More Uses for the tinySA Ultra Spectrum Analyzer | 30

QST
DIGITAL EDITION

ARRL The National Association for Amateur Radio®
April 2024 www.arrl.org
DEVOTED ENTIRELY TO AMATEUR RADIO

Ham Radio at the Top of the World

QST Reviews

ACOM 500S 160 – 4-Meter Linear Amplifier

W2IHY Multi-Switching System: 3 × 4 Switch Plus Controller, iPlus Audio Switch, and iBox Interface

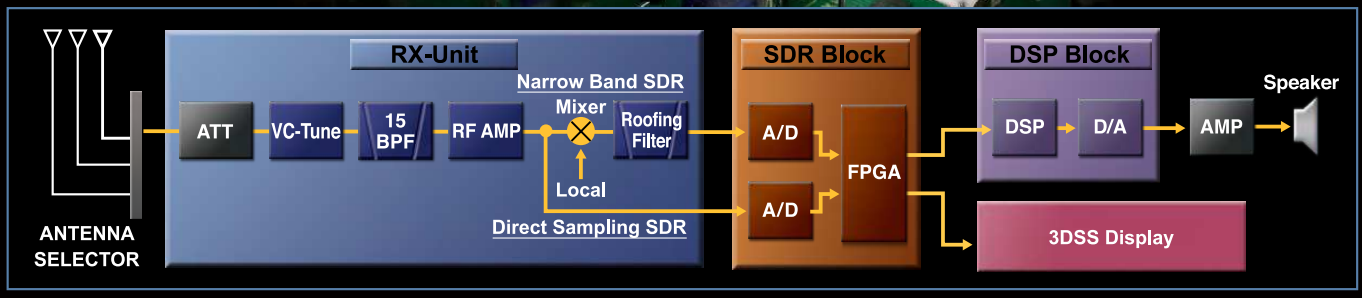
DVMEGA Globetrotter Digital Voice Companion

The radio... YAESU

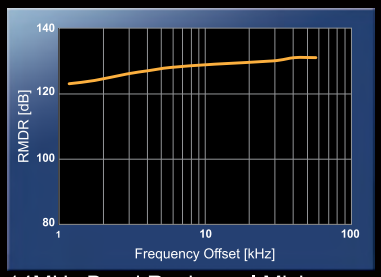
FTDX101 TECHNICAL HIGHLIGHT

True Performance
Hybrid SDR Configuration

The Hybrid SDR Configuration combines the excellent performance of a Narrow Band SDR receiver with the wide band sampling of a Direct Sampling SDR receiver that simultaneously provides a wide bandwidth real time display of band activity

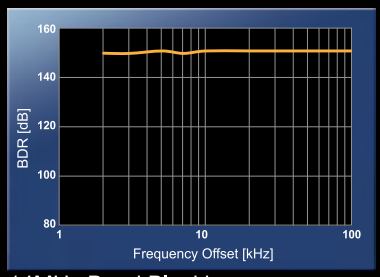


2kHz RMDR 123dB+



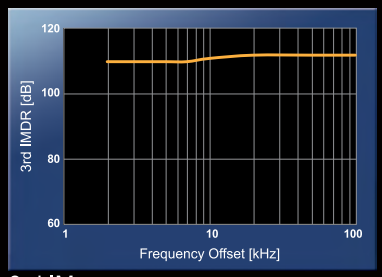
14MHz Band Reciprocal Mixing Dynamic Range (RMDR)

2kHz BDR 150dB+



14MHz Band Blocking Dynamic Range (BDR)

2kHz 3rd IMDR 110dB+



3rd IM Dynamic Range (IMDR)

HF/50MHz TRANSCEIVER
FTDX101MP 200W

HF/50MHz TRANSCEIVER
FTDX101D 100W

* Microphone M-1: Optional

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Radio for Professionals

YAESU USA
6125 Phyllis Drive, Cypress,
CA 90630 (714) 827-7600

For the latest Yaesu news, visit us on the Internet: **http://www.yaesu.com**

The radio... YAESU

FTDX101 TECHNICAL HIGHLIGHT

3DSS (3-Dimensional Spectrum Stream)

Displays the constantly changing band conditions in 3D
Instantly observe changes in the strength of the signals

- *Display up to 25 seconds of previous band conditions in real time*
- *Simultaneously view output from both Narrow band SDR and Direct Sampling SDR on the display*
- *Versatile scope and multi-color SDR display configuration enables clear and easy viewed presentation provided by 7" TFT Color touch panel display*

3DSS
3D Spectrum Stream

HF/50MHz TRANSCEIVER
FTDX101MP 200W

HF/50MHz TRANSCEIVER
FTDX101D 100W

* Microphone M-1: Optional

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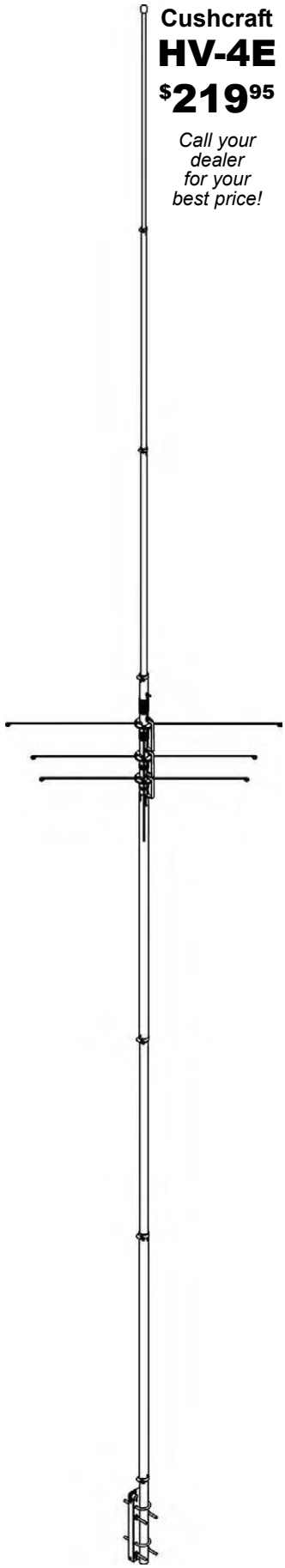
For the latest Yaesu news, visit us on the Internet: **http://www.yaesu.com**

New! **Cushcraft HV-4E**

40/20/15/10 Meter *Low Profile* Vertical Antenna

1200 Watts SSB, 500W CW, 500W Digital on 40 Meters!



Cushcraft
HV-4E
$219.95

Call your dealer for your best price!

Cushcraft HV-4E 40/20/15/10 Meter low-profile Vertical Antenna spans continents and oceans while hiding from sight in your back yard.

Handles 1200 Watts SSB, 500 Watts CW, 500 Watts digital on 40 Meters -- run with the big dogs!!

- **Low angle** radiation focuses RF energy on the horizon for optimum DX coverage
- **High-angle** overhead null rejects noise and local interference
- **Automatic band-switching** uses high-tech parallel end resonators instead of lossy series traps
- **High-Q** top-loading resonators delivers less loss, higher gain on 20/15/10 Meters
- **Center loading** on 40 Meters improves efficiency and lowers center of gravity making HV-4E easier to handle and increases strong wind survivability
- **Individual resonators** are simple to tune for lowest-SWR with to-the-kHz accuracy on every band. No unwanted interactions or compromises!
- **Aluminum,** stainless steel, and fiberglass construction ensure years of reliable service
- **Weighs** just 5 pounds and is 19 feet tall. Built in water resistant SO-239 for radio -- no pigtail needed
- **Small footprint,** low center of gravity and lightweight lets you easily install it by yourself almost anywhere. Low profile blends in with natural surroundings

Compare price and compare performance.

The bands are currently teaming with DX from around the world, and the HV-4E is uniquely designed to put you in the hunt!

HV-4E-RK, $49.95. Eight 25 foot Radials(two sets of 4-Radials), each set with solder lug, (200 feet of weather resistance insulated wire).

HV-4E-TB, $29.95. Sturdy Tilt Base lets you lower antenna to convenient height for easy tuning and maintenance.

Cushcraft HV-4E	VS Hustler 4-BTV
Enhanced 40 Meter Performance: Extra-long center loaded radiator improves efficiency	**Reduced 40 M Performance:** 40M power goes through multiple power wasting series traps
Highly efficient end/center loading: Reduces loss for more power out	**Lossy Traps:** Power lost in traps
Parallel resonators: Let's you independently tune each band with little or no interaction. Makes tuning easy	**Series resonators:** Tuning a band interacts with other bands -- may require repeated back and forth adjustments
Parallel resonators: If one resonator fails only that band is impacted	**Series resonators:** If a single trap fails, multiple bands could be wiped out
Included simple instructions make installation and optimum tune up easy	**A "special instruction package"** is recommended for teaching users how to retune 4-BTV traps and optimize performance
Low center of gravity: Makes it easy to handle/install and gives better wind survivability	**High center of gravity** makes it hard to handle
Built-in SO-239 coax connector provides convenient water resistance connection	**Requires coax pigtail** at extra cost that invites water incursion
Low suggested retail cost $219.95 and free direct MFJ shipping	**STREET price Ranges** from $229.95 to $295.95 plus shipping

Call your dealer for your best price!
www.cushcraftamateur.com

Cushcraft
Amateur Radio Antennas
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Call: 662-323-5803 • *mfjcustserv@mfjenterprises.com*

Comet's primary tool for any antenna adjustment or diagnostic project...

CAA-500MarkII Antenna Analyzer

1.8-500MHz

The CAA-500MarkII combines the simplicity and accuracy of an analog instrument, PLUS…a full color LCD graphic display Resistive (R) and Reactive (X) components of impedance graphed and displayed numerically SWR readings in both graphic and numerical results.

Functions:
In addition to the display of antenna properties, SWR curves are plotted quickly, easily and accurately!

Auto band-sweep function:
Switch to the amateur band of choice and press "Sweep Center". The chosen band is swept and the SWR graphed in seconds!

Manual band-sweep function:
Select the band, select the center frequency, and select the bandwidth. Manually sweep the chosen frequency range and display the SWR graph.

Multiple Manual Band-Sweeps
Manually graph the user defined bandwidth multiple times and see the results overlaid in 5 selectable colors! Make antenna length, position, height above ground, gamma match adjustments, etc…and graph each adjustment in seconds, in a new color, without losing the previous graph!

The perfect combination of analog and graphic information, designed in particular for antenna diagnostics and adjustments while on the roof, tower or in the field!

Features:
Operates on 8-16VDC external power, 6 AA Alkaline or NiMH rechargeable cells • Trickle charger built in (only when using NiMH batteries) • Typical battery life: 9 hours of continuous operation • Battery level indicator • Selectable auto power-off time limit preserves battery capacity • SO-239 connector for 1.8-300MHz range • N-female connector for 300-500MHz range • Optional soft carry case sold separately: CAA-5SC

Call or visit your local dealer today!
www.natcommgroup.com | 800-962-2611

COMET®

QST

Contents

April 2024 ♦ Volume 108 ♦ Number 4

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Departments

Digital and Mobile Editions

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Write for *QST*

www.arrl.org/qst-author-guide
email: **qst@arrl.org**

Our Cover
The 2022 JWØX/JW1ØØQO DXpedition started in Svalbard, an archipelago in the Arctic Ocean, where a team of 15 hams made thousands of contacts. After 4 days, a subset of the team embarked on a 6-hour trip by snowmobile from Longyearbyen to Kapp Linné, the site of Isfjord Radio, a radio and weather station. From this location, the team made the first-ever contact from Svalbard via the QO-100 satellite. For all the details on this adventure, read "JWØX/JW1ØØQO: An Unforgettable DXpedition in the Arctic." [Max Van Rymenant, ON5UR, photo]

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hamvention.org

Meet us at Hamvention® for the 2024 ARRL National Convention

Program Highlights

- Special Exhibits and Guests
- Presentations and Forums
- ARRL Program Representatives
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2024 ARRL Youth Rally at Hamvention®

Saturday, May 18

Hands-on ham radio activities, discovery, sharing, and fun! Advance online registration required (ages 11 – 21; includes t-shirt, lanyard, and badge)

Hamvention will provide admission tickets at no cost for these ARRL pre-registered Youth Rally attendees.

Register for the Youth Rally at **www.arrl.org/expo**

ARRL events

Download the ARRL Events app to find booths, exhibits, forums, maps, hourly prize drawings, and more!

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LISTEN FOR THE LOUDEST STATIONS

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DIAMOND ANTENNA

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When it comes to quality and performance, DIAMOND ANTENNA is the worldwide leader in VHF/UHF base and mobile antennas.

DIAMOND ANTENNAS help you get the most out of your on-air experience.

For all your base station and repeater needs, DIAMOND has an antenna that will work for you.

You've tried the rest, now own the best!

X700HNA Special Features:

- Heavy duty fiberglass radomes
- Four section assembly
- Overlapping outer shells for added strength
- Stainless steel mounting hardware & radials
- Strong waterproof joint couplings
- Type-N cable connection
- Wideband performance
- Highest gain Dual-band Base Antenna!

Here is a small sample of our wide variety of antennas

Model	Bands	Length Ft.	Max Pwr. Rating	Conn.
Dualband Base Station/Repeater Antennas				
X700HNA (4 section)	2m/70cm	24	200	N
X510HD (3 Section)	2m/70cm	17.2	330/250	UHF or N
X300A (2 Section)	2m/70cm	10	200	UHF or N
X200A (2 Section)	2m/70cm	8.3	200	UHF
X50A (1 Section)	2m/70cm	5.6	200	UHF or N
X30A (1 Section)	2m/70cm	4.5	150	UHF
Monoband Base Station/Repeater Antennas				
F23H (3 Section)	144-174 MHz (W/ Cut Chart)	15	350	UHF
F22A (2 Section)	2m	10.5	200	UHF
CP22E (Aluminum)	2m	8.9	200	UHF
F718A (Coax Element)	70cm	15	250	N
Dualband Mobile Antennas				
SG7900A	2m/70cm	62.2 in.	150	UHF or NMO
SG7500A	2m/70cm	40.6 in.	150	UHF or NMO
NR770H Series	2m/70cm	38.2 in.	200	UHF or NMO
MR77 Series	2m/70cm	20 in.	70	Mag Combo
AZ504FXH	2m/70cm	15.5 in.	50	UHF
AZ504SP	2m/70cm	15.5 in.	50	UHF
NR7900A	2m/70cm	57 in.	300/250	UHF
Monoband Mobile Antennas				
NR22L	2m	96.8 in.	100	UHF
M285	2m	52.4 in.	200	UHF or NMO

The Standard By Which All Others Are Judged

RF PARTS COMPANY

Diamond Antenna is a division of RF Parts Company

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

Second Century

The Road Ahead

In 1995, Bill Gates released The Road Ahead*, which was, at the time, a very important book on the future of computing. He was doing revolutionary things at Microsoft, from the work going into their Encarta series of digital encyclopedia products, to his own home where he was experimenting with digital art as you moved from room to room, causing him to purchase the digital rights to great works of art. In that same book, he said that he saw no commercial value to the internet being realized for another decade. Wow, did he get that wrong!*

Not long after that, as hams migrated from Commodore 64-based computing to PC clones, dial-up internet gave way to cable modems and high-speed access. The claim that the internet would be the death of amateur radio soon followed. Again, how wrong that prediction turned out to be. Early hits included ARRL's Logbook of The World, which made QSLing fast and free, and websites like eHam and QRZ, which continue to be popular. These simple databases were joined by real-time data tools such as the Reverse Beacon Network, PSK Reporter, and WSPRnet. Collectively, with hundreds of billions of records of stations heard and reported live, these tools make amateur radio more fun for award and DXpedition chasers, and provide higher scores, especially for casual contesters looking to work new multipliers.

Are we at the tipping point of a new revolution in amateur radio? I believe the answer is yes — and the next wave of tech will be in the artificial intelligence, or AI, space. There's likely going to be development coming that may cause you to say AI is the death of amateur radio!

It's important to understand what AI is about in order to begin to guess how it might impact amateur radio. For us, there are two critical elements: data mining and machine learning. For AI to become efficient and extensive, it requires access to massive amounts of information. And unlike a program on your computer, AI is a process that is constantly running and learning. So ultimately the best programming and access to the best data will win. How can access to massive amounts of data, smart programming, and integration into our daily use of amateur radio products and services change the way we operate? Let's look at two examples.

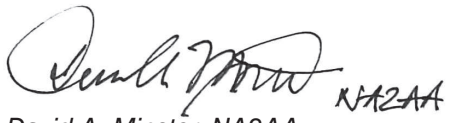
If you've ever made a serious effort in a 48-hour international contest, you know that part of the fun is in the complexities of the game. The extra work you put into planning which bands you'll be on, understanding propagation ahead of and during the contest, and real-time reporting tools like spotting networks and the Reverse Beacon Network all mean there are many moving parts to manage. By day 2, you're getting tired — and your reliance on tech can help you get over the finish line.

Imagine this: Your SDR is not only receiving a single signal for you to make contact with, but it is listening to the entire band, as well as processing all of the spots. As you work stations, they disappear from the SDR. Not just showing as a duplicate, but disappearing from the band! If you go up and down the bands, you'll hear only stations you need to work, and you'll see only their signals in your display. Now imagine this presented in color: AI knows that a given station (presented in one color), when it is on the air, rarely puts in much of a time effort, and that what looks like a rare station (presented in another color) will be there all weekend. Or perhaps there is a narrow window of propagation, calculated in real time, where a new multiplier may be on for only a matter of minutes. AI will be using real-time and historical data not just to display a list of what you need to work and a scrolling VFO window to show who is where based on spots, but to give you real-time customized information so you can target the highest possible score. Now AI becomes a competitive tool that can add to the scores of even the largest stations.

Another example has to do with filtering. Imagine going beyond the **NB** and **NR** buttons on your rig to a button labeled **AIF**: Artificial Intelligent Filtering. The software in the rig would use data stored in the cloud to access patterns of CW signals and even voice to dynamically peel away the QRM and QRN to make signals vastly more readable. As we've marveled at what static algorithmic filtering can do to make signals readable, this would go to a much higher level, taking into account your own noise challenges along with the nuances of the specific station you are listening to.

AI represents a bold future for amateur radio. It offers us the ability to use the vast quantities of data we have access to today, and foretells of the data needs of the future for hams to innovate with what AI can do within radios and within the shack. It is a very different way of thinking about amateur radio, and will challenge us even more than how we view FT8 and FT4's role in the hobby today.

So be radio active! Think about how you might use the emerging AI tools in your shack. Be a connector by getting involved with the teams progressing this revolution. And feel good about the role we are playing in fulfilling FCC Part 97.1(b): *Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.*



David A. Minster, NA2AA
Chief Executive Officer

hy-gain HF Vertical Antennas

Work amazing DX with these extremely low radiation angle omnidirectional antennas. All self supporting, 1500 Watts PEP SSB, low SWR. Heavy duty, slotted, tapered, swaged, aircraft quality aluminum tubing. Stainless steel hardware. Two year limited warranty.

AV-680, $769.95. 9 Bands: (6, 10, 12, 15, 17, 20, 30, 40, 80 Meters). 26 ft., 18.5 lbs. *Our most popular vertical now has 75/80 Meters! Lets you work exciting DX with a low 17 degree radiation angle!* Easily mount on decks, roofs, patios. *No ground or radials needed.* Extra wide 2:1 SWR bandwidths. *Each* band tunable. Auto band-switching, handle 1.5kW, 80 MPH wind survival, low 2.5 sq. ft. wind surface. Aircraft aluminum tubing, stainless steel hardware.

AV-640, $659.95. Like AV-680 less 80M. 25½', 17½ lbs.

AV-620, $599.95. Like AV-640 less 40M. 22½'/2'/10½ lbs.

AV-14AVQ, $299.95. (10, 15, 20, 40 Meters). 18 ft., 9 lbs. *Classic* AV-14AVQ uses same trap design as famous Hy-Gain Thunderbird beams. 3 air dielectric Hi-Q traps with oversize coils give superb stability and 1/4 wave resonance on all bands. Automatic bandswitching.

AV-12AVQ, $219.95. (10, 15, 20 Meters). 13 ft., 9 lbs. Lowest priced *automatic bandswitching* tri-band vertical! Uses Thunderbird beam design air dielectric traps for extremely hi-Q performance in limited space.

AV-18VS, $159.95. (10,12,15,17,20,30,40,80M). 18 ft., 4 lbs. hy-gain's lowest priced vertical gives you 8 bands. Easily tuned to any band by adjusting base loading coil.

See our website for even more hy-gain vertical antennas!

hy-gain HF Beam Antennas

Hy-gain beams are *stronger, light-er, have less wind surface and last years longer.* Why? *Hy-gain* uses durable *tooled* components -- massive boom-to-mast bracket, heavy gauge element-to-boom clamps, thick-wall swaged tubing -- no failures!

TH-11DX, $1799.95.
11-element, 4.0 kW PEP, 10,12,15,17,20 Meters. *The choice of top DXers.* With 11-elements, excellent gain and 5-bands, the super rugged TH-11DX is the *"Big Daddy"* of all HF beams! Features low loss log-periodic driven array on all bands with mono- band reflectors, BN-4000 high power balun, corrosion resistant wire boom support, hot dipped galvanized and stainless steel parts.

TH-7DX, $1599.95. 7-Element, 1.5 kW PEP, 10, 15, 20 Meters. 7-Elements gives you *the highest average gain of any Hy-gain* tri-bander! Dual driven for broadband operation without compromising gain. SWR less than 2:1 on all bands. Combined monoband and trapped parasitic elements give you an excellent F/B ratio.

TH-3MK4, $869.95. 3-Element, 1.5 kW PEP, 10, 15, 20 Meters. Gives most gain for your money in full-power, full-size *hy-gain* tri-bander! Impressive gain and a *whopping* average front-to-back ratio and still fits on an average size lot. 95 MPH wind survival.

TH-3JRS, $539.95. Compact 3-Element, 600 W PEP, 10, 15, 20 Meters. *Hy-gain's most popular and lowest-priced tri-bander fits smallest lot*, 14.75 ft turning radius, 21 lbs. Excellent gain and front-to-back let you compete with the "big guns"! 80 MPH wind survival.

hy-gain Rotators . . . the first choice of hams around the world!

HAM-IV . . . $799.95

The most popular rotator in the world! For medium communications arrays up to 15 sq. feet wind load area. 5-second brake delay! Test/Calibrate function. Low temperature grease permits normal operation down to -30° F. Alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. Indicator potentiometer. Ferrite beads reduce RF susceptibility. Cinch plug plus 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength and electric locking steel wedge brake prevents wind induced antenna movement. North or South center of rotation scale on meter, low voltage control, max mast size of 2¹/₁₆".

HAM-VI, $999.95. For medium arrays up to 15 sq. ft. wind load. Like HAM-IV but has *new* ***DCU-2*** *Digital Rotator Controller*. Just dial in your beam heading or let your computer control your antenna.

HAM-VII, $1099.95. Like HAM VI but with ***DCU-3*** digital controller with *six programmable memories*.

Tailtwister T-2X . . . $1099.95

For large medium antenna arrays up to 20 sq. ft. wind load. Choose ***DCU-2*** *digital* controller (T-2XD2) or *analog* control box (T-2X) with *new* 5-second brake delay and *new* Test/Calibrate function. Low temperature grease, alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, *new* weatherproof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing strength, electric locking *steel* wedge brake, N or S center of rotation scale on meter, low voltage control, 2¹/16" max. mast.

T-2XD2, $1299.95. Tailtwister with ***DCU-2*** *digital* controller.

T-2XD3, $1399.95. Tailtwister with ***DCU-3*** digital controller with *six programmable memories*.

AR-40, $539.95. For compact antenna arrays and FM/TV up to 3.0 sq. ft. wind load. Dual 12 ball-bearing race. Fully automatic.

CD-45II, $599.95. For antenna arrays up to 8.5 sq. ft. Bell rotator design gives total weather protection. Dual 58 ball bearing race.

Digital Rotator Controller with 6 programmable Beam Headings

DCU-3
$639.95

DCU-3 Digital Controller lets you program 6 beam headings! Gives fully automatic or manual control of hy-gain HAM or Tailtwister Rotators.

Push a memory button or dial in your beam heading or let *Ham Radio Deluxe* (or other program) control your DCU-3. Antenna automatically rotates precisely, safely to desired direction.

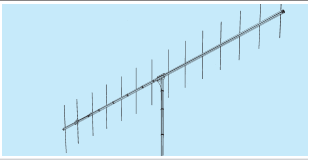
DCU-2, $519.95. Like DCU-3 but less beam headings.

Replace Your Yaesu Rotator Controller

YRC-1
$459.95

Replace your Yaesu rotator controller. More features and a much more robust controller that is far less prone to lighning damage. YRC-1 costs less than repairing your original Yaesu controller!

hy-gain VHF/UHF Antennas



VB-214FM, $219.95. 14-element 2-Meter FM beam antenna provides exceptional front-to-back ratio and maximum obtainable gains. **VB-23FM, $109.95.** 3-element. **VB-25FM, $129.95.** 5-element.
VB-28FM, $189.95. 8-element. Threaded stub for feedpoints. Accepts up to 2 inch mast.
DB-2345, $159.95. Dual band 144 (3-elements) 440 (5-elements) MHz.

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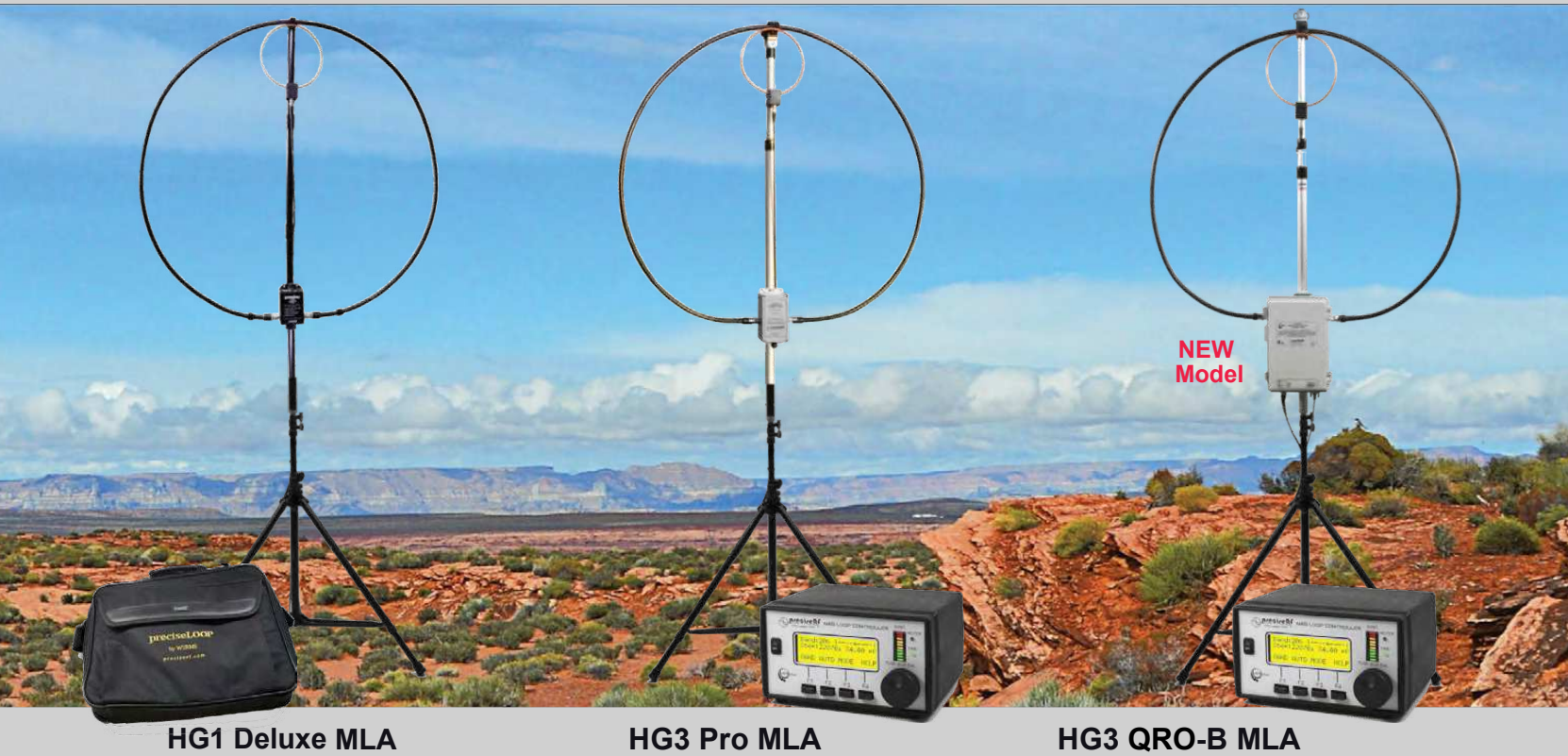

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Leanna Figlewski, KC1RMP, lfiglewski@arrl.org

Member Spotlight

Amanda Plexico, KY4GS

Amanda Plexico, KY4GS, discovered amateur radio later in life. Even when she returned home after college to find out her mother earned a ham license and was encouraging her to take the test too, she still wasn't drawn to learning about the hobby. It wasn't until about 10 years later that she surprised her mother by passing all of the written exams in one session. Now, after being a ham for only 3 years, she has become a dedicated mentor in the CW community.

Bitten by the Morse Code Bug

When Amanda first started operating as a licensed ham, she was mostly operating FT8. But after only a few months with her license, she became bored with digital modes and wanted to take on the challenge of learning how to operate CW. She never intended to learn Morse code because it was no longer a license requirement, but after finding out more about the mode, she became curious. "I was drawn to CW because of the opportunity to communicate with distant stations without the need for a superstation, but now it's much more than just chasing DX," she said.

Amanda has even become somewhat of a key collector, sharing, "I appreciate different ways to send Morse code, including various paddles, bugs, and straight keys." She currently owns nine keys and primarily uses a 9A5N solid-state single-paddle key, but she also has a 100-year-old bug that she uses in some straight key events.

Giving Back to the Ham Community

Morse code became such a big part of Amanda's operations that she wanted to start mentoring other hams and help them learn the mode. "I was fortunate to have great elmers who shaped my experiences with their patience and guidance. I hope to share the fun and enjoyment that I get from ham radio by tutoring Morse code," she said. She also shared that mentorship doesn't have to be a formal experience. It can be as simple as saying some encouraging words to another ham who might need help.

Amanda volunteers as an assistant advisor for CWops' CW Academy Intermediate classes, where she partakes in interactive Zoom sessions to help students practice sending Morse code, discuss techniques with them, and allow them to address any problems they may be experiencing. She was also a Morse code instructor with the Long Island CW Club for 18 months, and continues to assist with the club's kids class.

Learning the skill of sending CW takes practice, and Amanda's best advice for those trying to learn or improve their skills is to get on the air more. "As I gained more experience in CW mode (and ham radio in general), less effort was required, and the thrill of each QSO became more enjoyable."

Exploring a Multifaceted Hobby

While CW and mentorship are major parts of Amanda's ham radio journey, she also enjoys contesting as well as conversational contacts. When contesting, she doesn't take her scores too seriously. "I try to push myself to operate better than the last time, while having fun and working new stations," she said. But her favorite type of contacts to make involve longer conversations with other operators because it allows her to "meet some really awesome people who live all over the world."

Some of Amanda's other hobbies, such as spending time outdoors and working on home-improvement projects, often merge with amateur radio. POTA allows her to spend time in nature while experimenting with antennas and learning more about ham radio operations. She also often visits hardware stores to put her DIY skills to use with homebrew ham radio projects.

"I'm fortunate that I found [ham radio] in my 40s, with many years left to enjoy it!"

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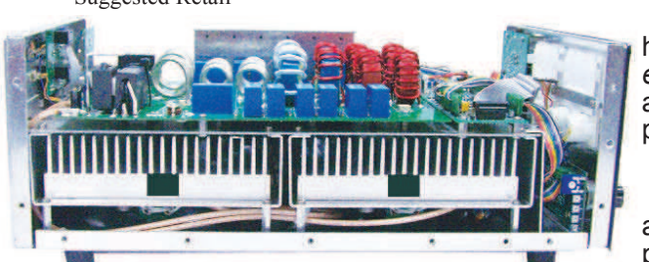
This compact operator-friendly and attractive desk-top amplifier fits neatly into any station. Just 10Wx6^{1}/2Hx18^{1}/2D inches. Weighs only 22 pounds.

SWR Protection prevents amplifier damage if you switch to a wrong band, use the wrong antenna or have high SWR.

If forward or reflected output power exceeds a safe level then output power is automatically reduced to prevent amplifier damage by controlling ALC to exciter.

LED-illuminated Cross-Needle SWR/Wattmeter lets you read SWR, forward and reflected *peak* power simultaneously. You also get ALC, SWR, PA balance and current metering with LED backlight. An Operate/Standby switch lets you run "barefoot", but you can *instantly* switch to full power if needed.



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Has bandswitch, ALC, SWR, PA and TX LED indicators.

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Place your amplifier and power supply out-of-the-way and control your amplifier directly from your rig!

ALS-1406 automatic bandswitching reads band data from your transceiver and automatically changes bands as you change bands. An optional interface cable is required for your particular radio.

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Ameritron ALS-1406 amplifier has modular construction for *easy-servicing*, unlike other amplifiers that are so tightly packed they are un-serviceable.

ALS-1406 Power Supply

The ALS-1406 is powered by a 50 VDC switching power supply. Comes with a pre-wired cable to plug into the ALS-1406.

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600W FET Fixed Station Amp

ALS-606S
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ALS-606, $2799, like ALS-606S above, but has transformer power supply.

ALS-500M
500 Watt Mobile Amplifier

ALS-500M
$1199
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500 Watts PEP/400W CW output, instant bandswitching, no tuning, no warm- up. SWR, load fault, thermal overload protected. On/Off/Bypass switch. Remote on/off control. DC current meter. Very quiet fan. 1.5-22 MHz (10/12 Meters with MOD-10M, $29.95). Requires 13.8 VDC. 9Wx3^{1}/2Hx15D in., 7 lbs.

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Up Front

CQ Hotel — The Place Where Hams Stay

While traveling through Philadelphia, Pennsylvania, Paul Sacks, WB9CZS, came across this hotel, CQ Club Quarters. Looks like a perfect place for hams, though there is no mention of a ham shack in the hotel's list of amenities.

FCC Expanding Services?

Looks like the FCC may be providing a new service. Peter Parrish, KG6KWV, snapped this photo while doing errands in Sunnyvale, California. We couldn't find a direct connection to the FCC from this auto body repair shop; perhaps the letters are the original owner's initials.

Going QRT?

This QRT van has been seen in many places throughout Hurricane, West Virginia. Clark Stewart, W8TN, finally got a photo while at Putnam County Parks and Recreation Valley Park. Fortunately, this QRT is not signing off. Quick Response Teams are three-person teams consisting of a paramedic, a law enforcement professional, and a counselor/recovery coach. Their goal is to reduce overdoses and overdose-related deaths, promote treatment services, and build healthy communities.

QRM Mystery Solved

Todd Gahagan, WA7U, took this photo to let us know he has finally discovered where QRM comes from. And he says, "It looks like they have a lot of it!" This is the sign for Quality Ready Mix concrete in Bozeman, Montana.

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

Troubleshooting Kept Me from Buying New Gear

My Kenwood TM-V71A started acting up and rebooted itself whenever I keyed the transmitter. I also have a Kenwood TS-590S and an Icom IC-7600. I use an Alinco DM-330MV for switching power supply. I use two grounding bar kits to distribute the power from the Alinco. I'm downsizing, so I don't have an exotic setup for repairs. I have a digital voltmeter and a few other basic items, and after asking my fellow club members for help, I still couldn't figure out what was wrong.

I took everything apart, took all the power leads off the terminal strips, and did a complete hands-on check of the fuses with the Alinco. I had a couple of Powerpoles that I thought were installed correctly, but I cut them off and soldered the wires. I hooked up the radio directly to the Alinco, and it failed. I realized I should have checked the meter on the front of the Alinco. I always keep it in the power position. If I had switched it to the amp position, I would have seen that when I keyed up the amp meter, it didn't register anything. When I used the antenna tuner on the Kenwood TS-590S, the radio turned off and came back on when I released the **AT** button. I disconnected the Kenwood TS-590S, hooked up the Icom, and got the same results.

I remembered I had a Samlex SEC-1235M stashed away. I found it and hooked it up, and everything worked! I hooked the Alinco back up and put the meter to the amp position, but there was no reading when I keyed it. I looked at **www.groups.io** and saw a suggestion that the power cable might be bad, and after the repair, it worked.

Looking back, I could have saved time if I had the Alinco switch in the amp position and saw that no amperage was being drawn — and I had a better understanding of what happens when you key a radio. I was 10 minutes away from ordering a new radio. I wonder how many people would have bought new gear only to find it wouldn't have worked. It's a matter of putting in the time and being a self-starter. The information is there; it's just a matter of finding it, learning, and understanding.

John Smale, K2IZ
Copiague, New York
Life Member

Suggestions to Build on FT8 Article

I love *QST* and look forward to it every month. There is always something interesting to read. The article "FT8 Visualized" by Thomas W. Brooks, KE1R, in the January 2024 issue was fantastic. Learning some of the nuts and bolts behind FT8 was eye-opening. I would love a follow-up article that gets more in-depth about what Gray code is, why that matters, and how all of this is translated to the American Standard Code for Information Interchange.

Thomas Johnson, K9KJ
Munster, Indiana
Life Member

FT8 Configuration and On-Air Noise Tips

To properly ensure good amateur practices on FT8, an operator must monitor their incoming and outgoing audio on a speaker or headphones. The proper transceiver and software configurations for FT8 operation are frequently ignored. If you listen in the FT8 windows on HF, you regularly hear a cacophony of noise, even possible rule violations.

For microphone sounds, I found that my Yaesu FTDX101D does not disable my boom microphone when using the USB connection for FT8. So, telephones ringing, dogs barking, and conversations go over the air. SSB voice is not permitted in the RTTY/DATA/CW band segment. The only fix is to turn the mic gain to zero or disconnect it. The menu misleads you to believe you have selected the correct USB connection source on the rear of the radio, but it still leaves the mic input active. Proper transceiver configuration and monitoring will prevent this.

Computer sounds such as dings, "you've got mail," etc., are sent to the radio's speakers rather than the computer's. There is a setting that turns the computer's sounds off if you cannot get the configuration right. *JTAlert* sounds also go out over the air because they go to the rig's sound card instead of the computer speakers. If you cannot get the *JTAlert* audio sent to the right place, turn off the audio notifications.

This is particularly important on 60 and 30 meters, where you cannot discern a primary user's request to suspend operation from a waterfall. We must ensure our operating practices are appropriate to continue to access that spectrum. Even on our primary spectrum, we need to prevent interference.

Janis Carson, AB2RA
Ithaca, New York

Frequent Activator and Hunter

Great job on the "How to Become a POTA Hunter" article in the January 2024 issue of *QST*. I love to activate and hunt, and Harold Kramer, WJ1B, addressed all the key points.

As an activator, I try to spend a bit of time conversing, which is admittedly a balancing act. The challenge, of course, is realizing a hunter is patiently waiting. I'm curious about what people are up to and enjoy learning about their stations. It's refreshing to step off the assembly line of rapid-fire signal report exchanges. This has resulted in some wonderful on-air friendships. Congrats on a great piece!

Paul Talbot, K7RKO
Las Vegas, Nevada

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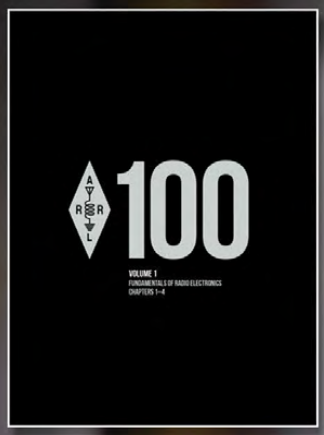

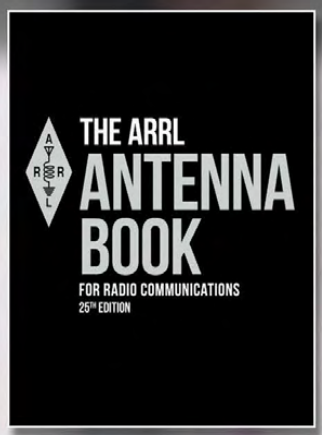

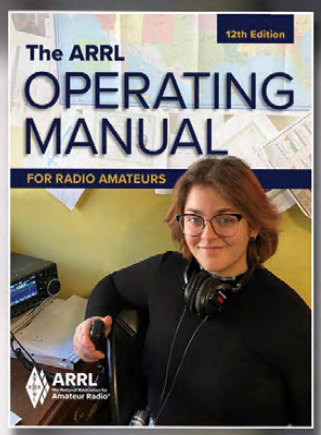

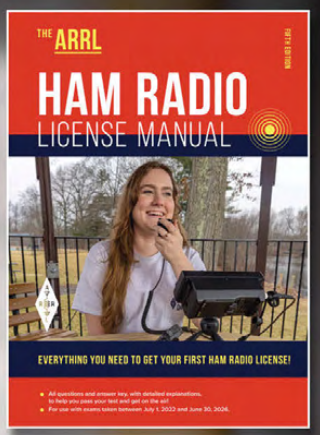

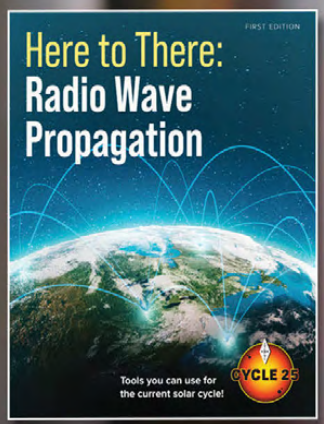

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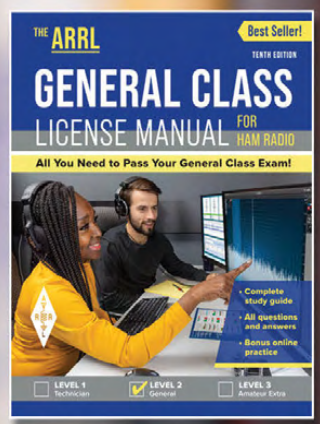

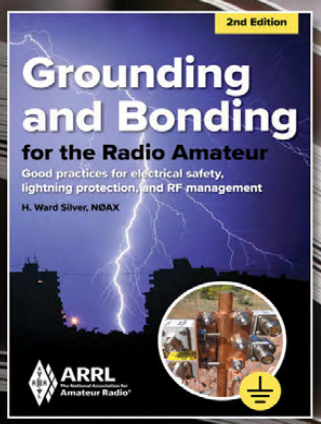

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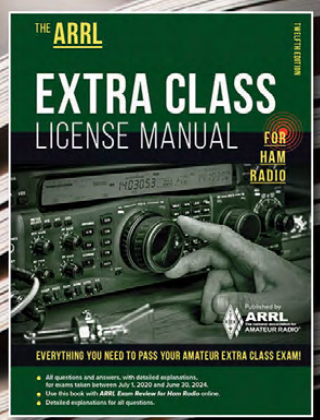

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W1AW Schedule

PAC	MTN	CENT	EAST	UTC	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM	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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Using the tinySA Ultra Spectrum Analyzer to Solve Amateur Radio and OTA TV Problems

The 0.2 – 1500 MHz noise source and filter connected to the tinySA Ultra.

Phil Salas, AD5X

I reviewed the $130 tinySA Ultra 6 GHz spectrum analyzer for Product Review in the April 2023 issue. In this article, I discuss expanding the use of this inexpensive spectrum analyzer by solving ham and non-ham problems.

Filter Response and Return Loss Measurements

Besides the spectral monitoring functions of the tinySA Ultra, it can also help you look at filter response and return loss. I first noted these techniques in my Rigol DSA705 review (see Product Review, July 2017). Now that some of the necessary equipment is different or less expensive, I'd like to revisit those techniques. For filter response and return loss measurements, you will need a broadband noise source. The lead image shows an aluminum box containing a 0.2 – 1500 MHz noise source that I purchased from Amazon for less than $20. Its output is essentially flat out to 800 MHz — my main area of interest. The noise source itself can be seen in Figure 1. Using this noise source with the tinySA Ultra's internal attenuator set

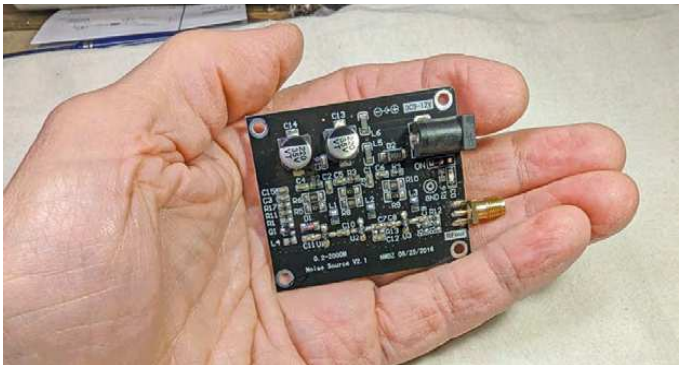


Figure 1 — The 0.2 – 1500 MHz noise source. [Phil Salas, AD5X, photo]

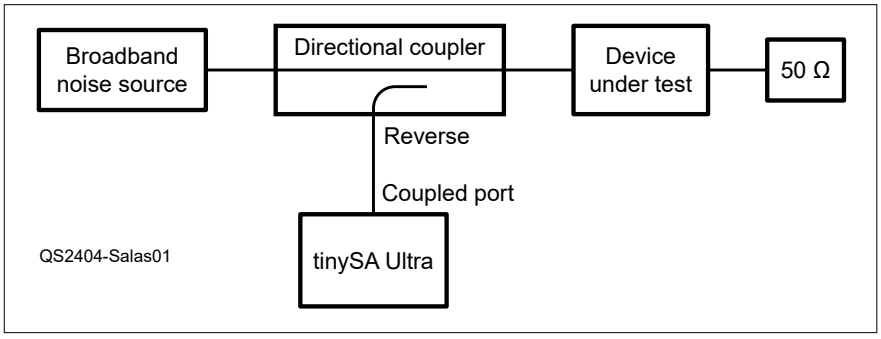


Figure 2 — A diagram depicting the use of a directional coupler to measure return loss.

tinySA Tips

When using a noise source for through and return loss measurements, the plot will be "noisy" rather than smooth. The **DISPLAY/CALC/AVER4** or **AVER16** features will smooth the plot and make it easier to read. These averaging features are slow to update, so when adjusting a filter, don't use averaging until the adjustments are done.

Use the **NORMALIZE** feature to directly display the difference between the smoothed level from the noise generator and the output of a network. This makes it much easier to read the actual value of network loss.

To measure return loss, put a short or open on the output of the directional coupler to generate the reference curve, and then smooth it and use the **NORMALIZE** feature to read the actual return loss, which will be directly displayed in dB.

For accurate results, use external or built-in tinySA attenuators as needed to prevent overloading. Visit **www.arrl.org/qst-in-depth** for more information about checking for overload with a noise source. — *John Stanley, K4ERO*

to 11 dB and an external 10 dB attenuator, the reference noise level is about –30 to –35 dBm when using the default 850 kHz video bandwidth. To look at a filter's passband frequency response, simply place the filter between the broadband noise source and the tinySA Ultra spectrum analyzer. See the sidebar, "tinySA Tips," for the best tinySA settings to use and precautions to take when looking at the passband frequency response.

