Observer program, and details how, why, and by whom it is done, and how you can assist in "Amateur Radio *SELF* Monitoring."
- The history of the National Traffic System is outlined in "Amateur Radio Public Service: How It All Started – The NTS" by Bill Mann, WA1FCM.

August 1999

- A handful of parts and a PIC are all you need to create the simple, inexpensive Morse code reader shown on the cover. The details are in "A PIC16F84-Based CW Decoder" by Francesco Morgantini, IK3OIL.
- In "It Seems to Us…Waiting for the Other Shoe," David Sumner, K1ZZ, discusses the FCC's process on filing comments for proposals, and why we seem to play the waiting game.
- As a member of a professional exchange program, Jay Dyer, W8JAY, relates his operating experiences, including making the first Clover QSO from Mongolia, in "A Digital DXpedition to China and Mongolia."
- A simple, inexpensive controller that can handle six loads and easily connect to your transceiver is described in "An Intelligent DTMF Remote Controller" by Peter J. Gailunas, KA1OKQ; Jeffrey B. Otterson, N1KDO, and Richard A. Cox, N1LTL.
- Steve Benson, NØBTH, explains the basics of trunked systems used by emergency communicators in "Hey Elmer, What's a Trunked Radio System?"
- A short history of operations on Annobon Island (3C) is reported in "How's DX? Annobon Island" by Bernie McClenny, W3UR.





Silent Keys

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

N1JEI **Marks**, Anthony A., Gloucester, MA
vKB1VSI **Mauzaka**, Tom A., Strong, ME
vN2KUD **Hansenn**, Gustav E., Modena, NY
K2KYN **Dittbrenner**, Paul F., Jr., St. Petersburg, FL
KB2MOT **Bozony**, Shirley M., Saratoga Springs, NY
KC2PWO **Alecksynas**, Patricia A., Niverville, NY
vWB2QHQ **Maier**, Christian E., Hastings-on-Hudson, NY
N3CXM **Mantell**, John R., III, Waxhaw, NC
WB3FUM **Mawhinney**, Brian L., Winchester, VA
vK3GEV **Yoder**, James H., Hilton Head, SC
vW3HC **McDaniel**, Carl F., Montoursville, PA
•KA3IJN **Potts**, John H., Enola, PA
♦KR3J **Heffner**, Leonard, Summit Hill, PA
K3JWI **George**, Kenneth R., Harrison, TN
vN3KXE **Nash**, Martin J., Lusby, MD
K3NXP **Snyder**, William A., Young Harris, GA
AF4B **Adams**, William R., Mansfield, TX
WA4DBF **Mason**, Harold R., Denver, NC
♦K4DET **Tiller**, David E., Glen Allen, VA
♦•N4ELH **Pleasants**, Walter C., Largo, FL
W4ENZ **Otnes**, John D., McDavid, FL
KI4PRU **Rogue**, Margie H., Eden, NC
N4QH **Dysinger**, Lyle, Toccoa, GA
v♦W4WR **Rothberg**, Warren L., Newburyport, MA
KF4ZFY **Mawhinney**, Tracy L., Winchester, VA
KJ4ZTV **Turlington**, John S., Gastonia, NC
vW5HWD **Ulmer**, James G., Houston, TX
vKC5LK **Bergman**, John A., Brandon, MS
vW5NW **Wolfe**, Nelson L., Collinsville, OK
vK5SS **Thompson**, David L., Allen, TX
vN5WI **Green**, Clifford T., McHenry, MS
vWB5YVG **Shook**, Robert W., Victoria, TX
v♦W6DZN **Fraser**, David G., Santa Rosa, CA
vW6GM **Woody**, William W., Fresno, CA
•N6HJ **Hyman**, Hank J., Phoenix, AZ
vKB6LQS **Rutan**, Richard G., Coeur d'Alene, ID
•KO6OL **Shirokoff**, Erik D., Chicago, IL
W6UJX **Leighty**, James B., La Quinta, CA
vK6VFW **Hansen**, Russell V., Jr., Chaparral, NM
vN7BV **Jones**, Charles A., Port Angeles, WA
v•N7CXZ **Cadiz**, Ellery E., Glendale, AZ
W7EMC **Christiansen**, Eric M., Libby, MT
N7JPD **Bennett**, Kathleen, Yakima, WA
KE7NF **Heller**, Douglas K., Sr., Florence, AZ
•W7UW **Salot**, Stuart E., Anacortes, WA
AE7VU **Gavenda**, William F., Jr., Anacortes, WA
vN8CJS **Fletcher**, Richard E., Lexington, OH
•K8CMS **Sickles**, James "Mike," Morgantown, WV
♦•K8GR **Ricketson**, Glenn L., Grand Rapids, MI
K8KBW **Kress**, Henry J., Santa Monica, CA
•KB8LCI **Hommes**, Jerry A., Venice, FL
WB8NEU **Barta**, John J., Toledo, OH
•KQ8R **King**, David M., Litchfield, MI
W8SYU **Marble**, Harold B., Sterling Heights, MI
KB9DRM **Weddle**, James L., Franklin, IN
vK9JO **Kamely**, Joseph R., Sr., Shell Knob, MO
W9LJR **Bergman**, Russell E., Madison, WI
W9LSE **Seaquist**, Robert J., Holmen, WI
KC9LZJ **Fisher**, Michael W., Evansville, IN
N9MNA **Harlson**, Nolene K., Altoona, WI
KB9MSA **Bowsman**, Joshua, Auburn, IN
v•NGØA **Kramer**, James J., Melrose, MN
vWBØESV **Beck**, Martin O., Wichita, KS
KDØOZE **Hicks**, Tina E., O'Fallon, MO
WØPXM **McKeown**, Mark H., Golden, CO
vNØRWR **Miller**, Donnie C., Dubuque, IA
KEØTQH **Johnson**, Steven L., Cedaredge, CO
AAØTX **Kyler**, Michele M., Crookston, MN
KCØUKU **Vaerewyck**, Janice J., Pueblo West, CO
•NØYCX **Rodgers**, Ron C., Union, MO
HB9EZU **Achermann**, Roland Xaver, Brunnen, Schwyz, Switzerland