To measure return loss, you must purchase a directional coupler. Mini-Circuits ZFDC-series directional couplers are inexpensive on eBay; I use a ZFDC-20-4+ because it covers 1 – 1000 MHz. Figure 2 is a block diagram of the return loss measurement setup. To make the measurement, replace the device under test with a short circuit to set your 0 dB reference. Normalize and then connect the device to test, and terminate it in 50 Ω if it is a through device, such as a filter. The return loss will directly read in dB, although the tinySA will label it as dBm.

Solving a Second Harmonic Problem

For my first task, I needed to solve an FCC issue with a 6-meter transverter. For transmitters that run less than 25 W on any frequency from 30 to 225 MHz, the FCC requires all harmonic and out-of-band spurious signals to be greater than 40 dB below the main signal. The transverter's second harmonic fell short of the

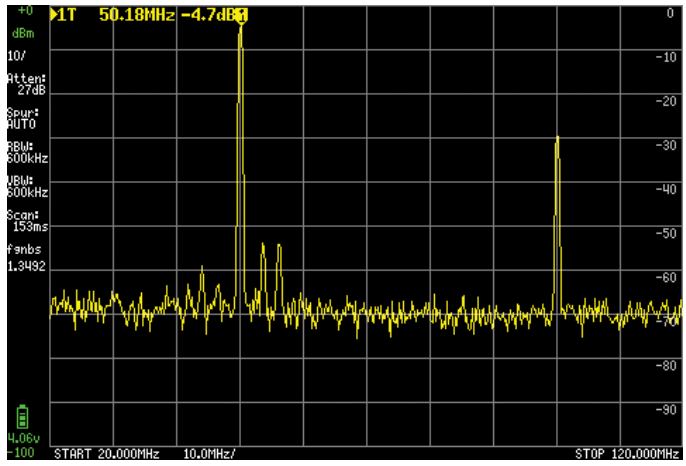


Figure 3 — The transverter's second harmonic is only about 25 dB below the main signal.

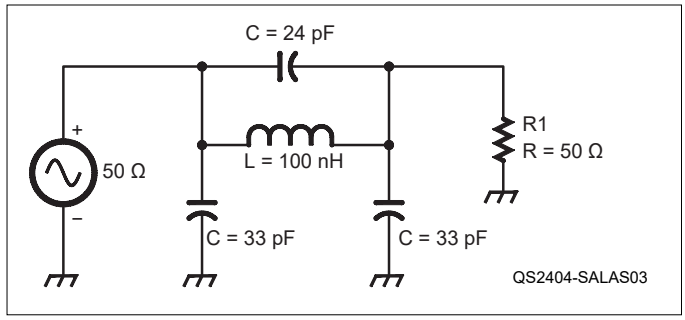


Figure 4 — A schematic of the Cauer low-pass filter.

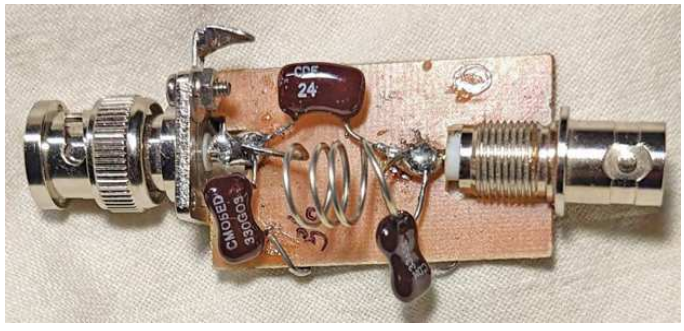


Figure 5 — The Cauer low-pass filter. [Phil Salas, AD5X, photo]

FCC requirement by about 15 dB. Figure 3 shows the tinySA Ultra's spectral display of the transverter output.

I designed a Cauer low-pass filter with the notch at 100 MHz (see Figures 4 and 5). By using the noise source method, I was able to easily tune the inductor (stretching and squeezing) for the correct response (see Figure 6). With the filter in line, the second harmonic now meets the FCC requirements (see Figure 7). I also measured the filter's input return loss using the reverse coupler method to ensure that it was rea-

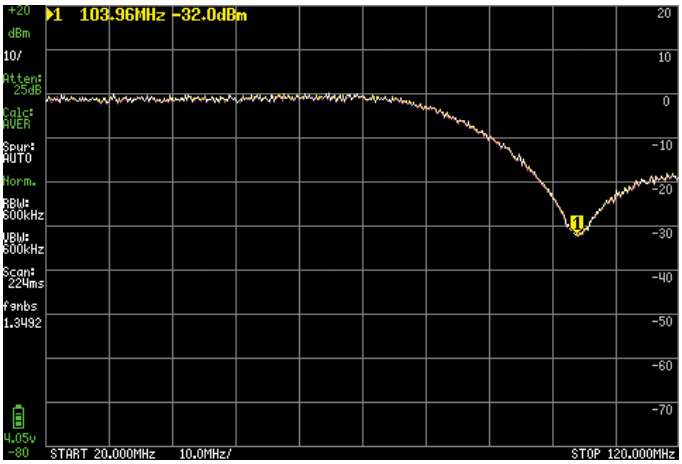


Figure 6 — The Cauer low-pass filter's response.

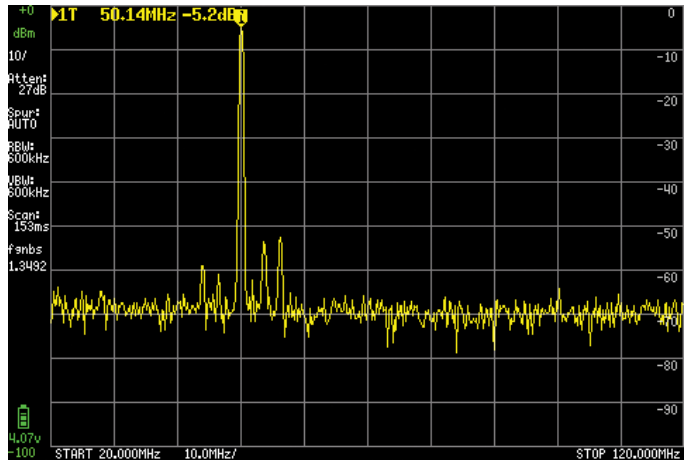


Figure 7 — The filtered transverter's output.

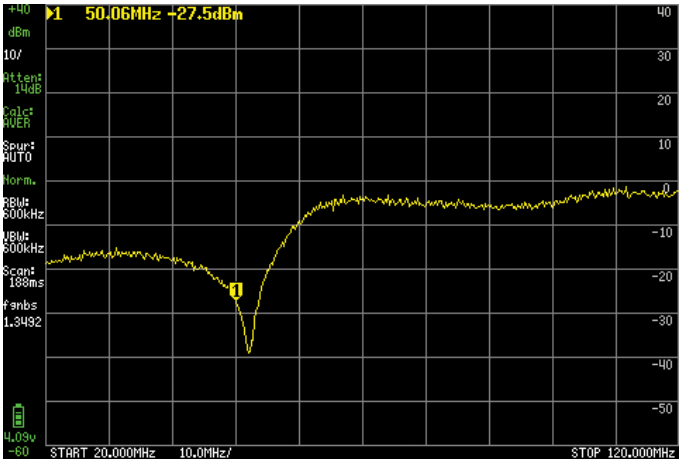


Figure 8 — The terminated filter's return loss.

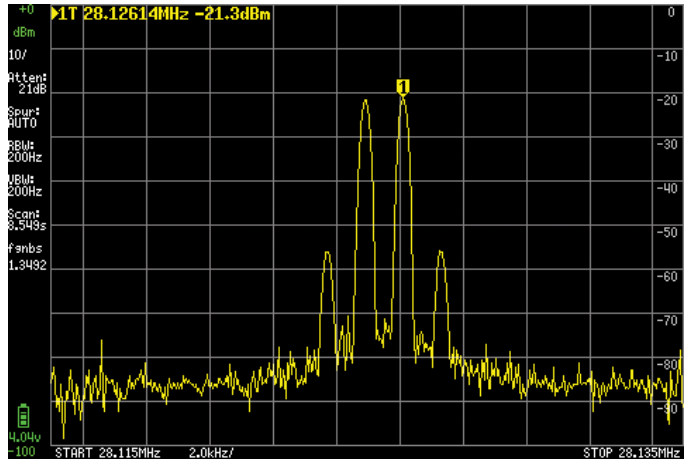


Figure 9 — The 10-meter two-tone transverter's input.

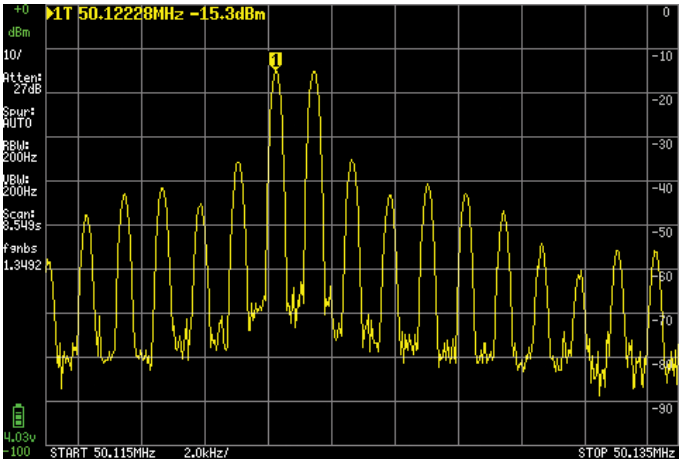


Figure 10 — The resultant 6-meter two-tone spectrum.

sonable, too. Figure 8 shows the terminated filter's return loss normalized to the return loss with the coupler feeding into a 0 dB return loss (short). It reads 27.5 dB of return loss at 50 MHz (the standing wave ratio is less than 1.1:1).

Measuring IMD Performance

After taking care of the FCC issue, I wanted to measure two-tone intermodulation distortion (IMD) performance. My Siglent SDG1062X dual-output signal generator permits combining two outputs. So, I set two frequencies on 10 meters, each 1200 Hz apart (per ARRL Lab test requirements), and then I fed the combined signals to a broadband amplifier to get the necessary transverter driving power level. Figure 9 shows the 28 MHz two-tone spectrum. As you can see, the results are desirable. The second-order products are 35 dB below the two primary tones, and the higher-level products are almost nonexistent. Figure 10 shows the resultant 50 MHz two-tone spectrum at 5 W output power. Here, the second-order products are about 20 dB below the two primary tones. This is actually 26 dBc, as the ARRL

Table 1 — XG3 versus tinySA Ultra Signal Levels as Measured on a Siglent SSA3021X Spectrum Analyzer

Band (meters)	XG3 at –73 dBm	tinySA at –73 dBm	XG3 at –107 dBm	tinySA at –107 dBm
80	–75 dBm	–74 dBm	–107 dBm	–107 dBm
40	–75 dBm	–74 dBm	–107 dBm	–107 dBm
20	–75 dBm	–74 dBm	–110 dBm	–107 dBm
10	–75 dBm	–74 dBm	–110 dBm	–107 dBm
6	–76 dBm	–74 dBm	–110 dBm	–107 dBm
2	–77 dBm	–73 dBm	–110 dBm	–107 dBm

Table 2 — Common OTA Channels in the Dallas Area

Channel	Old Channel No.	Digital Channel No.	Frequency (MHz)
FOX 4 KDFW	4.1	35	596 – 602
H&I	4.3	35	596 – 602
Get TV	4.4	35	596 – 602
NBC KXAS	5.1	24	530 – 536
COZI	5.2	24	530 – 536
ABC WFAA	8.1	8	180 – 186
CBS KTVT	11.1	19	500 – 506
PBS KERA	13.1	14	470 – 476
21 KXTA	21.1	18	494 – 500
Movies KDFI	27.2	27	548 – 554
CW33 KDAF	33.1	32	578 – 584
Comet KTXD	47.2	23	524 – 530
Grit KSTR	49.3	34	590 – 596
MeTV KAZD	55.1	31	572 – 578
Decades KAZD	55.6	31	572 – 578
Grit KPXD	68.3	25	536 – 542
ION KPXD	68.1	25	536 – 542

Lab measures distortion products. This result isn't terrible, as it is not much different than that of many transceivers on the market. The concern is that the higher-order products don't quickly roll off. I would feel comfortable running this transverter at 5 W, but I wouldn't suggest using an amplifier with it. I verified this spectrum by adding additional attenuation to avoid overloading the tinySA.

Using the tinySA Ultra Signal Generator

You can select the tinySA Ultra's signal generator function with the **MODE** menu. Any frequency or level can easily be set. An accurate signal generator can effectively measure receiver sensitivity, so I compared the tinySA Ultra to my Elecraft XG3 generator. I measured the levels on my Siglent SSA3021X spectrum analyzer, which has National Institute of Standards and Technology-traceable calibration. The results are shown in Table 1. As you can see, the tinySA Ultra's output level settings are highly accurate.

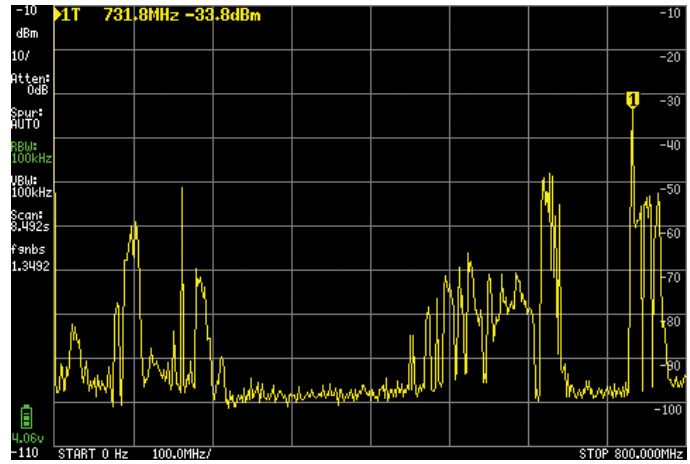


Figure 11 — The tinySA Ultra 0 – 800 MHz spectrum at the TV antenna feed.

A Non-Ham tinySA Ultra Application

Consider some over-the-air (OTA) TV basics; a North American 6 MHz TV RF channel can contain up to seven eight-level vestigial sideband-modulated ATSC (Advanced Television Systems Committee) TV channels, depending on the mix of high- and standard-definition channels. Typically, the main channel is high-definition, and the others are standard-definition. Table 2 lists some common OTA channels in the Dallas, Texas, area. Notice that ABC is VHF (180 – 186 MHz). All other channels are UHF (470 – 602 MHz). While the channel numbers are similar to the original analog TV channel numbers, in most cases, the frequencies have been changed. For example, the old analog FOX 4 KDFW TV channel was in the range of 66 – 72 MHz. However, while it is still Channel 4, the new digital FOX 4 KDFW TV channels (4.1 – 4.4) have been moved to 596 – 602 MHz (digital Channel 35). You can obtain the specific channel frequencies for any area at **www.fcc.gov** or other online resources. Incidentally, frequencies from 608 to 800 MHz have been transferred to 4G Long-Term Evolution (LTE) and 5G cellular service providers.

I wanted to receive local OTA TV stations, but my eight-way amplified splitter was being overloaded by local FM, as well as 4G and 5G transmissions. I had a lot of pixelation on several desired channels, and there was frequent loss of synchronization. In order to better understand what was going on, I took the tinySA Ultra into my attic and connected it directly to the TV antenna feed. Figure 11 shows the 0 – 800 MHz spectrum observed. You can see the 180 – 186 MHz TV channel and the rest of the TV channels from 470 to 608 MHz. The strong signal at 162 MHz is a National Oceanic

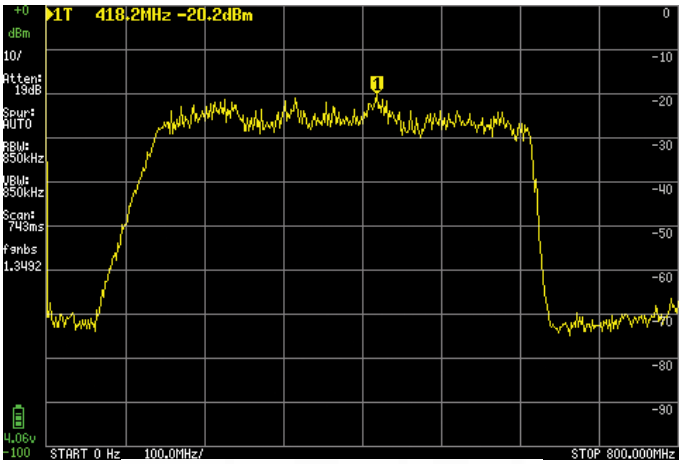


Figure 12 — The response when both of the filters shown are used in series.

and Atmospheric Administration Weather Radio transmitter. The FM broadcast signals are visible from 88 to 108 MHz. There is a strong signal just above 600 MHz, and there are several more from about 750 to 800 MHz. Some of these are probably 4G LTE or 5G signals from the AT&T cell tower located a few blocks away and directly in my TV antenna's main pattern. There are other strong signals from 700 to 800 MHz. Most of the non-TV signals are 10 – 40 dB higher than the TV signals; because the active splitter amplifies signals from 50 to 1000 MHz, all of the non-TV signals are amplified along with the desired TV signals. This can cause amplifier overload, TV front-end overload, or IMD products falling within the TV channels. Such IMD can happen when non-linearities from strong non-TV signals mix with each other and/or the TV signals.

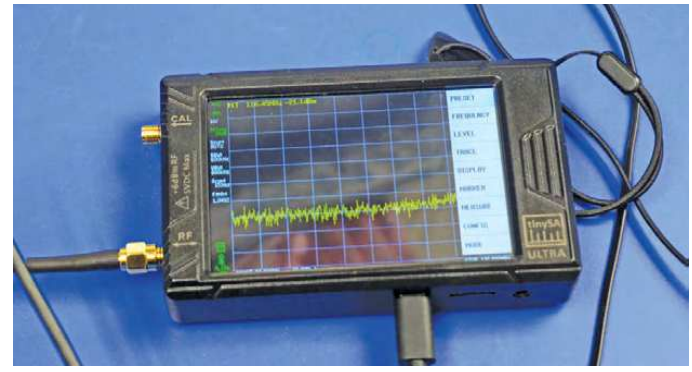
So, what can be done? If I find a way to reduce the level of out-of-band undesired signals, it might help solve the pixelation and loss of synchronization. Amazon sells a variety of inexpensive LTE filters. I ordered several for analysis, but most of them were of poor quality. However, while the KBFUSHI filter shown in Figure 12 didn't have much attenuation above 600 MHz, it turned out to be an excellent FM broadcast and HF filter. It has 3 dB of attenuation at 148 MHz, 21 dB of attenuation at 108 MHz, and 30 – 50 dB of attenuation below 50 MHz. Besides helping attenuate the FM broadcast stations, this filter will help eliminate HF front-end overload of my TV system from nearby ham transmitters.

I still needed a good LTE band filter; after further investigation, I found that the Channel Master CM-3201 had good attenuation characteristics above 600 MHz, but no attenuation below 150 MHz. That is, it was strictly a low-pass filter. My final solution was to put the KBFUSHI high-pass filter in series with the Channel Master CM-3201 low-pass filter. The combined band-pass response of the two filters is shown in Figure 12. This dual-filter configuration prevented out-of-band signals from having greater signal strengths than the desired TV signals. This completely resolved my OTA TV problems. This process, and the results, are covered in more detail at **www.arrl.org/qst-in-depth**.

See *QST* in Depth for More!

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

- ✓ More information on checking for overload with a noise source
- ✓ Additional details about applying filters to solve the OTA TV problem



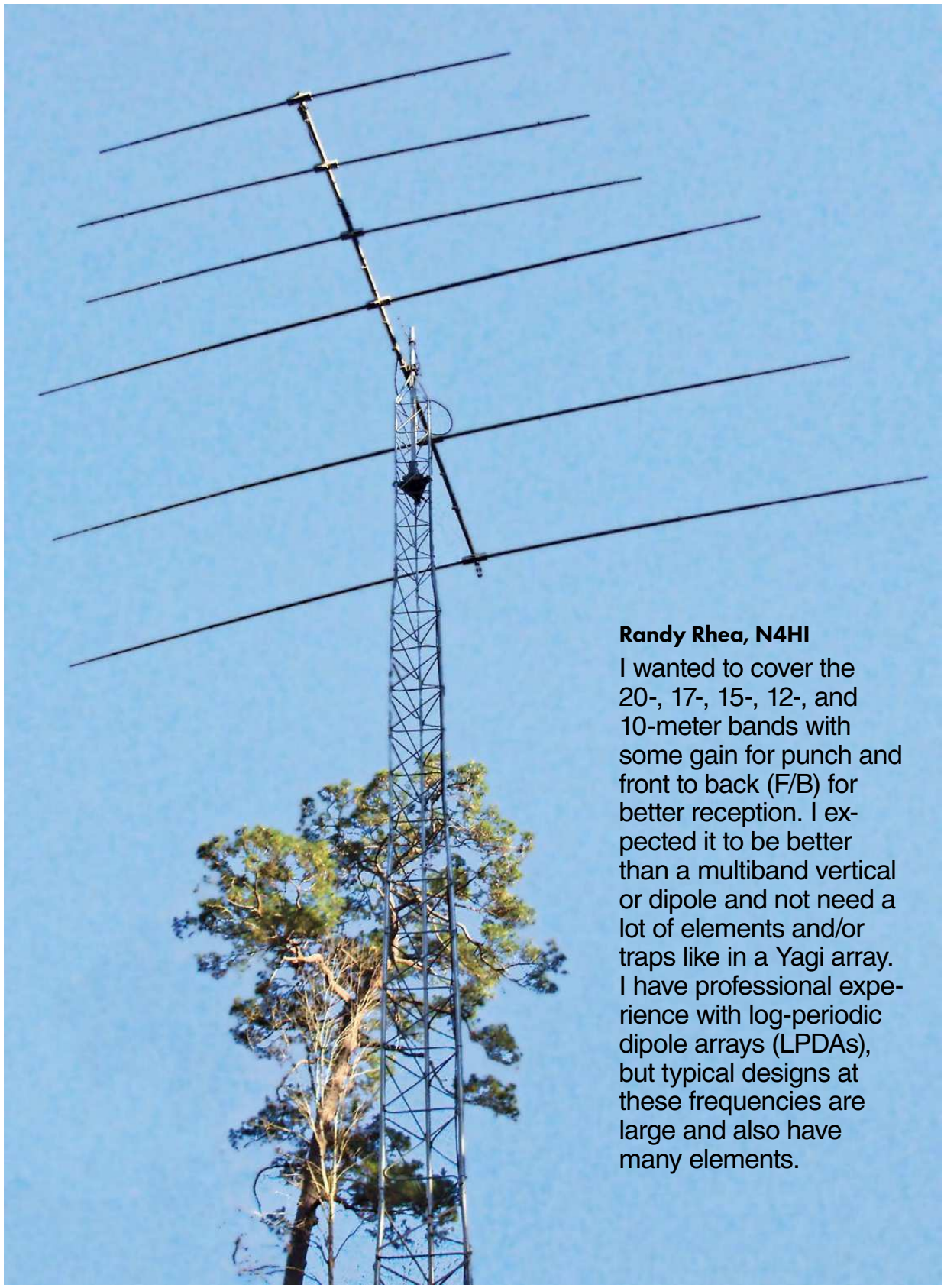
Click here to watch ARRL Lab Digital RF Engineer John McAuliffe, KD2ZWN, use the TinySA Ultra to measure the corner frequency and return loss of an RF filter.

Phil Salas, AD5X, an ARRL Life Member, has been licensed continuously since 1964. His interest in ham radio led him to pursue BSEE and MSEE degrees from Virginia Tech and Southern Methodist University, respectively, followed by a 35-year career in UHF, microwave, and lightwave design and management. Now fully retired, Phil enjoys tinkering with ham radio projects and spending time with his two grandsons. He can be reached at **ad5x@arrl.net**.

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

A Modest 20- to 10-Meter LPDA

This log-periodic dipole array is constructed on a 21.2-foot boom.



Randy Rhea, N4HI

I wanted to cover the 20-, 17-, 15-, 12-, and 10-meter bands with some gain for punch and front to back (F/B) for better reception. I expected it to be better than a multiband vertical or dipole and not need a lot of elements and/or traps like in a Yagi array. I have professional experience with log-periodic dipole arrays (LPDAs), but typical designs at these frequencies are large and also have many elements.

Only about 2 MHz of total frequency coverage was needed in a 15 MHz span from 14 to 29 MHz, so I wondered if a conventional LPDA could be optimized for the ham bands by sacrificing the non-ham frequencies to obtain reasonable performance on a limited boom. I explored designs using *EZNEC* and optimized them using *AutoEZ*.

My goal was to achieve the best-possible performance with my old 24-foot Hy-Gain TH6DX boom. I planned to use any aluminum that I could from the TH6DX and purchase the rest.

Initial Results

The simulation revealed that reasonable performance could be achieved on a 24-foot boom with just six elements. The structure deviated from true log-periodic geometry after optimization for gain, F/B, and standing wave ratio (SWR). The long rear elements resulted in an unbalanced weight. Because the boom-to-mast clamp of the TH6DX also joined the two 12-foot boom segments, to balance the antenna at the clamp, I cut 32.5 inches off the rear boom — I now had a 21.29-foot boom. Fortunately, the simulated performance

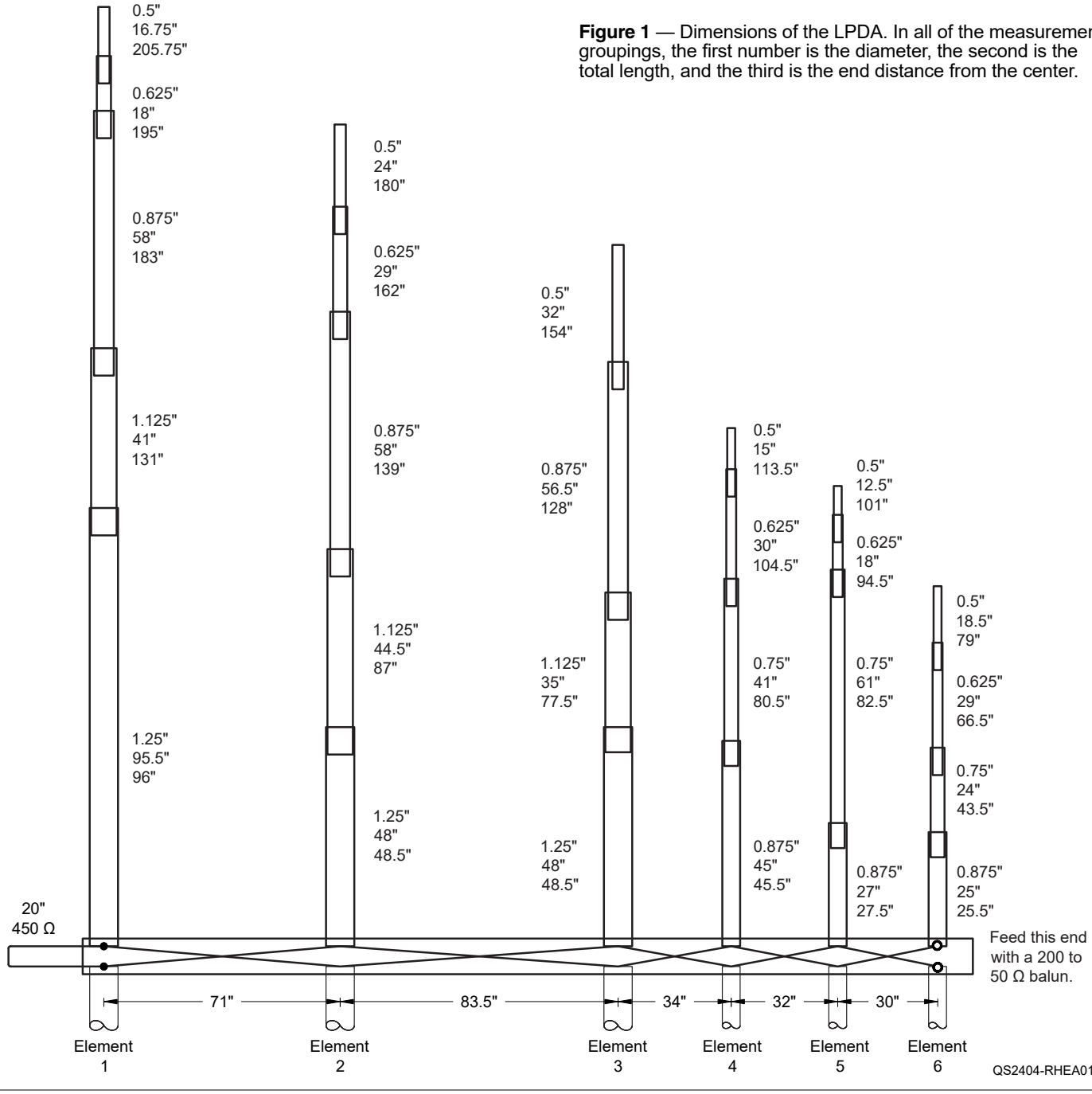


Figure 1 — Dimensions of the LPDA. In all of the measurement groupings, the first number is the diameter, the second is the total length, and the third is the end distance from the center.

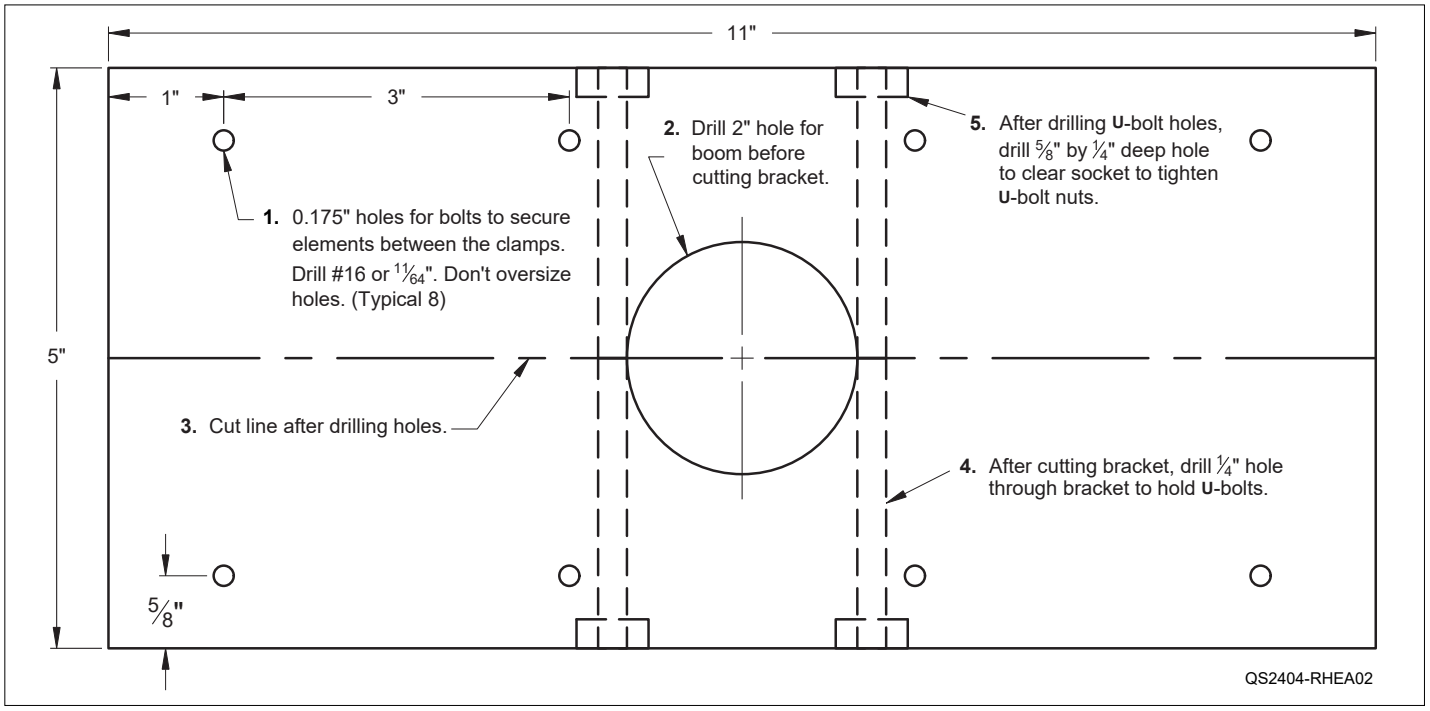


Figure 2 — The boom-to-element bracket. Observe the order of the construction steps.

was still good. The lead photo shows the final LPDA at the top of a self-supporting aluminum tower.

Antenna Construction

Figure 1 shows the spacing and design of each of the elements. The element lengths and spacings are not quite log periodic, which allowed me to optimize the design for good performance with a shorter boom and fewer elements.

Maximizing the use of aluminum from my old TH6DX dictated the unusual element taper. While most homebrewers will likely purchase aluminum rather than salvaging what they can, I recommend using these element tapers; a more conventional taper would change the resonant frequency of the elements, and this is a proven design. The TH6DX has some elements with swaged ends, resulting in steps larger than 0.125 inch. I recommend using sleeves made of short tubing lengths to create 0.250-inch steps where necessary. I used 6 inches of overlap to join the tubes.

LPDA antennas drive each element with a balanced transmission line and thus require that the elements be insulated from the boom. I homebrewed the element-to-boom brackets using 0.75- × 5.5-inch PVC trim boards from a local box store. Figure 2 shows the dimensions for constructing the brackets. Cut the board into 11-inch lengths and then rip 0.5 inch from the width of each cut piece. The center 2-inch hole is drilled before ripping the PVC into two brackets. Next, drill the **U**-bolt holes. Sandwich each element between two brackets and secure them with two 10-32 bolts. The four holes in each bracket and element should fit the bolt tightly so the elements don't droop. (If I were to redo mine, I would raise the outer holes by 1/32 inch to slightly pre-tilt the elements upward.) Space the ends of the left and right elements about 1 inch apart at the boom, and use **U**-bolts to attach the brackets to the boom. Make sure the elements don't contact the boom **U**-bolts, which would short the elements to the boom.

The LPDA Feed Line

Each LPDA element is fed with a balanced twinlead transmission line with an inverted phase for each element. This is done by twisting the twinlead between each element, or simply crossing the short jumper wires that connect the twinlead to the elements.

The parameters of the LPDA determine the required characteristic impedance of the feed line. In this design, a 200 Ω driving-point impedance is achieved with 250 Ω twinlead. Because this is not a commercially available twinlead impedance, I constructed the line using #8 AWG bare copper wire spaced 0.51 inch center to center. Remove any kinks in the unrolled bare wire by clamping one end in a vice and pulling hard on the other end to slightly stretch the wire. Using short pieces of the ripped PVC board, drill 0.51-inch holes center to center to serve as small spacers roughly 2 feet apart along the feed line. Screw these spacers to the element brackets to stabilize the feed

Figure 3 — The boom-to-element bracket with the feed-line spacer supported on standoffs. Just visible behind the spacer are the crossed wire jumpers from the antenna elements to the feed line.

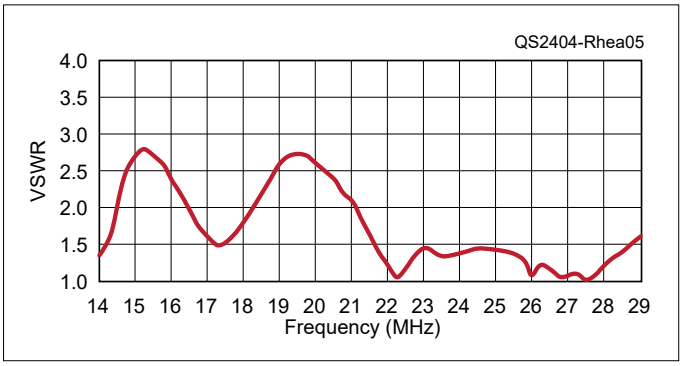


Figure 4 — VSWR of the LPDA through TMR-400 coax at the tower base.

line at the brackets. The bracket for element two and the feed line are pictured in Figure 3.

I homebrewed a 200 to 50 Ω balun to feed the dipole array at the high-frequency end of the LPDA. Your balun design can be verified using a 200 Ω resistor across the balanced terminals and measuring the SWR on the 50 Ω port. It should be better than 1.5:1, preferably 1.2:1. Some commercial baluns are not that good.

Element one serves as a reflector. To reduce its required length, use a 20-inch section of commercial 450 Ω ladder line to short the element.

Simulated Patterns and Measured VSWR

On the *QST* in Depth web page (**www.arrl.org/qst-in-depth**) you'll find the *EZNEC*-simulated azimuth patterns for the CW segment of each band. Each pattern is cut at the indicated optimum elevation angle for each band with the antenna mounted at 50 feet. The patterns in the phone portions are similar because of the broadband nature of LPDAs. The gain ranges from 10.5 to 11.3 dBi, and the F/B ranges from 10 to 15 dB.

Figure 4 shows the VSWR at the base of the tower with the LPDA fed through foam LMR-400-type coaxial cable, measured using a RigExpert AA-35 Zoom vector network analyzer.

On-Air Performance

I've been using my LPDA since May 2020, and it has survived 60 mph winds. I've used it on all five bands with my IC-7300 without a tuner. It demonstrates good F/B and signals peak well on beam. I operate exclusively HF CW, and I used it to extend my barefoot DXCC from 274 to 288 countries.

See *QST* in Depth for More!

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

✓ *EZNEC*-simulated azimuth patterns of the LPDA at the peak elevation angle of each band.

Click here to watch a video of Randy Rhea, N4HI, share why he wanted to build this project.

All photos provided by the author.

Randy Rhea, N4HI, was first licensed in 1962 as WN9FFO and has held the call signs WA7NLA and WB4KSS. He worked as an electrical engineer at Boeing, Goodyear Aerospace, and Scientific Atlanta. In 1985, he founded Circuit Busters (now known as Eagleware), which was acquired by Keysight in 2005. The Eagleware RF/microwave software design suite *Genesys* is still supported by Keysight and used by thousands of engineers worldwide. Randy is the author of five engineering reference books covering oscillators and filters, and he exclusively operates HF CW. Randy is married and has two children and five grandchildren. He can be reached at **randy.rhea@gmail.com**.

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

Product Review

ACOM 500S 160 – 4-Meter Linear Amplifier

Reviewed by Mark Wilson, K1RO
k1ro@arrl.net

ACOM's product line includes a wide variety of solid-state and tube-type amplifiers with RF output levels up to the 1500 W legal limit. Over the past 20 or so years, Bulgarian manufacturers' products have developed a reputation for quiet, reliable operation, and *QST* has reviewed many of their products. ACOM's latest offering, the 500S, uses solid-state technology to deliver 500 W from 160 through 4 meters (the 70 MHz band, available to amateurs in some countries outside North America).

Amplifiers in this power class have long been popular. They offer a 7 dB (more than 1 S-unit) improvement in signal strength compared with a 100 W transceiver, and are significantly less expensive than full-power models. Modern 500 W solid-state amplifiers such as the ACOM 500S are easy to operate. They switch bands automatically and require no tuning. Extensive protection circuitry helps keep them safe in case of operator error or failure in another part of the station (such as a broken feed line).

Documentation

The ACOM 500S does not include a printed manual, but a 66-page PDF manual is available online. The manual includes many color illustrations and covers installation, hookup, operation, remote control, maintenance, and troubleshooting. Other support files and firmware updates are available from ACOM's website.

I liked the **HELP** button available on most of the menu screens. That brought up information that answered most of my questions without having to consult the manual.

Overview

The ACOM 500S measures 6.2 × 11.5 × 10.7 inches (height, width, depth) and weighs just 17 pounds. You could easily take it along for a DXpedition or portable operation in addition to home station use. The 500S can operate with 100 to 240 V ac and requires 25 to 45 W of RF drive power depending on the band (see Table 1), and will deliver 500 W into a standing wave ratio (SWR) below 1.5:1. Output power folds back as SWR rises above 1.5:1. ACOM offers two optional antenna-matching units that integrate with the 500S and other ACOM solid-state amps. The 04AT can be mounted indoors or outdoors, while the 06AT is a desktop unit with styling that matches the amplifier.

The **ON/OFF** rocker switch on the rear panel controls ac to the power supply input and is left on to keep the amplifier in a low-energy standby mode when not in use. Pressing the front-panel **POWER** button for a few seconds begins the amplifier's start-up routine and turns on the display. After about 10 seconds, the 500S is ready for operation. Pressing the front-panel **POWER** button again returns the amplifier to the low-energy standby mode.

The 500S shares a simple front-panel design with other ACOM solid-state amplifiers. Control, metering, and monitoring functions are handled by a 5-inch color screen with six pushbuttons below (see Figure 1). On-screen labels for the pushbuttons are context sensitive and change depending on what you're doing. During normal operation, the screen shows the

Bottom Line

The ACOM 500S solid-state linear amplifier operates from 160 through 4 meters and easily provides 500 W output with 25 to 45 W of drive. It's compact and easy to operate.

Table 1
ACOM 500S, serial number 230136, firmware v1.0

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency range: All amateur frequencies in the range of 1.8 to 70.5 MHz.	160, 80, 40, 30, 20, 17, 15, 12, 10, and 6 meters.*
Primary power requirements: 100 to 240 V ac.	As specified. Tested with 120 V ac supply.
Power output: 500 W ± 0.5 dB PEP or continuous carrier with no mode limitations.	As specified.
Driving power required: Typically, 45 W for 500 W RF output.	Drive level for 500 W output: 1.8 MHz, 41 W; 3.5 MHz, 35 W; 7 MHz, 42 W; 14 MHz, 45 W; 18.1 MHz, 46 W; 21 MHz, 25 W; 24.9 MHz, 30 W; 28 MHz, 41 W; 50 MHz, 45 W. See Figure A.
Spurious and harmonic suppression: Below 30 MHz >50 dBc, above 30 MHz >70 dBc below rated output.	58 dB worst case band (10 meters); 67 dB, 6 meters. Meets FCC requirements.
Third-order intermodulation distortion (IMD): >30 below rated PEP.	14 MHz, 3rd/5th/7th/9th: At 500 W PEP: –35/–39/–62/–58 dB. See Figure B.
Keying time: Unkey to key, 10 ms.	Unkey to key, 13.4 ms; key to unkey, 28 ms.

Size (height, width, depth): 6.2 × 11.5 × 10.7 inches.

Weight: 17.2 pounds.

*Reminder: US amateurs must observe a limit of 200 W PEP output on the 30-meter band.

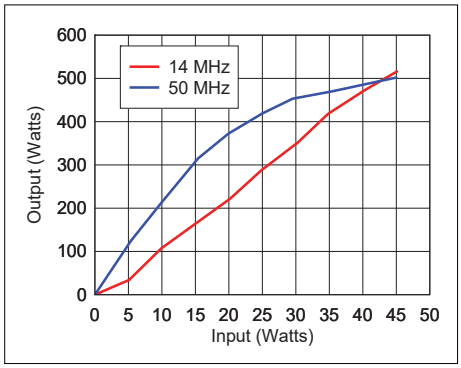


Figure A — ACOM 500S, RF power input versus RF output.

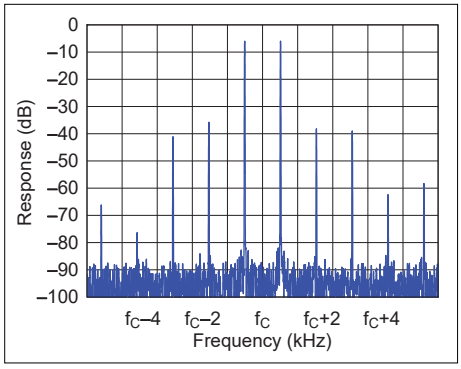


Figure B — ACOM 500S, the 20-meter band third-order IMD performance at 500 W.

band of operation, forward and reflected power, and power amplifier (PA) temperature as well as two additional user-selected parameters in the yellow bar above the frequency band display.

The yellow bar below the frequency band section indicates **OPERATE**, **STANDBY**, or **AUTO OPERATE** mode, transmit-receive relay status, whether or not the amplifier operating frequency is set to follow the transceiver (**CAT/AUX CONTROL**), and if the amplifier is under remote control.

When you turn on the amplifier, it goes into the **STANDBY** mode. Press the **OPR/STB** button to switch it to **OPERATE**. If you select **AUTO OPERATE** from the **USER PREFERENCES** menu, the amplifier goes into **OPERATE** mode when you turn it on.

Pressing the **MENU** button brings up a list of screens for monitoring or changing amplifier operation, as shown in Figure 2. The **AMP MEASURE** menu shown in Figure 3 selects the two user-selectable parameters shown on-screen. Choices include input or output power, forward or reflected power, SWR, amplifier gain, PA bias, PA voltage, or PA current. The **AMP SERVICE** menu is used to check the drain current of the PA transistors and to test relay and fan operation.

The **CAT/AUX SETTINGS** menu is used to set up the amplifier to interface with a transceiver via band data or RS-232. The manual includes settings for transceivers from Elecraft, Icom, Kenwood, and Yaesu. Note that the 500S will switch bands automatically when it senses RF at the input, but the CAT connection ensures that the amplifier follows your radio and is always set to the correct band before you start transmission. Transceiver interface cables are available from DX Engineering (ACOM's US distributor), or you can consult documentation from ACOM's website to make your own.

In addition to the **AUTO OPERATE** feature described previously, the **USER PREFERENCES** menu controls beep volume and display brightness. It's also used to add your call sign or other text to the message displayed at start-up. The **FAULTS LOG** menu displays information such as amplifier serial number, hardware and firmware versions, and total hours of operation. Along the bottom of the screen is information that can be used for troubleshooting in the event of an amplifier

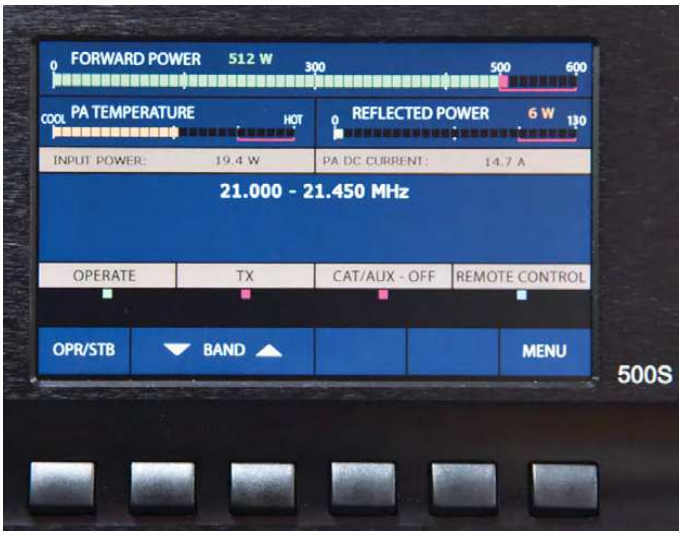


Figure 1 — The main operating screen shows important operating parameters such as selected band, forward and reflected power, drive power, and PA temperature. It's not a touchscreen — selections are made using the buttons below the screen. The **MENU** button at the lower right brings up various setup and monitoring screens.

Figure 2 — The **MENU** screen is used to set up the amplifier. Several of the screen selections are not active without an ACOM automatic antenna tuner connected.

Figure 3 — The **AMP MEASURE** screen is used to select the parameters displayed in the bar just above the band display.

fault. Using the **RESTORE DEFAULT SETTINGS** menu, you can restore the amplifier's factory settings, reset the user preferences to default values, erase the faults log, or reset the hours counter.

Protection Features

The 500S incorporates an automatic protection system similar to other ACOM solid-state amplifiers. The control unit monitors drive frequency and power, transmit-receive (TR) relay switching times, final transistor drain voltage and current, gate bias voltage, power supply temperature, heatsink temperature, forward and reflected output power, and other parameters.

If a monitored value approaches the protection threshold, a clear warning message appears on the screen in a yellow bar above the **BAND** and **OPR/STB** buttons below the frequency display. If you correct the problem (for example, lower the drive level), then the warning goes away. The next level is a "soft fault" where the amplifier switches to standby and displays a detailed error message. If **AUTO OPERATE** is active, the amplifier will stay in standby for 4 seconds before returning to operation. It will return to standby if the problem is not corrected.

The most serious problems trigger a "hard fault," which shuts off the main power supply, stores data about the fault in memory, blanks the front panel, and sounds a string of Morse code **F** characters. After a hard fault, the amplifier may or may not power up again depending on the problem. If it does, a fault message appears on the screen. In the event of a hard fault, the amplifier stores diagnostic data that may assist with troubleshooting.

Setting Up the 500S

The power supply can operate from 85 to 132 V ac with 10 A fuses, or 170 to 265 V ac with 6.3 A fuses. The ac line fuse holders are on the rear panel. Just install the correct power plug for your station, make sure the right fuses are installed, and plug it in — no jumpers or switches are needed to select the ac mains voltage. The review amplifier came with fuses and a plug for 120 V operation installed. I had no problem operating it from a standard household 120 V, 15 A circuit in my station.

The rear panel (see Figure 4) has SO-239A jacks for the transceiver and antenna. If you have one of the matching ACOM automatic antenna tuners, use **RF OUTPUT 1.** Otherwise, use **RF OUTPUT 2**. There's a phono jack for TR switching (**KEY-IN**), 15-pin **CAT/AUX** connector for band data, and 9-pin **RS-232** connector.

Figure 4 — The rear panel, showing the cooling fan and available connections.

The **KEY-OUT** phono jack is for controlling a transmit inhibit function if one is available on your transceiver.

To switch bands, you can either connect an appropriate cable between your transceiver and the 500S, rely on the amplifier's built-in frequency counter, or use the **BAND UP/DOWN** buttons on the front panel.

We didn't order a compatible cable for this review, so I relied on the frequency counter. The amplifier will switch bands automatically when it senses RF at the input, but you need to make a brief transmission (such as a single CW character or voice syllable), then allow the amplifier to change bands. There is a slight switching delay, so you need to pause before resuming transmission. On digital modes such as FT8 or RTTY, the transmission is continuous (no convenient way to send a character or two and pause). If you don't pause until the band change is complete, there is no power output and a warning to remove drive power immediately flashes on the screen. For permanent installations, I highly recommend using a CAT cable so the amplifier follows the transceiver instantly at band changes.

The 500S has no automatic level control (ALC) connection to adjust transceiver drive power automatically. You need to adjust your transceiver's power output to drive the amplifier to 500 W without tripping the amplifier's overdrive protection. I found that the drive power varied from about 25 to 45 W depending on the band.

I didn't try it, but the 500S includes some remote control and monitoring features via the amplifier's RS-232 jack or ACOM's optional eBox Ethernet remote control device. You can turn the amplifier on and off, switch between operate and standby, switch between transmit and receive, change bands, and adjust some of the options. More information is available from ACOM's website or the eBox manual.

Operation

According to the manual, the 500S will work into an SWR below 1.5:1 at full power, and that is sufficient for most of my antennas. Above 1.5:1, the power output folds back quickly. Although the 500S protection kicks in if the SWR is too high, in a number of places the manual stresses the importance of keeping the antenna system SWR under 1.5:1.

TR switching is relay-based, and the 500S doesn't offer full break-in (QSK) capability. Be sure to set your transceiver for a 14-millisecond or longer TR delay time to avoid potential damage to the amplifier from hot switching (applying RF before the amplifier relay contacts are fully closed).

The ACOM 500S is rated for 500 W continuous duty, so I used it while working weak DX stations on FT8/FT4 and also for a few hundred contacts in the CQ World Wide RTTY DX Contest. The PA temperature indicator stayed well within the safe range even during extended operating periods.

During receive periods, the amplifier cooling fans run at low speed. Fan speed increases as soon as the amplifier goes into transmit mode. During extended transmitting periods, especially when using digital modes, the fans run at higher speed all the time. While the fans are quieter than some high-power solid-state amplifiers I've used, they are not as quiet as my ACOM 1000 tube-type amplifier. I normally wear good headphones, so fan noise generally doesn't bother me.

Wrapping Up

ACOM's compact 500 W amplifier will find a spot in many stations where legal-limit power isn't desired or needed. Documentation is excellent, and the amplifier is simple to set up and use. Support is available from the factory in Bulgaria and from DX Engineering, the US distributor. ACOM amplifiers are also supported by user communities on **https://groups.io** and Facebook.

Manufacturer: ACOM Ltd., Sofia, Bulgaria, **www.acom-bg.com**. Available at US distributor DX Engineering. Price: $3,400 without ac plug; $3,475 with ac plug; transceiver interface cables, $50.

W2IHY Multi-Switching System: 3 × 4 Switch Plus Controller, iPlus Audio Switch, and iBox Interface

Reviewed by Pascal Villeneuve, VA2PV
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This review includes many products offered by W2IHY Technologies. It's hard to understand the complete value of these products by reviewing them separately. So, this review consists of a solution using four W2IHY products: the 3 × 4 coax switch plus controller, the iPlus audio switch, the iBox audio interface, and the eight-band audio equalizer that was reviewed in the December 2000 issue of *QST*.

As soon as you have more than one HF radio and want to use it in the same station, you need to be careful if you want to keep the two connected and ready to use; otherwise, you may damage one of the receivers. You can use different radios on different bands/antennas using band-pass filters, or you can set up a switching solution to use them independently. That's what I did, as my radio usage depends on the operating modes, not the band. In June 2019, I posted on my personal YouTube channel a video about how I safely managed multiple HF radios in the same station. To view the video, titled "Safely connect several HF radios with multiple antennas," see **https://youtu.be/9FntelKOjoc?si=sb0PV4krwBRzkp3N**. This setup has served me well over the years, and I've never damaged anything, which is the most important. But it doesn't allow me to enjoy my different HF radios quickly. Yes, it protects my rigs from switching mistakes, but it takes too long to compare my radio performance in a particular situation. Although I can switch the coax, all radios have their own speakers. My PTT connections are going through homemade splitters hanging from the wires behind the desk.

I started looking for a better solution. My plan was to keep my current coax antenna switch that is located outside, but replace my radio switch with something that can also switch the PTT and ALC, and it has to offer the same isolation protection or better than my current setup. In parallel I was looking for a speaker switch. The goal was to make some room on my shelves by removing some extra speakers. I also wanted to be able to use any of my radios with my bhi audio equalizer with DSP noise filtering. If everything can switch together, it will simplify and facilitate the comparison between my radios, as they will be using the same set of speakers. In my online search, I found some interesting products, but I kept coming back to the W2IHY website. My first impression was that it was expensive — until I understood its value. After a lot of reading, I couldn't find any equivalent. At the end, I concluded that the W2IHY coax switch and the iPlus were the best integrated solution for my needs.

Bottom Line

W2IHY Technologies offers one of the most advanced switching solutions for a station using multiple radios with multiple antennas. With its well-thought-out product integration, one-switch knobs allow switching safely between three radios, the microphone, the audio speaker output, the PTT, the amplifier keying, the ALC, and the coax input.

My initial intention was to buy only three out of the four units, but I soon found that if I added the W2IHY eight-band audio equalizer and noise gate, I would be able to use only one microphone that would be switched at the same time as the coax, PTT, ALC, and speakers. This also means that I can use an Icom, Kenwood, or Yaesu microphone that will work on all three HF radios.

The W2IHY 3 × 4 Switch Plus Controller

The 3 × 4 switch plus controller lets you control up to three radios to a single coax output. It's built to last with a rugged steel chassis, and it screams quality. The unit is 16 × 3⅜ × 5 inches. It's also possible to rack it into a 19-inch rack mount (an optional bracket is available for $40). It can handle up to 10,000 W of RF (PEP) and offers isolation between its coax ports greater than –70 dB, according to the manufacturer. My observations confirm that this is accurate and similar to my previous setup (more on this later; not tested by the ARRL Lab).

With this coax switch you can switch and route up to three radios to a single amplifier or one antenna output, plus the amplifier keying (PTT). The ALC and the speaker's output will automatically follow the selected radio.

There's another option that you can buy to switch multiple antennas to multiple radios — the 1 × 4 coax switch. But I wanted to keep my outside remote switch for my HF antennas, so I didn't need it. The 1 × 4 coax switch combined with the 3 × 4 coax switch plus will provide more output connection, allowing for the ability to switch three radios to up to three amplifiers or up to four antennas. If you have more than three radios, you can cascade another 3 × 4 switch if you wish.

The Front Panel

On the front panel, from left to right, you have the **POWER** switch with a yellow LED on top that will be lit when turned on. When the switch is in the off position, coax for all three radios will be put to ground. This is automatic and very convenient. Then you have the **TUNE** switch. When the red LED above is off (switch down), the amplifier PTT will be keyed, but when the switch is up, the LED will be on and your amplifier will not be keyed. Next, you have the **LOCAL / REMOTE INPUT SELECT** switch for the **RF INPUT** (the radios). You have four positions that you can switch using this rotary knob: radio **A**, **B**, **C**, and **REMOTE**. Obviously, this lets you switch between three radios —**A**, **B**, and **C** — and the **REMOTE** position is used when the switching is controlled by another box, like the iPlus (more on this later). For each radio you have a rotary knob with three positions for the **RF OUTPUT**, **1**, **2**, and **3**. If you have only one output connected on the coax switch and no 1 × 4 remote switch (like me), then all three radios' **RF OUTPUT** will be the same even if they are set to different positions (**1**, **2**, or **3**). If you have the 1 × 4 remote switch, you can set different output for each of the three radios. The final switch on the front panel is the **AUX** switch, which is to be used when the coax input of the optional 1 × 4 switch is connected to the auxiliary coax output of the 3 × 4 switch. In my case, this one is off.

The Rear Panel

On the rear panel (see Figure 5), from left to right, on top you have five DIN types of connectors. The first two have six pins and are for power — **POWER IN** and **POWER OUT** — if you need to power a second switch. The power requirements are 10 to 15 V dc at 1 A for powering one 3 × 4 controller and one 1 × 4 antenna switch. You will need 2 A if you want to power two of each. The power cable is included but you will need to connect it to your station's power supply. Keep in mind that the cable has no fuses but there is a fuse inside the unit. I used a dc power distribution outlet that is already fused.

The three other DIN connectors use five pins. The first one, **INPUT SEL**, is used when the **LOCAL / REMOTE** input select switch is in the **REMOTE** position. It allows the selection of the **A**, **B**, and **C** coax inputs (the three radios) to be selected remotely. The **OUTPUT SEL** is used to identify which of the three coax outputs (1, 2, or 3) on the optional 1 × 4 switch is active. This DIN connector can also be used to connect to the input select (**INPUT SEL**) of a second 3 × 4 switch when adding more radios, and an additional level of switching is required. The **OUT TO 1 × 4 SEL** connection switches the coax input of the 1 × 4 switch to one of the four coax outputs. If you want to switch the coax input with the iPlus audio switch, only the RCA connectors need to be connected, and you will

Figure 5 — The W2IHY 3 × 4 Switch Plus controller rear panel.

be able to switch remotely if the coax switch is in the **REMOTE** position.

Below the DIN connectors you have an obvious **GND** connection and four SO-239 connectors. The first two are for radios **A** and **B** (**RF INPUTS**). Then you have the RF **OUTPUT 3 × 1**, where you connect your amplifier or your antenna depending on your setup. The next one is for the third radio input (**RF INPUTS C**).

From the middle to the right of the rear panel, you have multiple RCA connectors, along with all the input and output for radios **A**, **B**, and **C** for the PTT, ALC, and speakers. Other than the input and output mentioned previously, you have three RCA connectors for remote switching, **INPUT SELECT** (where I connected the iPlus audio switch). You also have two RCA connectors for **SWR IN** and **SWR OUT**, which prevent keying the amplifier in case of high SWR or for other reasons. They may be connected to an SWR meter, an antenna tuner, or a SteppIR controller that has circuitry to disable amplifier keying when required. If you want to enable the PTT feature at all times and have nothing to connect to the **SWR IN** and **SWR OUT**, you will need to connect them; otherwise, the PTT won't work.

For more information about the 3 × 4 switch plus controller, you can download the manual online at **https://w2ihy.com/wp-content/uploads/2020/06/3x4SwitchManual.pdf**.

The W2IHY iPlus Audio Switch

The iPlus audio switch can be used to switch between three radios, the audio speaker output, the audio mic input, and the PTT. It must sound similar to the coax switch, but it can use one or two audio inputs to any of the three connected radios, plus it's meant to work in combination with the coax switch, as it can remotely control the radio selection. This means that if you have both units, you have only one switch that will switch everything to any of the three radios. I needed the iPlus audio switch to have two audio inputs and three audio outputs to the radios (the mic inputs). The first audio input is for the microphone (in my case it's the eight-band EQ), and the other is used to connect the iBox interface that is used for the LP-700 two-tone audio output. This allows me to inject a two-tone audio signal to the selected radio, a very convenient option.

The Front Panel

On the iPlus front panel, the first rotary knob on the left is the main switch for the three radios. If you connect the iPlus to the **INPUT SELECT** RCAs on the 3 × 4 switch plus controller, the iPlus will remotely switch the coax as well if the controller is in the **REMOTE** position. Next, there is a flip switch named **INVERT PHASE ON**, which reverses the phase of the audio output 180 degrees for proper AM modulation asymmetry. The other three knobs are for the **OUTPUT LEVEL**. These allow you to adjust the audio level output to the radio's microphone input independently.

The Rear Panel

On the rear panel (see Figure 6), from left to right, you will find the first two audio inputs (there are a total of three). The **AUX INPUT** uses a five-pin DIN connector, and the other uses an XLR named **AUDIO INPUT**. Next, on the right you have three other five-pin DIN audio outputs, named **AUDIO OUT**. I use these to connect up to three radio microphone inputs. On the right side of the rear panel, you have several RCA connectors to connect the speaker output and the PTT of all three radios to one output. In my case, the iPlus is used only for audio input, and all the PTT, speakers, and ALC connections are made into the 3 × 4 controller.

The iPlus is passive equipment, and no external power is required. The unit dimensions are 9 × 3 × 5.5 inches. There is no ground connector, but I used a screw on the chassis to ground the iPlus to the station common ground.

For more information about the iPlus audio switch, download the manual online at **https://w2ihy.com/wp-content/uploads/2020/06/iPlus_manual_8_21_12.pdf**.

The W2IHY iBox Audio Interface

The iBox is a variable attenuator and an interface box. Its dimensions are 4 × 1¾ × 1¾ inches. It's small (see the lead photo), and it doesn't require any power. You can buy it in a kit or as a fully assembled unit. This unit is simple but very useful, as it can serve many purposes, like interfacing an external audio device to your radio equipment, matching impedance, isolating your audio from hum caused by ground loops, providing RFI isolation, and interfacing with balanced and unbalanced audio gear. On top of the

Figure 6 — The W2IHY iPlus audio switch rear panel.

unit, you have a variable attenuator to adjust the output audio level. On one side is an audio input of 600 Ω using a ¼-inch stereo jack, named **AUDIO IN**. According to the manual, this input can accept a balanced source and run the iBox as a balanced input. It can convert a balanced source to an unbalanced input to the iBox, or accept an unbalanced source and run the iBox input unbalanced. On the other side you have the five-pin DIN **AUDIO OUT**. The DIN plug wiring can be modified to obtain a low-Z balanced output, a hi-Z balanced output, or a low-Z unbalanced output. The only other connector is an RCA type for the **PTT**. The **PTT** input jack offers an access point for your switch.

There are many reasons that you would need an iBox, but in my case it was to connect the audio output of my Telepost LP-700 to the iPlus in order to be able to send a two-tone signal to any of my HF radio mic inputs. What's funny is that on page 10 of my LP-700 user guide, Telepost suggests using the W2IHY iBox to interface the two-tone output to the radio.

For more information about the iBox, download the manual online at **https://w2ihy.com/wp-content/uploads/2020/06/iBox_Operating_Manual_8_21_12.pdf**.

Planning and Making the Connections

Shortly after you place an order for a 3 × 4 controller on the W2IHY website, you will receive an email from the owner, Julius Jones, W2IHY, who will want to talk to you in order to understand your specific setup. After your conversation with him, he will provide custom pictorials specific to your configuration, showing in detail how the switch should be connected. Considering the level of service he provides, it's better to know in advance; if there are any issues, he knows your setup and can easily help you remotely if needed.

I decided to buy from W2IHY all the necessary cables to connect my radios and equipment. I could have bought all the connectors and cables and soldered them myself, but I would still have to buy the cables, connectors, etc., and I would have to do the soldering of many small pins, which is always a struggle for me. So, I bought the 3 × 4 switch cable package ($60) and three pre-made 8-foot mic cables for my three radios ($41 each). I also got the W2IHY to iPlus 4-foot cable ($35) and some 3.5-millimeter TRS cables (another $35).

Julius had carefully prepared the diagram and all the cables to connect my equipment. Figure 7 is just one example, as there were many in the custom manual. Every diagram comes with a text description, and there's one for each type of connection, like the speakers, microphone inputs, ALC and PTT amplifier connections, etc. — this includes all your gear you need to connect. Julius sent the custom diagrams to me prior to shipping the equipment to ensure we were both confident it would be correct for my setup.

The package arrived well packed and well identified, with plug-and-play instructions. First, I unboxed the W2IHY equipment and noticed that all the cables were packed in bags grouped by the type of connection with all the necessary identification. Then I connected all the cables to the W2IHY equipment on a table in the garage (see Figure 8). I used hook-and-loop straps (not included) to tie the cables in order to move everything in the shack, and did the other end of the connections on my equipment, and it worked on the first try. I know there are a lot of cables involved, but it was worse before I added the W2IHY equipment. If you order all the cables from W2IHY, it's very easy to set up. The good news is that you won't have to do it again; now everything will switch without manipulating any cable.

On-the-Air Operation

Since I added the W2IHY equipment to my station, the way I operate my HF radios has changed com-

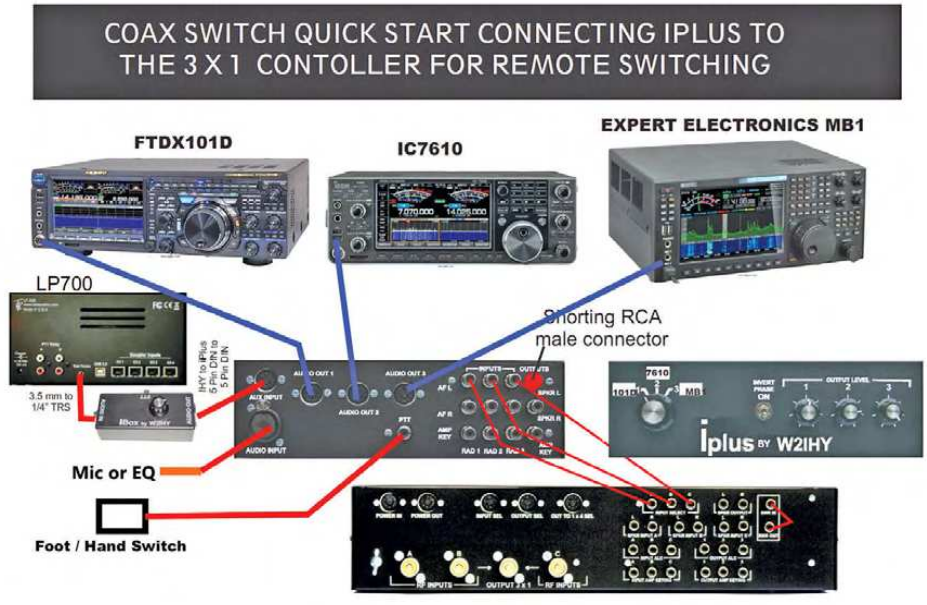


Figure 7 — The customized diagram prepared by W2IHY for my particular setup.

Figure 8 — The complete pre-wiring of all four pieces of W2IHY equipment.

pletely. Sometimes I even switch radios in between a transmission while in a QSO, and the receiving station can't even tell. It's such a pleasure to be able to enjoy my radios with a flip of a single switch. Now I do it all the time, just for fun.

I have only one microphone on the desk and only one set of speakers connected to the bhi audio equalization amplifier with DSP noise filtering that switches along with the other radio connections. At any moment I can send a two-tone audio signal to the active radio without touching any cables or going into any menus to change the mic input. All followed the only switch I used, the one on the iPlus. I can switch quickly and safely between radios and compare them in different situations.

When I switched radios before, I put the unused transceivers on another band (usually 6 meters), as far as possible from the transmitting frequency. While doing the tests with the Expert Electronics MB1 after installing the W2IHY equipment, I forgot to put the Icom IC-7610 to 6 meters, so both radios were set at the same frequency. I was running 1 kW on 80 meters and didn't hear any feedback while transmitting as the speaker was on the active radio, but when I looked at the Icom IC-7610, the received signal was only +20 over S-9, so the coax switch was doing a great isolation job. This is good to know, and with the coax switch, the speakers switch automatically. It's like putting the other transceiver on mute. Switching radios has never been easier, and I'm confident that it's safe.

Conclusion

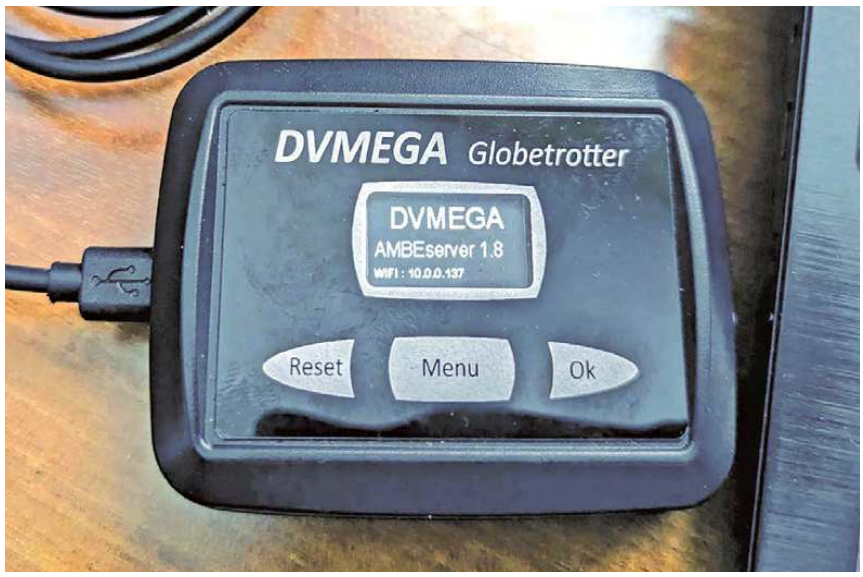
The W2IHY Multi-Switching System is a great addition to my setup. I'm very pleased with the result and the simplicity of operations that it provides.

I already knew that the W2IHY service was incredible, not only because of the reputation of the company but also from a past personal experience. In 2003, I bought a used W2IHY eight-band equalizer on eBay, and when it arrived it didn't work. I contacted Julius, W2IHY, and he tried to solve the issue over the phone. Ultimately, however, he asked me to ship the unit to him. When the unit was returned, it was repaired for free as the unit was still under warranty, so I only had to pay the shipping. This tells a lot about the manufacturer backing its products. Even if I didn't buy the unit from him, he still provided the support service. Plus, if you're not totally satisfied, he offers a 30-day, no-questions-asked, money-back guarantee.

If you have many radios and want to use them safely without disconnecting any cables, W2IHY can help you set up a safe and efficient multi-switching system to suit your operating needs.

Manufacturer: W2IHY Technologies Inc., 19 Vanessa Ln., Staatsburg, NY 12580, **www.w2ihy.com**. Price: 3 × 4 Switch Plus Controller, $549.99; iPlus, $239.99; iBox, $79.99; Eight-Band Audio Equalizer, $299.99. Shipping and cabling not included.

DVMEGA Globetrotter Digital Voice Companion



Reviewed by John Leonardelli, VE3IPS
jleonardelli@arrl.net

One of the fastest-growing segments of the radio hobby is the use of digital voice modes, and one of the significant devices catering to this growth is hotspots. As an avid user of the D-STAR digital mode, I've explored various radio frequency hotspots and dongles over the years. These devices act as bridges, connecting radios to the internet and facilitating communication through digital modes. Most digital hotspots have become increasingly popular, necessitating the use of a digital radio for operation. In contrast, some AMBE (Vocoder Chip) dongles/servers ("server" is the term used by DVMEGA) offer a unique advantage, as they don't necessitate a digital radio for this mode of communication, making them a compelling addition to your communication tool kit.

The DVMEGA Globetrotter stands out as a powerful digital voice communication AMBE dongle, offering an array of features for amateur radio enthusiasts. Utilizing *BlueDV* and *Peanut* software, in partnership with David, PA7LIM, this dongle transforms into a versatile digital voice communication tool, enabling radio-less communication from any location with an internet connection and a personal computer. Supporting various digital radio protocols, such as D-STAR, C4FM (Yaesu System Fusion), DMR, and NXDN, the Globetrotter is an upgraded version of the DVMEGA DVstick30, both manufactured by Guus, PE1PLM, and Dooren Electronic Systems. You can find new coverage on digital protocols and modes in the 100th edition of *The ARRL Handbook*.

Build and Design

The Globetrotter features a compact and rugged design suitable for both indoor and portable use. While not waterproof, its splash-resistant membrane-covered front panel enhances durability. The well-thought-out setup using front-panel buttons ensures fast and easy configuration. The bright and crisp 1-inch OLED display, along with a screensaver option, adds to the user-friendly design.

This palm-sized dongle connects to your computer via the supplied Micro USB-B cable, utilizing your computer's soundcard, microphone, and speaker (see Table 2). It also draws power from the PC USB port. The Globetrotter serves as a Swiss Army knife for digital voice communications, eliminating the need for a dedicated radio. Dual connectivity options set the Globetrotter apart. It is essentially an AMBE server and AMBE dongle in one, with the ability to switch between the two modes.

Setup Instructions

To get started with the Globetrotter, follow these steps to configure Wi-Fi settings and choose between the two AMBE modes. The *BlueDV* software is a crucial component to make everything work and is the equivalent of a physical radio front panel.

For digital voice communication with other radio operators, it is imperative to be registered for various digital modes, ensuring inclusion in their infrastructure trust access list. Visit **www.radioid.net** to facilitate your registration process and obtain the required IDs.

Bottom Line

The DVMEGA Globetrotter paired with *BlueDV* software allows radio-less digital voice communications using your internet-connected personal computer.

Table 2
DVMEGA Globetrotter Digital Voice AMBE Hotspot

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

Digital modes	Support for DMR, D-STAR, NXDN, and C4FM (Yaesu System Fusion)
Boot time	Less than 2 seconds
Display	1-inch bright OLED display
IP addressing	Static or DHCP (dynamic)
Software update	Automatic feature
Dimensions	3.5 × 2.5 × 1.2 inches (90 × 62 × 30 millimeters)
PC connection	Micro USB-B to USB-A (cable included)
Power	5 V dc via Micro USB-B
Baud rate in dongle mode	230400

Given the absence of provided instructions, I visited their website and found a helpful video link. The setup process for the *BlueDV* software is straightforward (see Figure 9). Shu, JA3GQJ, has crafted a comprehensive manual for this software, available at **http://radioham.mydns.jp/bluedv/BlueDVWindows.pdf**. Familiarize yourself with this manual before initiating the configuration process, as it explains the essential configuration parameters and user guide. I followed the video instructions and took notes, and after a few attempts to program both the Globetrotter and *BlueDV* application, I got it working.

Navigation through menus and inputting alphanumeric characters using the Globetrotter front-panel **MENU** and **OK** buttons are user-friendly, contributing to an overall positive user experience.

I configured the Globetrotter as an AMBE dongle, establishing a direct connection to the USB port on my Microsoft Windows PC. You may have to identify the COM port for your Globetrotter using the Windows Device Manager. Configure *BlueDV* for the COM port, and click **SAVE**. After rebooting the Globetrotter, I successfully monitored an ongoing QSO on a D-STAR Reflector REF030C.

Configuring the AMBE server mode is just as straightforward, this time utilizing Wi-Fi for connectivity to the *BlueDV* application. Employ the Wi-Fi **<SCAN>** function to locate your Wi-Fi router, input the password, and click **EXIT AND SAVE**. Configure *BlueDV* to enable **USE AMBE SERVER**, entering the host IP address of the dongle and clicking **SAVE**.

Use Cases

The Globetrotter, functioning as an AMBE dongle, is exceptionally well-suited for radio-less communication, catering perfectly to my operating preferences at home, during travel, and in portable setups. All that's needed is access to a Wi-Fi network connected to the internet.

For fixed mobile applications, connecting your PC to a Wi-Fi travel router or utilizing the shared Wi-Fi connection on your smartphone is an optimal setup.

Operating from various locations, such as parks, campsites, coffee shops, or club meetings, where Wi-Fi is available, is seamless and mirrors the experience from the comfort of your home.

During a recent club meeting, the Globetrotter garnered interest, particularly from individuals unable to set up high-frequency antennas. It serves as an alternative, enabling QSO activity in the hobby using the internet as your ionosphere.

I also used Globetrotter as an AMBE server. This time, I powered the device with my Goal Zero Sherpa 100PD power bank, allowing me to leave the Globetrotter in my shack while moving freely around the house with my laptop for seamless communication. This convenience proved invaluable,

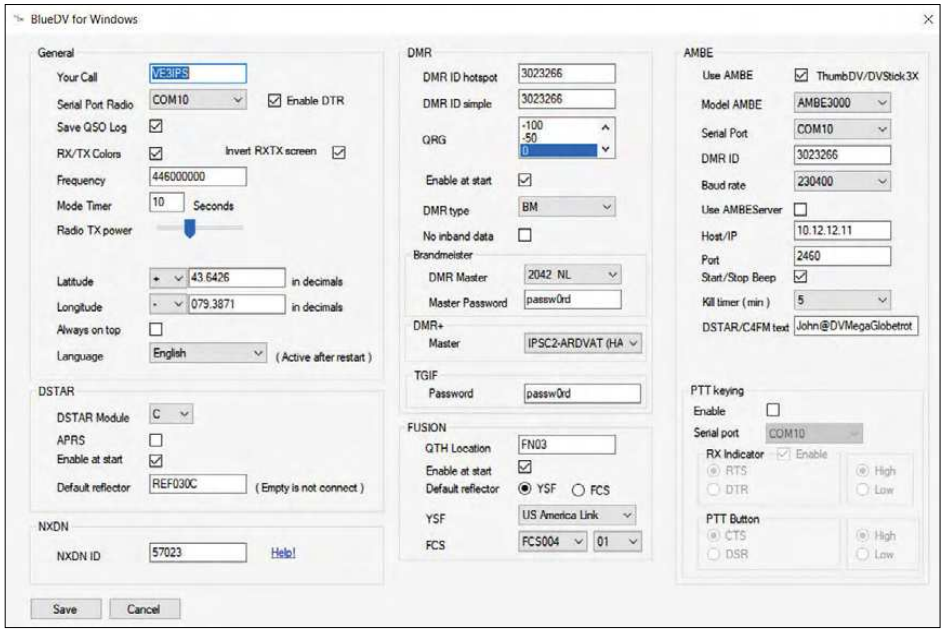


Figure 9 — The PC software screen capture of the *BlueDV* AMBE dongle settings.

Figure 10 — The DVMEGA Globetrotter in AMBE dongle mode on the kitchen table.

especially when transitioning from my shack to the kitchen for various tasks (see Figure 10).

I also enjoyed making contacts from a local coffee shop, but this time I used my Bluetooth headset.

I configured *BlueDV* to default to D-STAR REF030C, Fusion America Link, and NXDN Talk Group 65000, facilitating enjoyable participation in diverse conversations with fellow hams. Globetrotter, as its name implies, opens up global digital voice communication opportunities with just a click.

I now keep Globetrotter in my computer bag for digital voice communications without the need for radios, batteries, chargers, and rubber duck antennas. In the past when traveling, I would bring multiple radios with me, and now I bring just a handheld radio for local repeater access and my Globetrotter.

Looking ahead, I am eager to explore the possibilities of using Globetrotter with the available *BlueDV* and *Peanut* Android software, anticipating further experimentation and expanded capabilities.

Performance

The Globetrotter stands out with remarkable audio quality and signal clarity. Whether utilizing the PC's internal microphone and speakers, Bluetooth speakers, or wired gaming headsets, its sound quality surpasses that of other dongles and hotspots. The Globetrotter excels in monitoring all four digital radio modes using *BlueDV* simultaneously, offering the flexibility to select the desired mode for transmission by clicking on the mode icon. Dashboards allow "last heard" and other information to be available in the side bar windows.

I was able to operate using an i7 Core Windows 10 laptop, an HP Stream netbook, and a Microsoft Surface Go 2 laptop. With a dongle boot-up time of less than 2 seconds, the Globetrotter proved to be highly stable, with no observed issues or reboots necessary.

I conducted a power drain assessment with an external power source, using my USB analyzer and measured approximately 180 mAh in idle mode and 250 mAh in transmit mode. It's worth noting that this power consumption could impact your PC's battery life. After a few usage instances, you'll gain a better understanding of its influence on your PC's operating time.

Software and Updates

The manufacturer's dedication to ongoing support is evident through regular software updates. The auto-update mechanism streamlines the updating process by checking for new software versions upon power-up. Executing a simple menu command initiates the software update. Additionally, don't forget to update the *BlueDV* software to ensure seamless compatibility with the Globetrotter. Keeping both pieces of software up to date ensures optimal performance and functionality.

Conclusion

At its price point, balancing performance, versatility, and build quality, the Globetrotter presents a sound investment for amateur radio enthusiasts. Its ability to directly communicate using a PC offers cost savings compared to acquiring multiple digital radios.

Enhancements could include the storage of multiple Wi-Fi access-point SSIDs as profiles in the dongle, streamlining reconfiguration steps. Additionally, adopting a USB-C connector and providing an instruction leaflet with step-by-step instructions would enhance the overall user experience.

In summary, the DVMEGA Globetrotter stands out as an excellent choice for amateur radio operators seeking a reliable device supporting various digital radio formats without the need for a dedicated radio. Its robust build, dual connectivity options, and impressive performance make it a standout in its category, offering enthusiasts a high-quality digital radio experience and a welcome addition to your communications tool kit.

Manufacturer: DVMEGA, Dooren Electronic Solutions, Boomdijk 6C, 4417BE Hansweert, Netherlands, **www.dvmega.nl**. Price: $149.95.

Dave Casler, KEØOG, askdave@arrl.org

Ask Dave

Get more information from the "*QST:* Ask Dave" YouTube playlist at **https://bit.ly/3z2MBMl**.

Tips for Common Concerns

Testing Coax for Water Infiltration

Q Rollin Gary, WA5RFG, asks: Another ham had a problem with water infiltration in one of his antenna feed lines. Standing wave ratio (SWR) would not uncover the problem because the reflected signal experienced the same loss as the transmitted signal. The only suggested approach to test the coax is to disconnect it and check the SWR with the coax open and shorted, as they should both give the same high SWR. Is there any other way to test coax while it is in service?

A Water in coax is best dealt with by prevention. Use coax rated for direct burial. Wrap all connectors with appropriate UV-resistant, weatherproof self-bonding sealing tape for coax connections. This tape makes a watertight seal. You can also use a 3M product that is not UV-resistant and wrap it again with standard electrical tape like I do. You should check these wraps yearly to ensure the tape has not cracked. Create drip loops that can prevent water from running down the outside of your coax and encountering a connector.

The impurities in the water will start to corrode the shield. If water gets in through a connector, it can infiltrate the center conductor and eventually destroy the cable. If the cable is corroded, the only solution is to replace it.

You can strip off a couple of inches of the outer plastic shield and check for water in the cable. Touch the cable's wire leads with a tissue to indicate the presence of water. If there is any, you will need to replace the cable. Or you can chop off the connector to get a good look at the inner conductor. Note that nicks in the outer plastic cover can admit water. The woven outer shield will wick water into the entire piece of coax. This is where you should only use new cable and protect it properly.

PL-249 and SO-239 coax connectors are not waterproof. If you run coax in conduit underground, it will eventually fill with water over time, so make sure your conduit is rated for direct burial. Don't bury connections, even if they are sealed with self-sealing tape, because the tape is stretched slightly as part of applying it, and this slight tension will eventually crack the tape. For this reason, you should make the entire underground run with a single piece of carefully inspected cable. N connectors are ostensibly waterproof but should be wrapped anyway. Conduit (plastic or burial-rated metal) can help protect the cable from gophers and other pests. Temporary cable installations can end up in place for years, so do it correctly from the beginning.

The Truth about Antenna Tuners

Q Michael Wurzer, DF7RO, asks: I'm getting back into ham radio after 44 years. In that time, old tube rigs have given way to transistors. I have heard many statements about antenna tuners, including that the tuner burns all the power reflected by the antenna and that the only purpose of the tuner is to make the transmitter happy so that it won't lower its output power. If the tuner does reflect the reflected power back to the antenna, is there some time delay? Which statements are correct?

A Old tube transmitters usually had a pi network output tuning circuit. The pi network is a form of an impedance-matching device that matches the transmitter output impedance to the input impedance of the combination of the transmission line and the antenna. However, with the introduction of transistor radios, the output impedance was fixed at 50Ω, and any mismatch between the transmission line and the transmitter could cause excess heat to be generated in the output transistors.

The solution is an antenna tuner. This is a misnomer, as we are not tuning anything. Rather, this is a small network of reactance that would look like a 50 Ω zero phase angle

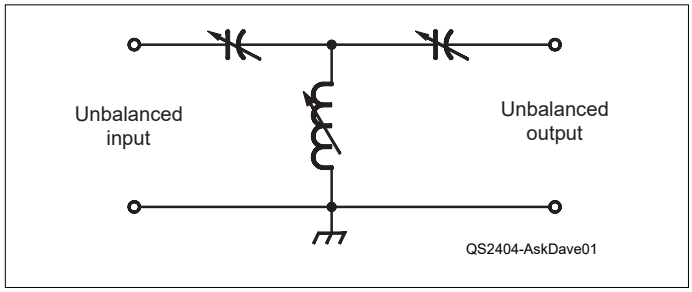


Figure 1 — A standard antenna tuner design. All three elements are adjustable. The first step is to tune for maximum received noise or signal volume. Then switch the transmitter to low power, and the knobs can be adjusted for the lowest SWR.

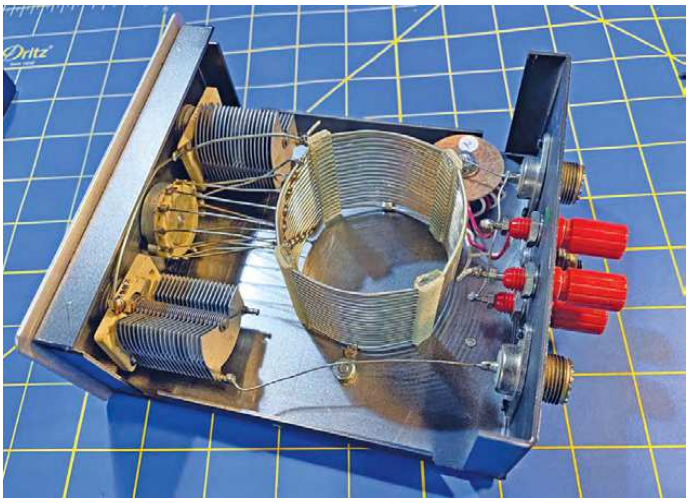


Figure 2 — The working components of an MFJ-901B manual tuner. There are two variable capacitors. A switch that can change between taps on the coil is in the middle. The schematic is the same as shown in Figure 1. The small component at the far right is a 4:1 balun that permits the tuner to drive window or ladder line.

load to the transmitter when properly adjusted. The antenna tuner only has reactive parts because its only purpose is to match impedances. Theoretically, the tuner cannot dissipate power as heat because there are only reactive components. The schematic for a standard, modern antenna tuner is shown in Figure 1, and the inside of a simple tuner is shown in Figure 2.

You need an SWR meter to tune it properly, and many external antenna tuners have built-in SWR meters. The first step is to twiddle the knobs for maximum receiver noise. Then a few watts from the transmitter will provide a steady carrier, and the knobs can be slightly adjusted for the lowest SWR. The transmitter final output transistors are happy when they see the load they want. The complex conjugate of the impedance presented by the combination of the transmission line and the antenna is in the output side of the tuner. So, if the antenna system is capacitive by virtue of being too short, the tuner adds inductance. The net of this is that the reflected power comes back to the tuner and is turned around and pointed back to the antenna. Some of that power is radiated, and some comes back to the antenna, and the same thing happens. No power (other than tiny ohmic losses) is dissipated in the tuner because it's completely reactive. The same is not true in the coax. The coax handles the power that is dissipated and the reflected power. Given a poor match, the coax sees the antenna current many times over; the resulting heat dissipation can be large, and a substantial part of the signal can be lost before radiating.

Sometimes, antennas present funky impedances when dealing with large loops used on higher frequencies. For this reason, these antennas are often fed with ladder or window line because of the much smaller losses in these transmission lines. The best option is to tune the antennas for low SWR, so you won't need a tuner. All modern radios have built-in tuners, and many are automatic, but the built-in tuners can rarely handle an SWR larger than 3:1.

Because there are potentially large voltages and currents in an antenna tuner, higher power requires beefier tuners. Therefore, tuners are rated in watts, indicating the transmitter power they can work with. I have an MFJ automatic tuner that can handle 300 W, but I no longer use it because I've carefully tuned my antennas by trimming them to an appropriate length.

It is possible to put a remote antenna tuner at the feed point of an antenna. This is most often done at the base of vertical antennas that will be used on multiple bands. In this case, there is no transmission line between the tuner and the antenna, eliminating the transmission line ohmic losses.

Relearning Ham Radio

Q Peter Walker, KB3VQT, asks: I already have my General license. However, I don't think I truly learned the basics of ham radio. What would be the best way to relearn ham radio from the beginning?

A You can carefully follow study guides such as ARRL license manuals and associated videos. Or you can get a ham friend to mentor you. But the best and quickest way to get into ham radio is to set up a station and get on the air. I emphasize getting on the air because it requires you to get over your mic fright and transmit! Having a mentor help you through this is important. Your first several HF contacts should be with people you already know. Check out **www.dcasler.com/reference** for specific recommendations to build a General station. If you follow the reference design, you'll have a nice station that should keep you happy for a few years. Or you can substitute things, such as getting a Yaesu FT-710 instead of the Icom IC-7300. Getting on the air will generate questions. Ask other hams on the air or at a club, which leads to joining a club! ARRL Affiliated Clubs can be found at **www.arrl.org/find-a-club**. You may have to do some club shopping to find a group you feel the most comfortable with.

I also emphasize joining ARRL (see **www.arrl.org/membership**). It will pay rich dividends just from the magazines alone. In your ham radio journey, everything somehow seems to trace back to an ARRL publication. As with everything, the key to success is summarized in one word — persevere!

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.

Paul Wade, W1GHZ, w1ghz@arrl.org

Local Oscillators for Transverters

The "Microwavelengths" column in the January 2024 issue of *QST* discussed transverters and how the local oscillator (LO) is an essential part. The LO provides a signal to the mixer at a frequency that is added to the IF signal to create a microwave signal for transmission. The LO also provides a signal to the mixer at a frequency that is subtracted from the microwave frequency to receive IF signals on a VHF or UHF transceiver. Finding weak signals or operating digital modes requires an LO that is clean, stable, and on frequency, and has low phase noise.

Traditional LOs started with a crystal oscillator, typically around 100 MHz. Then the crystal frequency was multiplied through a series of frequency multipliers, such as doublers, triplers, and quadruplers, up to the ultimate LO frequency. For a 10 GHz LO, the frequency might be multiplied 96 times or more. A crystal oscillator usually provides a very clean signal, but many multipliers can create off-frequency lower-level signals that can reach the mixer and produce unwanted signals. One result can be spurious signals in the receiver, which can be hard to differentiate from desired weak signals.

Good crystals needed for the LO frequencies have become difficult to find, so the trend is to use a flexible frequency synthesizer to generate LO signals. A modern version uses a single-chip synthesizer. These have onboard frequency dividers that convert to a low frequency, which can be compared to a reference crystal oscillator, typically at 10 MHz. Then a phase-locked loop controls the onboard voltage-controlled oscillator (VCO). The chips typically operate in the 1 to 4 GHz range, so additional frequency multiplier stages might be needed for higher bands.

Phase noise is created when any noise in the system reaches the oscillator and modulates it, changing the frequency slightly. A slight change at a low frequency (10 or about 100 MHz) is magnified by the frequency multiplication, so it worsens by 6 dB at high frequencies for each frequency doubling or almost 40 dB worse for a 96 multiplier. Crystals have very high Q, so they are less susceptible. However, the VCO in a synthesizer is sensitive to voltage, resulting in larger frequency variations from small amounts of noise. For example, if the VCO sensitivity is 100 MHz per volt, 1 µV of noise will result in 100 Hz wide phase noise. Digital noise from the frequency dividers on the chip and noise from power supplies reaching the oscillator make things worse. Very low noise power supplies and voltage regulators are important for synthesizers. Figure 1 shows phase noise in the output of a synthesizer and spurious signals generated by the synthesizer.

MDS and Phase Noise

The problem with phase noise is that it can raise the noise floor in your receiver, masking weak signals, and the minimum discernable signal (MDS) becomes larger. This is an insidious effect because it sounds just like any other noise.

The North East Weak Signal (N.E.W.S.) Group does an MDS comparison on several microwave bands at their annual summer picnic. Participants aim their antennas at a distant signal source, and the signal level is reduced in small steps. At some level, the signal disappears into the noise, so we can see how each system compares. This either assures that the system works well or highlights a problem to fix before the next contest or operating event.

Several years ago, I wanted to see if the phase noise of a synthesizer-based LO would affect MDS. Steve Kostro, N2CEI, at Down East Microwave, lent me a test

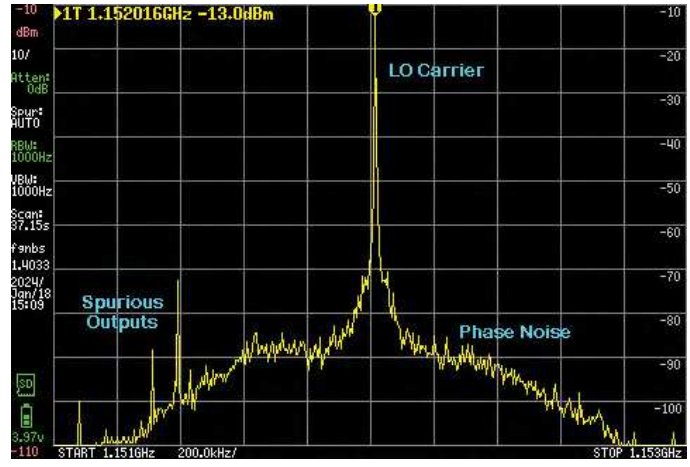


Figure 1 — Spectrum analyzer view of an inexpensive imported synthesizer signal with phase noise.