♦ Life Member, ARRL
v Veteran
• Former call sign

For information on how to list a Silent Key in *QST*, please visit **www.arrl.org/silent-key-submission-guidelines**.

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

This Month in QEX

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

Coming up in the July/August 2024 issue of *QEX*:

- Al Christman, K3LC, continues his analysis of elevated radials with folded configurations for small spaces.
- Peter Hall, VK6HP, repurposes a de-commissioned navigation aid.
- Paul Wade, W1GHZ, investigates causes of noise, and reducing it with filters.
- In his Essay series, Eric P. Nichols, KL7AJ, discusses the vacuum tube's purpose.
- Rudy Severns, N6LF, explains the relationship between radiation and ground loss resistance.
- Andrii Bilokon, UR5FFR, derives equations describing the pi network.

QEX is edited by Kazimierz "Kai" Siwiak, KE4PT, (**ksiwiak@arrl.org**) and is published bimonthly.

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

Strays

Looking to Thank a Long-Lost Friend

In the mid-1960s, a ham friend of mine in the Navy had a special cup made for me. It's Snoopy lying on his doghouse with a mic in his hand.

Lately, I've regretted being unable to contact or thank the friend who gave it to me. Unfortunately, I don't know his name or call sign. Am I out of luck in tracking him down? Thanks for the help! — *Harvey LeCato, W1JU*

QST Congratulates...

Bob Beaudoin, WA1FCN, for creating and maintaining the K4A special event, In Our Hearts and Minds. The Alabama Contest Group presented Bob with a plaque recognizing his efforts. The event was first held on the 20th anniversary of 9/11 and has recurred on that date since.

Bob Beaudoin, WA1FCN, with his plaque recognizing his efforts. [Tom Schwinn, W4NBS, photo]

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• System Fusion Compatible • Large Front Speaker delivers 700 mW of Loud Audio Output • Automatic Mode Select detects C4FM or Fm Analog and Switches Accordingly • Huge 1,105 Channel Memory Capacity • External DC Jack for DC Supply and Battery Charging

FT-5DR *C4FM/FM 144/430 MHz Dual Band*

• High-Res Full-Color Touch Screen TFT LCD Display • Easy Hands-Free Operation w/Built-In Bluetooth© Unit • Built-In High Precision GPS Antenna • 1200/9600bps APRS Data Communications • Supports Simultaneous C4FM Digital • Micro SD Card Slot

FT-65R | *144/430 MHz Transceiver*

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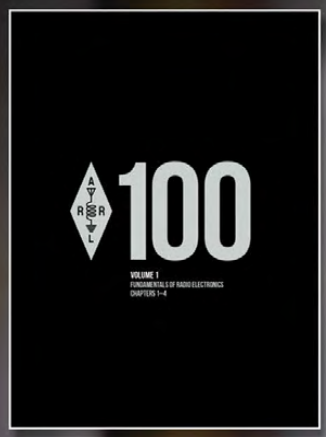