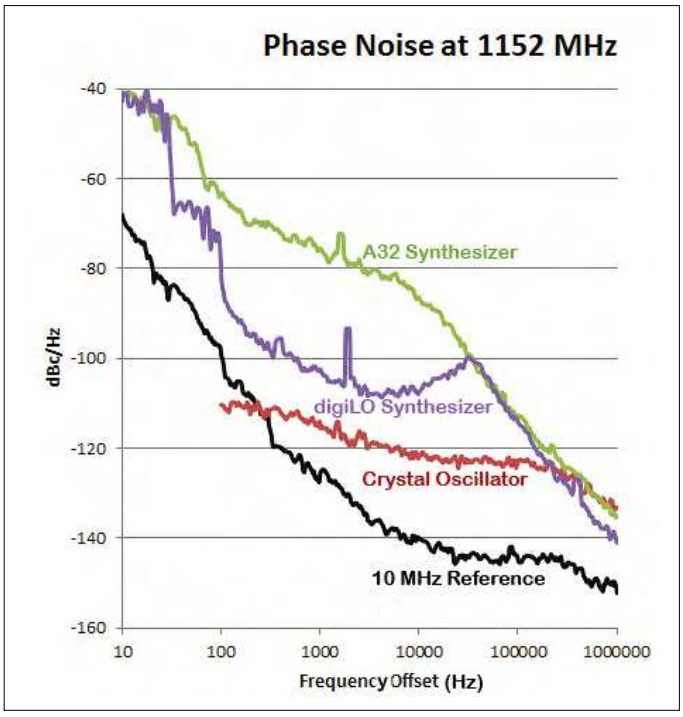


Figure 2 — Phase noise comparison of A32 synthesizer used in MDS testing to a new digiLO synthesizer and a crystal oscillator LO. The 10 MHz reference oscillator was used for both synthesizers.

10 GHz transverter with two switchable LOs, one with a traditional crystal oscillator and the other using a synthesizer. MDS testing at the picnic and switching back and forth showed that the MDS with the synthesizer was 2 dB less sensitive than with the crystal oscillator. Later, I set up a test range at home and got the same result to show that the experiment could be replicated.

Synthesizer Phase Noise

The A32 frequency synthesizer LO used in the MDS tests was one of the first made specifically for hams. A few new types have become available, some specifically for LO use, others for general purposes with pushbutton or computer-frequency selection.

I measured phase noise close to the LO carrier, where it has the greatest effect on MDS using sophisticated equipment at various VHF conferences. Figure 2 shows a few of the results. Some are significantly better by 10 to 20 dB than the A32 used for the MDS experiment. Any of the digiLO synthesizers from **http://q5signal.com**, made by and for hams, are the best. I've had excellent results at 10 GHz with one of the synthesizers but haven't repeated the MDS experiment yet.

One important factor in synthesizer performance is how it is programmed. The chip can be programmed in integer mode, where the frequency is divided by an integer, and the operation is fixed. In fractional-N mode, when

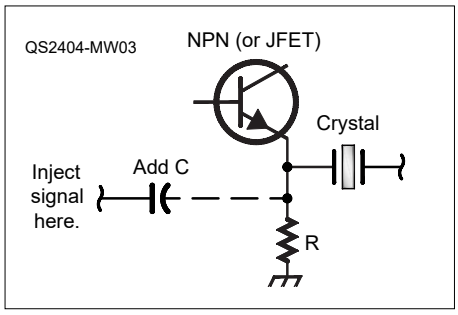


Figure 3 — Partial schematic of a typical crystal oscillator showing the recommended location for injection locking.

the frequency cannot be divided by an integer, the chip switches rapidly between two integer ratios and averages them to the desired frequency, which creates spurious signals. In theory, there would be no difference between the two modes, but real electronics don't always read the theory, and the integer mode is usually better. Fortunately, the LO frequencies needed for microwave transverters are all even MHz, which should be programmable with integer dividers.

The N.E.W.S. Group sponsors two 10 GHz beacons in New England that use good synthesizers to generate the beacon frequency. Tom Cefalo, W1EX, programmed them. He empirically found that certain frequencies were much cleaner than others and chose two for the beacon frequencies. If you are programming a synthesizer, pick round numbers and check carefully with a spectrum analyzer, even if you can't measure phase noise.

Practical LO Suggestions

If you are considering building a new microwave transverter, I recommend a synthesizer locked to a GPS reference for ultimate frequency accuracy. On the other hand, you might already have a good transverter where frequency accuracy or stability is marginal. The crystal in my old transverter has aged enough to have shifted 60 kHz at 10 GHz and tends to drift in the hot sun. A crystal oscillator can be stabilized by injection locking. Oscillators tend to synchronize if their frequencies are close together. A small accurate frequency injected into a crystal oscillator will cause it to settle at the same frequency. I found that a 106.5 MHz crystal oscillator will lock to an injected frequency within about ± 1 kHz, or about a 200 kHz range at 10 GHz. A signal level of about –8 dBm is adequate for locking the frequency.

Most oscillators have one end of the crystal connected to the emitter of a transistor (or source of an FET) with a resistor to ground, as shown in the "Inject signal here" portion of the partial schematic in Figure 3. The injected signal can come from a synthesizer, as the high-Q crystal in the oscillator determines the phase noise. Thus, we can have a clean LO with accurate frequency.

Introducing the ARRL Amateur Radio Innovation Award

In October 2023, John Karickhoff, MD, AA4JJ, had a vision — that we could inspire innovation in amateur radio through outstanding articles in ARRL publications. First licensed as a sophomore in high school, Dr. Karickhoff is 85 years old and has enjoyed 71 years of benefiting from amateur radio. As a licensed physician and ophthalmologist who has taught in a university and performed surgery on thousands of people, he realized that innovation is what truly advances humanity. Creativity and innovation — doing something that no one else has done before — have given him the greatest personal reward.

Dr. Karickhoff is no stranger to innovation himself. He is the inventor of multiple medical devices with US patents, the only researcher to innovate or advance treatment for all 14 parts of the human eye, and the designer of 10 original ophthalmology concepts. He also introduced 13 ophthalmic surgical procedures in Virginia and, in his spare time, published a faster method for learning to play the guitar.

Because of all of this, and through his philanthropy to endow a new award, ARRL is proud to introduce the ARRL Amateur Radio Innovation Award.

This annual award, recognizing an innovation that advances amateur radio technically or advances its enjoyment, is given to the author of an article published in *QST* or another ARRL publication. The article is determined to be the best published feature in the prior calendar year. This award further establishes ARRL as the center and repository of innovation in amateur radio within *QST* and other ARRL publications, and emphasizes that innovation is the way that the art and science of amateur radio is advanced. The $1,000 yearly award was endowed by an initial gift from John Karickhoff, MD, AA4JJ. ARRL is grateful for the vision, inspiration, and generosity of Dr. Karickhoff, and partnering with ARRL to invest in the future of amateur radio.

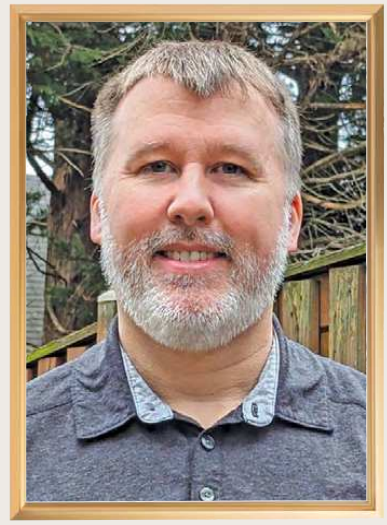
ARRL Amateur Radio Innovation Award

Inaugural Recipient

Oryx "Rucio" Gazella, KØRYX

For the article "Ham Radio in Virtual Reality," published in the November 2023 issue of *QST*.

The ARRL Amateur Radio Innovation Award is given to the author of the best article published by ARRL in the previous calendar year for an innovation that advanced amateur radio technically or advanced the enjoyment of amateur radio.



Oryx "Rucio" Gazella, KØRYX
Columbia, Maryland

This $1,000 yearly award was endowed with an initial gift by John Karickhoff, MD, AA4JJ.

JWØX/JW100QO: An Unforgettable DXpedition in the Arctic

During a memorable ham radio adventure in Svalbard, this DX crew made more than 32,000 contacts, one of which being the first ever from the QO-100 satellite.

Isfjord Radio in Kapp Linné, where the team stayed during the QO-100 DXpedition, is no longer active, but the masts and large satellite antennas are still there.

Max Van Rymenant, ON5UR

After nearly 16 months of hard work and planning, the DX Adventure team was ready to head to Svalbard for the JWØX/JW100QO DXpedition on April 19 – 26, 2022. The first part of our DXpedition included operating as JWØX from Longyearbyen. Then, a handful of team members were set to travel to Kapp Linné for the second part of the operation to attempt to make the first-ever contact from Svalbard with the QO-100 satellite.

Our team members included: me; Erik De Mey, ON4ANN; Jelmer Vos, DJ5MO; Willy Ghysens, ON2BDJ; Carlo Houben, ON4BR; Cedric Baelemans, ON4CKM; Patrick Blancquaert, ON4DCU; André Joos, ON4DTO; Erik Crabbe, ON4EC; Pascal Lierman, ON5RA; Marc Cosemans, ON6CC; Franky Beuselinck, ON7RU; Francis Balcaen, ON8AZ; Marc Celis, ON8AK, and Mike Van Hoorickx, ON2MVH, who joined the team at the last minute to replace Marc Wullaert, ON4MA, because of a medical emergency.

JWØX Operations

Our adventure started on April 17, 2022, when we (and all of our ham radio equipment) flew from Zaventem, Belgium, to Oslo, Norway. From Oslo, we continued north to Tromsø and landed safely in Longyearbyen, Svalbard (see the sidebar, “Facts about Svalbard,” for

Erik Crabbe, ON4EC, and Marc Cosemans, ON6CC, setting up the DX Commander antenna in Longyearbyen.

Marc Cosemans, ON6CC, operating CW and Patrick Blancquaert, ON4DCU, operating FT8 for JWØX.

more information about the archipelago), on April 19. After gathering our luggage, we quickly noticed that the suitcase with our high-power band-pass filters was missing. We sent a complaint to the airline, and they promised it would arrive with one of the next flights.

The weather was perfect: sunny and only a few degrees below freezing. We cleared our 4 × 4 rental truck of snow so we could distribute all of our equipment among the three locations we would be staying at. We also had access to the Svalbard Amatørradioklubb's, JW5E, location.

We were eager to get JWØX on the air as soon as possible. By early evening, it was getting considerably colder, and the ice was incredibly slippery — while placing the DX Commander antenna, Willy had a serious fall on the ice and needed medical attention. A helpful man provided us with foil to keep him warm while waiting for emergency services. The emergency services in Svalbard are made up of volunteers, so it took some time for them to arrive. Luckily, Willy was able to leave the hospital later that evening, when our first two stations were ready to start our JWØX operations.

The first evening we made 1,390 contacts. Not all of our stations were operational yet, and we were still missing our high-power band-pass filters. Still, the pileups were better than we thought they would be — you never know what to expect in the far north.

Svalbard is almost constantly in the aurora zone, and when we were there, the sun never went below the horizon, resulting in constant light. Operating on 160 meters was hopeless, and 80 meters was very difficult. Operating on 40 meters was sometimes good, but during the day there was little to do. The 20-meter band was constantly open, and the 17-meter band was open about 20 hours a day. During the evenings, 15 meters was completely closed. Twelve meters opened sporadically, and 10 meters was rarely open. Despite the fact that some bands remained completely closed, we were able to make 4,090 contacts on the second day and 5,219 contacts on the third day. Four days

En route to Kapp Linné for the QO-100 DXpedition. The only way to get there was to take a 6-hour trip via snowmobiles.

after our arrival, we finally received our missing suitcase. After installing the filters, we were able to make 6,725 more contacts at this location.

QO-100 Operations

We visited the specialized outdoor adventure company Poli Arctici to discuss the final details of the QO-100 DXpedition with Stefano Poli; he and his team provided the transport to Kapp Linné for the DXpedition, and they were also responsible for our safety during the trip because of the large polar bear population in the area.

On the fourth day, Cedric, Patrick, and I left for Kapp Linné to join the QO-100 DXpedition. Before our departure, Stefano gave us instructions on what to do during an emergency. We then departed for our 6-hour trip with four snowmobiles, each equipped with a sled holding our ham radio gear, extra fuel, emergency equipment, and coffee.

Our trip to Kapp Linné was pure enjoyment — the beautiful scenery, the adventure, and the experience dominated the cold temperatures. We had to brave some mountains, and sometimes the slope was so steep that Stefano had to bring the sleds up one by one. We arrived safely at Isfjord Radio, a radio station that was important during World War II and was later used for communications to the mainland. The station is no longer in use, but the antennas and masts are still there, and the tourism company Basecamp Explorer has turned it into a hotel destination.

Patrick Blancquaert, ON4DCU, during the installation of the Triax satellite antennas. The team brought two 120-centimeter antennas because they were active with two stations at the same time on the QO-100 satelite.

Facts about Svalbard

Svalbard is 23,570 square miles and is the northernmost inhabited area in the world. Of the country's 2,500 inhabitants, about 1,700 moved to Longyearbyen from various countries. It's been said that Svalbard and Barents Sea are home to more polar bears (about 3,000) than humans. It's estimated that about 300 polar bears inhabit Spitsbergen, Svalbard's largest island.

From mid November to late January, Svalbard experiences a dark season, when the sun doesn't rise. Then, from April to August, Longyearbyen experiences the midnight sun, when the sun stays above the horizon. When the team was there at the end of April, they bore witness to this incredible phenomenon.

We found this location after months of research — it was the only place where we could have a line-of-sight connection with the QO-100 satellite over Africa. Remember, we are 78° north at the end of the QO-100 footprint, at an elevation angle of only 3°. Even though we had absolutely no guarantee of success, we knew it was possible.

After being welcomed with a delicious meal from Isfjord Radio Station Manager Maaike Groeneveld and her team, it was time to unpack and build the stations. The feet of the Triax satellite dishes were stormproof, which was necessary, given their location in an open plain. At times, the wind was fierce, and with the cold temperatures, it took a little bit longer than usual to construct everything.

At the time, no one had attempted to reach the QO-100 satellite from Svalbard before; the pressure on our shoulders was enormous. When we saw the first QO-100 signals appear on our screens, the adrenaline raced through our bodies. Sixteen months of preparation and all of our efforts had paid off!

After adjusting our antennas, we had strong signals. During the first audio tests we had pronounced only a few words in Dutch, and operators went crazy — several stations immediately started calling us and shouting at each other to keep quiet. After urging them to be patient while we carried out a few more tests, it was silent again. Our thanks and respect for the discipline that was shown.

Our tests were complete, and we were ready to start operating. The first-ever contact from QO-100 in Svalbard was made with Alex Jamar, ON6AJ. To give as many people as possible a chance to contact us, we decided to put JWØX and JW1ØØQO on the air simulta-

neously. We were able to see peoples' excitement on social media, we received compliments and pictures of people celebrating, and we were sent images of the pileups. Seeing the world of ham radio enjoying itself was a great pleasure for us!

Maaike came around now and then to listen in, because it had been a very long time since signals were sent into the world from Isfjord Radio. She brought us some food so we didn't have to stop operating to eat — thanks, Maaike!

AMSAT-DL President Peter Gülzow, DB2OS, asked us if we wanted to attempt a contact with the German Antarctic research station, Neumayer Station III, DPØGVN, and on Saturday afternoon, we contacted Karsten Böddeker, DM2KX, who was wintering there; the first-ever QO-100 connection between the north and south poles was in the name of the Belgians, thanks to the cooperation of Felix Riess, DL5XL. In total, we made 1,229 QO-100 contacts in 68 countries. We recorded 743 unique call signs in the logbook, including 38 Belgian calls. More than 50 percent of these contacts were made on our first night.

On Sunday evening, Stefano picked us up and safely brought us back to Longyearbyen. Once again, it was an unforgettable trip. We arrived a little after midnight and were welcomed by the HF crew with congratulations.

The HF crew in Longyearbyen had not been idle while Cedric, Patrick, and I were in Kapp Linné. On day five, they suffered from aurora but still made 5,797 contacts, and day six was completed with 6,730 contacts. On our last night in Longyearbyen, we stopped operating during the early hours of the morning so we could dismantle the stations and repack all 36 suitcases. We were able to make another 2,272 contacts. To our great surprise, the pileups were still as fierce as they were on day one.

Contacts Roundup

In total, we made 32,223 contacts, with 13,041 in CW, 10,115 using SSB, and 9,067 on FT8. See Table 1 for more information.

Without help from Basecamp Explorer and Poli Arctici, none of this would've been possible. Thank you for your cooperation, for answering our many emails, and above all, for your patience.

The expenses for the QO-100 DXpedition alone amounted to more than 10,000 euro (nearly 10,910 USD). Thank you for all of your donations and support — together we made this DXpedition possible! Thank you to all of our commercial sponsors for their contributions and for their equipment donations. And thank you 32,223 times to everyone who called us for giving us an experience we'll never forget!

Table 1 — JWØX/JW1ØØQO Most-Worked Countries

Out of 32,223 contacts, 12,996 were made on 20 meters.

Country	Percentage of Contacts
United States	21.8%
Germany	9.7%
Japan	8.5%
Italy	7.7%
European Russia	6%
Belgium	4.7%

Click here to watch the JWØX/JW1ØØQO DX Adventure team tell the story of their DXpedition through video.

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

All photos provided by the author.

Max Van Rymenant, ON5UR, has participated in nearly 20 DX operations since 2001, either with a team or individually. He immensely enjoys contesting, and even though he doesn't always have the time, he tries to participate often as OR1X. Max can be reached at **info@maxi-print.be**.

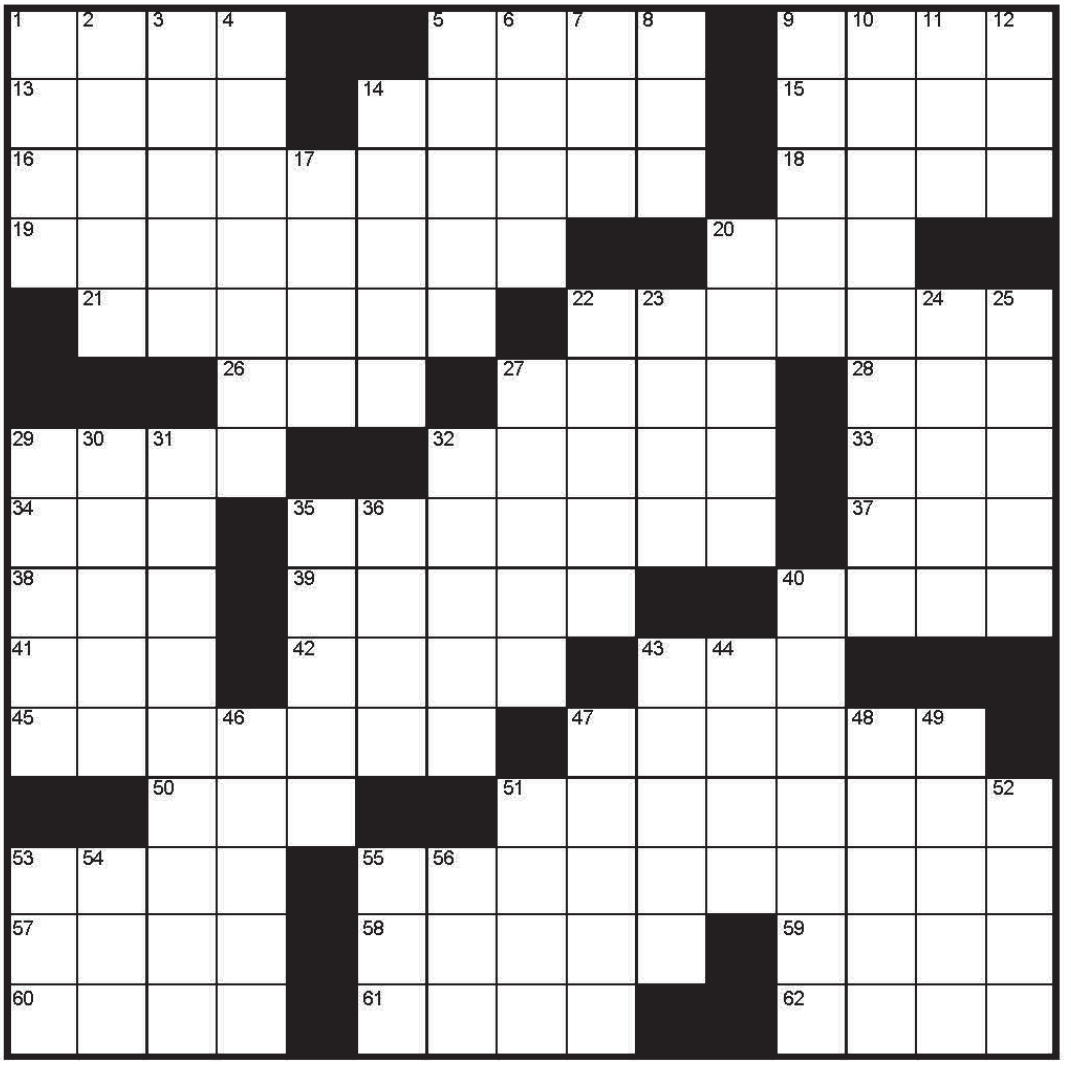
For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

CQ CQ CQ: A Ham Radio Crossword Puzzle

April fun, with a radio theme.

Colin Phoon, AE3A

Play online at **www.crosswordlabs.com/view/cq-cq-cq-a-ham-radio-crossword-puzzle**. Note: the puzzle layout differs in the online version.



Across

1 Spatial Web standard enabling interoperable hardware-software connections (abbrev.)

5 "Speed" of an engine (abbrev.)

9 Puppy sounds

13 Common lot size

14 QRN or QRM

15 Pass this to get your license!

16 "Far-out" amateur communications type

18 I-35 in Kansas, I-90 in Massachusetts, I-44 in Oklahoma, and I-76 in Pennsylvania (abbrev.)

19 What a guy does for a tower — or a radio net — in an emergency

20 Old-fashioned "go quickly"

21 Kudos with clinks

22 Skip, Reverse, Draw Two, or Wild

26 _____ de Forest, inventor of the triode vacuum tube

27 Not quite a ragchew

28 Don't stub this on your boat anchor!

29 Higher ones are more skin-protective on ARRL Field Day (abbrev.)

32 To treat one's radio gear poorly

33 Ed White accomplished this US space first (abbrev.)

34 An anonymous VPN protocol

35 Class of license, or perhaps an operator at W2KGY?

37 Upper bound of safe exposure as defined by NIOSH

38 Ginger _____, a popular soft drink

39 The "U" in UHF

40 Helper (abbrev.)

41 Where to find answers on the Web, or in a specs manual (abbrev.)

42 Certain experienced IBM programmers

43 This provides in-circuit debugging functionality in CPUs (abbrev.)

45 "Above the _____ plain!"

47 A naval petty officer

50 Hare of ARRL and Snyder of W1YU

51 A multiple of your operating frequency

53 Algeria, Egypt, Iraq, Jordan, and Qatar belong to this region, according to the UN

55 40 meters, 2 meters, or 70 centimeters

57 Label (your equipment with a fine drill or laser)

58 When two waves are synced and the same, they are in _____

59 Professional association for certain engineers (abbrev.)

60 _____Vac batteries

61 High-acuity hospital care area (abbrev.)

62 The National Association for Amateur Radio in the US

Down

1 Amateur radio operators, colloquially

2 Ten-Tec made a model 555 of this popular rig

3 A kind of ducting on VHF and UHF

4 Letter-writing friends

5 Defeats badly

6 Those tiny things that plug into boards

7 Graduate degree in STEM

8 To catch sight of

9 Poor location to string up your antenna

10 Radio relay stations

11 Modulation of a carrier freq. in discrete steps

12 Official program name of the space shuttle (abbrev.)

14 Dirección de Argentina a Estados Unidos

17 Popular speaker brand

20 ITU phonetic alphabet word for "H"

22 Communications officer on the USS *Enterprise*

23 US government space program

24 Operates portable across grid squares

25 Handed out, as cards

27 Ham operators' "cousins," with their own bands

29 Workers

30 Relating to the northern-most or southern-most regions on Earth

31 "QRZ, is the _____ in use?"

32 Started the poker pot

35 These can take your antenna down

36 "When All _____ Fails®"

40 Nitrogenous compound in fertilizer

43 "Uncle Miltie" on old radio programs

44 Common sight on observatories or cathedrals

46 State in "7" territory

47 Major manufacturers Icom, Kenwood, and _____

48 Ire

49 Saltpeter

51 System that warms or cools indoor spaces (abbrev.)

52 Canadian slang for the NHL, or character in "The Road to El Dorado"

53 Sea, in "F-land"

54 Greek letter denoting the efficiency of a system, in electronics

55 CW speed (abbrev.)

56 Yellowfin in "KH6-land"

See page 93 for the answers!

Colin Phoon, AE3A, was first licensed as WB3GUZ in 1977. He operated at his school radio station, WA3ALW, under the tutelage of Jim Shea, W3MO. Colin's ham family includes his father-in-law, Barry, K2JV (SK); his brother, Kelvin, KI3Z, and his son, Gordon, KC2SRY. Colin is a clinical pediatric cardiologist active in teaching and research, and he has published more than 100 papers and book chapters, as well as a textbook. He enjoys low-power CW, but he admits to spending far more time doing crossword puzzles. Colin started constructing crossword puzzles in 2021 and still considers himself a "newbie." He can be reached at **ae3a@arrl.net**.

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

April 2024 Frequency Measuring Test

There will be two transmitting stations for the April Frequency Measuring Test (FMT) — W8RKO in Ohio and K5CM in Oklahoma. Transmissions will be made on 40 and 80 meters (in that order). The FMT will start with a "call up" by K5CM at 0300 UTC on April 24 (Tuesday evening in North America). If the scheduled frequency is busy, transmissions will be on frequencies close to the published frequency, so be prepared to tune.

Measure the transmitted frequency and report your results at **http://fmt.arrl.org**. Results must be submitted by 0200 UTC on April 27, at which time they'll be published on the website. Stations submitting measurements within ± 1 Hz for all transmissions from K5CM or W8RKO will be listed in the "Green Box" of the results.

Although the call up is scheduled to start at a specific time, both stations will try to start earlier. Every effort will be made to start key down at the published time. The call-up period will last 4 minutes, one minute longer than usual, and the key-down period will be 1 minute.

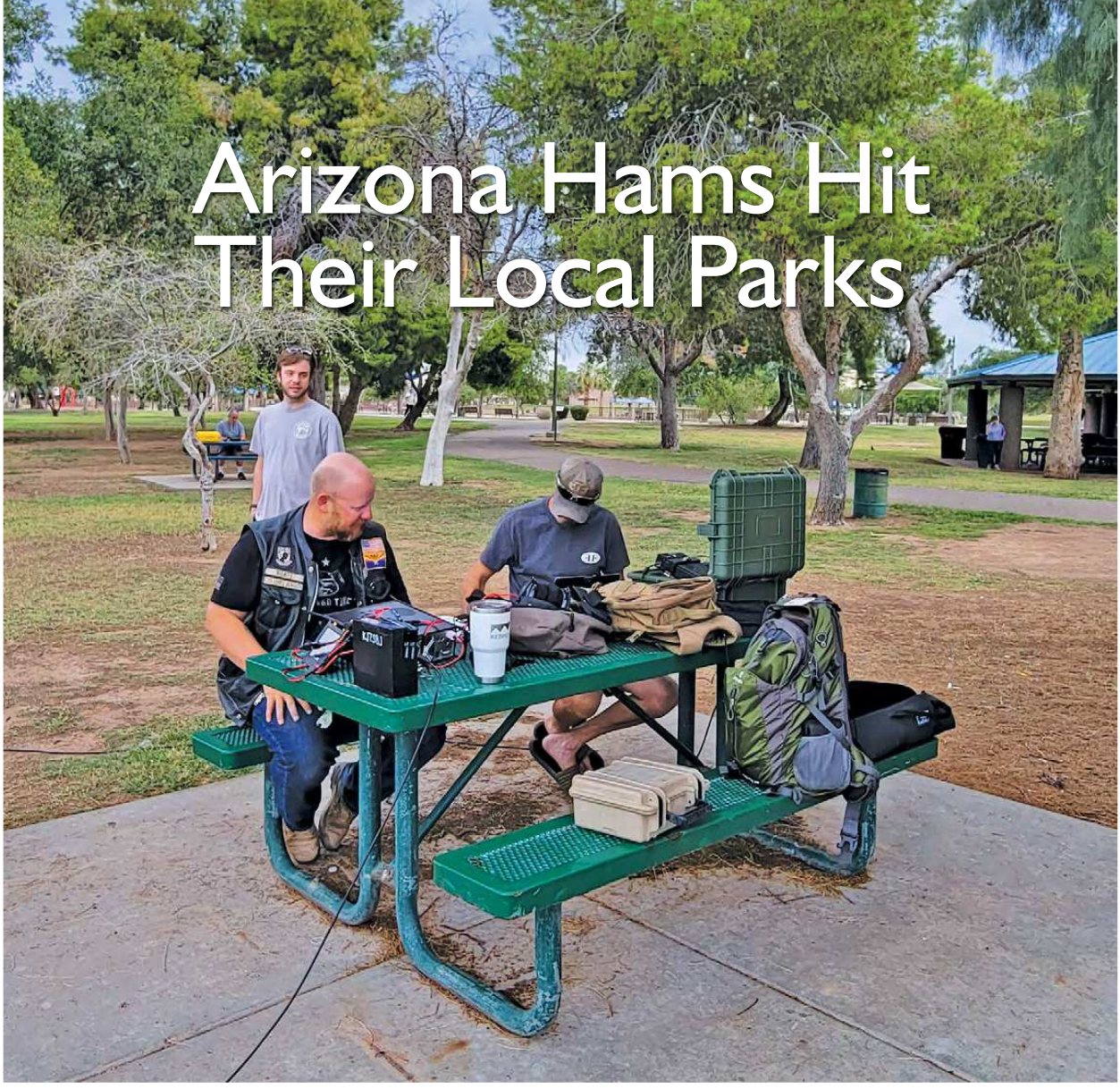
K5CM
40 meters near 7064 kHz
03:00 Call up
03:04 Key down
03:05 End 40-meter run

W8RKO
40 meters near 7065 kHz
03:15 Call up
03:19 Key down
03:20 End 40-meter run

K5CM
80 meters near 3598 kHz
03:30 Call up
03:34 Key down
03:35 End 80-meter run

W8RKO
80 meters near 3599 kHz
03:45 Call up
03:49 Key down
03:50 End 80-meter run

Arizona Hams Hit Their Local Parks



A relaxed group of Hams in Parks (HIP) have fun operating portable.

Gary Laatsch, KI7PBR

The BE-HIP group was born out of COVID-19. Many of us are part of the Chandler Ham Radio Club in Arizona, founded in July 2019. The pandemic halted most events we were planning. After several months of no interaction, a couple of members decided to go out to a local park for Winter Field Day 2021. In a park we could practice social distancing and abide by CDC guidelines. More than 20 hams showed up. It was so successful that we decided to start doing it once a month to get out of the house.

We are not competing or setting up in POTA-registered parks; we are just hams in the park, so our name, "Hams in Parks (HIP)," was born, and we evolved to "BE-HIP" to be catchy. Our events are usually scheduled on the third Saturday of the month, from October through April. BE-HIP provides a means to reach out to the general public, who often stop by one of our several stations and ask us questions about who we are and what we are doing. In addition to the regularly scheduled BE-HIP events, we spontaneously meet up because the weather is nice and out of love for the hobby. We are still going strong more than 3 years later.

Operating

Most of us can set up our stations and be on the air in less than 30 minutes. At most BE-HIP events, seven or eight operators set up their portable stations, and the rest are curious to see what do-it-yourself projects we have put together. The events are also for socializing, as well as a place to exchange technical information. Because we are not competing or keeping logs to score points, most of us are content with making a couple of contacts, which lets us know our latest change or new piece of equipment is functional. We also communicate

within the park via our handhelds to coordinate what band and mode we will be focusing on that day, to reduce interference between our stations. We space ourselves around the park to create separation between our stations for the same reason. It has worked out very well. We have no particular mode of operation. Some of us activate on SSB or digital modes such as FT8, and many of us operate CW.

Equipment

There is no typical setup that we use; everyone has slightly different stations. We use everything from Elecraft KX2s and Yaesu FT-891s to Xiegu G90s. I started with a Xiegu G90, a home-built battery box with a Bioenno Power 12 V 12 Ah battery, and a multi-band (up to 40 meters) end-fed half-wave (EFHW) wire strung across two telescoping fiberglass masts. The feed point was 20 feet high, and the end point was about 30 feet high. I discovered the 66 feet required for the EFHW was a bit challenging for me in local parks, and I started looking for an alternative. One of the regulars, Lee, N7LP, was using his Summits on the Air box, which has an off-center vertical dipole on a single telescoping mast. I built a similar antenna and used it at the next event. It worked well and required only a single mast. I continued to look at other quick setup solutions, and I now use a vertical end-fed random wire connected through a 9:1 unun that I built. Some of us use the old "toss a wire into a tree" method in more of an inverted **V** configuration.

Recently, I upgraded to the Yaesu FT-891 and paired it with an LDG Z-11 Pro II antenna tuner. This setup works well for park activations and allows me to run low power at 5 W up to a low-power max of 100 W. I was portable for a recent Ten-Ten International event and managed 10-meter SSB contacts to Hawaii and Scotland. One of our other members ran CW and had several European contacts.

A Small Community

Our members' experience levels vary from Technician- to Extra-class licensees and from brand-new operators to several operators with more than 30 years of experience. We always help each other when needed and when questions or setup problems occur, and we share equipment to enable portable setups or improve them. We have paired several of our Technician members with upper-level operators to work HF for the first time. This, of course, helps motivate them to become General- and Extra-class operators.

We encounter more and more people in local parks, and they often stop and ask us what we are doing. When we explain that we are amateur radio operators,

Mark, N2IU, working his Elecraft KX2 setup. [Gary Laatsch, KI7PBR, photo]

Bruce, KK7HTE, and Rick, K7RCR, using the Discone antenna at the Titan Missile Museum. [Bert Moore, K7DIP, photo]

quite often, we get the response, “Oh, is that still around?” Several dormant operators have stopped by and said, “I need to get back on mine. It’s been years.” We have also encouraged several non-licensed people to join the hobby.

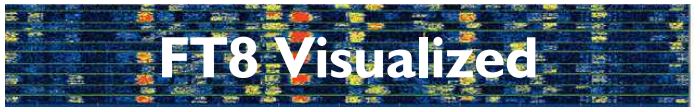
BE-HIP events are open to all who are interested in and curious about amateur radio and portable setups. We don’t have plans to become a club. We are simply local ham radio operators who love to be outdoors and do what we love most. Basic ham radio is alive and doing well in the parks in Chandler, Arizona. If you’re scanning the bands and hear “CQ CQ CQ BE-HIP Chandler, Arizona,” be sure to respond and give us a simple RST report — and a 5- to 10-minute chat wouldn’t be a bad idea either.

For more information, join our **www.groups.io** email reflector, BE-HIP, or look us up on Facebook under the same name. Updates on upcoming meetup events are always posted there.

Lead photo by the author.

Gary Laatsch, KI7PBR, is a retired electrical engineer and firmware architect. He retired in 2016 after working at R&D Labs for nearly 40 years. Gary worked for several leading-edge high-tech companies, including Beckman Coulter, Western Digital Technologies, Inc., and Intel. He was granted a patent in 2002 for a caching algorithm used in digital video recording technology. Gary became interested in amateur radio in the early 1980s when he discovered the 2-meter Earthquake Net in Southern California. He finally became a Technician in July 2017. That September, Gary upgraded to General, and then to Extra class in December 2018. He is the co-founder and former president of the Chandler Ham Radio Club. Gary is also a certified VE for ARRL and the Laurel Amateur Radio Club, and is part of the monthly VE team in the Chandler area. He can be reached at **ki7pbr@cox.net**.

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



KE1R provides an overview of the structure and intricacies of FT8.

Thomas W. Brooks, KE1R

Data streams are nothing new, and neither is error correction. We stream data all the time with our cell phones, computers, and other devices. CW is a data stream, as are RTTY and PSK31. In this article, I will explore the general makeup of FT8 and explain the basics of error correction. A list of references that I consulted for this article is provided at **www.arrl.org/qst-in-depth**.

In 2001, Joe Taylor, K1JT, released *WSJT*; this changed the ease with which hams could interface transceivers with computers and experiment with weak-signal modes. Next came the release of *WSJT-X* in 2012, followed by FT8 in 2017. FT8, which limits messages to 13 characters, uses a 15-second cycle with a 50 Hz bandwidth. FT8 was initially created by Joe Taylor and Steve Franke, K9AN, for 6-meter E-skip propagation. In 2019, FT4 was added, with a 7.5-second cycle and a 90 Hz bandwidth.

I was curious about FT8 waterfall data streams and how they are structured (see Figures 1 and 2). Without delving too far into data communication theory and error correction techniques, I will offer some knowledge to help hams visualize such data streams and learn how they are generated and used.

You can look at a simple sudoku puzzle to understand error correction (see Figure 3). For those who are unfamiliar with sudoku puzzle rules, each of the four small 2 × 2 matrixes must contain 1, 2, 3, and 4. Additionally, each column and row of the larger 4 × 4 matrix must also contain 1, 2, 3, and 4. This structure is similar to how low-density parity check (LDPC) coding works. That is, it enables you to find and correct errors when you look at a completed matrix.

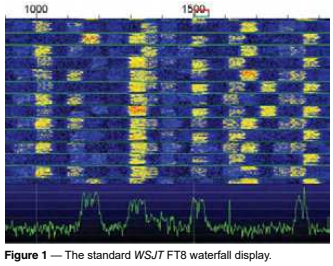


Figure 1 — The standard *WSJT* FT8 waterfall display.

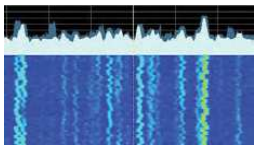


Figure 2 — An Icom IC-7610 waterfall display. This shows what the yellow blocks of data in Figure 1 look like when vertically spread.

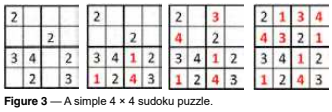


Figure 3 — A simple 4 × 4 sudoku puzzle.

Get On the Air April 8 for the Solar Eclipse QSO Party

Contribute to ionospheric research while having fun on HF.

McKenzie Denton, KO4GLN

An extraordinary celestial event is set to occur over North America on Monday, April 8, 2024, where the sun and moon will align in a total solar eclipse! This date marks the next Solar Eclipse QSO Party (SEQP) for hams interested in HF operating or contributing to studies of the ionosphere (or both). Sponsored by Ham Radio Science Citizen Investigation (HamSCI, **https://hamsci.org**), the SEQP invites amateur radio operators to participate in an ionospheric research initiative, transforming routine radio exchanges into valuable scientific data. Operators of all experience levels, with stations small and large, are invited to make contacts on a variety of modes and bands during the SEQP. The contact data will help researchers unravel the mysteries of our planet's upper atmosphere and its interactions with the sun.

An Opportunity to Contribute to Radio Science

The 2024 SEQP is an event that no serious amateur radio enthusiast should miss because it's the last total solar eclipse visible from the contiguous United States until 2044. This event is a unique blend of scientific pursuits and radiosport. Amateur radio operators will have a chance to experience the changes to radio wave propagation when the moon's shadow temporarily reduces the amount of solar radiation reaching the ionosphere during the eclipse. This initiative is not just about radio contacts; it's also about building a vast repository of data relative to the time of the eclipse passing overhead, such as who contacted whom and when, where they were located, and on which bands their contacts occurred. Networks, such as the Reverse Beacon Network, PSKReporter, and WSPRnet, along with individual logs, will yield invaluable insights into the ionosphere's behavior to researchers. This event could be a transformative moment for amateur radio enthusiasts and scientific discoveries.

Paul Christy, NØGN, operated during the 2017 SEQP using solar power from the Rockford Lake State Recreation Area in Beatrice, Nebraska. [Denise Christy, KEØMVM, photo]

Amateur radio operators will submit logs that contain details such as frequency, mode, contact times, and signal reports to the HamSCI team after the SEQP. This information will be combined into a comprehensive database for preliminary analysis, which ensures completeness and consistency and identifies any anomalies. Then physicists, engineers, and other scientists collaborate to analyze this data pool rigorously. The focus is to observe the ionosphere's reaction to the solar eclipse by identifying shifts in signal propagation. Integrating the data with other sources, such as the Reverse Beacon Network, PSKReporter, WSPRnet, and other (non-amateur) data sources, can achieve a more detailed understanding of the ionosphere. The findings will be shared at conferences, published in scientific journals, and made available to the public, thus advancing global knowledge about the ionosphere and its impact on radio communications.

HamSCI's Recognition of Hams' Contributions to Science

As the solar eclipse nears, it's essential to acknowledge the valuable contributions of amateur radio op-

Denise Christy, KEØMVM, pictured at the campsite she shared with her husband, Paul Christy, NØGN, at the Rockford Lake State Recreation Area in Beatrice, Nebraska, during the 2017 SEQP. [Paul Christy, NØGN, photo]

erators in scientific exploration. Amateur radio has played a crucial role in advancing scientific knowledge for years, offering vital communication support and accurate data from the early days of radio. The upcoming eclipse is more than just a fascinating celestial event; it's a testament to the significance of amateur radio in scientific research. HamSCI's involvement highlights the importance of the data collected by amateur radio, validating its role in the scientific community.

As HamSCI continues to integrate and validate these contributions, it calls all amateur radio operators to be part of this momentous occasion. Operating in this event signifies more than personal achievement; it represents a collective effort in scientific discovery, where each contribution is a valuable piece of a much larger puzzle. Step into this event ready to contribute to a legacy that HamSCI and the scientific community deeply value with a sense of pride and purpose.

The HamSCI community is led by The University of Scranton Department of Physics and Engineering Amateur Radio Club, W3USR, in collaboration with Case Western Reserve University Amateur Radio Club, W8EDU, The University of Alabama, the New Jersey Institute of Technology Center for Solar-Terrestrial Research Amateur Radio Club, K2MFF, the MIT Haystack Observatory, Tucson Amateur Packet Radio in Arizona, additional collaborating universities and institutions, and volunteer members of the amateur radio and citizen science communities. We are grateful for the financial support of the United States National Science Foundation, NASA, and Amateur Radio Digital Communications. If you have questions regarding the SEQP or to learn more about HamSCI's many other eclipse-related events, please visit **https://hamsci.org/eclipse**.

Operate in the SEQP

Date and Time:
- April 8, 2024
- 1400 to 2400 UTC (may operate all 10 hours)

Station Requirements:
- Remote operation allowed with conditions
- Portable operation from a fixed location is encouraged (no mobiles or rovers)

Bands and Modes for Two-Way QSOs:
- Bands: 160, 80, 40, 20, 15, 10, and 6 meters
- Modes: CW, SSB, and digital (all types)

Exchange for Two-Way QSOs:
- Include signal report and 4-character grid square

Transmitting Digital Modes:
- Recommend *N1MM+* software with *WSJT* for FT8
- Configure software with station location into a 4-character grid square
- Enable PSKReporter to send received signal data

Scoring:
- Based on QSO points, multipliers, and bonus points (see rules, **https://hamsci.org/seqp-rules**)
- Duplicate contacts allowed after 10 minutes
- Cabrillo-formatted logs preferred, though ADIF logs, such as from *WSJT*, will be accepted

FAQs and complete contest rules can be found at **https://hamsci.org/contest-info**.

McKenzie Denton, KO4GLN, is a fervent science enthusiast and pre-med student at Old Dominion University. She is President of the ODU Amateur Radio Club. McKenzie was first licensed in 2020 and is now an Amateur Extra-class operator and Volunteer Examiner. Her profound passion for science has steered McKenzie to be a key member of the HamSCI team. She is active in the amateur radio community and involved with the Williamsburg Area Amateur Radio Club (WAARC) and the Potomac Valley Radio Club (PVRC). McKenzie is the ARRL Virginia Section Youth Coordinator, dedicating her efforts to inspiring young enthusiasts. She can be reached at **mckenziedenton15@gmail.com**.

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

ARRL Board Holds 2024 Annual Meeting

The Annual Meeting of the ARRL Board of Directors was held on January 19 – 20, 2024, in Windsor, Connecticut.

ARRL President Rick Roderick, K5UR, led the meeting with a moment of silence for the radio amateurs who passed away since the previous Board meeting. Among the Silent Keys remembered were Thomas Ciciora, KA9QPN; John Core, KX7YT; David Lee Coons, WT8W; Marty Engstrom, Jr., N1ARY; Arnold Sexe, WBØOPZ; Gary Wilson, WD8CBO; John Gohndrone, N7TT; Mitch Wolfson, K7DX; Paul Staupe, WØAD; Ray Richards, W4RPR; Sister Lauren Weinandt, WAØRRJ; Stephen Howard, ABØXE; Stephen Merchant, K6AW; Steve Crouch, NO7V; William Kent, WØPCP; Richard King, K5NA; George Taft, W8UVZ; Carl Gansen, WBØCFF, and Elmer Berg, KCØNGY.

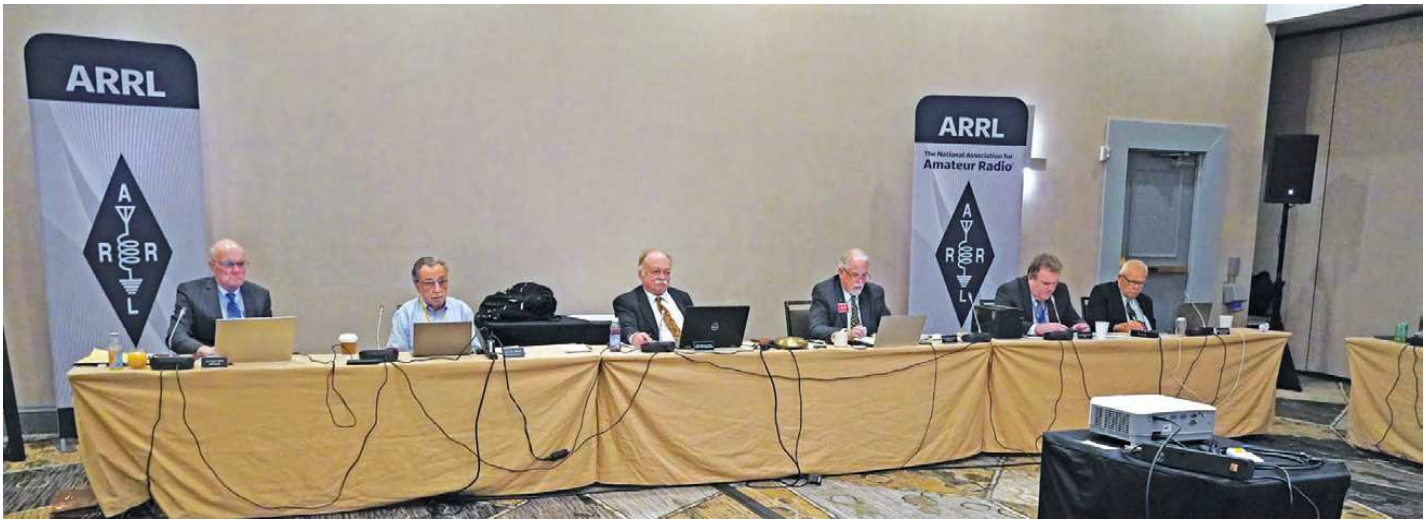
Report Highlights

Board members discussed proposed changes to By-Law 46, the Board's Conflict of Interest Policy. They unanimously voted to approve the establishment of a committee appointed by the ARRL President to affirm the set of ethics guidelines and standards for the Board. In addition to the guidelines, the committee will review By-Laws 42 (Ethics and Elections Committee) and 46 for possible revision. The committee will also engage with a legally qualified independent third party to handle all Ethics and Elections inquiries in the future.