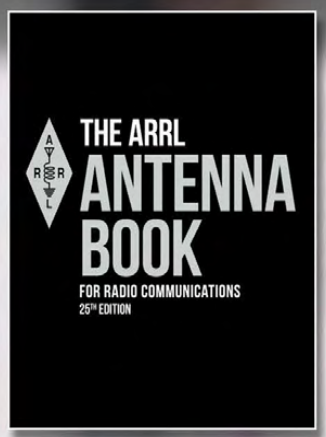

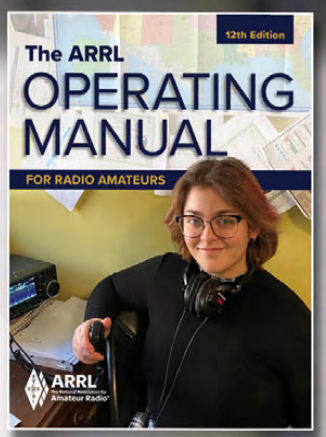

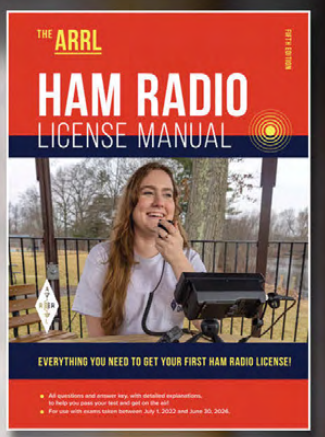

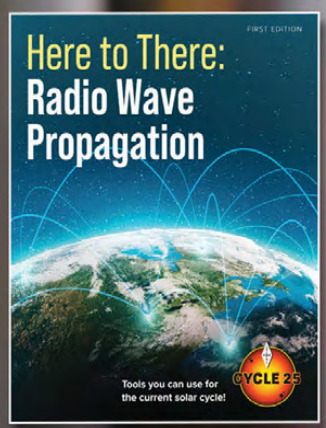

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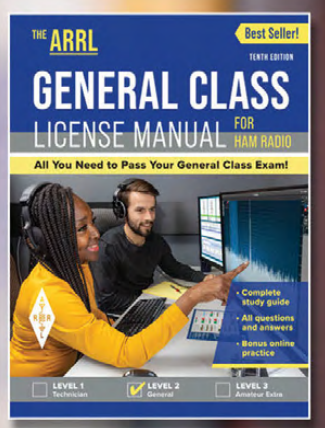

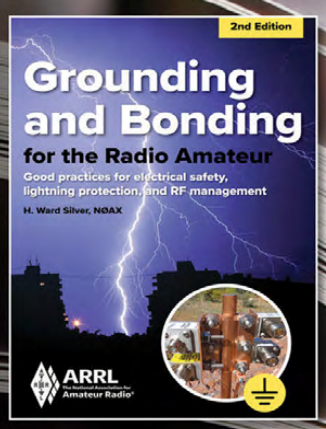

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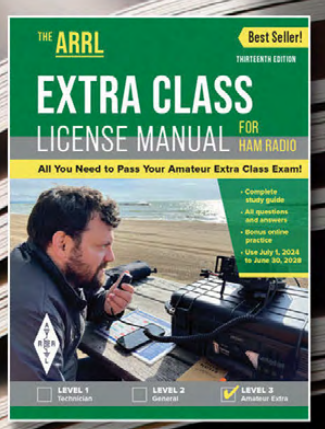

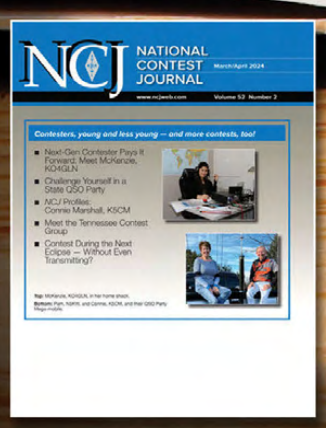

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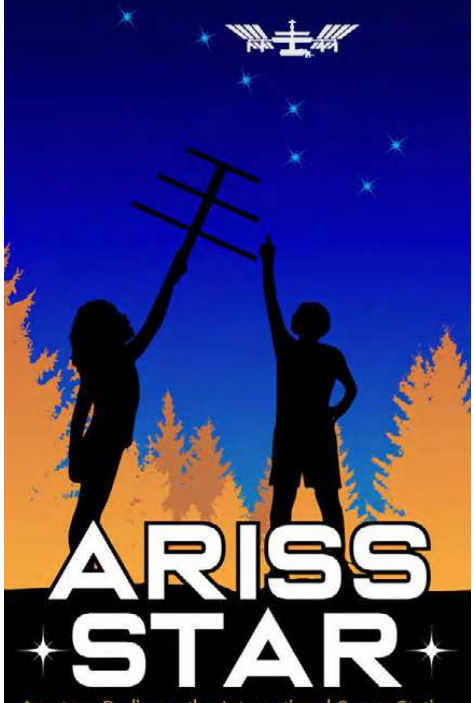