The Board voted to make the *ARRL Director Workbook* publicly available on the ARRL website after revisions have been made to update the document.

The Board approved the reintroduction of an ARRL Life Membership and a 70+ Life Membership (for members age 70 and over) on a revenue-neutral basis. The Board had suspended the Life Membership Program, pending the approval of an adjusted revenue-neutral program at the July 2023 meeting.

The Board approved two motions to engage young hams with a strong start to their lifelong journey in amateur radio and ARRL. For decades, ARRL has offered a reduced dues rate for young hams, currently priced at $30 per year. At this meeting, the Board established a new option for a no-cost Associate Membership for full-time students age 21 and younger. The Board also approved the creation of the ARRL Student Coding Competition, which will challenge students age 21 and younger to design a software application that meets the specifications



ARRL Officers prepare to start the meeting of the Board of Directors.

established by ARRL. Awards up to a total of $25,000 will be granted by an awards committee to the winning student(s). The committee will determine the terms and schedule for the competition.

The Board approved a commitment to expand messaging and marketing for the ARRL Amateur Radio Emergency Service® (ARES®) program at the recommendation of the Emergency Communications and Field Services Committee, with the goal of recruiting and developing greater participation.

Government Relations

The Board issued its strongest rebuke of efforts by the ad hoc group Shortwave Modernization Coalition (SMC) to introduce high-power signals to the shortwave spectrum, including frequencies immediately adjacent to the amateur radio HF bands. The Board made a clear statement that the interests of the SMC conflict with those of ARRL, and its membership has requested that ARRL Volunteer Monitors explore ways to gather data on SMC station emissions.

The Board voted to expand ARRL's ongoing efforts to help hams who face involuntary limitations with their amateur radio operations beyond the regulatory efforts pursued in Washington, DC.

ARRL Foundation

ARRL Foundation President David Norris, K5UZ, presented a report about the status of the Foundation, which marked its 50th anniversary last September. The Foundation provides philanthropic support for amateur radio through the ARRL Foundation Scholarship Program and Club Grant Program, and other grants and funds. In 2023, the Foundation awarded 113 scholarships totaling more than $600,000 through the generosity of individuals and clubs. Norris also recognized the generous commitment made by Amateur Radio Digital Communications (ARDC), which will fund more than $2.1 million over 3 years, to support scholarships, radio technology for classroom teachers, and amateur radio club grants.

Elections

Officers

The Board re-elected ARRL President Rick Roderick, K5UR, for his fifth 2-year term. The Board also elected Pacific Division Director Kristen McIntyre, K6WX, as First Vice President, succeeding Michael Raisbeck, K1TWF. Northwestern Division Director Mike Ritz, W7VO, was elected Second Vice President, succeeding Bob Vallio, W6RGG. International Affairs Vice President Rod Stafford, W6ROD, was re-elected.

The elections of McIntyre and Ritz to the Vice President positions mean that incumbent Vice Directors Anthony Marcin, W7XM, of the Pacific Division, and Mark Tharp, KB7HDX, of the Northwestern Division, will succeed as Division Directors, creating vacancies for Vice Director in those Divisions. Michael Sterba, KG7HQ, has been appointed Vice Director of the ARRL Northwestern Division. The position of Vice Director of the ARRL Pacific Division will also be filled by appointment.

Executive Committee

First Vice President Kristen McIntyre, K6WX, will remain on the Executive Committee (EC), succeeding former Vice President Michael Raisbeck, K1TWF. Directors re-elected to the EC include Jim Boehner, N2ZZ, of the Roanoke Division, Fred Kemmerer, AB1OC, of the New England Division, and Art Zygielbaum, KØAIZ, of the Midwest Division. Newly elected members include Jeff Ryan, KØRM, of the Rocky Mountain Division, and Bill Lippert, ACØW, of the Dakota Division.

Finances

ARRL Treasurer John Sager, WJ7S, reviewed the fourth quarter and full-year investment results of 2023. The fourth quarter had a return of $3.03 million, or 9.1%. In 2023, the ARRL portfolio had a return of $4.7 million, or 14.4%. The balance of ARRL investment assets was $35.7 million as of December 31, 2023, which includes approximately $16 million in Board-controlled assets.

ARRL Chief Financial Officer Diane Middleton, W2DLM, stated that ARRL had a deficit spending of approximately $1.3 million from operations in 2023. She noted that revenues remained relatively flat, with increases in most expenses across the organization. The balance sheet remained healthy, with some growth due to the partial investment market recovery.

The next meeting of the ARRL Board of Directors is scheduled for July 19 – 20, 2024.

US Amateur Radio Bands

Operator license classes: **E** = Amateur Extra **A** = Advanced **G** = General **T** = Technician **N** = Novice
CW operation is permitted throughout all amateur bands. Except as noted, all frequencies are in megahertz (MHz).

= RTTY, data, phone, image = USB phone, RTTY, data and CW = RTTY and data = phone and image
= SSB phone = CW only

LF – Low Frequency band

2200 Meters (135 kHz) E,A,G

1 W EIRP maximum

135.7 kHz — 137.8 kHz

MF – Medium Frequency bands

630 Meters (472 kHz) E,A,G

5 W EIRP max, except in Alaska within 496 miles of Russia where the limit is **1 W EIRP**

472 kHz — 479 kHz

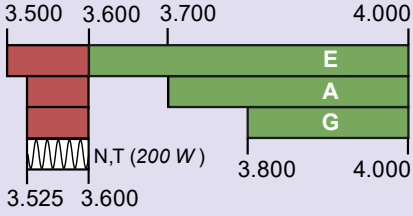
160 Meters (1.8 MHz) E,A,G

1.800 — 1.900 — 2.000 MHz

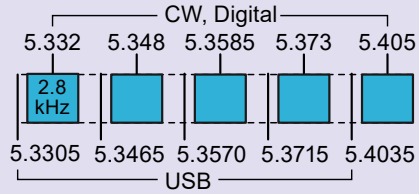
Amateurs wishing to operate on **2200 or 630 meters** must first register with the Utilities Technology Council online at **https://utc.org/plc-database-amateur-notification-process/.** You need only register once for each band.

HF – High Frequency bands

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

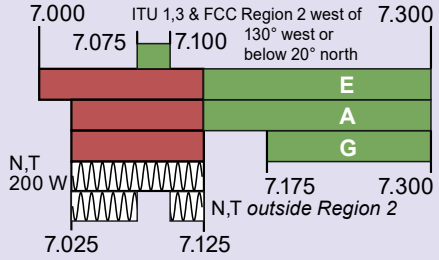


60 Meters (5.3 MHz) E, A, G (100 W)

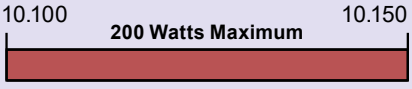


General, Advanced, and Extra licensees may operate on a secondary basis with a maximum ERP of 100 W (relative to a half-wave dipole antenna).

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

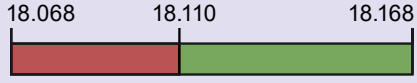


30 Meters (10.1 MHz) E,A,G

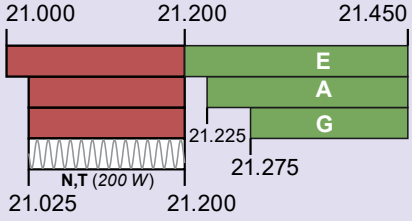


20 Meters (14 MHz) E,A,G

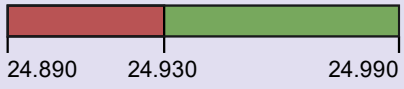
17 Meters (18 MHz) E,A,G



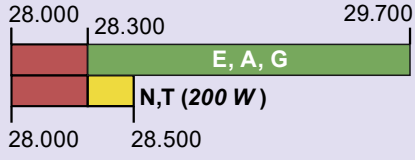
15 Meters (21 MHz) E,A,G,T,N



12 Meters (24 MHz) E,A,G



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

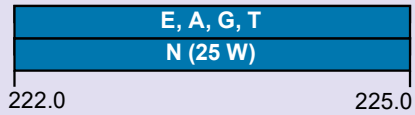


VHF – Very High Frequency bands

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

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

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

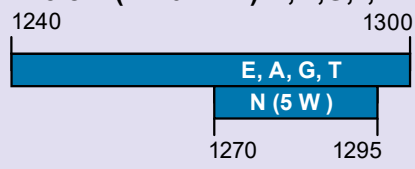


UHF – Ultra High Frequency bands

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

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

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



SHF&EHF – Super and Extremely High Frequency bands

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

2300-2310 MHz	3300-3450 MHz	10.0-10.5 GHz	47.0-47.2 GHz	122.25-123.0 GHz	241-250 GHz
2390-2450 MHz	5650-5925 MHz	24.0-24.25 GHz	76.0-81.0 GHz	134-141 GHz	All above 275 GHz

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

OTAbands **rev. 11/16/2023**

Amateur Radio Represented as Educational Tool in Washington, DC

ARRL and Amateur Radio Digital Communications (ARDC) represented amateur radio at a symposium in Washington, DC, on February 1, 2024. At this symposium, top domestic spectrum policymakers from the federal government considered implementation of the National Spectrum Strategy (NSS). For more information about the NSS, see **www.ntia.doc.gov/sites/default/files/publications/national_spectrum_strategy_final.pdf**.

ARRL ensures that amateur radio is represented at sessions like this so that decision-makers understand amateur radio's roles when spectrum decisions are made. Such roles include creating student interest in science, technology, engineering, and mathematics (STEM) subjects, and providing communications during natural disasters and other emergencies.

In the NSS, which was released by the White House in November 2023, national policymakers identified 2790 MHz of spectrum to be considered for future commercial needs. No new amateur spectrum was included, and only the ongoing reallocation studies related to 3.1 – 3.45 GHz were addressed.

The NSS was prepared for the President by the National Telecommunications and Information Administration (NTIA) in collaboration with the Federal Communications Commission. NTIA considered input from federal executive branch agencies that use spectrum, in addition to input from other spectrum users, including amateur radio operators. As the NSS was being formulated in 2023, ARRL's Washington Counsel presented information about amateur radio to policymakers at an NTIA listening session. This was followed by a written submission about amateur radio spectrum concerns and a one-on-one meeting with NTIA's Senior Spectrum Advisor, who was overall in charge of formulating the NSS.

The February 2024 symposium followed the release of the NSS and supported finalizing NSS implementation plans; as of press time, the plans are expected to be announced by the White House in mid-March 2024.

ARRL Life Member and ARDC Director and former President Phil Karn, KA9Q, was a panelist at the symposium. He reinforced amateur radio's national role in workforce development, with personal testimony based on his own career at Qualcomm.

Phil Karn, KA9Q (far right), represented amateur radio in the National Telecommunications and Information Administration spectrum symposium. [BOC Engineering YouTube photo]

Karn's recruitment by Qualcomm was due to his pioneering amateur radio accomplishments and digital wireless projects. He retired from his position as Qualcomm's Vice President for Technology in 2011. Karn's life experience also supported his remarks about amateur radio's role in attracting youth to STEM projects.

"I see [amateur radio] — having been involved in it for 52 years now — as fundamental as an educational system... It is a type of hands-on, intuitive learning that is almost impossible to get any other way," said Karn. You can watch a recording of the panel at **www.youtube.com/watch?v=NaaFb6Sh61E&t=21090s**.

Senators Roger Wicker and Richard Blumenthal Introduce S.3690 to Eliminate Private Land Use Restrictions on Amateur Radio

On January 30, 2024, US Senators Roger Wicker (Mississippi) and Richard Blumenthal (Connecticut) introduced S.3690, the Senate companion bill to H.R.4006, introduced in June 2023. Both bills reflect ARRL's congressional campaign efforts to eliminate homeowner association land use restrictions that prohibit, restrict, or impair the ability of an amateur radio operator to install and operate amateur station antennas on their residential properties.

Amateur radio operators are repeatedly relied upon to provide essential communications when disaster strikes, but their ability to do so is being impaired by the exponential growth of residential private land use restrictions. Such

restrictions hinder the ability to establish home stations that can be used to train and provide emergency communications when needed. When announcing the introduction of S.3690, Senator Wicker said:

> Because communication during natural disasters is often hindered, we should be making every attempt to give folks more options. Reliable access can make the difference between life and death in an emergency. Our legislation removes roadblocks for amateur radio operators looking to help their friends, families, and neighbors.

In a similar announcement, Senator Blumenthal stated:

> Our measure will help clarify the rules so ham radio enthusiasts can successfully continue their communications. In the face of emergency or crisis, they help provide vital, life-saving information that allows listeners to properly and safely respond, but prohibitive home association rules and confusing approval processes for installing antennas have been an unnecessary impediment. The Amateur Radio Emergency Preparedness Act resolves these bottlenecks and ensures that radio operators can function successfully.

ARRL President Rick Roderick, K5UR, and ARRL Government Affairs Committee Chair and Director of the ARRL West Gulf Division John Robert Stratton, N5AUS, both extended their thanks on behalf of ARRL, its members, and the amateur radio community. They voiced their appreciation for the leadership of Senator Wicker and Senator Blumenthal in their efforts to support and protect the rights of all amateur radio operators.

Highlights from 2024 ORLANDO HamCation®

Warm weather greeted the crowds of radio amateurs who attended the 2024 Orlando HamCation® on February 9 – 11. The convention hosted the ARRL Florida State Convention, but it drew attendees from across the country, and some from even farther, thereby renewing HamCation's reputation as the second-largest US ham radio convention.

HamCation is sponsored by the Orlando Amateur Radio Club (OARC). The convention sprawled across the Central Florida Fairgrounds and Expo Park, and it included a huge outdoor tailgate and buildings filled with exhibitors and swap tables. The convention enjoys significant participation from amateur radio manufacturers, dealers, clubs, and organizations. In the months leading up to this year's event, HamCation International Relations Co-Chairs Lidy Meijers, KJ4LMM, and Peter Meijers, AI4KM, traveled to ham radio conventions across Europe to cast a spotlight on the convention. Their work paid off by garnering an attendance of amateurs from many other countries, and even by attracting exhibitors from international societies, including the Radio Society of Great Britain and the Deutscher Amateur Radio Club.

"It was very successful and very busy," said OARC President John Knott, N4JTK. "The vendors reported that traffic at their booths was high and both the trunk fest and the flea market were busy." Knott also said that reservations filled 200 RV spaces.

The East-West Hall included a row of booths organized by ARRL. Attendees had the opportunity to meet ARRL President Rick Roderick, K5UR; ARRL CEO David Minster, NA2AA, and Director of the ARRL Southeastern Division Mickey Baker, N4MB. Baker also moderated the ARRL membership forum on Saturday afternoon during the event. Together, Baker, Roderick, and Minster covered several key areas of membership interest. Roderick, who asked attendees to consider what they've done for amateur radio lately, urged members to find opportunities to support new licensees and strengthen radio clubs.

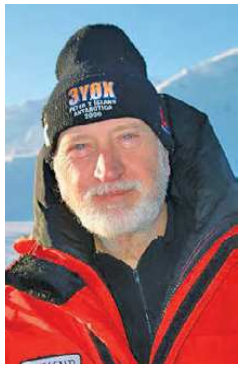
Minster spoke about a new, free ARRL membership for students 21 and younger. He also described ways that ARRL is increasing amateur radio's role in education through teachers, students, and schools. "ARRL knows that amateur radio is an effective tool in developing student experiences in the science, technology, engineering, and math (STEM) disciplines," said Minster. "Our efforts to increase our outreach in education and other areas is playing a prominent role with the development of the new ARRL strategic plan."

Also at HamCation was ARRL Education and Learning Manager Steve Goodgame, K5ATA. Goodgame presented a forum covering recent efforts and success stories to develop pathways for more teachers and students to use amateur radio in their classrooms. His wife and member-volunteer Cyndi Goodgame, K5CYN, who is also an educator, engaged dozens of young and prospective hams by collecting their experiences and interests for ARRL's ongoing student outreach.

A familiar face to many was ARRL National Instructor Gordon West, WB6NOA. In January 2024, ARRL announced that it had become the new publisher of Gordon West's popular license preparation books and related resources. HamCation attendees were also drawn to the ARRL booths to meet Gordon West. He was introduced as ARRL National Instructor at the membership forum. On Saturday night, HamCation recognized Director of the ARRL New England Division Fred Kemmerer, AB1OC, and his wife, Anita Kemmerer, AB1QB, with the 2024 Gordon West Ambassador of the Year Award.

Bob Allphin, K4UEE, Silent Key

Prolific DXpedition leader, ARRL Maxim Society member, and former ARRL DX Advisory Committee Chair Robert C. "Bob" Allphin, Jr., K4UEE, has become a Silent Key. Allphin passed away on February 10, 2024, at the age of 79.



Prolific DXpedition leader, ARRL Maxim Society member, and former ARRL DX Advisory Committee Chair Robert C. "Bob" Allphin, Jr., K4UEE (SK).

Allphin was first licensed at the age of 14, and he graduated high school in Okinawa, Japan. He served in the US Air Force as an electronic warfare instructor during the Vietnam War. After an honorable discharge with the rank of Captain, Allphin entered the world of financial services. He retired after 28 years to focus on his passion for DXpeditions.

"Bob was always optimistic and hopeful in DXpedition planning. He encouraged and coaxed his fellow team members to bring out the best in everyone. If there were disappointments, he turned them into humor and diplomatically mitigated conflicts. He excelled in DXpedition PR and financing," said Ralph Fedor, KØIR, who frequently co-led DXpeditions with Allphin.

"Bob was very good at organizing and motivating people to participate," said Dr. Glenn Johnson, WØGJ, who co-led several DXpeditions with Allphin. "He was always thinking outside of the box. His concern was to put on the 'best show' possible and to work the hard-to-reach areas," said Johnson.

Iconic activations were Allphin's specialty. According to his QRZ page (**www.qrz.com/db/k4uee/sk2024?aliasfrom=k4uee**), Allphin participated in, led, or co-led DXpeditions to locations like the Howland and Baker Islands, Heard Island, Bhutan, and more. In all, he participated in 38 contest DXpeditions.

Allphin was a generous donor to ARRL, being honored as part of the President Class of the Maxim Society and a member of the Diamond Club. He was a major gift donor to the 2014 ARRL Second Century Campaign. "Bob leaves amateur radio with a legacy of accomplishments. Above all, he strove to do things well, do things right, and do things fairly," said Fedor.

Details about Allphin's many non-radio accomplishments may be found in his online obituary at **www.dignitymemorial.com/obituaries/marietta-ga/robert-allphin-11663385**. A photo memorial has been assembled by photographer Tom Roscoe, K8CX, at **www.hamgallery.com/tribute/k4uee/index.html**.

Section Manager Nomination Notice

To all ARRL members in Connecticut, Idaho, Minnesota, North Dakota, Ohio, Oklahoma, Southern Florida, Western New York, Puerto Rico, and the US Virgin Islands. 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 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 June 7, 2024. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters no later than July 1, 2024, to full members of record as of June 7, 2024, which is the closing date for nominations. Returns will be counted on August 20, 2024. Section Managers elected as a result of the above procedure will take office October 1, 2024.

If only one valid petition is received from a Section, that nominee shall be declared elected without opposition for a 2-year term beginning July 1, 2024. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the October 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*

Steve Ford, WB8IMY, wb8imy@arrl.net

Amateur Radio World

WRC-23 Wrap-Up

In this month's column, International Amateur Radio Union (IARU) Secretary Joel Harrison, W5ZN, briefly reviews the handling of agenda item 9.1b at the International Telecommunication Union World Radiocommunication Conference 2023 (WRC-23). He also addresses pertinent agenda items discussed at the conference that were not widely reported by ARRL.

The WRC-23 IARU team included: (back row, from left) ARRL Technical Relations Specialist Jon Siverling, WB3ERA; Barry Lewis, G4SJH; Deutscher Amateur Radio Club Representative Bernd Mischlewski, DF2ZC; Radio Society of Great Britain Representative Murray Niman, G6JYB; IARU Secretary Joel Harrison, W5ZN; Wireless Institute of Australia Representative Peter Pokorny, VK2EMR; Singapore Amateur Radio Transmitting Society Representative Roland Turner, 9V1RT; (front row, from left) Radio Amateurs of Canada Representative Paul Coverdale, VE3ICV; Liga de Amadores Brasileiros de Rádio Emissão Representative Flavio Archangelo, PY2ZX; IARU President Tim Ellam, VE6SH; IARU Vice President Ole Garpestad, LA2RR; Organisasi Amatir Radio Indonesia Representative Wahyudi Hasbi, YB1PR, and Wireless Institute of Australia Representative Dale Hughes, VK1DSH. Not shown is Japan Amateur Radio League Representative Ken Yamamoto, JA1CJP.

WRC-23, held in Dubai, United Arab Emirates, concluded on December 15, 2023. Amateur radio fared well despite enormous pressures.

At the top of the priority list for the IARU was agenda item 9.1b, which concerned the coexistence of the secondary amateur and amateur-satellite allocation with the primary radionavigation-satellite service systems from 1240 to 1300 MHz. Four years of strenuous effort in the run-up to WRC-23 resulted in an agreed-upon recommendation at the Radio Assembly, followed by an agreement at WRC-23 to mention the recommendation in a new footnote for the allocation. For more information about the conclusion of agenda item 9.1b, see the February 2024 "Happenings" column.

Other items relevant to the Amateur Radio Service were taken up at the conference, including:

♦ Agenda item 1.12: 40 – 50 MHz radar sounders. These are now largely limited to the polar regions.

♦ Agenda item 1.14: 231.5 – 252 GHz re-allocations for remote sensing. Fortunately, our secondary 241 – 248 GHz allocation remained unchanged, and the primary allocation of 248 – 250 GHz is unaffected.

♦ Agenda item 9.1a: This concerned the issue of space weather sensors, and it was an item of major interest. After much discussion, a clear definition for such sensors was formulated, and the subject of frequency protection was added as an agenda item for WRC-27.

♦ Agenda item 1.2: More broadband usage at 3.3 GHz and 10 GHz in Region 2. This was a complicated issue because amateur services are secondary on these bands, with numerous — mainly South American — countries allocating mobile broadband in this spectrum by way of footnotes. Instead of a region-wide designation for International Mobile Telecommunications at 10.0 – 10.5 GHz in Region 2, there is a footnote limiting it to a dozen countries.

An Effective Team

IARU WRC Coordinator and Vice President Ole Garpestad, LA2RR, expressed his pleasure with the results and complimented the extraordinary effort of the dedicated IARU volunteers who worked long hours to achieve outcomes that will benefit all radio amateurs.

Rick Palm, K1CE, k1ce@arrl.net

Goals for ARES Growth and Development

At its Annual Meeting in January, the ARRL Board of Directors set a goal of recruiting and developing greater participation in the venerable Amateur Radio Emergency Service® (ARES®) based on a recommendation of its Emergency Communications and Field Services Committee. The Board established a commitment to expand messaging and marketing for the program.

Every ARES registrant and emergency coordinator (EC) should rally around this year's effort. The need for a vibrant, well-staffed ARES program has never been greater, given the rise in frequency of climate-related disasters and the severity of natural meteorological emergencies and disasters. The situation is exacerbated by understaffed and under-resourced local and state departments of emergency management, as well as the ever-increasing demand for volunteers.

Precursors to the ARES Program

More than a hundred years ago, hams attending colleges in Michigan and Ohio passed disaster messages when other means of communication were down during the aftermath of severe storms and flooding in that part of the country. A US Department of Commerce bulletin followed, proposing a dedicated communications network of radio amateurs to serve during disasters. They became essential auxiliary assets of the national public's welfare, and we've responded with emergency communications services ever since.

Around this time, a memorandum of understanding was set with the American railroad system for them to have amateur radio support whenever the railroad's wire lines were down, and the ARRL Railroad Emergency Service Committee was formed. A major New England flood had amateurs supplying the only efficient means of communication from the devastated areas to the outside world, prompting the chairman of the Federal Radio Commission (which became the Federal Communications Commission in 1934) to say that the future of radio depended on radio amateurs.

In 1933, ARRL Field Day was created to help amateurs prepare for portable operations. The ARRL Emergency Corps was formed with the goal of having an amateur radio emergency station in every community; similar goals are manifested today. The American Red Cross became a served agency. Technical advances supported this evolution. There was even a World War II War Emergency Radio Service for natural disaster response. The Cold War resulted in the Radio Amateur Civil Emergency Service (RACES) for civil defense purposes and is the basis for today's emergency management model and ARES program.

Over the past 60 years, the roles, procedures, protocols, equipment, and techniques of amateur radio in emergency communications have continued to develop, thanks to advances in amateur radio technology and its application, as well as lessons learned through hotwashes and after-action reports and improvement plans from each and every incident. The need for amateur operators has never been greater, with training that has never been more professional and rigorous.

Recruitment Techniques

There's an infinite number of ways to recruit new ARES members. One of the most effective methods is to align local and county amateur radio clubs with ARES programs. In Florida, Columbia County EC Brad Swartz, N5CBP, has fostered an excellent working and cooperative relationship between the Columbia Amateur Radio Society (CARS) and the Columbia County ARES (CCARES). As a result, CCARES continues to grow in numbers and vitality through recruitment, exercises, and planning linked with CARS.

Columbia County EC Brad Swartz, N5CBP, at the helm of the amateur radio station at the Florida county's Emergency Operations Center.

Other methods include mailing recruitment flyers and newsletters to a county's amateur population. These mailings can be used to invite amateurs to meetings of the club and ARES group. Also, talk about the benefits of being an ARES volunteer on local repeater chat nets, swap nets, ARES nets, etc. Mailings can also include invitations to join county ARES exercises, general club activities and meetings, and to participate in public event responses. One of the best recruitment devices is a public event where new hams and veteran operators work side by side to provide radiocommunications for event leaders, public safety, and medical and law enforcement personnel. These events generate excitement, adventure, team spirit, and camaraderie in a public service environment.

Incident Communications Planning

In Columbia County, Florida, after a spate of various natural disasters, ARES leadership coordinated with the county's professional emergency manager to embrace more sophisticated planning as the critical key to efficient, effective, organized, and coordinated responses. This was recognized by the emergency manager when he recently devoted 90 minutes to a one-on-one planning and coordination meeting with county EC Swartz.

As a result, ARES meetings are held every month, and communications planning documents are more comprehensive in response to the more complex and demanding disaster management arena. Two good examples can be found in the drafting and publication of a new local county emergency communications plan and a simplex net protocol. The new 48-page document covers every aspect of responsibilities, protocols, alerting mechanisms, rosters, evacuation centers with addresses, frequencies and repeaters to be used for various functions, and much more.

A Directed Simplex Net Protocol

Because repeater systems sometimes go down during a disaster, the county ARES group has instituted a protocol for conducting voice communications using simplex operation — peer-to-peer communications without repeater use. On this net, the net control station (NCS) doesn't use a roster to call from. Instead, stations are asked to check in by suffix. For example, the NCS may call for stations with a suffix of Alpha through Golf, and the station KE4BQI could answer, but station KK4KSM couldn't check in until the NCS calls for stations with a suffix beginning with Hotel through November. If the NCS doesn't hear a station, another station that's able to copy the unheard station can write down that station's call sign and wait for the NCS to ask for relays. Then, the copying station would give their call sign and wait to be acknowledged. Once acknowledged, the station then gives the NCS the call sign using phonetics.

Generally speaking, for a simplex net, a mobile or base station radio with an RF output of 25 W or greater is preferred. Handheld radios may be used if there's sufficient height above the average terrain and an efficient antenna is employed.

CCARES Net Control Dalton Weatherford, KK4KSM (on the left), and Colen Boutwell, WA5RKR (on the right), of CARS at an antenna workday at the CCARES headquarters in Lake City, Florida.

FEMA Independent Study Courses

Duane Mariotti, WB9RER, is the veteran coordinator of the Kaiser Permanente Amateur Radio Network (KPARN), a California-based organization of hams who volunteer their technical expertise to support emergency preparedness. "We require KPARN communicators to pass the Federal Emergency Management Agency (FEMA) Independent Study courses ICS 100, 200, and 700 on the Incident Command System for Initial Response and National Incident Management System, respectively," Mariotti said. "All are taken online and take about 4 hours to complete. ARRL and ARES emergency coordinators should require [these courses] as part of basic EmComm training." Visit **https://training.fema.gov/is** for more information.

All photos provided by the author.

Contest Corral

April 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	1500	1	1729	3.5,7	DARC Easter Contest	CW Ph	RS(T), DOK or serial	**www.darc.de**
1	1900	1	2300	144	144 MHz Spring Sprint	CW Ph Dig	4-char grid	**sites.google.com/site/springvhfupsprints**
4	0000	5	0300	7	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or pwr	**qrpcontest.com/pigwalk40**
4	1700	4	2000	3.5	SARL 80m QSO Party	Ph	RS, serial, grid locator or QTH	**www.sarl.org.za**
4	1800	4	2200	28	NRAU 10m Activity Contest	CW Ph Dig	RS(T), 6-char grid	**nrau.net/nrau-contests-in-general**
6	1000	7	0400	14	PODXS 070 Club PSK 31 Flavors Contest	Dig	SPC, mbr or name	**www.podxs070.com**
6	1200	7	1200	3.5-28	EA RTTY Contest	Dig	RSQ, province or serial	**concursos.ure.es**
6	1200	7	1200	1.8-28	RSGB FT4 International Activity Day	FT4	Signal report	**www.rsgbcc.org**
6	1200	7	2359	No WARC	Georgia State Parks on the Air	CW Ph Dig	RS(T), park nbr or SPC	**gaparks.org/forms-rules-register**
6	1400	7	0200	1.8-28, 50,144	Louisiana QSO Party	CW Ph Dig	RS(T), LA parish or SPC	**laqp.louisianacontestclub.org**
6	1400	7	0200	1.8-28, 50,144	Mississippi QSO Party	CW Ph Dig	RS(T), MS parish or SPC	**www.arrlmiss.org**
6	1400	7	2000	1.8-28, VHF/UHF	Missouri QSO Party	CW Ph Dig	RS(T), MO county or SPC	**www.w0ma.org/index.php**
6	1400	7	2200	3.5-28	Florida State Parks on the Air	CW Ph Dig	Park nbr or SP	**flspota.org/rules**
6	1500	7	1500	1.8-28	SP DX Contest	CW Ph	RS(T), SP province or serial	**spdxcontest.pzk.org.pl**
7	1000	7	2100	3.5-14	WAB 3.5/7/14 MHz Data Modes	Dig	RS, serial, WAB square or country	**wab.intermip.net/Contests.php**
8	1400	8	2359	1.8-28,50	Solar Eclipse QSO Party	CW Ph Dig	RS(T), 4-char grid	**hamsci.org/seqp-rules**
8	1900	8	2030	3.5	RSGB 80m Club Championship, CW	CW	RST, serial	**www.rsgbcc.org**
9	1800	9	1929	3.5,7	DARC RTTY Sprint	Dig	RST, DOK or serial	**www.darc.de**
13	0000	13	0600	1.8-28	QRP ARCI Spring QSO Party	CW	RS, SPC, mbr or pwr	**qrparci.org**
13	0700	14	1300	1.8-28	JIDX CW Contest	CW	RST, JS prefecture or CQ zone	**www.jidx.org/jidxrule-e.html**
13	1200	14	1200	1.8-28	OK/OM DX Contest, SSB	Ph	RS, OK/MO county code or serial	**okomdx.crk.cz**
13	1200	14	1800	3.5-28	IG-RY World Wide RTTY Contest	Dig	RST, 4-dig yr first licensed	**www.ig-ry.de**
13	1400	14	0200	1.8-28, 50,144	New Mexico QSO Party	CW Ph Dig	Name, NM county or SPC	**www.newmexicoqsoparty.org**
13	1500	13	1900	3.5-14	Africa FT4 DX Contest	FT4	Signal report, 4-char grid	**www.sarl.org.za**
13	1800	14	2359	1.8-28,50	Georgia QSO Party	CW Ph	RST, GA county or SPC	**gaqsoparty.com**
13	2100	14	2059	1.8-28, sat	Yuri Gagarin International DX Contest	CW Ph	RST, ITU zone	**gccontest.ru**
16	1900	16	2300	222	222 MHz Spring Sprint	CW Ph Dig	4-char grid	**sites.google.com/site/springvhfupsprints**
17	1900	17	2030	3.5	RSGB 80m Club Championship, SSB	Ph	RS, serial	**www.rsgbcc.org**
18	0000	19	0300	14	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or pwr	**qrpcontest.com/pigwalk20**
20	0500	20	0859	3.5,7	ES Open HF Championship	CW Ph	RS(T), serial	**www.erau.ee**
20	0600	21	0559	3.5-28	Worked All Provinces of China DX Contest	Ph	RS(T), BY province or serial	**www.mulandxc.com**
20	0700	21	0659	3.5-28	YU DX Contest	CW Ph	RS(T), YU/YT county or serial	**www.yudx.yu1srs.org.rs**
20	0900	21	2359	3.5-28	CQMM DX Contest	CW	RST, continent abbr, mbr code (if any)	**www.cqmmdx.com/rules**
20	1100	21	0059	1.8-28, VHF/UHF	Nebraska QSO Party	CW Ph Dig	NE county or SPC (FT8: grid)	**nebraskaqsoparty.com**
20	1400	21	2000	No WARC	Texas State Parks on the Air	CW Ph Dig	RST, park nbr or SPC	**www.tspota.org**
20	1600	21	0400	3.5-28	Michigan QSO Party	CW Ph	RST, MI county or SPC	**miqp.org/index.php/rules**
20	1700	21	1200	3.5-28	EA-QRP CW Contest	CW	RST, category, "M" if mbr	**www.eaqrp.com**
20	1800	21	1800	1.8-28, 50,144	Ontario QSO Party	CW Ph	RS(T), ON county or SPC	**www.va3cco.com/oqp/rules.htm**
20	1800	21	1800	1.8-28, 50,144	North Dakota QSO Party	CW Ph Dig	RS(T), ND county or SPC	**www.ndarrlsection.com**
21	0700	21	1900	3.5,7	International Vintage Contest HF	CW Ph	RS(T), 6-char grid	**vintagecontest.webnode.it**
21	1200	21	2200	1.8-28, 50,144	Quebec QSO Party	CW Ph	RS(T), QC zone or SPC	**wp1.quebecqsoparty.org**
21	1800	21	2359	3.5-28	ARRL Rookie Roundup, SSB	Ph	Name, 2-dig yr first licensed, state/province/XE area/DX	**www.arrl.org/rookie-roundup**
21	2300	22	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or pwr	**qrpcontest.com/pigrun**
24	1900	24	2300	432	432 MHz Spring Sprint	CW Ph Dig	4-char grid	**sites.google.com/site/springvhfupsprints**
25	1900	25	2030	3.5	RSGB 80m Club Championship, Data	Dig	RST, serial	**www.rsgbcc.org**
27	0001	28	2359	28	10-10 Int'l Spring Contest, Digital	Dig	Name, mbr or "0," SPC	**www.ten-ten.org**
27	1200	28	1200	3.5-28	SP DX RTTY Contest	Dig	RST, SP 2-letter province or serial	**www.pkrvg.org**
27	1200	28	1200	3.5-28	UK/EI DX Contest, CW	CW	RST, UK/EI district code, serial	**www.ukeicc.com**
27	1600	28	2159	7,14,21,28	Florida QSO Party	CW Ph	RS(T), FL county or SPC	**floridaqsoparty.org**
28	1300	28	1859	3.5-28	UA1DZ Memorial Cup	CW Ph	RS(T), RDA district or 4-char grid	**ua1dz.ru**
28	1700	28	2059	3.5-28	BARTG Sprint 75	Dig	Serial	**bartg.org.uk**

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.*

2024 Straight Key Night Results

"CW is music to my ears!" — Rich Zott, WA2ELW

Paul Bourque, N1SFE,
ARRL Contest Program Manager

Many hams look forward to starting the new year with the sounds of Morse code. 2024 was no exception, as 161 participants reported 1,360 contacts on Straight Key Night (SKN). Stations throughout the United States and Canada submitted entries. There were also DX entries from stations in Guatemala, Panama, and the Netherlands.

Craig Bishop, W2NTN, noted that the event is "a fun and terrific way to start the new year!" Thomas Bredemus, KCØINP, commented, "Straight Key Night was a nice way to start 2024 on the radio, meeting some new friends and having some longer and interesting QSOs." Howard Holden, WB2AWQ, said he hasn't missed SKN since its inception in 1971.

Seasoned operators and those new to CW can enjoy the leisurely pace of SKN. On holiday break from his research studies at the US Naval Academy in Annapolis, Maryland, Michael "Mac" Cullen, K6MAC, made his first-ever CW contact with John Magliacane, KD2BD, on 40 meters using a key that was last used by his father, Michael Cullen, K1NPT, in 1972.

For some hams, SKN is more than just a night to get on the air using Morse code; it's a way to remember relatives and friends. Richard "Woody" Linwood, WØUI, used a 1920s-era Signal Electric Manufacturing Co. key that belonged to his grandfather, who served in World War II. Colin Phoon, AE3A, used a Ten-Tec Omni VI Plus transceiver with a Lionel J-38 straight key that belonged to his father-in-law, Barry Cohen, K2JV, who was licensed for more than 75 years.

Michael "Mac" Cullen, K6MAC, made his first-ever CW contact during the 2024 Straight Key Night. Licensed since 2011, he recently upgraded to Extra class in 2023. He used a key that was last used by his father, Michael Cullen, K1NPT, in 1972. [Michael Cullen, K1NPT, photo]

Best Fist and Most Interesting QSO

SKN participants are asked to vote for "Best Fist" and "Most Interesting QSO." This year's vote for "Best Fist" is a five-way tie between Mark Melchiori, N9AK; David Miller, N9SS; Dennis Sokol, WØJX; Robert Sauvan, WØYBS, and Jim Wickstrom, W1IK. For "Most Interesting QSO," there is a tie between Scott Overholt, KA6IOM, and Ed Moxon, K1GGI, who operated the WHNJ Amateur Radio Association's club station, W1HNJ, from the Marconi-RCA Wireless Museum in Chatham, Massachusetts.

The next ARRL Straight Key Night will be held on January 1, 2025.

Participating Stations

AA1HO, AA4RA, AA4TB, AA8UU, AAØQZ, AB8FJ, AB9BZ, AE3A, AE7AX, AE7CG, AF4MY, AK4KM, AL7JK, K1AJ, K1EEE, K1TW, K2AL, K2RP, K3BVQ, K3LO, K3MD, K3SWZ, K3TW, K4DS, K4FOY, K4TRH, K5EC, K5MBA, K5NZ, K5RIX, K6DF, K6GPB, K6KQV, K6MAC, K6PBQ, K8EG, K9MMS, K9PFA, K9SB, K9YA, KØJW, KØWOI, KA4WJB, KA5HRF, KA7T, KA9FZR, KAØLDG, KB8PGW, KB8TXZ, KB9W, KC2KWA, KC2LM, KC6MIE, KCØINP, KD2BD, KE1R, KE4Q, KEØTT, KF8KS, KF9AQ, KG5IEE, KG7BF, KG7CW, KI4DEF, KI5PED, KK7B, KQ6BZ, KQ9J, KR4EE, KW6G, N1SFE, N2HM, N2KZ, N4FTD, N4HAY, N4QR, N5LB, N6KZ, N6TCZ, N6ZO, N7MM, N7QR, N8GU, N9BOR, N9EVP, N9RU, N9SS, NØQLT, NØZB, NA5N, NC6Q, NI8W, NN3E, NV5P, NW6V, NZØT, VA3RKM, VE3CBK, VE3FIT, VE7CA, VE7NI, VO1NA, VY1KX, W1AST, W1FJ, W1PID, W1RO, W1TPB, W1TS, W2NTN, W2WSC, W3GW, W3SOX, W3TIM, W4NNF, W5ESE, W5NZ, W5ZA, W6LX, W6SGJ, W7AIT, W7FOX, W7IY, W7VHW, W8DPK, W8FDV, W8WTS, W8WZ, WØCTX, WØEJO, WØESE, WØUI, WØYBS, WA1CFX, WA2ELW, WA3WAW, WA9LKZ, WA9PWP, WA9ZBW, WAØJLY, WB2AWQ, WB3JKQ, WB6VRN, WB7AEA, WB7EHX, WB8CFO, WB8DQT, WB8RFB, WB9HFK, WBØB, WBØCJB, WD8RIF, WD4OQH, WI5ARD, WKØX, and WN4OFT.

DX stations included HP1IBF, HP1RIS, PA3AAA, and TG9ADM.

Ralph "Gator" Bowen, N5RZ, wb5aar@gmail.com

2023 September VHF Contest Results

Check out the results of the event, held September 9 – 11, 2023.

Regional Leaders

LM = Limited Multioperator; R = Classic Rover; RL = Limited Rover; RU = Unlimited Rover; SO-ALG-3B = Single Operator, Analog Only, Three-Band; SO-ALG-HP = Single Operator, Analog Only, High Power; SO-ALG-LP = Single Operator, Analog Only, Low Power; SO3B = Single Operator, Three-Band; SOFM = Single Operator, FM Only; SOHP = Single Operator, High Power; SOLP = Single Operator, Low Power; SOP = Single Operator, Portable; SOP-ALG = Single Operator, Portable, Analog Only; UM = Unlimited Multioperator

West Coast Region

(Pacific, Northwestern, and Southwestern Divisions; Alberta, British Columbia, and NT Sections)

WA6OEM/R	1,668	R
KD6EFQ/R	1,649	R
N7DA/R	546	R
N6VHF/R	468	R
N6GP/R	6,902	RL
KA7RRA/R	2,268	RL
WE7X/R	1,648	RL
NN6U/R	1,406	RL
K6LMN/R	1,105	RL
N7EPD	8,322	SOHP
N6UTC	7,018	SOHP
K6KLY	5,600	SOHP
N7KSI	3,774	SOHP
W7MEM	2,795	SOHP
N7IR	6,192	SOLP
AL1VE	5,920	SOLP
N6ZE	2,337	SOLP
N7DB	2,016	SOLP
KG7PD	1,368	SOLP
K6MI	4,320	SO-ALG-HP
KB7IOG	858	SO-ALG-HP
VE7AFZ	616	SO-ALG-HP
VA7SC	4,060	SO-ALG-LP
K2GMY	3,422	SO-ALG-LP
VE7HR	1,037	SO-ALG-LP
K6MUG	960	SO-ALG-LP
KE7UQL	800	SO-ALG-LP
WQ6D	230	SOP
W7IMC	4,095	SOP-ALG
W7JET	1,360	SOP-ALG
AA6XA	116	SOP-ALG
N7JA	68	SOP-ALG
KG7RQJ	36	SOP-ALG
WA7PVE	1,309	SO3B
KI6X	848	SO3B
AA7EA	450	SO3B
WA8ZID	372	SO3B
WA2KDL	264	SO3B
N7QOZ	3,087	SO-ALG-3B
K7CX	2,340	SO-ALG-3B
KN7Y	884	SO-ALG-3B
WB7FJG	550	SO-ALG-3B
KG7D	360	SO-ALG-3B
K6RJF	1,056	SOFM
K1CT	728	SOFM
AF6GM	660	SOFM
N6DRE	456	SOFM
N6MX	261	SOFM
WO1S	1,092	LM
KC6NKK	551	LM
W6SPR	70	LM
KN6UWK	5,859	UM

Midwest Region

(Dakota, Midwest, Rocky Mountain, and West Gulf Divisions; Manitoba and Saskatchewan Sections)

KCØP/R	11,417	R
NØHZO/R	9,064	R
N5ZY/R	4,182	R
AF4JF/R	1,460	R
WAØCNS/R	952	R
KØLTC/R	1,863	RL
ABØYM/R	1,333	RL
W5OC/R	986	RL
WA5AZQ/R	750	RL
NØLD/R	135,888	RU
ABØRX/R	99,862	RU
KI5VZJ/R	27,712	RU
WØAUS (WØZQ, op)		
	47,088	SOHP
W5PR	30,960	SOHP
K5ND	18,232	SOHP
K5GZR	16,830	SOHP
N5JS	12,702	SOHP
WM5L	27,776	SOLP
N5EKO	19,448	SOLP
WB5TUF	19,240	SOLP
AJ4F	10,033	SOLP
KM5RG	7,935	SOLP
WØGHZ	5,664	SO-ALG-HP
WA5LFD	320	SO-ALG-HP
KAØPQW	5,376	SO-ALG-LP
KAØCRO	1,140	SO-ALG-LP
KBØKQI	220	SO-ALG-LP
AEØEE	84	SO-ALG-LP
AEØG	30	SO-ALG-LP
NØJK	703	SOP
NØSUW	243	SOP
WD5AGO	3,168	SOP-ALG
W5TRL	39,182	SO3B
KFØLKJ	2,336	SO3B
N5UM	1,776	SO3B
KC7QY	1,530	SO3B
NØAT	1,456	SO3B
NØUI	42	SO-ALG-3B
KEØOR	2	SO-ALG-3B
KG5UNK	392	SOFM
K5QE	107,124	LM
WØVB	3,640	LM
NØEO	2,840	LM
WQØP	25,800	UM
KC5MVZ	5,856	UM

Central Region

(Central and Great Lakes Divisions; Ontario East, Ontario North, Ontario South, and Greater Toronto Area Sections)

VE3OIL/R	97,966	R
KA9VVQ/R	34,914	R
W9FZ/R	33,728	R
K9JK/R	444	R
KG9OV/R	28,391	RL
W8ISS/R	1,189	RL
K9CT	40,320	SOHP
VE3WY	20,298	SOHP
W9EWZ	16,000	SOHP
VA3IKE	14,924	SOHP
WA8MCD	14,678	SOHP
K2DRH	123,384	SOLP
K9MU	49,407	SOLP
K9KLD	43,043	SOLP
KA9UVY	28,860	SOLP
W9XT	7,345	SOLP
K2YAZ	15,232	SO-ALG-HP
N9LB	11,766	SO-ALG-HP
K8TQK	3,713	SO-ALG-HP
VE3KG	20	SO-ALG-HP
VE3DS	24,880	SO-ALG-LP
VE3RWJ	1,540	SO-ALG-LP
K8BB	1,125	SO-ALG-LP
N9GH	54	SO-ALG-LP
VE3RVZ	52	SO-ALG-LP
KO9A	59,714	SO3B
K9PW	13,203	SO3B
KA9FOX	9,052	SO3B
WB9TFH	6,360	SO3B
W9AV	4,032	SO3B
N9OBB	285	SO-ALG-3B
WO3X	20	SO-ALG-3B
VA3PHP	24	SOFM
VE3RGO	1	SOFM
W9VW	34,638	LM
K8AEP	108	LM
WD9EXD	75,174	UM
N8GA	72,268	UM
VE3MIS	47,880	UM
N2BJ	25,615	UM

Southeast Region

(Delta, Roanoke, and Southeastern Divisions)

AG4V/R	15,128	R
W5VY/R	7,020	R
KQ4GEX/R	1,176	R
KM4OZH/R	10,976	RL
NV4B/R	63,142	RU
K4CNY/R	7,257	RU
W8BRY/R	4,284	RU
W3IP	52,302	SOHP
K1HTV	24,012	SOHP
K3SK	23,520	SOHP
WA4GPM	16,530	SOHP
N3MK	16,128	SOHP
W4TM	12,560	SOLP
AJ6T	10,400	SOLP
W2UA	10,224	SOLP
KY4G	5,252	SOLP
AA4DD	4,264	SOLP
WB4WXE	3,666	SO-ALG-HP
K4WI	1,312	SO-ALG-HP
W4HLR	850	SO-ALG-HP
N4RA	480	SO-ALG-HP
N1GC	450	SO-ALG-HP
W4RAA	5,016	SO-ALG-LP
KW4G	448	SO-ALG-LP
WA4WZQ	63	SO-ALG-LP
AD4IE	6	SO-ALG-LP
NJ4Q	1	SO-ALG-LP
N2BMN	1	SO-ALG-LP
W4RXR	9,570	SOP
W2QL	432	SOP
N3AWS	4	SOP-ALG
KK4MA	20,768	SO3B
KO4ECD	13,950	SO3B
NS4T	10,349	SO3B
KD4ADC	6,600	SO3B
K3FR	3,850	SO3B
KW4SW	49	SO-ALG-3B
KV4ZY	35	SO-ALG-3B
KI4POT	102	SOFM
WX4DAT	78	SOFM
KQ4CAX	6	SOFM
WB2FKO	6	SOFM
KG5FHU	6	SOFM
AA4ZZ	184,646	LM
W4AD	67,398	LM
N9HF	14,792	LM
NE5BO	6,138	LM
W4NH	49,138	UM

Northeast Region

(New England, Hudson, and Atlantic Divisions; Maritime and Quebec Sections)

K2QO/R	78,516	R
KF2MR/R	73,341	R
KV2X/R	14,196	R
KE2BUY/R	9,009	R
KJ1K/R	2,336	R
AA2SD/R	6,680	RL
KE5HDE/R	1,809	RL
N2SLN/R	17,884	RU
N2XRE/R	3,306	RU
K1TEO	306,606	SOHP
N2JMH	165,066	SOHP
N2NT (N2NC, op)		
	79,846	SOHP
K1KG	46,620	SOHP
WA3DRC	37,520	SOHP
N2WK	83,000	SOLP
NR2C	81,736	SOLP
WB1GQR (W1SJ, op)		
	72,720	SOLP
KA2ENE	41,934	SOLP
N2OA	30,149	SOLP
W2FU	94,612	SO-ALG-HP
WZ1V	49,450	SO-ALG-HP
K1TR	26,896	SO-ALG-HP
WA1PBU	14,720	SO-ALG-HP
KR1ST	8,750	SO-ALG-HP
AF1T	71,853	SO-ALG-LP
WB2JAY	19,108	SO-ALG-LP
AC1J	5,254	SO-ALG-LP
KØSM	3,675	SO-ALG-LP
KD2HZI	3,267	SO-ALG-LP
WX3P	960	SOP
N2MAK	264	SOP
K3GD	210	SOP
KC3UKC	52	SOP
KC2JRQ	9	SOP
WB2AMU	988	SOP-ALG
K2AXX	700	SOP-ALG
NU2H	18	SOP-ALG
NF3R	11,256	SO3B
W3FAY	11,220	SO3B
KD2CDV	8,848	SO3B
NA2NY	7,686	SO3B
W1DYJ	6,897	SO3B
K3SFX	1,430	SO-ALG-3B
N1ZN	1,232	SO-ALG-3B
W1SRH	867	SO-ALG-3B
N1JD	680	SO-ALG-3B
WA3SRU	559	SO-ALG-3B
KB1YNT	306	SOFM
W2EA	84,064	LM
WW2Y	35,046	LM
WA3EKL	22,356	LM
W3SO	22,272	LM
W1XM	9,776	LM
W2SZ	368,896	UM
KD2LGX	52,824	UM
KV1J	48,688	UM
WE1P	48,076	UM
KE1LI	20,000	UM

The next September VHF Contest will be held September 14 – 16, 2024.

Top Ten

Classic Rover

VE3OIL/R	97,966
K2QO/R	78,516
KF2MR/R	73,341
KA9VVQ/R	34,914
W9FZ/R	33,728
AG4V/R	15,128
KV2X/R	14,196
KCØP/R	11,417
NØHZO/R	9,064
KE2BUY/R	9,009

Limited Rover

KG9OV/R	28,391
KM4OZH/R	10,976
N6GP/R	6,902
AA2SD/R	6,680
KA7RRA/R	2,268
KØLTC/R	1,863
KE5HDE/R	1,809
WE7X/R	1,648
NN6U/R	1,406
ABØYM/R	1,333

Unlimited Rover

NØLD/R	135,888
ABØRX/R	99,862
NV4B/R	63,142
KI5VZJ/R	27,712
N2SLN/R	17,884
K4CNY/R	7,257
W8BRY/R	4,284
N2XRE/R	3,306

Single Operator, High Power

K1TEO	306,606
N2JMH	165,066
N2NT (N2NC, op)	79,846
W3IP	52,302
WØAUS (WØZQ, op)	47,088
K1KG	46,620
K9CT	40,320
WA3DRC	37,520
W5PR	30,960
K1HTV	24,012

Single Operator, Low Power

K2DRH	123,384
N2WK	83,000
NR2C	81,736
WB1GQR (W1SJ, op)	72,720
K9MU	49,407
K9KLD	43,043
KA2ENE	41,934
N2OA	30,149
KA9UVY	28,860
WM5L	27,776

Single Operator, Analog Only, High Power

W2FU	94,612
WZ1V	49,450
K1TR	26,896
K2YAZ	15,232
WA1PBU	14,720
N9LB	11,766
KR1ST	8,750
WØGHZ	5,664
K6MI	4,320
W1GHZ	3,772

Single Operator, Analog Only, Low Power

AF1T	71,853
VE3DS	24,880
WB2JAY	19,108
KAØPQW	5,376
AC1J	5,254
W4RAA	5,016
VA7SC	4,060
KØSM	3,675
K2GMY	3,422
KD2HZI	3,267

Single Operator, Portable

W4RXR	9,570
WX3P	960
NØJK	703
W2QL	432
N2MAK	264
NØSUW	243
WQ6D	230
K3GD	210
KC3UKC	52
XE2YWB	35

Single Operator, Portable, Analog Only

W7IMC	4,095
WD5AGO	3,168
W7JET	1,360
WB2AMU	988
K2AXX	700
AA6XA	116
N7JA	68
KG7RQJ	36
NU2H	18
KO6BCW	8

Single Operator, Three-Band

KO9A	59,714
W5TRL	39,182
KK4MA	20,768
KO4ECD	13,950
K9PW	13,203
NF3R	11,256
W3FAY	11,220
NS4T	10,349
KA9FOX	9,052
KD2CDV	8,848

Single Operator, Analog Only, Three-Band

N7QOZ	3,087
K7CX	2,340
K3SFX	1,430
N1ZN	1,232
KN7Y	884
W1SRH	867
N1JD	680
WA3SRU	559
WB7FJG	550
KG7D	360

Single Operator, FM Only

K6RJF	1,056
K1CT	728
AF6GM	660
N6DRE	456
KG5UNK	392
KB1YNT	306
N6MX	261
W6JBR	119
KI4POT	102
WX4DAT	78

Limited Multioperator

AA4ZZ	184,646
K5QE	107,124
W2EA	84,064
W4AD	67,398
WW2Y	35,046
W9VW	34,638
WA3EKL	22,356
W3SO	22,272
N9HF	14,792
W1XM	9,776

Unlimited Multioperator

W2SZ	368,896
WD9EXD	75,174
N8GA	72,268
KD2LGX	52,824
W4NH	49,138
KV1J	48,688
WE1P	48,076
VE3MIS	47,880
WQØP	25,800
N2BJ	25,615

Division Winners

Classic Rover

Atlantic	K2QO/R	78,516
Central	KA9VVQ/R	34,914
Dakota	KCØP/R	11,417
Delta	AG4V/R	15,128
Hudson	KD2TAI/R	1,560
Midwest	N5ZY/R	4,182
New England	KJ1K/R	2,336
Northwestern	WA6OEM/R	1,668
Roanoke	KQ4GEX/R	1,176
Southwestern	KD6EFQ/R	1,649
Canada	VE3OIL/R	97,966

Limited Rover

Atlantic	AA2SD/R	6,680
Central	KG9OV/R	28,391
Dakota	KØLTC/R	1,863
Great Lakes	W8ISS/R	1,189
Northwestern	KA7RRA/R	2,268
Pacific	NN6U/R	1,406
Roanoke	KM4OZH/R	10,976
Rocky Mountain	ABØYM/R	1,333
Southwestern	N6GP/R	6,902
West Gulf	W5OC/R	986
Canada	VA7USD/R	340

Unlimited Rover

Atlantic	N2SLN/R	17,884
Midwest	NØLD/R	135,888
Roanoke	W8BRY/R	4,284
Southeastern	NV4B/R	63,142

Single Operator, High Power

Atlantic	N2JMH	165,066
Central	K9CT	40,320
Dakota	WØAUS (WØZQ, op)	47,088
Delta	W5ZN	5,504
Great Lakes	WA8MCD	14,678
Hudson	N2NT (N2NC, op)	79,846
Midwest	KFØM	6,141
New England	K1TEO	306,606
Northwestern	N7EPD	8,322
Pacific	K6KLY	5,600
Roanoke	W3IP	52,302
Rocky Mountain	KBØNAV	4,180
Southeastern	WA4GPM	16,530
Southwestern	N6UTC	7,018
West Gulf	W5PR	30,960
Canada	VE3WY	20,298

Single Operator, Low Power

Atlantic	N2WK	83,000
Central	K2DRH	123,384
Dakota	KØJJR	1,972
Delta	AJ6T	10,400
Great Lakes	AA8MA	4,416
Hudson	WA2VNV	12,696
Midwest	NØLL	6,097
New England	WB1GQR (W1SJ, op)	72,720
Northwestern	AL1VE	5,920
Pacific	N6ORB	972
Roanoke	K4FJW	3,465
Rocky Mountain	KD5XB	2,904
Southeastern	W4TM	12,560
Southwestern	N7IR	6,192
West Gulf	WM5L	27,776
Canada	VA2IW	8,850

Single Operator, Analog Only, High Power

Atlantic	W2FU	94,612
Central	N9LB	11,766
Dakota	WØGHZ	5,664
Delta	W4HLR	850
Great Lakes	K2YAZ	15,232
Hudson	K2XA	364
New England	WZ1V	49,450
Northwestern	KB7IOG	858
Pacific	K6MI	4,320
Roanoke	N4RA	480
Southeastern	WB4WXE	3,666
West Gulf	WA5LFD	320
Canada	VE7AFZ	616

Single Operator, Analog Only, Low Power

Atlantic	KØSM	3,675
Central	N9GH	54
Dakota	KAØPQW	5,376
Great Lakes	K8BB	1,125
Hudson	WB2JAY	19,108
Midwest	AEØG	30
New England	AF1T	71,853
Northwestern	N7VGO	336
Pacific	K2GMY	3,422
Roanoke	WA4WZQ	63
Rocky Mountain	KBØKQI	220
Southeastern	W4RAA	5,016
Southwestern	K6MUG	960
Canada	VE3DS	24,880

Single Operator, Portable

Atlantic	N2MAK	264
Dakota	NØSUW	243
Delta	W4RXR	9,570
Hudson	WX3P	960
Midwest	NØJK	703
Roanoke	W2QL	432
Southwestern	WQ6D	230

Single Operator, Portable, Analog Only

Atlantic	K2AXX	700
Delta	N3AWS	4
Hudson	WB2AMU	988
Northwestern	W7IMC	4,095
Pacific	AA6XA	116
Southwestern	W7JET	1,360
West Gulf	WD5AGO	3,168

Single Operator, Three-Band

Atlantic	NF3R	11,256
Central	KO9A	59,714
Dakota	KFØLKJ	2,336
Delta	WD5HJF	1,287
Great Lakes	KA8CNI	3,600
Hudson	NA2NY	7,686
Midwest	WØDTM	416
New England	W1DYJ	6,897
Northwestern	WA7PVE	1,309
Pacific	N5KO	189
Roanoke	KK4MA	20,768
Rocky Mountain	KC7QY	1,530
Southeastern	NS4T	10,349
Southwestern	KI6X	848
West Gulf	W5TRL	39,182
Canada	VA2CY	1,848

Single Operator, Analog Only, Three-Band

Atlantic	K3SFX	1,430
Central	N9OBB	285
Dakota	KEØOR	2
Great Lakes	WO3X	20
Hudson	WV2C	112
Midwest	NØUI	42
New England	N1ZN	1,232
Northwestern	N7QOZ	3,087
Pacific	KG7D	360
Roanoke	KV4ZY	35
Southeastern	KW4SW	49
Southwestern	KN7Y	884

Single Operator, FM Only

Delta	KE5WMA	2
New England	KB1YNT	306
Roanoke	KI4POT	102
Southeastern	KG5FHU	6
Southeastern	WB2FKO	6
Southwestern	K6RJF	1,056
West Gulf	KG5UNK	392
Canada	VA3PHP	24

Limited Multioperator

Atlantic	W2EA	84,064
Central	W9VW	34,638
Dakota	NØEO	2,840
Delta	NE5BO	6,138
Great Lakes	K8AEP	108
New England	W1XM	9,776
Roanoke	AA4ZZ	184,646
Rocky Mountain	WØVB	3,640
Southeastern	N9HF	14,792
Southwestern	WO1S	1,092
West Gulf	K5QE	107,124

Unlimited Multioperator

Atlantic	KD2LGX	52,824
Central	WD9EXD	75,174
Great Lakes	N8GA	72,268
Hudson	WE1P	48,076
Midwest	WQØP	25,800
New England	W2SZ	368,896
Southeastern	W4NH	49,138
Southwestern	KN6UWK	5,859
West Gulf	KC5MVZ	5,856
Canada	VE3MIS	47,880

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.

Volunteers On the Air Year in Review

Bart Jahnke, W9JJ, ARRL Radiosport Manager

While the 2023 ARRL Year of the Volunteers celebration and Volunteers On the Air (VOTA) operating activity have concluded, like similar year-long events that have recently come before — such as the 2014 ARRL Centennial, 2016 National Parks on the Air, and 2018 International Grid Chase — the events remain fresh in our minds. They offered fond memories of experiences enjoyed with new and old friends, and meeting and contacting volunteers and prospective volunteers on our many amateur radio bands during the year.

VOTA 2023 provided abundant on-the-air contact opportunities for everyone. There were more than 134 million Logbook of The World (LoTW) contacts uploaded during the year. Of these, more than 835,000 unique call signs from separate participants that were evaluated for scoring were uploaded. LoTW took in more than 72,000 log-file uploads to amass these totals. Talk about awesome numbers!

During 2023, our VOTA activation calendar (**https://contests.arrl.org/docs/2023-VOTA-State-Activations-Schedule.pdf**) reported W1AW portable stations were activated in all 50 states, as well as in Washington, DC,

Top 25 USA

US Rank	Call Sign	Overall Rank	State Rank	QSOs	Points
1	K1RH	1	1 (MD)	24,622	194,096
2	N6PE	7	1 (CA)	19,963	149,376
3	N8HRZ	9	1 (OH)	19,338	147,252
4	W6MSU	10	2 (CA)	29,049	143,016
5	NF3R	11	1 (PA)	23,402	138,270
6	KC5TT	12	1 (TX)	17,027	136,973
7	AC0W	13	1 (MN)	15,579	135,014
8	K8JH	15	1 (MI)	7,247	133,216
9	K7BG	16	1 (SD)	13,619	132,654
10	AI0Y	18	1 (ND)	13,742	129,853
11	K8BL	19	2 (OH)	21,351	129,028
12	WD9HSY	20	1 (IL)	14,649	121,411
13	W8FSM	21	2 (MI)	17,298	120,324
14	N5EKO	25	2 (TX)	10,224	99,283
15	AD7J	27	1 (NV)	6,611	97,254
16	KX8X	29	3 (MI)	15,617	95,469
17	AB8MO	32	3 (OH)	11,877	93,999
18	N8CWU	33	4 (OH)	11,811	93,790
19	AA3B	34	2 (PA)	14,495	92,095
20	W7MY	35	1 (WA)	17,771	92,044
21	N0POH	36	1 (CO)	11,627	91,704
22	N5RZ	38	3 (TX)	12,954	90,064
23	N7UVH	39	1 (ID)	15,597	90,037
24	KV0I	43	1 (NE)	14,345	88,850
25	N4ZZ	44	1 (TN)	14,665	88,632

During the 2023 ARRL 10-Meter Contest held on December 9 – 10, 2023, ARRL staff put in an extra checklog effort for the event at the Hiram Percy Maxim Memorial Station, W1AW, giving out CW and Phone VOTA contacts with a focus on working Technician-class licensees. Pictured are ARRL CEO David Minster, NA2AA (front); ARRL Development Associate Mimi Guerrat, KC1TJW (center), and ARRL Radiosport Manager Bart Jahnke, W9JJ (rear). [Sierra Harrop, W5DX, photo]

Top 25 DX

Overall Rank	Call Sign	QSOs	Points
1	PJ2T	28,477	183,776
2	ZF1A	23,542	154,180
3	TN8K	23,178	133,481
4	8P5A	20,384	130,756
5	CN3A	17,409	109,757
6	CR6K	16,528	107,178
7	CY0S	17,366	104,751
8	PJ4K	15,510	98,483
9	E7DX	13,968	96,948
10	OM2VL	14,164	94,420
11	ZF5T	12,528	90,473
12	VA6RCN	12,273	89,987
13	ED1R	13,235	89,446
14	US2YW	15,612	87,077
15	5W1SA	18,191	86,606
16	LN8W	12,203	85,393
17	CT1ILT	12,567	83,397
18	3B7M	15,178	81,721
19	E51D	13,001	81,518
20	TM7A	11,750	80,979
21	TI7W	11,745	80,514
22	II2S	11,542	79,721
23	P40L	12,190	79,424
24	V31DL	17,353	78,732
25	F6AGM	11,662	78,276

Participants by Point Value Category		
Volunteer or Staff Position	**Points per Contact**	**Number of Activators**
ARRL President	300	1
Past President/President Emeritus	275	3
Vice President/Honorary Vice President	250	10
Director/Director Emeritus/Past Vice President	225	23
Vice Director	200	13
Section Manager	175	71
Staff Officer/Treasurer/Counsel/Past Director	150	27
Past Vice Director	125	28
ARRL Headquarters Station W1AW/Past Section Manager/Charter Life Member	100	146
ARRL Headquarters Department Manager	75	12
ARRL Headquarters Staff Member/ ARRL Headquarters Volunteer/Maxim Society Member	50	237
CAC/DXAC/ECAC Advisory Committee Member/Assistant Director	40	178
Direction Finding Coordinator/Assistant Section Manager/Electromagnetic Compatibility Committee/LoTW Committee/Public Relations Committee/RF Safety Committee/Youth Committee	35	185
Affiliated Club Coordinator/District Emergency Coordinator/*NCJ* Editor/ Public Information Coordinator/*QST* Columnist/State Government Liaison/ Section Traffic Manager/Section Youth Coordinator/Technical Coordinator	30	618
Diamond Club Member/W1INF-W1HQ ARRL Lab Museum Operation/District Emergency Coordinator	25	822
Contest Content Manager/Log Checker/Incoming QSL Bureau Manager	20	18
Volunteer Counsel/Volunteer Consulting Engineer	15	126
Area Digital Coordinator/Assistant District Emergency Coordinator/Area Net Manager/Assistant Section Emergency Coordinator/Assistant Section Traffic Manager/Bulletin Manager/ Emergency Coordinator/Local Government Liaison/Official Bulletin Station/ Official Emergency Station/Official Relay Station/Public Information Officer/ Region Net Manager/Transcontinental Corps Director/Technical Specialist	12	2,306
Technical Advisor	10	19
W1AW portable around the USA (work each state twice)/Awards Manager/ Card Checker/Registered Instructor/ Volunteer Examiner	5	15,844
Incoming QSL Bureau Sorter	3	119
ARRL Life Member	2	6,388
ARRL Member	1	51,528

ARRL Northwestern Division Director Mike Ritz, W7VO, had his station ready for VOTA 2023. His station and team were fired up to operate the ARRL International DX Phone Contest on March 4 – 5, 2023. Mike exclaimed, "Time to start getting radio Scappoose, Oregon ready for ARRL DX Phone this weekend. We'll be running MSHP signing W7VO, and we will also be running a second station devoted to ARRL Volunteers on the Air (VOTA), also as W7VO. We're worth 225 points, so come get us!" [Mike Ritz, W7VO, photo]

Puerto Rico, and American Samoa. Each state was activated twice, which resulted in more than 426,000 contacts by all W1AW portable stations. Thank you to all the coordinators and operators who manned these week-long activations.

Leaderboard and Certificates

As the year and event proceeded, we added a point value lookup page that was updated regularly to view how participants' scores were accumulating (**https://vota.arrl.org/callPoints.php**). Next, we introduced online participation certificates for all ARRL members who participated. If you haven't received one yet, enter your call sign at **https://vota.arrl.org/certificates.php** to display a certificate that includes your numbers for overall rank, total score, total QSOs, US or DX rank, and state rank (for US participants) for printing. Log in using your LoTW credentials at **https://vota.arrl.org/my-info.php** for more details. Later we added a Worked All W1AW Portable States certificate for those who contacted all 50 states.

See the VOTA home page at **https://vota.arrl.org/index.php** for the top participant results and additional statistics. Thank you to everyone who participated in the 2023 yearlong event, and a special thank you to all who volunteer on ARRL's behalf!

Mike Walters, W8ZY, mwalters@arrl.org

Club Station

Solutions for Rejuvenating Your Club's Library

The Tamiami Amateur Radio Club (TARC), W4AC, in Nokomis, Florida, knew they needed to update their club's library, but TARC Board of Director (BOD) member Brian M. Jacobson, W1JBD, had something bigger in mind. In this month's column, W1JBD explains how TARC's library grew to include the resources of the entire county's library system.

In 2022, TARC President Paul Nienaber, KN4BAR, was mulling over some project ideas for the club. He asked me which one I would like to take on, and I chose the task of updating the old library.

Prior to my joining TARC, it had a small internal library that consisted of books to help you study for your radio license, a few handbooks for communications, an assortment of project books, and a couple of books about electronics theory. Members could borrow the books from the club library for a defined amount of time, then return them for others to use.

At TARC's inaugural Ham Radio Day at the Library event, Bob Schneider, W5GJ; Jeff Staple, KO4AEA, and two library patrons spoke with visitors about ham radio and the new resources available through the SCLS. [Dwight Sullivan, KT4DDS, photo]

A Community Partnership

Paul and I discussed our ongoing relationship with the William H. Jervey, Jr. Venice Public Library, where we held ARRL Volunteer Examiner (VE) sessions on the second Saturday of every month. I met with the library's manager, Katie Dow, and a new collaboration between TARC and the Sarasota County Library System (SCLS) — an organization of 10 local libraries within Sarasota County — was born.

The SCLS has an extensive online system that allows people to search for books on the internet. If the book isn't at the library closest to the customer, it can be ordered from another branch for pickup at the local library.

Several club members told me that they've visited libraries in Sarasota County to look for project information and books on upgrading their license, or even just to sit in a comfortable chair and read a library copy of *QST*. This told me that in addition to the library system and Sarasota County residents, our own club members would benefit from the library collaboration as well.

Program Funding

I presented a proposal to the club's BOD that involved purchasing 43 books on various ham radio subjects, such as exam study materials, projects, and antenna systems, as well as various editions of *The ARRL Operating Manual for Radio Amateurs* and the 100th edition of *The ARRL Handbook for Radio Communications* (read the sidebar "Donate the ARRL Library Book Set" for more information about donating books). I proposed that these books be donated to the SCLS for distribution to the 10 libraries within the system, not just the library that was local to the club, and that we update any expiring books (such as exam practice books) each year.

Prior to the BOD meeting, I learned of the ARRL Foundation Club Grant Program for ARRL Affiliated Clubs (**www.arrl.org/club-grant-program**), and that the current submission deadline was 3 weeks away. The Board approved the proposal at the meeting, and I was able to submit the grant application on time — it was approved!

While I waited for ARRL's response to our grant application, I spoke with other BOD members about what a public fundraising operation would encompass. Sarasota County and the surrounding areas are home to many retired hams and other technology specialists who have a peripheral interest in helping our hobby stay alive. For example, club member Tony DiCenzo, KX1G, offered to donate a second copy of the 100th edition of *The ARRL Handbook*, which

Donate the ARRL Library Book Set

ARRL Affiliated Clubs and members who wish to gift or donate books to a local library, school, or classroom can do so with ease via ARRL's Library Book Set. For a special price of $250, the set includes the most popular ARRL publications, such as ARRL license manuals, *The ARRL Handbook*, and *The ARRL Antenna Book for Radio Communications*, among others. These publications and resources will encourage potential new amateur radio operators from among students, youth, and the wider community, while also providing support to current licensees who are library users. A complete description of the program, including the books and details for ordering, is available at **www.arrl.org/Library-Book-Set**.

The Jackson Amateur Radio Club (JARC) donated two complete sets of ARRL books and posters to the Madison County Library System (MCLS) in Canton, Mississippi. JARC President Jim Armstrong, AK5J (far left), and ARRL Delta Division Assistant Director Frank Howell, K4FMH (far right), are shown presenting the books with MCLS staff. [Frank Howell, K4FMH, photo]

raised the total to 44 books. We're beyond grateful for this kind of generosity and kindness that provides others in the community with information they might not be able to locate otherwise.

Additionally, the profits made from selling donated ham radio equipment at hamfests could generate enough money for this type of project. TARC produces $1,000 to $3,000 each year from this activity — in 2023, we raised more than $10,000!

Everyone Benefits

As part of TARC's library program, we wanted to host an event commemorating our book donations and our continuing promise of service to the library and the community as a whole. On October 14, 2023, we hosted the inaugural Ham Radio Day at the Library event. TARC Information Officer Dwight Sullivan, KT4DDS, put together a program to inform Sarasota County residents of the event, and we had two fully equipped stations in tents operating as special event station N4V to demonstrate ham radio to the public and let them know of the new resources available at the library. We had a successful turnout, and we look forward to hosting this event annually!

We've learned that the amount of ham radio information that's available to the public is indicative of the number of people who contact us to earn their license or to upgrade, or who wish to reach out and support the community they live in. The community benefits because the library system has a new stock of current books available to anyone who has an interest in ham radio, and the club benefits from community members contacting them for more information, looking to take exams with our VE team, and potentially becoming club members.

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 January 29, 2024.

New SSCs

Western Carolina ARS — Murphy Chapter, WC4NC	Murphy, NC
Valley Radio Club of Oregon, W7PXL	Eugene, OR

Renewing SSCs

Kanawha ARC, W8GK	Charleston, WV
Medina 2 Meter Group, W8EOC	Brunswick, OH
Columbia ARC, W4CAE	Columbia, SC
Smoky Mountain ARC, W4OLB	Maryville, TN
York County ARS, K4YTZ	Rock Hill, SC
Sumter ARA, W4GL	Sumter, SC
Sandusky Valley ARC, W8NCK	Fremont, OH
Meriden ARC, W1NRG	Wallingford, CT
Montgomery ARC, W4AP	Montgomery, AL
Cape Ann ARA, W1GLO	Gloucester, MA
Acadiana ARA, W5DDL	Lafayette, LA

Steve Goodgame, K5ATA, sgoodgame@arrl.org

Ham Media Playlist

TheSmokinApe — A Ham of Mystery

YouTubers often personalize their channels in some way. Some have little sayings they toss out from time to time; others are known for the amount of coffee they consume. In the case of TheSmokinApe, he never says who he is. Sure, Ape is real, and he is, in fact, a licensed amateur radio operator. But beyond that, most of his viewers don't know who he is, where he hails from, or his call sign.

I first met Ape several years ago when I was teaching amateur radio in school and attempting to fund it through my relatively small YouTube channel. Ape's channel (**www.youtube.com/@TheSmokinApe**) was significantly larger than mine and, as such, had a much larger reach. Like other HamTubers, Ape saw what I was trying to do for kids and stepped up to help. We began hosting a weekly show on YouTube talking about ham radio, getting kids on the air, and projects we were working on. It involved significant work on Ape's part, and he was happy to do it. Ape has been a stalwart supporter of getting kids engaged in amateur radio for as long as I have known him.

Swinging Over to Amateur Radio

Let's start with the proverbial elephant in the room. Why is his channel called "TheSmokinApe," and why does he go by "Ape"? His name harkens back to his younger days when he and his friends had silly nicknames for each other. Ape's nickname, as you might have guessed, was "Ape." When creating his YouTube channel, Ape combined his nickname with his other loves (cigars and smoking meats). Thus, TheSmokinApe was born. Ape created his YouTube channel before becoming a ham and, at the time, focused on various hobbies and projects he was working on. As his interest in radio grew, his channel slowly transitioned to being mostly radio-related.

Ape was introduced to radio in high school. In the 1980s, he and his friends wanted a way to communicate with each other, so they purchased CB radios and installed them in their vehicles. Over time, Ape's interest in CB radio waxed and waned, but he always found enjoyment in some sort of radio. He tinkered with scanners to monitor public service traffic, SDRs, and more.

Ape wanted to learn more about self-sufficient, grid-independent communications, and discovered amateur radio. He and several friends purchased the *ARRL Ham Radio License Manual* and some handheld radios. Once licensed, he learned how to program them and became known as the technical guy.

Ape didn't have an in-person mentor. Instead, he learned from a combination of ARRL publications and a group of YouTubers such as Randy Hall, K7AGE; Dave Casler, KEØOG, and Stan Gibilisco, W1GV (SK).

Digging into the Technical Aspects of Ham Radio

Ape regularly found himself frustrated that topics he wanted to learn more about were often the most difficult to find good information on. As he dug deeper into some of those topics, he slowly figured out that many hams were in a similar situation. Ape recalls having bought a radio and looking for videos about the more technical aspects of the radio. Instead, he found many unboxing videos and even some that talked briefly about the features, but nothing about functionality or testing of the radio. As a result, Ape started filming when tinkering with new gear, and posting the results to YouTube.

Hams often have very specific questions about how to program a radio. Sometimes, they ask about how to change modes; other times they want to know how to program the buttons to do different things. In Ape's

Ape walks viewers through the process of custom programming the microphone buttons on the Yaesu FTM-500D.

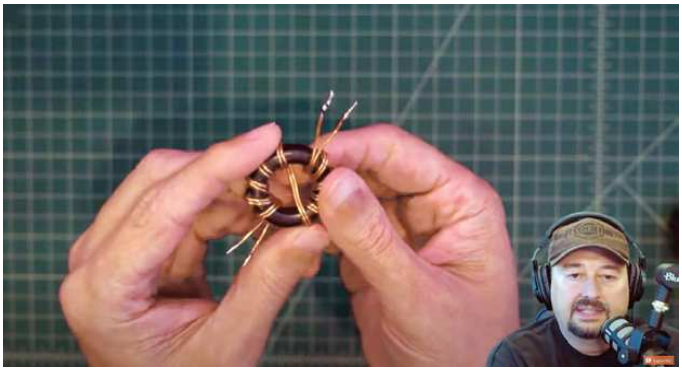
video titled “Yaesu FTM-500D – Programmable Buttons” (**http://tinyurl.com/ape-ftm500d**), Ape shows how to access the menu on the radio. He then discusses what some of the various buttons are preprogrammed to do. He also steps through custom programming options on the radio. The main focus of the video is the face of the radio itself.

Ape also participates in a YouTube show called “Coffee and Ham Radios” with Chuck Thompson, KK6USY; Steve McGrane, KM9G, and Jim Perry, WT1W (**www.youtube.com/@CoffeeandHamRadios**). This show airs multiple times a week and ranges in topics from technical aspects of the hobby to interviewing other hams. It is generally formatted like a talk show. Many viewers enjoy this format because Ape and the other hosts usually interact with viewers throughout the show. “Coffee and Ham Radios” has supported getting youth on the air through donating gear to classrooms as well as helping to raise funds for the ARRL Teachers Institute.

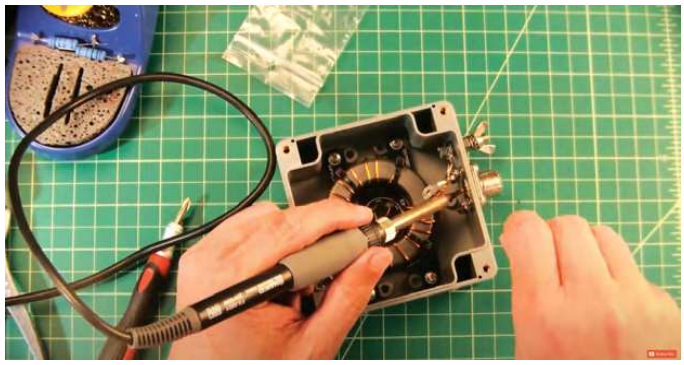
Chokes, Antennas, and More

Ape loves to get technical but isn’t without a sense of humor. He is infamous for some of his intentional mispronunciations, but it doesn’t diminish the quality of his instruction. A commonly misunderstood piece of equipment in amateur radio is a balun choke. Many hams use them, but not nearly as many understand how they actually work. In Ape’s video “Balun Chokes – How do they work?” (**http://tinyurl.com/Ape-Choke**), Ape takes the time to explain what a toroid is and how it works, and shows some testing using relatively inexpensive equipment available to hams.

As we all know, hams love antennas, and Ape’s viewers are no different. His most popular videos usually involve antenna design or antenna building. In fact, his video on the ARRL End-Fed Half-Wave Antenna Kit, titled “ARRL End Fed Antenna Build – Ham Radio” (**http://tinyurl.com/ape-efhw**), is the most viewed YouTube video on this antenna build. If you want to go along with Ape on this build, you can pick up a kit at **http://tinyurl.com/ARRL-EFHW**. Ape begins by showing the instructions, then quickly moves on to unboxing and explaining the various components in the package. He then shows the process of drilling the box, winding the toroid, and mounting it. One of the nicest things about Ape’s video is that he explains every little step, even those often missed by other videos, such as removing the enamel from magnet wire, testing for continuity before mounting in the box, etc.



TheSmokinApe explains what toroids are and how they work.



Ape steps viewers through the build process of the ARRL End-Fed Half-Wave Antenna Kit.

Having known Ape for many years, I do know his call sign. He is a great guy who goes out of his way to help others grow in amateur radio. He has been known to be spotted at some of the larger hamfests, such as Orlando Hamcation and Dayton Hamvention, so if you’re lucky, you may be able to spot him in the wild. Whatever your questions are about amateur radio, Ape is likely to have a video answering it, so head over to his YouTube channel and check it out.

Feedback

In “The Un-Ugly Balun Form” by John Portune, W6NBC, and Jim Bailey, W6OEK, in the February 2024 issue, it was incorrectly stated that an ugly balun can be used to cover several higher frequency bands than the one for which it was designed. Due to self-resonance of the balun windings, the frequency range is limited to one or two higher frequency bands at most. Additionally, 3D-printer files that will assist with the build are now accessible on *QST* in Depth (**www.arrl.org/qst-in-depth**).

Bernie McClenny, W3UR, w3ur@arrl.org

How's DX?

A5 — Bhutan

Bhutan, a primarily Buddhist kingdom in the Himalayas, was on the original 1947 postwar DXCC list. The first on-air activity from Bhutan was by Chhawna, AC5PN, in 1955.

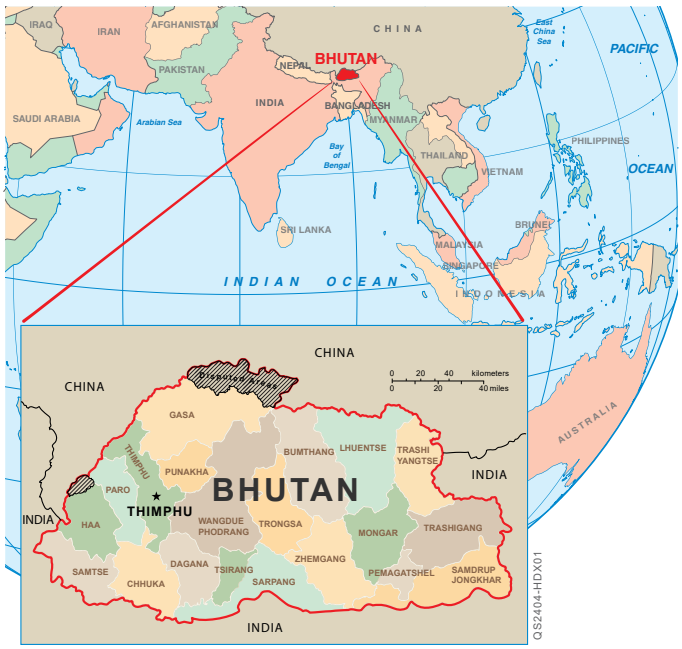
Seven years later, members of the Amateur Radio Society of India activated VU2US/AC5 in April 1962. The operators were in the Indian Army and set up near the Bhutan/Indian border. The team included Lt. General K. Umrao Singh, VU2US; Brigadier Ram Z. Kabraji, VU2BK; Colonel P. S. Gill, VU2PS, and Captain T. A. "Ram" Ramakrishan, VU2TN. Famous DXpeditioner Gus Browning, W4BPD, was there in 1963. Thanks to Chhawna, he was able to get the call signs AC5A and AC7A.

In 1965, Gus was back in Bhutan, operating from multiple locations as ACØH (Chukha Dzong), AC1H (Zhongar Dzong), AC2H (Wangdue Phodrang), AC5H (Tashichho Dzong), AC6H (Dukey Dzong), AC7H (Phuentsholing), AC8H (Chamaphu Dzong), and AC9H (Dechen-Choling).

Bhutan switched to the A5 prefix in the early 1970s, as the US was assigned the AA – AL prefixes at that time. In 1972, Venkat, VU2KV, conducted a DXpedition to Thimphu as A51KV. In the 1970s and 1980s, Pradhan, A51PN (not to be confused with AC5PN), operated from Bhutan's capital.

Bhutan was still rare by the 1990s. Thanks to the persistence of Jim Smith, VK9NS (SK), A51JS was on the air from the kingdom in spring 1990. While there, he met up with Yonten, AC5TY, and Pradhan. In February 1995, Zorro Miyazawa, JH1AJT (SK); Mitty Yokota, JE1OMO; Jin Fujiwara, JF1IST, and Victor, JR6GV (SK), were active as A51/JH1AJT.

By the turn of the next century, Bhutan was on the air much more frequently. May 2000 started off with the 10-day A52A DXpedition by an international team of 15. They made a total of 82,087 contacts; 25,039 of them were unique call signs. The A52A team included James Brooks, 9V1YC; Yuji Yoshitani, JA3IG; Mac Shimamoto, JA3USA; Jin Fujiwara, JF1IST; Al Hernandez, K3VN; Bob Allphin, K4UEE (SK); Mark Johnson, NØMJ; Don Greenbaum, N1DG; Jari Jussila, OH2BU; Mark Demeuleneere, ON4WW; Harry Buklan, RA3AUU; Andy Chesnokov, UA3AB; Glenn Johnson, WØGJ; Wes Lamboley, W3WL, and Vince Thompson, K5VT (SK). Jim Smith was there again in May 2000, but he operated as A52JS. In July of the same year, Sam, JA6NL, was active in Bhutan as A52NL, and a French DX team later operated there as



A map of Bhutan, which currently ranks number 69 on Club Log's DXCC Most Wanted List.

A52FH. Hirotaro Tsukahara, JA1PCY (SK), subsequently put A52XX on the air, and Charly, K4VUD/HSØZCW, concluded 2020 with an operation as A52UD.

The next year, Dimitri, UA9CO, was active as A52CO; Dave Anderson, K4SV, was A52DA, and Ken Nollet, KØEN, was A52ED. Melissa Holcomb, NØMAJ/K1MJ (A52YL); Glenn Johnson, WØGJ (A52GJ); Vivien Johnson, KL7YL (A52VJ); Mark Johnson, NØMJ (A52MJ), and Paul Johnson, WØPJ (A52PJ), were active in Bhutan as well.

Finishing the first decade in the new millennium were A52CDX and A5100A (both by the Clipperton DX Club), as well as A52SY (by Harvey Vanhauwaert, ON5SY).

Zorro returned to Bhutan with friends in 2012, 2016, 2017, 2018, and 2019 to operate as A5A, A5B, and A5ØBOC. During his 2018 and 2019 trips, he met with Prince Dasho Jigyel Ugyen Wangchuck. Other operations during this decade include A51IVU (2014), A52JR (2014), A52BH (2018), A52UR (2019), and A52UB (2019).

This decade, there have been two activations: A52CC in 2021 and A52AA in 2023. Despite all of these operations, Bhutan currently ranks number 69 worldwide on Club Log's DXCC Most Wanted List. It is number 30 throughout North America and number 23 in the western half of North America, specifically.

Upcoming Bhutan DXpedition

In early January 2024, Polish DXpeditioners Janusz Wegrzyn, SP9FIH, and Les Przybylak, SP6CIK, an-

nounced their plans for a 2024 DXpedition to Bhutan. They will be operating from April 19 to May 4 using the call signs A52P and A52CI, respectively. Finding a location with good short-path openings to North America, Europe, and Japan has not been easy for the duo because of Bhutan's mountains and deep valleys. Also at play is the "high level of electromagnetic interference in the valleys," according to Janusz. They chose to set up at the Dochula Eco Retreat and will be operating at "3,070 meters above sea level." This location should be great for hams in North America, Europe, and Japan via short path, but not so great via long path to North America, as that path crosses a mountain range near the team's hotel. This will be an excellent chance for those who need to work Bhutan for an all-time new one; Janusz likes to pick a band and stay on it for a week or so to maximize unique contacts. For more information about this DXpedition, visit **www.a5.dxpeditions.org**.

DX News from Around the World

ZC4 — UK Sovereign Bases on Cyprus

It's been more than 30 years since Adrian, GØKOM, was last active as ZC4MK from the UK Sovereign Bases on the island of Cyprus. He recently had his license renewed, and it will be valid through March 2025. This year, Adrian is planning to be there from March 26 to April 2, which will coincide with the single sideband (SSB) portion of the CQ World Wide (CQ WW) WPX Contest. He said his "equipment will be simple" with an Icom IC-706MKIIG or IC-7000, a DX Commander Expedition vertical, and a hexbeam. Adrian's operating location will be Melanda Beach, Avdimou. He hopes to go again this summer for 6-meter E-skip season. He'll be leaving equipment behind for future visits — he also plans to acquire a five-element Yagi for 50 MHz. Contacts will be uploaded to Club Log, and he will use OQRS. Once he's back home, contacts will be uploaded to Logbook of The World. Adrian is planning next year's 10-day operation in the Sovereign Bases for March, which will again align with the SSB portion of the CQ WW WPX Contest.

J8 — St. Vincent and the Grenadines

Kevin Thomas, W1DED, is going back to Bequia for his third J8NKI operation. He'll be there from March 23 to April 1, which is at the same time as the CQ WW WPX Contest. Check out Kevin's YouTube channel, W1DED WW Ham Radio.

FO/A — The Austral Islands

Haru Uchida, JA1XGI, is planning to be active from Raivavae as TX5XG from March 27 to April 3. He has a web page at **https://australvacation.amebaownd.com**.

Change of Plans

In the March 2024 "How's DX?" column, an announcement was made about veteran DXpeditioner Hrane Milosevic, YT1AD, and his crew heading to the Pacific, with the focus on a DXpedition to Tokelau between February 7 and March 1. In the time since that issue went to press, Hrane announced a change of plans. They have to postpone the DXpedition until later this year or early next year. Instead, they plan to be in Fiji (3D2), Samoa (5W), and Tonga (A3) this year.

Wrap-Up

That's it for this month, with thanks to Bob, KD1CT; Les, SP6CIK; Janusz, SP9FIH; Bill, W4ZV; Hrane, YT1AD, and The Daily DX (**www.dailydx.com**) for helping to make this month's column possible. You can follow The Daily DX on X (@dailydx). If you have any DX, Islands on the Air, or contest expedition news, photos, or newsletters, please send them to **bernie@dailydx.com**. Until next month, see you in the pileups! — *Bernie, W3UR*

Strays

Radio Club d'Haiti Celebrates their 75th Anniversary

On March 26, 2023, the Radio Club d'Haiti (RCH) celebrated its 75th anniversary at the Karibe Convention Center in Pétion-Ville, Haiti.

The RCH was founded in Port-au-Prince in 1948 to bring together radio enthusiasts throughout the country. Its purposes include the development and coordination of experimental research of its members, increasing the spirit of camaraderie among amateur radio operators and IARU member nations, providing services to the community, especially in times of regional or national natural disasters, and ensuring that its members comply with national and international laws governing radio communications. As it moves to the future, the RCH and its members look forward to continuing their service to the citizens of Haiti and the international community. — *Chris Patterson, W3CMP/HH2M*

President of the Radio Club d'Haiti Jean-Robert Gaillard, HH2JR (left), and Directeur Général du Conseil National des Télécommunications Joses Jean-Baptiste (right) signing the Memorandum of Understanding for training future amateur radio operators.

Jon Jones, NØJK, n0jk@arrl.org

Sporadic E Rocks ARRL January VHF Contest

The 2023 – 2024 winter Northern Hemisphere sporadic-E season had been lackluster throughout mid-January. The ARRL January VHF contest was scheduled for the weekend of January 20 – 21, and many entrants had low expectations for the band conditions. That outlook changed as strong, widespread E_s openings appeared, along with transequatorial propagation (TEP) starting in the evening on January 20 (21 UTC). Ron, K3FR (FM18), noted CO2QU (EL83) and CO7MS (FL01). From Kansas, KFØM (EM17), and I, NØJK (EM28), had E_s to Mexico, with XE2YWH (DL92), XE2N (DL95), and 6D5C (DL80) in for us after 0030Z on 50.313 MHz. The E_s center allowed a cross path for stations in the southeast states as well as Texas and Louisiana, in turn creating an E_s link to the South Pacific. Tim, W5TRL (EM10), said he had "near-pipeline conditions, netting 51 contacts with stations in Chatham Island, [mainland] New Zealand, and Australia." The westernmost Australian stations that he worked were "VK5RM and VK5BC, both in PF95." The K5QE (EM31) contest station in EM31 also contacted stations in Australia. Alton, N4IDH (EM71), worked ZL1RS using 100 W and a Moxon antenna elevated 10 feet. Rich, K1HTV (FM18), worked four New Zealand stations. The Australian operators later had an opening to Europe, as many VK3 stations worked those in Austria, France, and Italy at around 0900Z.

The next day, there was widespread E_s on 6 meters all day across the continental US. N7GP/R was active on Sunday afternoon from several rare Arizona Fred Fish Memorial Award (FFMA) grids, including the rare DM31. I noted strong E_s from Kansas to the western US states. At 1926Z, Mike, VP8NO (GD18), worked W7FN (CN88)! At 2322Z, Larry Lambert, NØLL (EM09), logged ZL1AKW. Paul, WGØG (EN35), worked ZL1AKW a few minutes later. W4ATM (EL98) worked ZL1RS at 0115Z. The E_s continued into the evening, extending northwest from Kansas to Washington state, which allowed me to work K7CW (CN87); it is a difficult path that is between single- and double-hop range. At the end of the contest (0359Z), Lance Collister, W7GJ (DN27), worked PY2XB (GG66). Many consider this to be one of the best-ever January VHF contest E_s openings.