The ARISS *STAR* ***Keith Pugh Memoriam Project*** honors ARISS Technical Mentor Keith Pugh, W5IU (SK), and seeks to improve ARISS US STEM education via robotics — with telerobotics adding a wireless accent.

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

In-Line Module

In-Line Module connections

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

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

Compact In-Line

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

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

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

NES10-2MK4

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Main Trading Company (MTC Radio), a leading provider of amateur radio equipment, is proud to announce its new partnership with SPE Expert, the renowned Italian manufacturer of high-quality amplifiers, becoming the exclusive distributor of SPE Expert amplifiers in North America.

MTC Radio has formed a new company: **Expert Amps USA, LLC**. Effective immediately, Expert Amps USA will take on the role of North American Distributor for SPE Expert amplifiers. This collaboration ensures that ham operators throughout North America will have access to cutting-edge amplification technology.

MTC Radio and Expert Amps USA will also be offering factory authorized service for SPE Expert amplifiers. The Factory Authorized service center in Florida is continuing its operation and by Summer of 2024 there will be another repair center in Texas.

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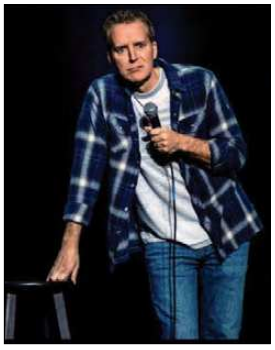
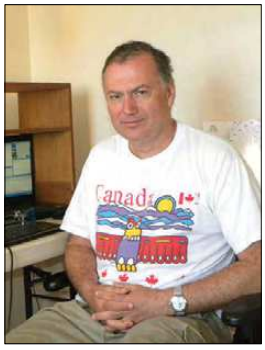
Thursday Night Comedy Kick-Off



Featuring Comedian Juston McKinney
Thursday, August 22, 2024 at 8 PM

Friday Night DX/Contest Banquet



Featuring Yuri Onipko, VE3DZ
Friday, August 23, 2024

Convention Keynote Address

Featuring Steve Goodgame, K5ATA
Saturday Morning, August 24, 2024

Saturday Grand Banquet Presentation

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- New England Sci-Tech Kit Building
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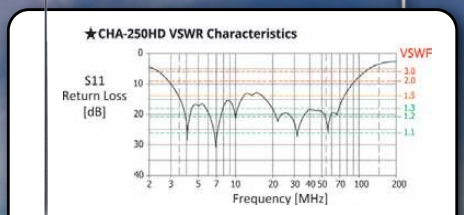

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Wavelength: 146MHz 5/8 wave x 2 • 220MHz 5/8 wave x 3• 446MHz 5/8 wave x 5 • Max Pwr: 120W • Length: 10'2" • Weight: 3lbs. 1oz.• Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

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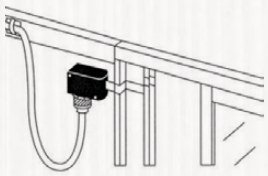