TX5S Covers VHF/UHF and Microwave Bands

"Thanks to the skill of Andreas, N6NU, the [TX5S] group provided a varied selection for VHF/UHF/microwave enthusiasts," said the team that conducted the recent TX5S DXpedition to Clipperton Island. On January 22, they reported making contacts on 6 meters. TX5S was in to North America via sporadic E starting at around 0100Z on January 23. They started on Q65 mode on 50.189 MHz to make Earth-Moon-Earth (EME) contacts, and then they switched to FT8 Fox and Hound mode. TX5S worked K2DRH (EN41), W3IP (FM19), KA9CFD (EN40), KA9FOX (EN43), and others on FT8. Scott, KA9FOX, first copied TX5S on Q65 mode. On January 23, they worked stations in South America and the South Pacific on 50.313 MHz. The following day, TX5S logged a few stations in Texas. WQØP (EM19) and I decoded TX5S (at –18 dB) on 50.313 MHz at 2321Z on January 25. Dave, KJ9I; Lance, W7GJ, and Tim, NØTB, reported making EME contacts with TX5S. The team used the effective AG6EE portable EME array on 50 MHz. They were also on 1296 MHz EME and satellite IO-117 on 435.310 MHz. The Club Log TX5S report is as follows: 209 contacts on 50 MHz FT8, 17 contacts via 70-centimeter EME, 2 contacts on MFSK, 515 contacts via packet radio, and 57 contacts via 23-centimeter EME. They worked 13 countries on 6-meter FT8.

Quadrantid Meteor Shower

During the Quadrantid meteor shower on January 4, Larry Lambert, NØLL, operated portable on 6 meters from DM89. He made 43 MSK144 contacts, and his contact with WA4CQG (EM72) was his farthest, at a distance of 1,800 kilometers. The shower peak was predicted to be around 1300Z on January 4, but many operators noted that the peak seemed to occur at around 1900Z. Jay, NY2NY (FN30), noted strong signals from K2DRH (EN41), AC4TO (EM70), and others on 6 meters. Sid, K3SX (FM19), reported good conditions on 2 meters.

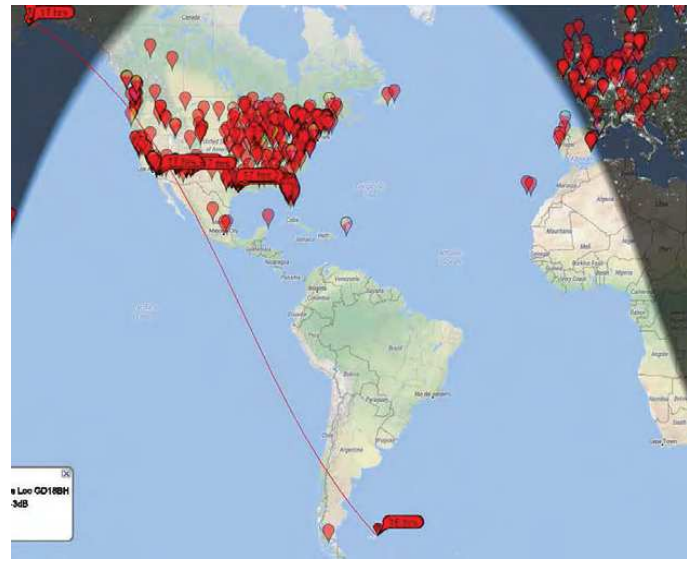
On the Bands

50 MHz. Brad, WF7T (EM66); Dave, N9HF (EL99), and Jim, K5ND (EM12), reported working ZL7DX on January 6 at around 0100Z. N9HF and W3LPL (FM19) worked ZL1RS on January 10. Ron, K3FR, had strong E_s to NØFJP (EN34) on January 12. Two days later, Frank, W3LPL, observed F2 to G8BCG and F4VPC. He said, "Reliable North Atlantic and North Pacific 6-meter F2 needs the solar flux to persist well above 200 for a few days."

There was a strong and long-lasting opening from North America to New Zealand on January 16 – 17. Paul, NOØT (DN70), reported "multiple ZLs and ZL7DX." Rich, K1HTV (FM19), worked TG9AJR (FK44) and had a PSK flag from ZL7DX. I, NØJK, copied ZL7DX working WZ9W (EM39) at 0006Z on January 17. Tim, W5TRL (EM10), made 11 New Zealand contacts. K5ND logged ZL2WHO (RE79) and ZL3AAD (RE68). Pete, K5CPR (EM13), worked three New Zealand stations. Bob, ZL1RS, made many North American contacts, including one with KDØPO in rare grid EM24. Bob said he now has 245 out of the 488 grids needed for the FFMA award! John, KFØM (EM17), said KCØY (EM17) worked ZL7DX at 0034Z. John arrived home too late to work ZL7DX himself, but he logged stations in Mexico as well as ZL3OY and ZL3WO.

From Guatemala, Juan, TG9AJR, had New Zealand in and noted a strong opening to Hawaii on January 16 – 17. He said he "worked KH6HI, NH6JC, NH6Y, and KH6TU on FT8, but also managed to make a nice contact with NH6JC on single sideband (SSB)." Jay, KØGU, noted "massive" E_s across North America that evening, so it is likely that there was an E_s-to-TEP mode of propagation. On January 18, there was F2 to Europe for the US east coast. Nelson, KD2CYU (FN20), had stations in Ireland, France, England, Northern Ireland, and Scotland in to his location, as well as the rare TF2MSN. N9PGG (FM05) worked TF2MSN at 1529Z.

Sporadic E continued into the week after the January VHF contest. In the afternoon on January 22, Bob, K2DRH (EN41), caught ZL7DX during a 5-minute opening at 2249Z. He mentioned that ZL7DX was operating his station remotely. KL7J and KL7HBK in Alaska were in to south Texas at around 2300Z. The propagation mode is unclear, but it was late in the afternoon for F2. I had E_s to British Columbia at the time. Mike, VP8NO (GD18), worked KL7J (BP40) at 2250Z — a 14,942-kilometer path. In the morning on January 23, there was sporadic E from Kansas to Arizona and Montana. At 1826 UTC, NØLL worked ZL7DX at 1801Z during a brief opening. This was very early for a South Pacific-to-North America path on 6 meters.



The PSK flags demonstrating the distance between Michael Harris, VP8NO, and Les Buchholz, KL7J. Mike worked Les at 2250Z on January 22, 2024. [**www.pskreporter.info/pskmap**]

On January 25, I, NØJK, logged XE2KK (DL96), XE1XJB (EK09), and XE1EE (DL90). In the morning on January 31, Robert, 3B9FR, was in to North America. Phil, NØPB (EM39), worked 3B9FR at 1433Z during a 2-minute opening. Phil said the contact was "total luck, I think."

144 MHz. Jim, K5ND (EM12), worked W9RM (DM58) on MSK144 and a station in EL08 via tropospheric propagation during the January VHF contest. It was a new grid for him. Sam, K5SW (EM25), worked WB5ZDP (EM13) on CW. Despite widespread — and some short — E_s on 6 meters, I received no reports of 2-meter sporadic E.

1296 MHz. The 2023 DUBUS EME 1296 MHz Contest results are in. The top five winners were OK2DL, KØPRT, OK1DFC, G4CCH, and PA3DZL. This contest is CW and SSB, not digital. The next DUBUS EME 1296 MHz contest is scheduled for May 10, 2024, and it will start at 0000 UTC and end at 2359 UTC on May 12. You can read the contest announcement at **www.marsport.org.uk/dubus/emecontest2024.pdf**.

Here and There

Ray, W9VHF, has a nearly complete collection of the *50 MHz DX Bulletin*. The bulletin was started by Harry Schools, KA3B, in 1990. He is willing to ship them to anyone who is interested in taking them. Ray can be emailed at **ray@w9vhf.com**.

The 2024 Central States VHF Society Conference will be held in Cedar Rapids, Iowa, on July 25 – 28. More information about the conference can be found at **www.csvhfs.org**.

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

Alabama (Mobile) — Apr. 27 D F H Q R S V
8 AM – 2 PM. *Spr:* Mobile ARC. Greater Gulf State Fairgrounds, 1035 Cody Rd. N. *Tl:* 146.940. *Adm:* $7. **www.w4iax.net**

Arizona (Prescott Valley) — Apr. 20 D H R T
8 AM – noon. *Spr:* Amateur Radio Council of Arizona. Granville Elementary School, 5250 Stover Dr. *Adm:* $5. **www.prescotthamfest.org**

Arizona (Sierra Vista) — May 4 F H R T V
7 AM. *Spr:* Cochise ARA. 2756 S. Moson Rd. *Tl:* 146.76 (162.2 Hz). *Adm:* Free. **www.k7rdg.org**

California (Sonoma) — Apr. 27 D F H R T V
7 AM – noon. *Spr:* Valley of the Moon ARC. First Congregational Church of Sonoma, 252 W. Spain St. *Tl:* 145.35 (88.5 Hz). *Adm:* Free. **www.vomarc.org**

75TH ANNUAL INTERNATIONAL DX CONVENTION

April 12 – 14, Visalia, California

D H Q R S
Fri. 8 AM – 6 PM, Sat. 8 AM – 10 PM, Sun. 7:30 AM – 11:30 AM. *Spr:* Southern California DX Club. Visalia Convention Center, 303 E. Acequia Ave. *Adm:* $170 Advance, $185 door. **www.dxconvention.org**

Colorado (Longmont) — Apr. 6 D F Q S V
8 AM – noon. *Spr:* Longmont ARC. Boulder Co. Fairgrounds Event Center, 9595 Nelson Rd. *Tl:* 147.270 (100 Hz), 448.800 (88.5 Hz). *Adm:* $5. **www.w0eno.org**

Connecticut (Dayville) — Apr. 28 D F H R
8 AM – noon. *Spr:* Eastern Connecticut ARA. Killingly High School Cafeteria, 226 Putnam Pike. *Tl:* 147.225 (156.7 Hz). *Adm:* $5. **www.ecara.net**

Connecticut (Gales Ferry) — Apr. 13 R
8 AM seller registration, 9 AM buyer registration, 10 AM auction begins. *Spr:* Southeastern Connecticut ARS. Our Lady of Lourdes Parish Hall, 1650 CT Rte. 12. *Tl:* 146.730 (156.7 Hz). *Adm:* $5. **www.secars.org**

ARRL DELAWARE STATE CONVENTION

April 20, Georgetown, Delaware

D F H Q R S T V
8 AM – 3 PM. *Spr:* Sussex ARA. Cheer Center, 20520 Sand Hill Rd. *Tl:* 147.090 (156.7 Hz). *Adm:* $7. Email: **ashton@mchsi.com**

Florida (Tampa) — Apr. 13 H Q R T V
7 AM – noon. *Spr:* Tampa ARC. Tampa ARC clubhouse, 7801 N. 22nd St. *Tl:* 147.105 (146.2 Hz). *Adm:* $5. Email: **n4web@hamclub.org**

Georgia (Savannah) — Apr. 27 F H T
8 AM – 1 PM. *Spr:* Coastal ARS. Savannah Hilton Head Regional Airport Recreation Bldg., Crossroads Pkwy. *Tl:* 442.70. *Adm:* Free. **www.coastalamateurradiosociety.net/wpw4lhsblog/?page_id=1357**

Idaho (Kamiah) — Apr. 20 D F H R S V
8 AM – 3 PM. *Spr:* 3 Rivers ARC, Clearwater Valley ARC. American Legion Hall, 618 Main St. *Tl:* 146.62 (88.5 Hz). *Adm:* $5. **www.3riversarc.club**

Illinois (Sandwich) — May 5 D H R T
7 AM – 1 PM. *Spr:* Kishwaukee ARC. Sandwich Fairgrounds, 1401 Suydam Rd. *Tl:* 146.73 (100 Hz), 146.520 simplex. *Adm:* $8 Advance, $10 door. **www.karc-club.org**

Indiana (Columbus) — Apr. 13 D H R V
8 AM – noon. *Spr:* Columbus ARC. Columbus North High School Cafeteria, 1400 25th St. *Tl:* 146.79 (103.5 Hz). *Adm:* $5. Email: **idlewine@comcast.net**

Indiana (Marion) — May 4 D H R S T V
9 AM – 2 PM. *Spr:* Cass, Grant, Howard, Miami Counties. Hart's Celebration Center, 3031 E. 450 N. *Tl:* 146.790 (141.3 Hz). *Adm:* $5. **www.ncihamfest.com**

Iowa (Des Moines) — Apr. 27 D F H Q R S V
8 AM – 1 PM. *Spr:* Des Moines Radio Amateurs' Association. Iowa State Fairgrounds Elwell Family Food Center, 3000 E. Grand. *Tl:* 146.940 (114.8 Hz). *Adm:* $10; 12 and under, free. **www.dmraa.com/hamfest**

Maryland (Maugansville) — May 4 D F H Q R S T V
7 AM – 12:30 PM. *Spr:* Antietam Radio Association. Maugansville Bible Brethren Church, 17904 Binkley Ave. *Tl:* 147.09 (100.0 Hz). *Adm:* $7. **www.antietamradio.org**

Maryland (Odenton) — Apr. 21 D F H R T
7:30 AM – noon. *Spr:* Maryland Mobileers ARC. Odenton Volunteer Fire Company, 1425 Annapolis Rd. *Tl:* 146.805 (107.2 Hz). *Adm:* $5. **www.sites.google.com/view/marylandmobileers/hamfest?authuser**

Michigan (Burnips) — May 4 F H R
8 AM – noon. *Spr:* Allegan Co. ARC. Salem Township Hall, 3003 142nd. *Tl:* 147.240 (94.8 Hz). *Adm:* $5. **www.ac8rc.org**

Michigan (Cadillac) — May 4 D F H R V
8 AM – noon. *Spr:* Wexaukee ARC. Mackinaw Trail Middle School, 8401 S. Mackinaw Trail. *Tl:* 146.980. *Adm:* $5. **www.wexaukeearc.org**

Michigan (Centreville) — Apr. 20 F H R T V
8 AM – noon. *Spr:* St. Joseph Co. Michigan ARC. Saint Joseph Co. Grange Fair, S. Franklin St. Gate 52. *Tl:* 145.310 (123 Hz). *Adm:* $5. Email: **fuseboxr@hotmail.com**

Minnesota (Brainerd) — Apr. 27 D F H Q R
9 AM – 1 PM. *Spr:* Brainerd Area ARC. Brainerd National Guard Armory, 1115 Wright St. *Tl:* 147.225. *Adm:* $5. **www.brainerdham.org**

Minnesota (East Grand Forks) — Apr. 20 F H Q R S V
8 AM – 1 PM. *Spr:* FORX ARC. Heritage Village, 219 20th St. NE. *Tl:* 146.940 (123.0 Hz). *Adm:* $10. **www.wa0jxt.org**

OZARKCON

April 5 – 6, Branson, Missouri

D F H R S
8 AM – 5 PM. *Spr:* Four State QRP Group. Stone Castle Hotel, 3050 Green Mountain Dr. *Adm:* $15 Advance, $20 door. **www.ozarkcon.com**

Missouri (Kansas City) — Apr. 20 D F H R S V
6 AM – 1 PM. *Spr:* Ararat Shrine ARC. Ararat Shrine Temple, 5100 Ararat Dr. *Tl:* 145.130 (151.4 Hz). *Adm:* Free. **www.hambash.us**

Missouri (Palmyra) — May 4 D F H R T V
8 AM – noon. *Spr:* Hannibal ARC, Western Illinois ARC. Palmyra American Legion, 600 Short St. *Tl:* 146.625 (103.5 Hz). *Adm:* $8 building access, $5 tailgating access. **www.w0kem.com**

Missouri (Perryville) — Apr. 20 D F H R T V
8 AM – 1 PM. *Spr:* River Hills ARC. Fraternal Order of Eagles, 2746 W. St. Joseph St. *Tl:* 147.315 (100.0 Hz). *Adm:* $5. **www.facebook.com/w0rhx**

Nebraska (Bellevue) — Apr. 13 F R
9 AM – 1 PM. *Spr:* Bellevue ARC. Reed Community Center, 1200 Bellevue Blvd. S. *Tl:* 147.390 (131.8 Hz). *Adm:* $5. **www.bellevuearc.org**

New Hampshire (Moultonborough) — Apr. 13 D F H R T
8 AM – 1 PM. *Spr:* Lakes Region Repeater Association. Moultonborough Function Hall, 139 Old Rte. 109. *Tl:* 147.03 (88.5 Hz), 444.700 (123.0 Hz). *Adm:* $10. **www.w1bst.org**

New York (Queensbury) — Apr. 13 D F H
8 AM – noon. *Spr:* Warren Co. Radio Club. Aviation Mall, 57 Aviation Rd. *Tl:* Prospect 146.730 (100 Hz), Gore 147.120 (123 Hz), Burch 146.774 (146.2 Hz). *Adm:* Free. **www.w2wcr.org/events/swapmeet**

North Carolina (Goldsboro) — May 4 F
8 AM – noon. *Spr:* Wayne Co. ARA. The First Church, 1100 The First Church Rd. *Tl:* 146.850 (88.5 Hz). *Adm:* Free. **www.k4cyp.com**

North Carolina (Winston-Salem) — Apr. 13 D F H T
7 AM – 11:30 AM. *Spr:* Forsyth ARC. Robinhood Road Baptist Church, 5422 Robinhood Rd. *Tl:* 146.47 (100 Hz). *Adm:* $5. **www.w4nc.com**

Ohio (Athens) — Apr. 28 D F H R T V
8 AM – noon. *Spr:* Athens Co. ARA. Athens Community Center, 701 E. State St. *Tl:* 145.15. *Adm:* $5. **www.ac-ara.org**

Ohio (Bidwell) — Apr. 13 D F H Q R T V
8 AM – 1 PM. *Spr:* Mid-Ohio Valley ARC. Fellowship of Faith Church, 20344 State Rt. 554. *Tl:* 147.060 (74.4 Hz). *Adm:* $5. Email: **docdiesel@hotmail.com**

Ohio (Cuyahoga Falls) — Apr. 13 D F H Q R S V
8 AM – 1 PM. *Spr:* Cuyahoga Falls ARC, Inc. Emidio & Sons Expo Center, 48 E. Bath Rd. *Tl:* 147.270, 444.850 (both 110.9 Hz). *Adm:* $7 Advance, $8 door. **www.w8vpv.org/hamfest**

Ohio (Dover) — Apr. 27 D F H R V
8 AM – 1 PM. *Spr:* Tusco ARC. Tuscarawas Co. Fairgrounds, 259 S. Tuscarawas Ave. *Tl:* 146.730 (71.9 Hz). *Adm:* $5. **www.w8zx.net/hamfest**

Ohio (Toledo) — May 5 D F H
9 AM – 1:30 PM. *Spr:* Lucas Co. ARES. Toledo Speedway, 5639 Benore Rd. *Tl:* 146.940 (103.5 Hz). *Adm:* $5. **www.lucasares.org**

ARRL OKLAHOMA STATE CONVENTION

April 12 – 13, Claremore, Oklahoma
D F H Q S V
Fri. 4 PM – 9 PM, Sat. 8 AM – 3 PM. *Spr:* Green Country Hamfest, Inc. Claremore Expo Center, 400 Veterans Pkwy. *Tl:* 147.09 (88.5 Hz). *Adm:* $8 Advance, $10 door; kids under 12, free. **www.greencountryhamfest.org**

Pennsylvania (Bristol) — May 5 D F H Q R S T V
7 AM – 2 PM. *Spr:* Warminster ARC. Bucks Co. Community College-Lower Bucks Campus, 1304 Veterans Hwy. (Rte. 413). *Tl:* 147.090 (131.8 Hz). *Adm:* $8. **www.wp.k3dn.org/hamfest**

Pennsylvania (Spring Grove) — Apr. 27 D F H Q R S T V
8 AM – 1 PM. *Spr:* York Hamfest Foundation. Elicker's Grove Park, 511 Roths Church Rd. *Tl:* 147.330 (123.0 Hz). *Adm:* $7. **www.yorkhamfest.org**

Tennessee (Bartlett) — Apr. 6 D F H V
9 AM – 3 PM. *Spr:* Mid-South ARA. Bartlett Station Municipal Center Auditorium, 5868 Stage Rd. *Tl:* 147.63 (107.2 Hz). *Adm:* Free. **www.maraonline.org/freefest**

Tennessee (Greeneville) — Apr. 20 F H R T V
8 AM – noon. *Spr:* Andrew Johnson ARC. Greene Co. Fairgrounds, 123 Fairgrounds Ln. *Tl:* 145.390 (88.5 Hz). *Adm:* $10. **www.greenevillehamfest.com**

Tennessee (Murfreesboro) — Apr. 27 D H R
8 AM – 2 PM. *Spr:* Short Mountain Repeater Club. First Cumberland Presbyterian Church, 907 E. Main St. *Tl:* 146.910. *Adm:* $5. **www.smrclub.com**

Texas (Amarillo) — Apr. 27 H Q R S T V
9 AM – 2 PM. *Spr:* Panhandle ARC. AmTech Career Academy, 3601 Plains Blvd. *Tl:* 146.94 (88.5 Hz). *Adm:* Free. **www.w5wx.org**

Texas (Belton) — Apr. 13 D F H R T V
7 AM – 1 PM. *Spr:* Temple ARC. Bell Co. Expo Center, 301 W. Loop 121. *Tl:* 146.82 (123.0 Hz). *Adm:* $10. **www.tarc.org**

Virginia (Ruckersville) — Apr. 13 D F H Q R S V
8 AM – 2 PM. *Spr:* Greene Co. Virginia ARC. Ruckersville Elementary School, 105 Progress Pl. *Tl:* 145.470 (151.4 Hz). *Adm:* $10; kids under 14, free. **www.thawfest.net**

Washington (Union Gap) — Apr. 13 F R T
9 AM – 2 PM. *Spr:* N7YRC Group. Yakima Valley Emergency Management, 2403 S. 18th St. *Tl:* 444.750 (131.8 Hz), 146.520. *Adm:* Free. Email: **kc7vqr@arrl.net**

Wisconsin (Cedarburg) — Apr. 27 D F H R
8 AM – noon. *Spr:* Ozaukee Radio Club, Inc. Ascension Columbia St. Mary's Center (Milwaukee Curling Club), W67N890 Washington Ave. *Tl:* 146.97 (127.3 Hz). *Adm:* $7. **www.ozaukeeradioclub.org**

Wisconsin (Stoughton) — Apr. 13 D F H R V
8 AM – noon. *Spr:* Madison Area Repeater Association. Mandt Community Center, 400 Mandt Pkwy. *Tl:* 147.150 (123.0 Hz). *Adm:* $8 Advance, $10 door. **www.w9hsy.org**

Wisconsin (Superior) — May 4 D F H Q R V
9 AM – 1 PM. *Spr:* Arrowhead Radio Amateurs Club. Head of the Lakes Fairground, 4700 Tower Ave. *Tl:* 146.940 (103.5 Hz). *Adm:* $10. **www.thearac.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 **May 1** to be listed in the **July** 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**.

Special Event Stations

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

Mar. 30 – Apr. 10, 0000Z – 2359Z, W5E, Greenville, TX. Sabine Valley Amateur Radio Association (K5GVL). **Total Solar Eclipse in Hunt County, Texas**. 7.235 14.280 21.400 28.450. QSL. Sabine Valley Amateur Radio Association, P.O. Box 843, Greenville, TX 75403-0843**. www.k5gvl.com/w5e-total-solar-eclipse-special-event-station**

Apr. 1 – Apr. 7, 0000Z – 2359Z, W2A, New York, NY. New York City DX Association. **Global Autism Awareness Week**. 14.250. QSL. NYCDXA, 149 Marine Ave. # 6F, Brooklyn, NY 11209. **www.qrz.com/db/w2ndx**

Apr. 8, 1600Z – 2100Z, W2E, Rochester, NY. Roc-Ham Radio Network. **Solar Eclipse 2024**. 20 and 10 meters; 14.313 28.405; AllStar 2585. QSL. John Derycke, W2JLD, 85 Amherst St., Apt. 2, Rochester, NY 14607. **www.roc-ham.net**

Apr. 9 – Apr. 13, 0300Z – 1200Z, W4S, Lakeland, FL. Sun 'n Fun Fly In, Inc. **Sun 'n Fun Aerospace Expo**. 7.250 14.225 146.685 (127.3). QSL. Geoff Schuck, P.O. Box 90853, Lakeland, FL 33804. *Frequencies will be spotted on DX Summit; QSL cards will be sent to all HF contacts*.

Apr. 12 – Apr. 13, 1600Z – 2100Z, K8L, Youngstown, OH. WF8U and KC3GFU. **National Library Week 2024**. 7.074 14.074; SSB FT8; 40 and 20 meters. QSL. K8L, 239 Elvira Ct., McDonald, OH 44437. **kd8ely@gmail.com** or **www.qrz.com/db/kd8ely**

Apr. 12 – Apr. 15, 0001Z – 2359Z, K9L/W9L, Effingham, IL. National Trail Amateur Radio Club. **Remembering Abraham Lincoln**. 14.312. QSL. NTARC/K9UXZ, P.O. Box 903, Effingham, IL 62401. **www.nationaltrailarc.org** or **www.qrz.com/db/k9uxz**

Apr. 12 – Apr. 22, 1400Z – 0600Z, N5M, all New Mexico. WA5LHM and WA5POK. **Celebrating 60 Years of Friendship and Ham Radio with the Hatch Green Chili Pepper Run to 33 New Mexico Counties**. 7.060 7.260 14.060 14.260. Certificate. Scott Kendall, WA5LHM, 1804 Louise St., Georgetown, TX 78262. **www.facebook.com/groups/996268021434046**

Apr. 13, 1600Z – 2300Z, NI6IW, San Diego, CA. USS *Midway* Museum Ship. **Commemorating USS *Midway* Conducting the First Airship Ops on CV (Apr. 7, 1949)**. 7.250 14.320; 140.070 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**

Apr. 13 – Apr. 14, 1500Z – 2000Z, K4S, Nokomis, FL. Tamiami Amateur Radio Club. **Venice Shark's Tooth Festival**. 14.320 SSB. QSL. Tamiami ARC, P.O. Box 976, Nokomis, FL 34274. **www.tamiamiarc.org**

Apr. 15 – Apr. 22, 1600Z – 1600Z, W2W, Rochester, NY. Roc-Ham Radio Network. **World Amateur Radio Day 2024**. EchoLink conference 531091; AllStar 2585, 47620, 47918, 531310; 14.313 28.405. QSL. John Derycke, W2JLD, 85 Amherst St., Apt. 2, Rochester, NY 14607. *The special event net is on April 18 – 19, 1700Z – 0200Z*. **www.roc-ham.net**

Apr. 17, 2000Z – 2200Z, K6SRH, Sahuarita, AZ. Sam's Radio Hams. **SRH Special Event Station at the Titan Missile Museum**. 14.315. QSL. Paul Craft, 357 Morningside Ter., Palmdale, CA 93551. Digital QSL available. **www.qrz.com/db/k6srh**.

Apr. 19 – Apr. 23, 1700Z – 2359Z, K4H, Camden, SC. Kershaw County Amateur Radio Club. **Battle of Hobkirk's Hill (Second Battle of Camden Hill)**. 14.325 21.325 28.325. E-certificate, email **info@kc4rc.com** for details. **www.kc4rc.com**

Apr. 20, 1300Z – 2200Z, N5T, Springdale, AR. Bella Vista Radio Club. **Northwest Arkansas Train Mobile**. 7.040 7.190 14.040 14.260. QSL. Don Banta, K5DB, 3407 Diana St., Springdale, AR 72764. **www.bellavistaradioclub.org**

Apr. 26 – Apr. 28, 1900Z – 1900Z, WØZSW, Minneapolis, MN. Handiham Radio Club. **Handiham Program 57th Anniversary**. 7.200 14.250 21.350 28.350. QSL. Courage Kenny Handiham Program, 3915 Golden Valley Rd., MR 78446, Minneapolis, MN 55422. **www.handiham.net**

Apr. 27, 1400Z – 1830Z, K9N, De Pere, WI. Green Bay Mike & Key Club, Inc. **The 125th Anniversary of the Founding of St. Norbert College in De Pere, Wisconsin**. 3.915 7.270 14.285. E-certificate only, email **contact@k9eam.org**. **www.k9eam.org**

Apr. 27, 1200Z – 2359Z, KG4NXO, Ocala, FL. Marion County Emergency Management. **MERT20 Special Event**. 3.862 7.262 14.262; D-STAR 146.790 REF-037. Certificate & QSL. Kraig Pritts, 6637 NE 5th Ln., Ocala, FL 34470. **www.mert20.org**

Apr. 27, 1700Z – 2300Z, W1M, Rochester, NY. Roc-Ham Radio Network. **International Marconi Day 2024**. 20 and 10 meters; 14.313 28.405; AllStar 2585, 47620, 47918, 531310. QSL. John Derycke, W2JLD, 85 Amherst St., Apt. 2, Rochester, NY 14607. **www.roc-ham.net**

Apr. 27 – Apr. 28, 0200Z – 2300Z, N3P/PanCan, New Kensington, PA. Skyview Radio Society. **HAMS for PanCAN — Bonus Station**. 3.960. 7.172; SSB. Certificate. Skyview Radio Society, N3P, 2335 Turkey Ridge Rd., New Kensington, PA 15068. **rybar1949@gmail.com** or **www.skyviewradio.net**

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

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

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **July** *QST* would have to be received by **May 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**.

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 March/April 2024 issue of *QEX*:

- Gary Johnson, NA6O, describes a laboratory RF power meter.
- Mark R. Titchener, ZL4CDE, maps a binary code to Morse code, facilitating the efficient exchange of binary-coded messages.
- Richard Place, WB2JLR, adds networks to *4nec2* models.
- Greg Hebner, AG5FE, studies the vertical antenna with a spiral counterpoise.
- Steve Geers, KA8BUW, accurately predicts crystal filter performance.
- In his essay series, Eric P. Nichols, KL7AJ, discusses a self-exam.

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**.

Feedback

- In the January 2024 issue of *QST*, "FT8 Visualized" contains an error. The second and third sentences in the first paragraph under the "Final FT8 Format and More Resources" subhead should read, "These are assembled in groups of three and converted to Gray code to get 58 symbols or transmitted tones. Add the three Costas arrays of seven symbols each (21 symbols in total) to determine that an FT8 message is 79 symbols, or the equivalent of 237 binary bits." This has since been corrected in the digital edition.

- In the February 2024 issue of *QST*, "How's DX?" contains an error. The first paragraph states that Alejandro Selkirk Island had never been activated before, but the CBØZ operation was conducted there in 2020. This has since been corrected in the digital edition.

Answers to the Crossword Puzzle on Page 60 of This Issue

Across

1 HSTP
5 RPMS
9 ARFS
13 ACRE
14 NOISE
15 TEST
16 MOONBOUNCE
18 TPKS
19 SUPPORTS
20 HIE
21 TOASTS
22 UNOCARD
26 LEE
27 CHAT
28 TOE
29 SPFS
32 ABUSE
33 EVA
34 TOR
35 GENERAL
37 REL
38 ALE
39 ULTRA
40 ASST
41 FAQ
42 SSES
43 BDM
45 FRUITED
47 YEOMAN
50 EDS
51 HARMONIC
53 MENA
55 WAVELENGTH
57 ETCH
58 PHASE
59 IEEE
60 RAYO
61 MICU
62 ARRL

Down

1 HAMS
2 SCOUT
3 TROPO
4 PENPALS
5 ROUTS
6 PINS
7 MSC
8 SEE
9 ATTIC
10 REPEATERS
11 FSK
12 STS
14 NORTE
17 BOSE
20 HOTEL
22 UHURA
23 NASA
24 ROVES
25 DEALT
27 CBERS
29 STAFF
30 POLAR
31 FREQUENCY
32 ANTED
35 GUSTS
36 ELSE
40 AMMONIA
43 BERLE
44 DOME
46 IDAHO
47 YAESU
48 ANGER
49 NITER
51 HVAC
52 CHEL
53 MER
54 ETA
55 WPM
56 AHI

Notes

1A HSTP = Hyperspace Transaction Protocol
37A REL = Recommended Exposure Limit
42A SSES = Senior Software Engineers
43A BDM = Background Debug Mode
53A MENA = Middle East and North Africa
61A MICU = Medical Intensive Care Unit
52D CHEL = "En-aitch-el," shortened to "chel" in Canada

Field Organization Reports — January 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**.

553
WA7PTM

445
N9VC

415
AD8CM

406
W9RY

400
WA3EZN

394
K6DDZ

363
W7EES

355
WM5N

308
KO4KUS

306
W7PAT

279
KE8BYC

267
K3EAM

261
KC8YVF

240
N2CL

229
W9EEU

215
KK4PUX

191
W5WMC

189
KB5PGY

185
W4DNA
N1ILZ

180
ND8W

177
WØPZD

175
AC8NP

170
KT5SR

168
KD2LPM

169
KV8Z

167
WM2C

165
AC0KQ
N8SY
N5MKY

160
K7OED

155
KB9IME
KE5YTA

150
WAØQLW

146
KC8T

WV5Q

145
W4CMH

143
W8DJG

142
KE8DON

WB3YRU

140
KR4PI

WB9QPM

137
WB8YYS

135
AG9G
N2DW
AI9F
W3YVQ
NI2W
WD8USA
KW1U

134
KB8RCR

130
W2PAX
K3JL

128
KD8ZCM

127
W4CAC

125
KC3MAL
KE4RS

123
KN4WX

121
KD2QAR

120
KFØBPN
NØDMP
WC4FSU
WA4VGZ
KY2D
WA1URS
KE4ANW
K5ANP
KF5OMH
W2AH
KA9QWC
NA7G
N7IE
KDØHHN

115
K9LGU
WB9WKO
N3GE

111
KD8UUB

110
AD4DO
KM4WHO
KA9MZJ
W9GRG
NW3X
KC8WH
KF5IOU
WB8TQZ
KB2QO
N1IQI
W1RVY
W1LEM

109
WK4WC

104
W8IM

101
K1HEJ

100
KZ8Q
WB4RJW
NX9K
AA3SB
W1KX
KB8GUN
WB8SIQ
KA5AZK
N4CNX
W4EDN
KB8PGW
K3YAK
KA2HZP
W2OOD
N1LAH
KC1KVY
W1TCD

98
KD2TDG

97
KC1HHO

94
WB8R
WB2VUF
WW3S

93
KG5NNA
KB1NMO
K4DL

90
KB9GO
KC9UC
N3SW
WA3QPX
WA2BBS
N8MRS
W8GSR
KL7RF
K8KRA
KB8HJJ
W8MAL
N8OD
K3RC
W4KX
K8ED
W2QMI
WX2DX
AB9ZA
N1CVO

89
K2MTG
NØET

88
KF7GC

W4TTO
KBØDTI

87
K4FHR
KT4WX
KV2J

86
N5RH

85
W4PXE
KB3MXK
KB1TCE
K6JT
K1XFC

84
KT5EM
KB4OLY

WB8RGE
N2TSO

83
W7MIN
AA3N

81
W2ARP

80
AE2EY
KR4ST
KA8BJA
W2ITT
K8RDN
KB1NAL

79
KN6ICE

78
W4NHO

75
KN4AAG
N2GS

74
W3ZR

73
NØJAR

72
KM4WXX
W5XX

70
K5OB
NT1N

The following stations qualified for PSHR in previous months, but were not acknowledged in this column yet. (Dec. 2023) KK4PUX 225, K3JL 130, W2AH 120, KC3MAL 113, KB2QO, KO4OL 110, W4CAC 108, K2MTG, K3YAK, KA2HZP, N2GS, AA3SB 100, WW3S 96, KB3YRU 93, N3KRX, W4NHO 92, WX2DX, WA3QPX 90, WB2VUF 85, KA2GQQ 84, WB8RGE 81, W2QMI 80, K2PHD 78, WB4ZDU 75, N3SW 73. (Nov. 2023) KK4PUX 220, W4CAC 119, N3SW 90.

Section Traffic Manager Reports

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

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported: AR, CT, DE, ENY, EPA, EWA, GA, KY, MI, MO, MS, NLI, NM, NNJ, NNY, NV, ORG, SCV, SNJ, STX, TN, VA, WCF, WMA, WPA, WTX, WWA, WY.

Brass Pounders League

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

NX9K 2,180, KY2D 1,450, W2AH 1,046, N9CK 879, WB9WKO 849, WA3QLW 794, N9VC 686, KW1U 652, K8ED 508.

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 January 2024 activity report of the VM Program.

♦An advisory notice was sent to an operator in Ohio for deliberate interference and use of a false call sign on 7.185 KHz.

♦An advisory notice was sent to a repeater owner in New York City for operation of an AllStarLink network on the national calling frequency of 145.520 MHz.

♦Operators in Georgia and Pennsylvania received advisory notices for out-of-band operation. The Georgia operator is a General and used 14.211 MHz on SSB for DX. General-class SSB frequencies on 20 meters start at 14.225 MHz. The operator in Pennsylvania worked SSB DX on 7.120 MHz. Forty-meter voice privileges start at 7.125 MHz.

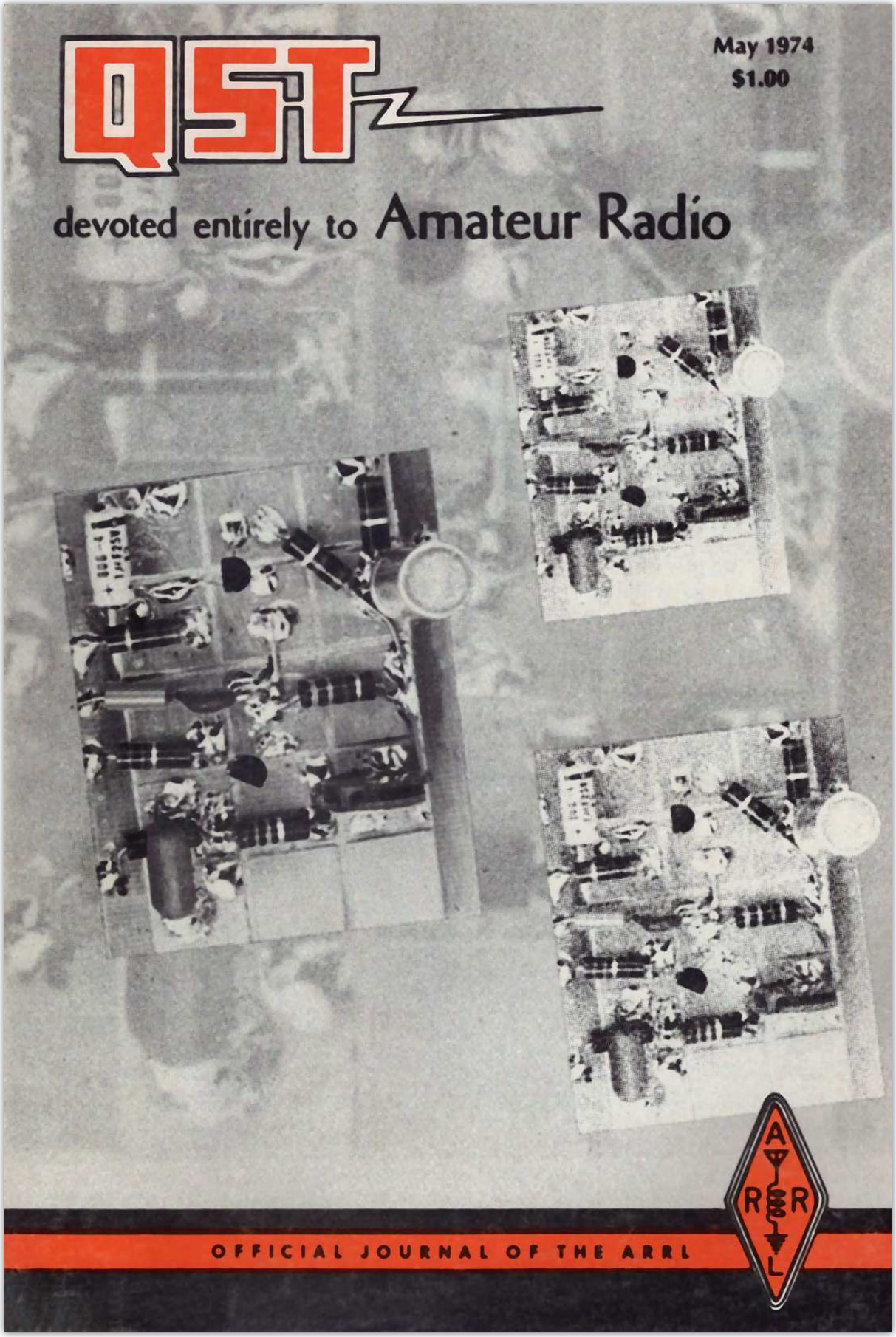
♦Two operators in Florida and one in West Virginia received advisory notices for improper bandwidth. The operators in Florida were 9 kHz wide, and the operator in West Virginia was 11 kHz wide. Section 97.307(a) of Commission rules states that "no station shall occupy more bandwidth than necessary for the information rate and emission being transmitted."

♦An operator in Florida received an advisory notice for operation on a license that expired in 2022, and an operator in Iowa received an advisory notice for operation on a license that expired in 2014.

♦The VM Program Administrator participated in two meetings with the FCC. One case was referred from the FCC to the VM Program for evidence gathering. A VM Program presentation was made to a club in Harrisburg, Pennsylvania.

The totals for December 2023 monitoring were 2,410 hours on HF frequencies, and 3,960 hours on VHF frequencies and above, for a total of 6,370 hours. — *Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH*

A Look Back


QST
May 1974
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devoted entirely to Amateur Radio
OFFICIAL JOURNAL OF THE ARRL

The popularity of Oscar 6 communications has caused many amateurs to turn their attention toward keeping track of where the satellite is and when they can use it. When two authors present workable and attractive ideas simultaneously, it provides an opportunity to present both to the readers. You can try either of the systems or both, for that matter

Instant! Oscar 6 Locator

BY JAMES E. MCKIM,* WØCY

THE INSTANT Oscar 6 locator is the lazy-man's solution to the problem of wanting to know where the satellite is at all times – now all I have to do is see which light-emitting diode is blinking. No more calculations or plotting, and the accuracy is such that a high-gain antenna can be pointed with precision. In addition, the locator is an excellent demonstration unit for showing the real-time motion of a satellite when talking to a science club or other interested group.

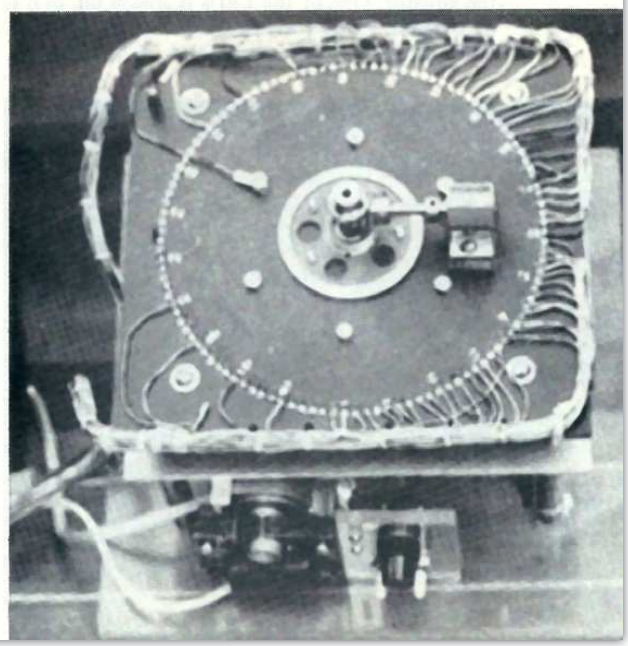
Some plotting methods do not take into account the motion of the earth during the pass, and consequently Oscar 6 is five degrees west of the plotted location at the end of the pass. This represents about 350 miles (563 km) at the equator or almost the east to west distance across the state of Kansas. The instant locator shows where Oscar 6 is to the closest minute of time in the Northern Hemisphere, and to the closest five minutes in the Southern Hemisphere. The pictures pretty well explain the project, which consists of three parts: the globe, a Plexiglas ring with LEDs mounted on the periphery, and a rotary switch to control the voltage to the LEDs.

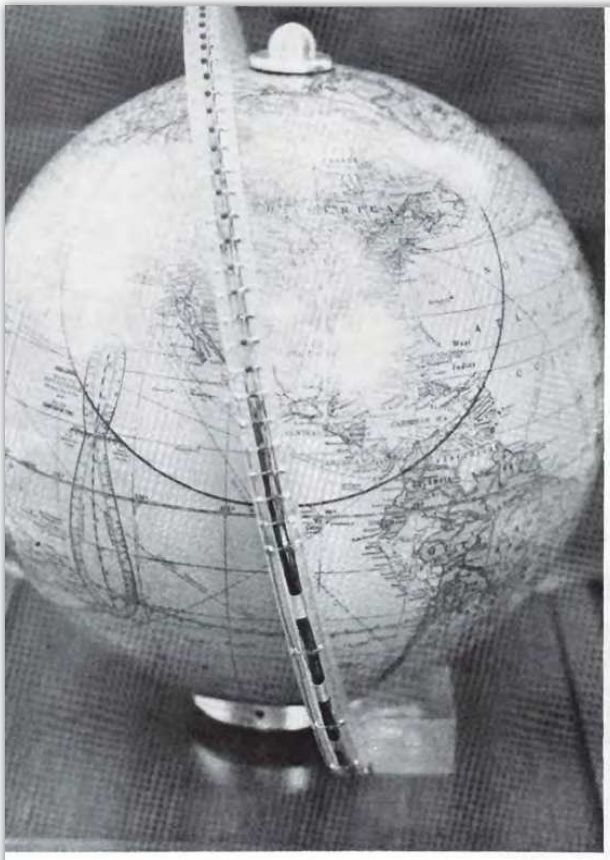
* 1404 S. Tenth, Salina, KS 67401.

Top view of the 115-point rotary switch. An orbit counter is geared to the switch shaft through a one-to-one bevel gear assembly

Construction

The globe, which turned out to be made of glass (did you ever try to ream a hole in glass, thinking it was plastic?), is mounted on a double ball-bearing support and driven by a 1-rph clock motor through a 24-to-1 gear chain. A knob on top of the globe releases it for timing and for correction after a power failure. One of the new felt-tipped non-permanent marking pens was used to draw a 2500-mile (4,022 km) radius circle centered



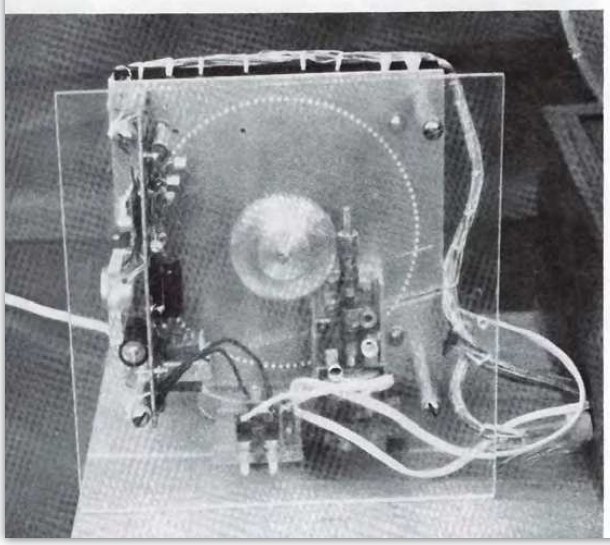


The Plexiglas ring has eyelets pressed into it to aid in making connections to the LEDs. The groove in the ring carries the wires from the LEDs to the base. A 2500-mile circle is shown centered on Salina, Kansas.

on Salina, Kansas. If the next Oscar should be at a different altitude, the non-permanent ink can be removed with soap and water.