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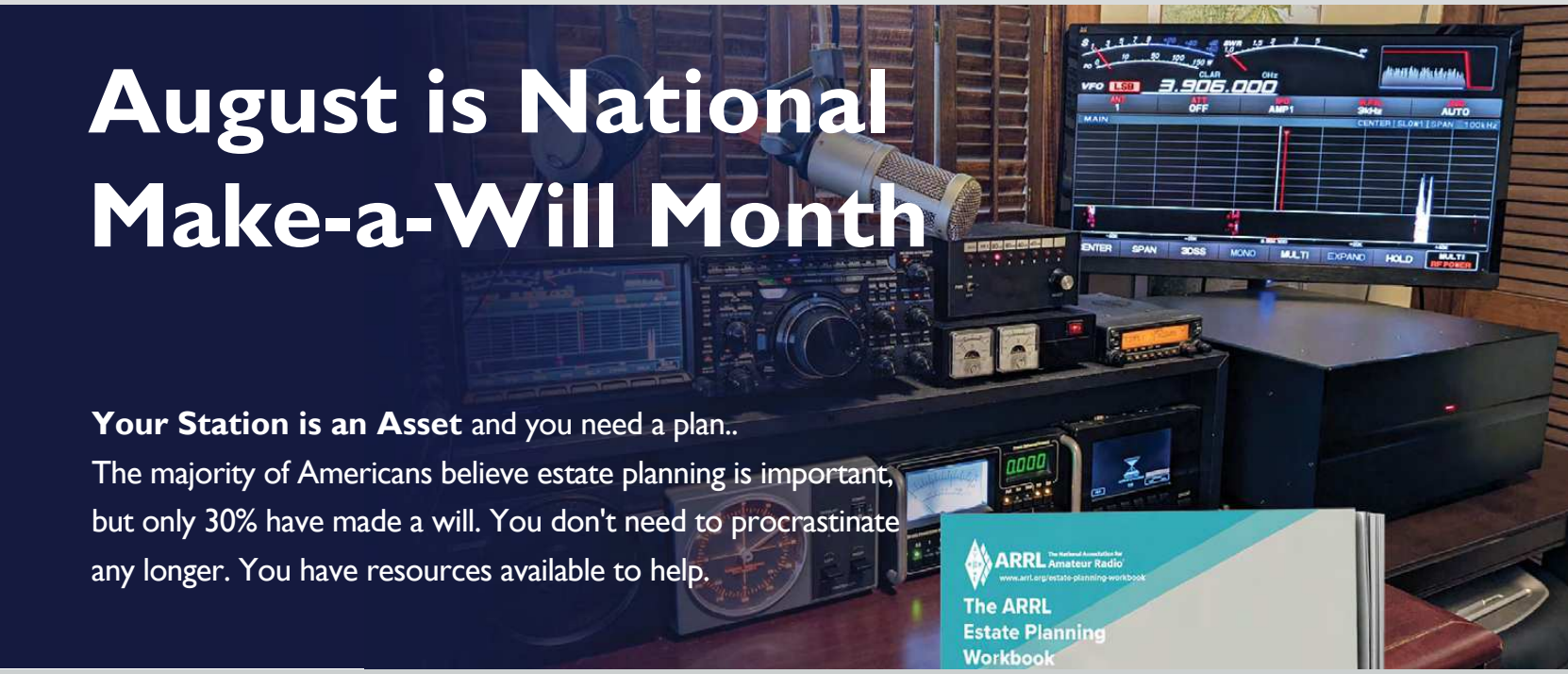
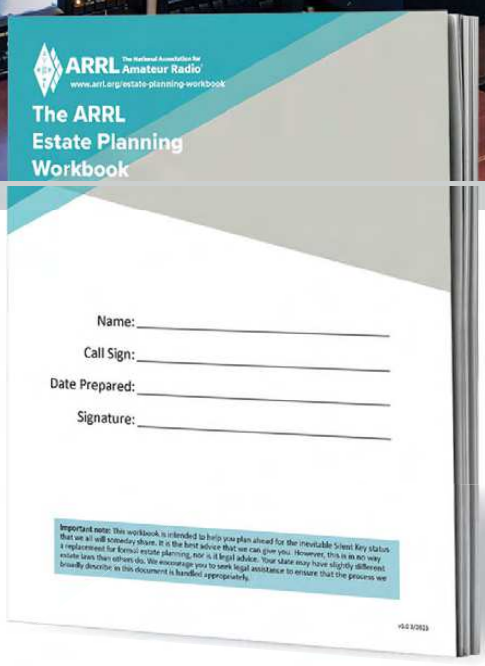


Your Station is an Asset and you need a plan..
The majority of Americans believe estate planning is important, but only 30% have made a will. You don't need to procrastinate any longer. You have resources available to help.



The ARRL Estate Planning Workbook is a resource to guide you. Planning in advance will help your family and friends. Use the workbook to help you create your plan.

- **Handle your station and its many assets**
- **Decide how you will leave your legacy**
- **Use part or all of your station to support the future of amateur radio**

Download the ARRL Estate Planning Workbook today at **www.arrl.org/estate-planning-workbook** or contact ARRL Development with questions about your plans.

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The ARRL Legacy Circle recognizes the generosity of individuals who have planned support for ARRL through wills, trusts, life insurance gifts, and other planned giving opportunities. The ARRL Legacy Circle ensures that ARRL and amateur radio will continue to thrive for generations to come.

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

CN-501
Economy Series

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

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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

CN-901
Professional Series

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

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CS-201

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

CS-201GII

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

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