The second part, the Plexiglas ring, is scaled so that the top represents an orbit 900 miles (1,448 km) above the globe, and supports the LEDs that mark Oscar's progress. In the Northern Hemisphere, an LED is mounted every minute of time, and in the Southern Hemisphere, every five minutes. At this location, about all you want to know is the approximate location in the Southern Hemisphere, and about how soon Oscar is going to cross the equator One of the LEDs is always on, so it is no problem to spot where Oscar is at the moment. The ring is mounted at an angle of 102 degrees, corresponding to the approximate inclination of the Oscar 6 orbit. Diffused-light type LEDs are used which easily can be seen from twenty feet in a well-lighted room. They only draw 10 mA, therefore No. 28 wire is adequate to connect them to a terminal board in the base. Small eyelets were pressed into the perimeter of the ring, making it easy to join the small leads on the LEDs to the wire. Removing a bad LED is no problem when this type of mounting is used – a couple of them did get overheated in soldering and had to be replaced.

The third section is a 115-point rotary switch which is driven by a 1-rpm clock motor turning a single worm gear and driving the 115-tooth main gear. Therefore, the switch arm makes one rotation every 115 minutes and lights the appropriate LED. The motor must be turned off for 16 seconds every 50 orbits to compensate for the 114.9946-minute actual orbit time. Toggle switches are provided for the rotary-switch motor as well as the power supply for the LEDs. Included in the power supply is a transistor flip-flop to cause the LED to blink twice per second with an 80-percent on time; it is a lot easier to spot a blink than a steady glow The orbit-number counter is geared to the rotary-switch shaft with a one-to-one bevel gear. The Plexiglas cover over the switch and power-supply assembly helps people resist the urge to see if the shaft can be turned by hand. It should be possible to do all that the rotary switch does by using shift registers, then everything could be mounted in the globe base. I hope to have this worked out in time for Oscar 7 and it will be a lot easier to change for future satellites than rebuilding the rotary switch. A beeper is connected to the 114th-minute point on the switch to warn that an equatorial crossing is about to occur. At the time of this writing, only the evening passes of Oscar 6 are to be used, but the beeper can be connected through a diode to any of the points should other passes become active. It is nice to go on about your work and know that you will not be late for a pass. The unit has been in operation for a month now; and it is still exactly on schedule with the orbital information from W1AW QST



A clock motor and worm-gear arrangement drives the rotary switch The pc board to the left contains the power-supply components and a "beeper" circuit.

QST for

A Tone BEEP Keyer for Repeaters

Obtain an Audible Indication of Off-Frequency Operation

BY ART GENTRY,* W6MEP

Some repeater users, in their haste to operate a newly acquired mobile rig, simply hook it to a power source and an antenna, then key up the local machine. If they get a response, they assume that all is well. The need to adjust the transmitter frequency does not attract their attention until they are in an area of poor coverage, or if some fellow user informs them that the audio "doesn't sound right." Now a problem appears. Frequency checking at vhf is beyond the capabilities of many amateur stations, and it may be weeks or months until the local club has a frequency-netting session. Here is a device that will help the communicators stay "in the groove." One word of caution: Extensive keying of the machine to "walk" the frequency in can be very annoying to the monitors and other users. It would be considerate to ask permission, or wait until a slack time to do your tweaking.

THIS SIMPLE telemetry[1] circuit is the latest of a series of modifications to the WR6ABN repeater Earlier uses of tones and tone bursts reminded users to allow time for breaking stations, and to indicate that the time-out timer had been reset. This latter indication was by means of transmitting two tones simultaneously

The designers of the telemetry system decided to inhibit one of the two tones, selectively and allow either the high or low tone to indicate the position of the user's carrier in the receiver passband. Since installation of this feature, it has been an unqualified success.

The sensors were adjusted to trip the relays at 1 kHz above or below the center frequency· this appears to be a practical value for narrow-band receivers. Thus, the "on-channel" slot is 2-kHz wide, centered about the receiver input frequency

This system makes use of such nonexotic equipment as relays to perform the switching. Those readers who are well versed in solid-state logic systems will find it easy to apply the principles to their favorite machine.

Technical Description

The 741 op amp is set for a dc gain of 1000. The ac gain of the circuit is very low, as set by the 1 μF bypass capacitor across the 1-MΩ resistor in the feedback loop, and the 1 μF across the 50-kΩ control in the input circuit. The output of the 741 feeds two transistors and a zero-center meter

The steering diodes, CR1 and CR2, allow the op amp to drive Q1 or Q2 into conduction and to charge C1 or C2 to the value of the op-amp output voltage. R1 and R2 allow capacitors C1 and C2 to charge above the base voltage of the transistors and to cause them to conduct for about 5 seconds after the drive voltage from the op amp is removed. This delay acts as a memory so the delayed tone beep can indicate the frequency readout after the carrier of the user station goes off.

Note that the poor ac frequency response of the op-amp means that the input to it must remain for approximately 3 seconds in order for it to load C1 or C2 for the readout. This delay was intentional for two reasons: (1) to prevent noise or fluctuating signals from giving false readings, and (2) to prevent unscrupulous users from abusing the device by keying up several short bursts.

Note that the input to the op amp is shorted to ground when a carrier is not present. This prevents noise from loading up the sensor prior to a reading. It also allows the adjustment of the dc offset control, R5. The calibrate potentiometer, R6 is adjusted to a point where signals 1 kHz above or below the center frequency of the receiver will just trip relays K4 or K5 (Note that the receiver should be adjusted so that the discriminator voltage is zero with no signal.) This adjustment of R6 to ±1 kHz determines the slot width. The center frequency is determined by the usual crystal-oscillator adjustments in the receiver.

* 7832 Jellicoe Ave., Northridge, CA 91324.

[1] "Telemetering. Measurement with the aid of intermediate means that permit the measurement to be interpreted at a distance from the primary detector." – *IEEE Standard Dictionary of Electrical and Electronics Terms, 1972.*

QST for

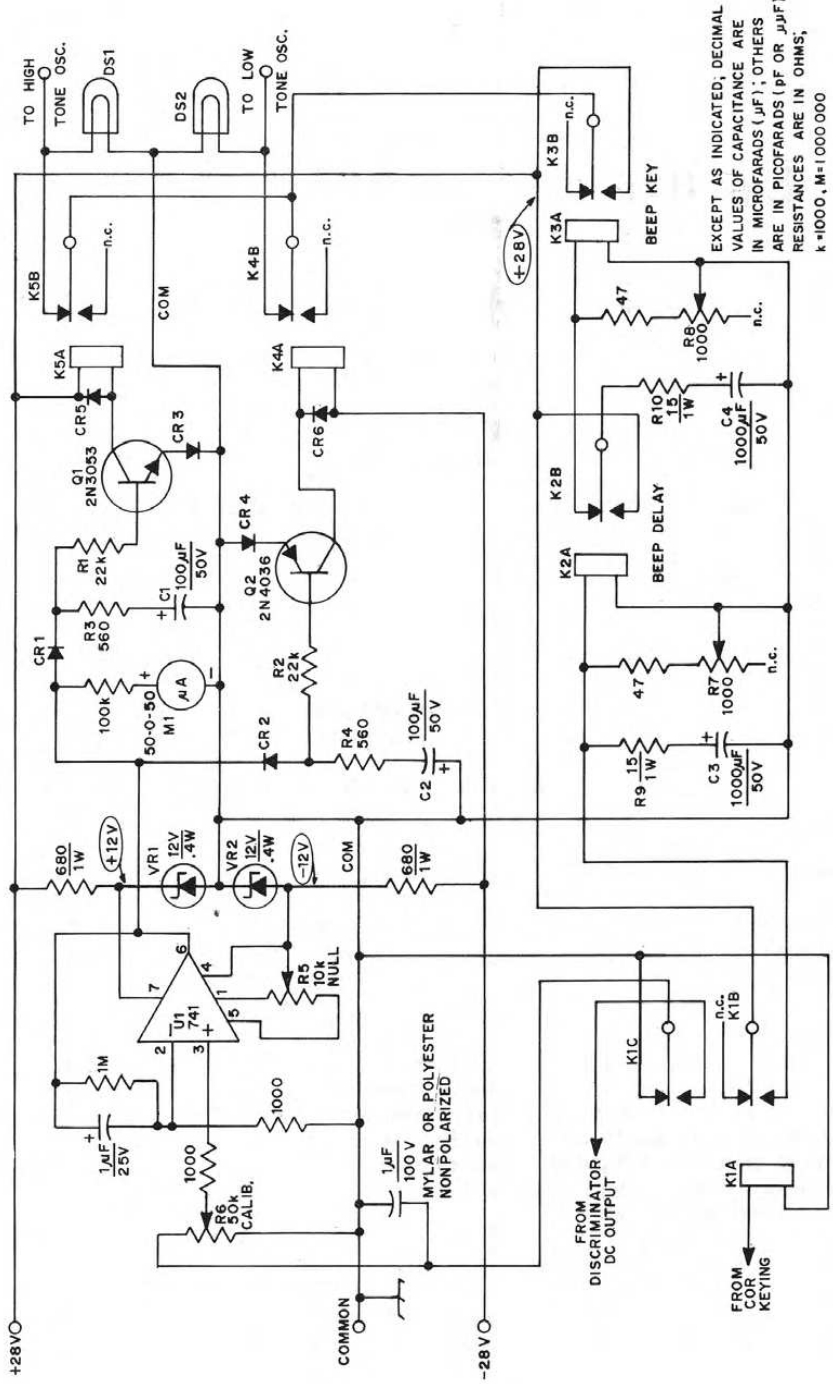


Fig. 1 — The schematic diagram of the tone-beep keyer. A dual 28-V supply is used in this system, but there should be no difficulty in revising values to make use of lower voltages. The charging current of C1 through C4 is limited to a safe value by means of the series resistor in each case. If the meter is omitted, tip jacks should be provided to aid in adjusting the circuit.
CR1-CR6, incl — Silicon diodes, 1N2069 or equiv.
DS1 DS2 — 28-V pilot lamps. Lower-voltage units or LEDs with suitable dropping resistors may be used.
K1 — Dpdt relay. Coil voltage and current must be compatible with voltages available from receiver COR circuitry
K2-K5, incl. — Spdt relays, 450- to 700-ohm coil for 24 V dc. Allied Control T154-2C or equiv
U1 — Operational amplifier IC. Fairchild μA741 (U5B7741312) Signetics μA741T or μA741CV Motorola MC1741G or MC1741P1 or equiv

K1 can be the normal COR or a separate relay keyed by the COR. This relay keys both the input to the op amp and the delay relay, K2. Because of the discharge time of C3, K2 will have a delayed release. When K2 releases, it keys K3 for a short period as determined by C4 and R8. The values needed for C3, C4, R7 and R8 will vary depending upon the characteristics of K2 and K3.

Operational Notes

1) K2 establishes length of delay between end of carrier and keying of tone beep.

2) K3 establishes length of tone beep.

3) K4 or K5 select the desired tone to be keyed.

4) Adjust R5, NULL control, for zero dc volts at the output of the 741 with K1 deenergized.

5) The trip point of K4 or K5 is adjusted by means of R6, the CALIBRATE control. It should be adjusted while monitoring a carrier set to the desired frequency offset value.

Decoding of the telemetry is by means of widely available equipment. the user's ears. QST

Certificate of Code Proficiency Recipients

Sponsored by

www.i2rtf.com

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

September 2023

Ralph E. Duncan, N7WWY	10
David G. Gower, W7JMG	10
Nathan T. Lyons, N8HWV	10
Ryan B. Massey, WB6EQK	10
Thomas F. Wentworth, W8LA	10
Christopher J. Brown, NY9X	15
Erich C. Fitschen, KQ4BBC	15
William G. Homsany, KG6COH	15
Nathan T. Lyons, N8HWV	15
Bruce Garrett, AC4CW	20
Joseph W. Chapman, NV1W	25
Ron Kinney, KCØZPS	25
Dain Webster, K7SXN	25
Michael J. Kerezsi, W3ASW	40

October 2023

Joseph P. Kononchik, KS1I	20

November 2023

Eric D. Benjaminson, WA9CEK	10
Paul K. Earhart, WD4OQH	10
Paul K. Earhart, WD4OQH	15
Alfred F. Hanzl, K2AL	15
Jerry W. Kerns, K6FN	15
Jerry W. Kerns, K6FN	20
John P. King, KA2F	20
David A. Rose, N8GZ	20
Robert D. Spearman, N5VUC	20
James C. Stekas, K2UI	20
Jerry W. Kerns, K6FN	25
John P. King, KA2F	25
Scott T. McNutt, N3ADP	25
Donald W. Brown, WØAF	30

December 2023

Matthew K. Jamison, KI5PGL	10
Andrew C. Kirk, WB2C	10
Richard F. Phillips, AEØQH	10
Erica W. Zavaleta, W7WXR	10
Russell L. Bast, Jr., AD2BO	20
James W. Carter, K7IOL	20
Alfred F. Hanzl, K2AL	20

January 2024

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

February 2024

Albert J. Whetter, W9WJ	20

Congratulations to all of the recipients.

April 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.

April 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 KH6TU on Wednesday, April 24, at 6 PM HST (0400 UTC on April 25) on 7047.5 and 14047.5 kHz. Unless indicated otherwise, sending speeds are from 40 to 10 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 — April 2024
(All times are in Eastern Daylight Time.)

Monday	Tuesday	Wednesday	Thursday	Friday
	4/2 7 PM – 2300Z 35 – 10 WPM	**4/3** 4 PM – 2000Z 10 – 35 WPM	**4/4** 10 PM – 0200Z **(4/5 – UTC)** 10 – 40 WPM	
	4/9 10 PM – 0200Z **(4/10 – UTC)** 10 – 35 WPM	**4/10** 7 PM – 2300Z 10 – 40 WPM		**4/12** 9 AM – 1300Z 35 – 10 WPM
	4/16 9 AM – 1300Z 10 – 35 WPM	**4/17** 10 PM – 0200Z **(4/18 – UTC)** 35 – 10 WPM	**4/18** 7 PM – 2300Z 10 – 35 WPM	**4/19** 4 PM – 2000Z 10 – 40 WPM
4/22 10 PM – 0200Z **(4/23 – UTC)** 10 – 40 WPM			**4/25** 7 PM – 2300Z 10 – 35 WPM	**4/26** 4 PM – 2000Z 35 – 10 WPM

Celebrating Our Legacy

Interest Sparked by Books

♦ A novel inspired my ham radio journey and career in electronics. In 1962, when I was in fifth grade, I read *SOS at Midnight* by Walker A. Tompkins. It was an exciting adventure of Tommy Rockford, K6ATX, and his teenage ham friends battling the Purple Shirt Mob. This piqued my interest in ham radio, but unfortunately, I didn't know anyone who was a ham.

My father was a railroad telegrapher, and he gave me his 1939 Morse code practice set. I subscribed to electronic magazines, learned Morse code, and purchased ARRL's ham radio books for beginners. I was determined to get a license. My father remembered that his high school classmate, Robert Gumm, then W9RG (SK), had his license. We contacted him, he graciously gave me the Novice test, and in February 1968, I received my call sign, WN9WYI. In August, I passed the General license test. I received my Advanced call sign in 1970 while studying electronics in Michigan, where I became active in the Michigan Post Office Net. I also got my father into ham radio, and he became N9JNZ (SK).

I served in the Navy for 6 years and was able to operate as K3ORS. After my time in the military, I worked in the medical electronics industry for 40 years. I received my Extra-class license and First Class Radiotelephone Operator Certificate in 1979. Lately, I have remained active on FT8, and I am a member of two clubs. Looking back, it is remarkable that it all started because of a work of fiction.

Neal Degner, WA9WYI
Germantown, Wisconsin
Life Member

♦ I became interested in ham radio after reading *The Boy Electrician* by Alfred P. Morgan when I was seven. I joined the science club at my grammar school, where several members were hams. I used code training records to learn Morse code, and listened to them repeatedly.

Randall Burg, WB6JLA, at his station in Marina del Rey in Los Angeles County, California. [Randall Burg, WB6JLA, photo]

One day after I was licensed, I was sending CQ DX on 20 meters, and a station whose call sign I'd never heard answered. I quickly looked up the call sign, and I almost fell off my chair! It was Pitcairn Island, one of the most remote locations on Earth. I had the contact of a lifetime!

I had always been interested in technology and had careers designing automated machine tools and selling mainframe computers, CAD/CAM systems, and printers. Years later, I retired to build a yacht broker business and an extensive ham station in my California office that could communicate with and assist yachtsmen cruising the Pacific Ocean. Cruisers first used phone patches and PACTOR, as satellite phones were too expensive and cell service was not available yet. I outfitted the station with a fair amount of restored classic equipment that, as a young ham, I had always wanted to own. Outside of my office, I installed a crank-up tower with a three-element Mosley triband beam.

I've since relocated my business to Florida and equipped my office with a FlexRadio FLEX-5000A transceiver, a Henry Radio 1KD-5 linear amplifier, and a Dentron DTR-3KA antenna tuner. My backup radio is my much-loved Icom IC-756 Pro II. I'm still into CW, rarely use SSB, and enjoy ham radio.

Randall Burg, WB6JLA
Fort Lauderdale, Florida

Keeping the Family Together

In the early 1980s, my late father-in-law, Ralph Everett Ables, Jr., wanted to maintain contact with his brother, Reverend Ed Ables, and his family, who had received their appointment to serve in Ecuador as Southern Baptist missionaries.

Mr. Ables began the journey of earning his ham license and taught himself Morse code. My wife, Katherine, said he spent many hours sharpening his Morse code skills to ace the test, and was licensed, becoming KA4BSQ. She also told me that her dad loved technology and was passionate about ham radio and the responsibilities that came with it. He kept detailed logs and was an ARRL member.

Mr. Ables talked with folks from Texas to the South Seas. He chatted with people in Australia, the Dominican Republic, Haiti, Lima, Peru, New York, and Colorado. Of course, his brother Ed made many ham friends all over the world, too, and enjoyed many conversations on a wide variety of subjects all the way from Ecuador, Buenos Aires, and Argentina.

Johnny Brewer
Albertville, Alabama

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

Clark Burgard, N1BCG, n1bcg@internetwork.com

A New Life for Old Iron

Country music, local news, and the feeling of a close-knit community beamed out from KPGE, a small AM station beloved by its devoted listeners in Page, Arizona. It was 1995, and the station's kilowatt transmitter, a Gates BC-1T (which had been in service for 24 years), signed off for the last time and would be replaced with a new transmitter.

At about the same time, Grant Bagley, W3GB, headed west in his pickup truck to help Rich Briggs, WA7MTF (SK), a KPGE employee, move his home and shack across the country to Maryland. The two had been friends since the 1980s, and this trip would reunite them and, unexpectedly, add a very large item to the move.

Two Paths Converge

During Grant's visit with Rich, he learned that Dan Brown, the owner of KPGE, wanted his BC-1T to go to a good home and not to the scrapyard. Arrangements were made to load the massive transmitter onto Grant's truck, along with all of Rich's gear.

"I envisioned putting the Gates on the air as AM 160 and/or 80," recalled Grant. "[It] arrived at my QTH in Baltimore, where I kept it until 2011, [when] I moved into a retirement community with no ham radio. [The] Gates was moved around several times during my time storing it. It seemed to gain weight each time it was moved," he added. Reluctantly, it was decided that the BC-1T had to go. It would be donated to the National Capital Radio & Television Museum in Bowie, Maryland.

"The story of the Gates is interesting and is a good example of how ham radio and the relationships we develop can become so much of our lives," Grant said fondly.

According to National Capital Radio & Television Museum Curator Brian Belanger, KB3PRS, they didn't have a good place to exhibit the transmitter, so they contacted other museums. The Vintage Radio and Communications Museum of Connecticut (VRCMCT) agreed to take ownership of it, and ARRL would take possession. ARRL would also make the transmitter functional on the amateur bands, with the stipulation that modifications would be kept to a minimum. On March 24, 2017, the

"The story of the Gates is interesting and is a good example of how ham radio and the relationships we develop can become so much of our lives."

BC-1T was transported in a rental van from Maryland to its new home at the ARRL Laboratory in Newington, Connecticut.

The transmitter needed a thorough cleaning and inspection, as it had been in storage for a number of years. Dan Thomas, NC1J, who had extensive broadcast engineering experience, headed up the team from the museum, which included Larry Butler, KB1KIZ; Dan Crowley, AB1XL, and Bill Storey, AB1LZ. ARRL arranged for the installation of a dedicated electrical panel in the Lab for the transmitter. This allowed the VRCMCT crew to restore the BC-1T to being fully operational on 1340 kc.

News of the conversion spread quickly through the ham community, resulting in an outpouring of support —

Tim "Timtron" Smith, WA1HLR, used his AM radio expertise to convert the BC-1T transmitter from broadcast to the ham bands.

most notably from Billy Yates, N6YW, who donated four 833 vacuum tubes used in the modulator and final power amplifier sections, and Dennis Gilliam, W7TFO, who donated the RF ammeter, which was missing from the transmitter.

From MF to HF

Tim "Timtron" Smith, WA1HLR, an AM mainstay with a rich and colorful history in amateur radio, worked on the transmitter's conversion from broadcast to ham bands. Tim was well known for offering detailed instructions for improving the audio and performance of a vast range of transmitters. For those on frequency, it was an authoritative schooling rooted in amateur and professional radio, as Tim had engineered broadcast stations on AM, FM, and shortwave throughout his expansive career.

The project was directed by then-ARRL Assistant Lab Manager Bob Allison, WB1GCM, who arranged for Tim to receive an official ARRL Lab coat with his name and call sign on it. His first challenge was getting the oscillator to function on 160 and 80 meters. From there, the driver stage was converted, followed by the output matching circuit. A number of design features, which were satisfactory for broadcast band operation, required changes for operating on the higher frequencies. No more lengthy RF leads connecting tuned circuits or bypass caps!

Trial Operation

The Gates BC-1T was making power on 160 and 80 meters, and for the four 833 tubes that had been used to provide a fully modulated kilowatt carrier 24/7, amateur use would be a cushy retirement. For the time being, the transmitter would be left on 3885 kc, crystal-controlled.

The first on-air test was made on February 22, 2018, from the ARRL Lab using a dipole designed for this transmitter. Despite being unannounced, a surprising number of operators discovered the test transmissions and joined in the celebration of the day. Some audio tweaks were made, but for the most part, the Gates BC-1T sounded loud and proud in its new home.

Current Status

In 2022, the VRCMCT took possession of the transmitter and moved it to the museum, where it's on display and occasionally on the air as W1VCM, operated by the museum's amateur radio club. The transmitter is also used during AM operating events, such as the AM Rally

Tim "Timtron" Smith, WA1HLR, dug into the innards of the broadcast transmitter to convert it to operation on 160 and 75 meters. Click here to access an audio recording of the BC-1T's first transmission on AM.

(**www.amrally.com**), the Electric Radio Heavy Metal Rally (**https://forums.qrz.com/index.php?threads/34th-electric-radio-heavy-metal-rally.892062**), and Antique Wireless Association on-air events (**www.antiquewireless.org/homepage/operating-events**).

The successful conversion of the transmitter greatly expanded ARRL's capabilities on the 160- and 80-meter bands, particularly for special AM operating events. The rest of the time that the transmitter was at ARRL, Bob operated as W1INF, the ARRL Laboratory Operators Club call sign, on the weekends, as ARRL staff is not permitted to operate while working.

The mission to get the BC-1T operational on the amateur bands was accomplished. Tim visited ARRL again to install the antenna changeover relay, and now that the transmitter has moved, he'll eventually visit the museum to make additional modifications.

Watch "WA1HLR Converts A Gates BC1T To 160 And 80 At The ARRL" (**www.youtube.com/watch?v=cqM-nbiMBOE**) for in-depth information about the transmitter's conversion, and Ham Nation episode 391 (**www.youtube.com/watch?v=67VfEdfRTkw**) to hear Bob explain the project. For technical data on the conversion, visit **https://forums.qrz.com/index.php?posts/4569753**.

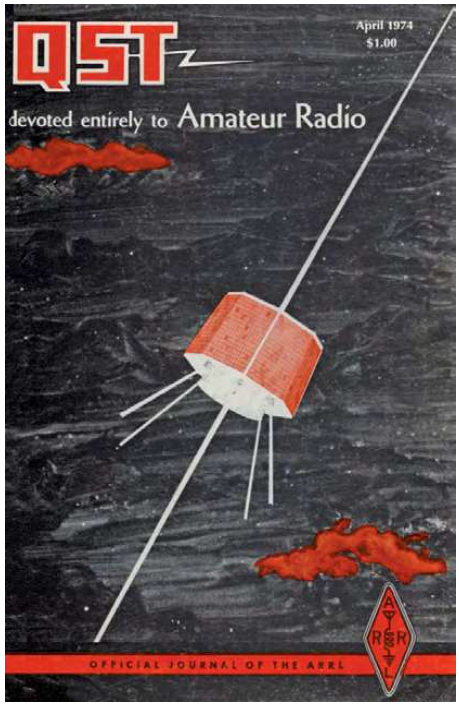
100, 50, and 25 Years Ago

April 1924

- The cover shows a ham in wintertime looking up at his antenna pole and holding the broken ends of the rope that had been supporting the three-wire "hundred-footer."
- "Editorials: The April Elections" and "B.C.L. Amateurs" remind members of their upcoming opportunity to choose representation for their division, and discuss broadcast listeners, pointing out that many may be brought into amateur radio because of their technical interests.
- A tuned radio frequency amplifier that does not oscillate under ordinary conditions of broadcast reception is presented in "Something New in Radio Frequency Amplifiers" by M.B. Sleeper.
- A useful way of manufacturing 3-phase supply from ordinary house current is shown in "Phase Multipliers and Mercury Arc Rectifiers" by S.P. Sweeney, 5KM.
- F.D. Fallain, 8ZH-8AND, tells the origin and early history behind ROWH in "The Story of the Royal Order of the Wouff Hong."
- A simple, inexpensive method of measuring plate dissipation, tube output power, and antenna resistance is described in "Seeing What Your Tubes Are Doing" by H.J. Nolte.
- In "The Amateur Builder," H.F. Mason, 1ID, explains how to "Build Your Own Battery Charger."

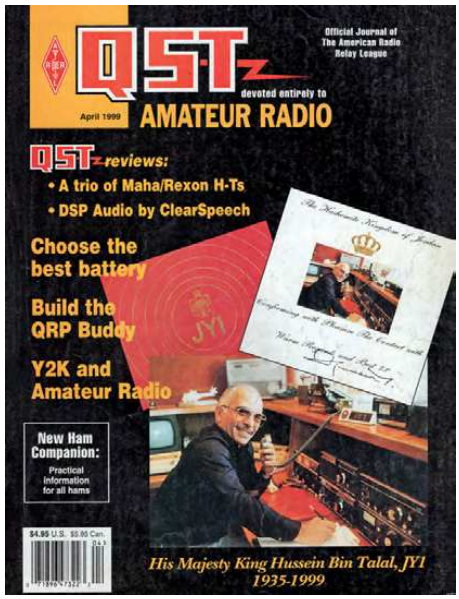
April 1974

- The cover shows an artist's conception of the Amsat-Oscar 7 satellite.
- "It Seems to Us…Trends and Basics" discusses some concerns in a current, independent survey of amateur characteristics, and reports that, going forward, the Beginner and Novice section will be more structured, combining "book learning" with simple lab projects.
- A simple-to-build, 2304-MHz balanced mixer that requires no tuning is described in "A Simple and Efficient Mixer for 2304 MHz" by Leroy May, W5AJG/W5HN, and Ben Lowe, K4VOW/WA5UVM.
- Part 1 of a course in fundamental theory and application of semiconductor devices for the newcomer appears in "Learning to Work with Semiconductors" by Doug De Maw, W1CER, and Lew McCoy, W1ICP.
- A space-saving vertical for 160 meters is described in "Hints and Kinks: A Backyard 160-Meter Vertical" by Mike Mussler, WB8JJA.
- A brief history of the Worked All Continents (WAC) award is shared in "A Gleam In Your Grandfathers' Eyes" by Hank Brown, W6HB.
- A photo of Bob Miner, Jr., VE3JN, who placed first in the Intermediate Engineering division of the 12th Canada Wide Science Fair with his Mars Landing Vehicle, appears in "Strays." The transmitter used is W1CER's 2-meter fm Pip-Squeak (featured in the March 1971 issue of *QST*).



April 1999

- King Hussein bin Talal, JY1, appears on the cover. His passing leaves an enduring legacy as one of the most active supporters of amateur radio on the international stage. A farewell to JY1 appears in "The Passage of a King" by Rick Lindquist, N1RL.
- Gratitude shown to our Official Observers (OOs), the *Amateur Auxiliary to the FCC*, for their role in the FCC's new enforcement actions is in "It Seems to Us… Pleased with More FCC Enforcement? Thank an OO!" by Rick Palm, K1CE.
- Start building your projects with surface-mount devices. Sam Ulbing, N4UAU, shows how in "Surface Mount Technology — You *Can* Work with It!, Part 1."
- "I'll see you in Hell." Steve Meltz, N2QLQ, summarizes "The 'New' HF Digital Modes."
- "One man's trash is truly another man's treasure." Jay Craswell, WØVNE, describes fixing radio equipment with a few tools and a keen sense of smell in "DIY Ham Radio Repair."
- Diane P. Ortiz, K2DO, explains how and why she infiltrated a Yankee Clipper Contest Club (YCCC) meeting in "YL News: A YL at the YCCC."



Silent Keys

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

vN1ARY **Engstrom**, Martin D., Jr., Fryeburg, ME
W1AUZ **Trudell**, Richard E., Hingham, MA
vWA1DGU **Gaylor**, Richard W., Sr., Brookfield, CT
•K1FIR **Little**, Paul A., Port St. Lucie, FL
♦WE1H **Atwood**, Matthew T., Merrimack, NH
KA1OJR **Goodland**, Elizabeth A., Woburn, MA
vKA1OJS **Goodland**, John L., Woburn, MA
vK1PTI **Carbone**, J. Peter, Jr., Canton, CT
N1TM **Magera**, Thomas E., East Hartford, CT
vKA1UUX **Cassidy**, George A., Stonington, CT
vK1VDE **Guerin**, Gilbert E., Essex, MA
KE2BV **Kingsley**, Richard A., Penn Yan, NY
KG2FN **Spaeth**, Peter G., Aquebogue, NY
vW2NZH **Mack**, Arthur E., Ellenton, FL
vKC2ROJ **Meeker**, Richard B., Brick, NJ
AC2T **Maytan**, Paul, Yonkers, NY
vKC2TRX **O'Connell**, Daniel, New York, NY
K2TWL **Parish**, Howard I., West Windsor, NJ
KC2YMI **Donovan**, James S., Stormville, NY
v♦N3AOG **Comly**, Richard E., Hatboro, PA
vKB3AP **Hofkin**, Gerald A., Owings Mills, MD
vAF3D **Andersen**, Robert G., Glen Burnie, MD
N3EMQ **Bradley**, William J., Media, PA
N3JOY **Long**, Robert C., Annville, PA
N3NZ **Zeibari**, Noel, Swarthmore, PA
NI3P **Oksala**, Stephen Paul, Exton, PA
♦K3SEW **Klock**, Ronald R., Northumberland, PA
vW3YZ **Kensinger**, Philip R., Acworth, GA
WJ3Z **Nardone**, George J., Manchester, MD
W4AMS **Sims**, Angus M., Jr., Canal Point, FL
N4AOC **Hoover**, Henry M., Franklin, TN
♦W4BZL **Ragland**, Joe R., Jr., Raleigh, NC
v♦W4CT **Booth**, Benjamin S., Mentone, AL
N4FAN **Bridges**, Chris, Shelby, NC
W4GSP **West**, Victor H., Gainesville, GA
N4HIX **Winter**, Melanie W., Huntsville, AL
KK4IAJ **Smith**, William Eugene, Jr., Rome, GA
WA4IOR **Russell**, Alvin F., Hendersonville, NC
KM4JRH **Kilmer**, Mark A., Raleigh, NC
KI4JWZ **Pierpoint**, Sarah O., Spring Hope, NC
N4KAJ **Karden**, Chana, Fort Lauderdale, FL
N4LH **Latta**, William I., Jr., Louisville, KY
vK4LOF **Huffingham**, Irving D., Jacksonville, FL
WB4LQS **Lemmons**, Gordon C., Gastonia, NC
vKJ4MDY **Eggimann**, Peter, Wendell, NC
v•W4NGS **Hancock**, Arnold L., Mayodan, NC
KA4OBK **Meacham**, Grace A., Memphis, TN
•KY4P **Lewis**, Charles L., West Jefferson, NC
N4PNI **Grant**, Franklin D., Woburn, GA
vK4QYK **Castle**, Roger, Greenup, KY
WA4RD **Ward**, Stanley D., Leicester, NC
KI4SLW **Koehler**, Bradley M., Kennewick, WA
v•W4STS **Sacco**, Steven Thomas, Whitsett, NC
v•KB4UBF **Klemm**, Richard R., Enterprise, AL
KW4UD **Worland**, Linda S., Kernersville, NC

v♦W4XT **Schlenker**, Clayton N., Louisville, KY
N5ATV **Daze**, Richard E., Houston, TX
♦K5FA **Abide**, Fred W., Jr., Leland, MS
vAB5FG **Ream**, Douglas M., Alamogordo, NM
vKC5FSC **King**, Gaylon, San Antonio, TX
K5GSM **De Hart**, Bryan N., Choctaw, OK
KV5I **Hatcher**, Eddie L., Mesquite, TX
K5JGU **Bearce**, Duane G., Houston, TX
W5JYB **Badeaux**, John J., Waskom, TX
♦K5LAD **Pickett**, Jim C., Owasso, OK
vKF5OVT **Davis**, Ronald, Jr., Rayville, LA
v•KF5OZS **Staples**, Robert D., Norman, OK
KF5PAL **Walker**, Brett, New Iberia, LA
•KB5SBG **Wilke**, Jeffrey L., Van Buren, AR
WB5UKU **Fremin**, George P., Jr., Austin, TX
WB5ULK **Skaggs**, Gary A., Laguna Vista, TX
N5XPI **Pinkston**, Bobby W., Colorado Springs, CO
vK5YKD **Wolf**, Earnest G., Oklahoma City, OK
♦K6AW **Merchant**, Stephen F., Goleta, CA
WB6BDN **White**, Paul H., Los Angeles, CA
KB6DMZ **Pearson**, Alan J., Rio Vista, CA
KG6DQG **Horsley**, Donald A., Emerald Hills, CA
N6IMV **Malo**, John A., San Diego, CA
♦K6KO **Anderson**, Kay O., Pine Grove, CA
K6MR **Beals**, Kenneth A., Anderson, CA
vK6QYN **Corby**, Joseph P., Hughson, CA
KM6RNW **Harmon**, Dean L., Redding, CA
vK6SI **Lamson**, Kenneth C., Las Vegas, NV
♦K6TA **Anderson**, Kenneth O., Pine Grove, CA
•KJ6VI **Collins**, John T., Dublin, CA
vW6YLD **Wahl**, Philip E., Santa Maria, CA
vWA6ZHE **Spaulding**, Norman E., San Jose, CA
vKE7AOA **Berney**, Richard V., Milwaukie, OR
v♦N7AS **Armstrong**, Grant C., Prescott Valley, AZ
K7DRH **Huycke**, Ann, Boise, ID
vK7EKG **Hull**, Robert E., Missoula, MT
KB7GYU **Tipton**, Christopher P., Klamath Falls, OR
vAC7JH **Dickey**, Steven L., Nampa, ID
vK7JYN **Baker**, Craig R., Walla Walla, WA
KG7LQP **Hastings**, Douglas G., Garden Valley, ID
KR7R **Vincent**, Richard D., Seattle, WA
♦W7RIL **McLean**, Riley, Eugene, OR
KF7SHR **Bersos**, Robert K., Mercer Island, WA
vKB7UBF **Harris**, Ralph W., Port Orchard, WA
•KD7VXW **Houser**, William G., Brigham City, UT
vN7VZW **Manning**, Bradford E., Yakima, WA
•N8BFI **Hazelton**, Marilyn J., Lawton, MI
vWA8BIJ **Cuker**, Vincent L., Chelsea, MI
W8CXZ **Swanson**, John E., Jr., Northville, MI
W8DRS **Sprude**, Donald R., Brookville, OH
N8ETP **Kopcak**, Thomas A., Westlake, OH
vW8GCW **Rich**, Charles E., Holland, MI
♦•N8JC **Cook**, Jerry, New Martinsville, WV
vWD8JHL **Staffey**, Don R., Stearns, KY
N8JIW **Howard**, Don, Shaker Heights, OH

v♦KN8KAZ **Sanders**, Franklin S., Jr., Buda, TX
W8KBA **Hassler**, Craig R., Columbus, OH
vWB8MLP **Carter**, Roy B., Hinton, WV
vK8NYL **Andrews**, John W., Sr., Akron, OH
W8OU **John**, Andrew C., Edmond, OK
vKD8RMU **Foor**, Thomas E., Kalamazoo, MI
K8VEN **Kolenich**, Jerome J., Solon, OH
K8WRF **Faulkner**, William R., Winfield, WV
WQ9A **Spellman**, William B., Waukesha, WI
WB9AKG **Stockton**, James D., Bloomington, IN
vKB9AO **Laska**, Gerald W., Wausau, WI
vN9AQF **Gardner**, Earl A., Greenwood, IN
vWD9CKO **Denick**, Gene A., Tucson, AZ
v♦WB9EBO **Swetsky**, Gerald P., Milton, FL
K9HJL **Enigl**, John R., Sr., Sturgeon Bay, WI
♦W9IM **Raffel**, Leslie J., Mettawa, IL
•WB9MFB **Shimek**, Ron, Manitowoc, WI
•N9QQE **Blaser**, Karen M., Sycamore, IL
KD9SEZ **Enter**, Steven H., Fredonia, WI
•N9UNR **Barrow**, David W., III, Cedarburg, WI
W9VA **Smith**, William B., Riverwoods, IL
vK9VCN **Treleven**, Robert E., Oneida, WI
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vWØBLE **Pierson**, Gerald V., Jr., Des Moines, IA
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vWDØGTM **Monkman**, Dennis E., Salol, MN
v•WØHKD **Bard**, Gene C., St. Paul, MN
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v•KØJFI **Schwartz**, Jay, Lake St. Louis, MO
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vNØOUW **Schmidt**, Gerald D., Longmont, CO
KEØOYW **Duncan**, Billie G., Jr., Warrensburg, MO
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KEØQXD **Nelson**, Patricia, Minneapolis, MN
WØRCT **Taggart**, Ross C., Overland Park, KS
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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.

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• Narrow Band SDR & Direct Sampling SDR • Crystal Roofing Filters Phenomenal Multi-Signal Receiving Characteristics • Unparalleled - 70dB Maximum Attenuation VC-Tune • 15 Separate (HAM 10 + GEN 5) Powerful Band Pass Filters • New Generation Scope Displays 3-Dimensional Spectrum Stream

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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

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Compact Commercial Grade Rugged Design • Large Front Speaker Delivers 1W of Powerful Clear Audio • 5 Watts of Reliable RF Power Within a compact Body • 3.5-Hour Rapid Charger Included • Large White LED Flashlight, Alarm and Quick Home Channel Access

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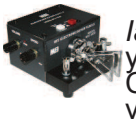

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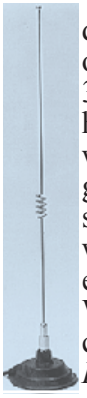
MFJ-281, $19.95. *Clearest speech you ever heard!* 3" speaker, 8W, 8 Ohms, 6' cord, 3.5 mm plug.

Best Sellers! Dual Band Mag Mount Ant



MFJ-1724B **$29.95** **MFJ-1724B** 2-Meter/440 MHz antenna is perfect for your dual band mobile or HT. Powerful 3½ inch magnet holds firm at highway speeds, rubber guard, 19" black stainless steel whip, low SWR, excellent gain, 300 Watts PEP, 12 feet coax with PL-259. *Free* BNC adapter.

MFJ-1729 **$49.95** **MFJ-1729** ***Power*Gain***™ Ham Radio's most powerful dual band antenna gives whopping gain on 440 MHz and 2-Meters! Low SWR. 27½" stainless steel *Slimline*™ radiator minimizes wind vibration for less SWR flutter for longer range, better readability. 12' coax, PL-259, Heavy duty magnet mount.

MFJ-1728B **$39.95** **MFJ-1728B** ***5/8 Wave 2/6 Meter Mobile*** Full 50-inch 5/8 Wave gives you maximum possible gain of *any* single element antenna on 2-Meters. On 6-Meter "magic band" you get a powerful signal with its high-performance low SWR *full* 1/4 Wave. 300 Watts PEP, heavy duty magnet, 12 feet coax, stainless steel radiator.

MFJ *Super-Strong* Magnet Mounts with Coax/PL-259

MFJ 5-inch Magnet

MFJ-335BS SO-239
MFJ-335BM NMO
MFJ-335BT 3/8 - 24 For HF sticks
$29.95 Each

Best Seller!
These jet-black ***5-inch*** *super strong* magnet mounts have 17' coaxial line terminated with PL-259 connectors. SO-239 (BS) or NMO (BM) for your VHF/UHF antennas or 3/8-24 threaded (BT) for your HF hamstick antennas with a 3/8-24 threaded connector.

MFJ 3-inch Magnet

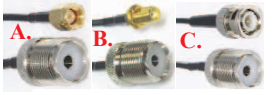
MFJ-333BS pictured
$19.95 Each

3-inch black magnet antenna mounts. 17 foot coax is terminated with PL-259 connector. Choose SO-239 (**BS**) or NMO (**BM**). For VHF/UHF lightweight antennas.

MFJ SMA/BNC Cables, $19.95

Release strain on your HT's antenna connector! 3 ft. flexible, mini coax with SO-239 connector.

A.MFJ-5612S SMA Male.
B.MFJ-5612SF SMA Female Wouxun/Baofeng.
C.MFJ-5612B BNC Male.

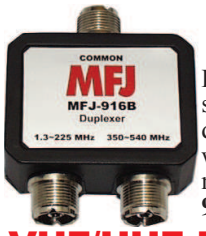


MFJ Triple 5" Magnets

$49.95 Each
MFJ-336S SO-239
MFJ-336M NMO
MFJ-336T 3/8x24

Three super-strong 5-Inch Magnets make up this MFJ *Goliath*™ Tri-Magnet Mount. 1/4" thick steel triangle base. 17' coax. Select SO-239, NMO, 3/8-24 antennas. **Caution:** once on, it's difficult to get off!

HF/VHF/UHF 200 Watt Duplexers



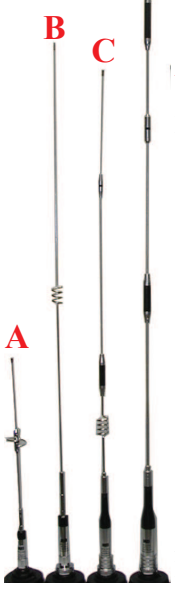
MFJ-916B **$44.95** **Use** separate HF/VHF and 440 MHz UHF antennas with single transceiver ***OR*** use two separate HF/VHF and 440 MHz UHF transceivers with a single HF/VHF/UHF antenna. Heavy-duty diecast enclosure houses low/high pass networks that separate/combine HF/VHF/UHF signals. Low loss SO-239s. 50 Ohm ports. **MFJ-916BC, $79.95** 3 ft. coax pigtails on 2-port side.

1.8-200 MHz SWR/Wattmeter

Compact 1.8-200 MHz SWR/Wattmeter has HUGE 3" *Cross-Needle* meter. Read forward/reflected power and SWR simultaneously. Perfect for mobile/portable. 30/300 Watt ranges. Built-in meter light. SO-239s. 3¼Wx3¼Hx3¼D". **MFJ-842, $79.95** covers 140-525 MHz, 15/150 Watts.

MFJ-822 1.8-200 MHz **$79.95** MFJ-842, 140-525

VHF/UHF Hi-Gain Antennas



A. MFJ-1402, $29.95. ***VHF/UHF RuffRiderJunior***™**.** Premium, short 16½" antenna fits in any garage on any auto. ¼ Wave on 2 Meters, ½ Wave, gain on 440 MHz. 100W. No foldover. B or C.

B. MFJ-1412, $39.95. ***VHF/UHF RuffRider High Power***™**.** Just 40" long handles full *200 Watts*. Great for high power mobile amp. ½ Wave, gain on 2 Meters, ⅝ Wave, great gain on 440 MHz. Black or chrome.

C. MFJ-1422, $59.95. ***VHF/UHF RuffRider High Gain***™**.** 41½ inch long antenna gives extra gain with little height increase. Handles 150 Watts. ½ wave with good gain on 2 Meters, ⅝ wave, excellent gain on 440 MHz. Black or chrome.

D. MFJ-1432, $69.95. ***VHF/UHF RuffRider Hyper Gain***™**.** 62½" brute gives whopping gain on ⅞ Wave 2-Meters, ⅝ Wave and a *MONSTER* gain on 440 MHz. MFJ will rock your ham radio world! 150 Watts. Use tri-magnet. Black or Chrome.

MFJ Mobile HF *Ham Sticks*

MFJ-1675T - 75 Meters
MFJ-1660T - 60 Meters
MFJ-1640T - 40 Meters
MFJ-1630T - 30 Meters
MFJ-1620T - 20 Meters
MFJ-1617T - 17 Meters
MFJ-1615T - 15 Meters
MFJ-1612T - 12 Meters
MFJ-1610T - 10 Meters
MFJ-1606T - 6 Meters
$21.95 Each 6-30 Meters
40-60 Meters, **$22.95**
75 Meters, **$29.95**

Each is ruggedly constructed. A heavy duty 4', ⅜ inch diameter fiberglass rod; a nearly indestructible .125 inch diameter PH-17-7 stainless steel whip and chrome plated brass fittings will give you years of service. It's sleek, low profile construction has low wind loading and its semi-rigid fiberglass eliminates the need for springs or guys.

Black anti-static jacket protects loading coil, blends with any vehicle. Stainless steel whip is adjustable for lowest SWR. Push it down to park in the garage or fully extend it for maximum efficiency during mobile operation.

Includes allen wrench and complete tuning and matching instructions. Handle 250 Watts PEP. Whips are 7 feet fully extended, and collapse to about 4 feet for easy storage. **Simply** screws into any 3/8 x 24 female mount for quick band-changing. Get them all for great band coverage!

3/8-24 Ham Stick Mounts

MFJ-343, $19.95. Tough 3/8-24 hard mount for permanent installation.

MFJ-342T, $19.95. 3/8-24 HF horizontal or vertical 1/4 or 1/2 inch pipe or mirror mount.

MFJ-344, $19.95. Like MFJ-342T, but horizontal pipe mount.

MFJ Power Supplies

Wold's Best and Largest Selection of Clean, NO RF Hash, no RFI power supplies are designed for ultra-reliable ham radio! High duty cycles on switchers for long Digital mode transmissions!

75-Amps, $379.95

MFJ-4275MV high-current switching power supply gives 75A max/70A continuous. Great for ALS-500M amplifier. Adjustable output 4-16 VDC/ 110/220 VAC. Binding posts, quick connects, *PowerPoles*(R), cigarette lighter socket on front. Battery charger gives charging current of 20A max, 5A continuous. 9¾Wx5½H x9½D". Only 10.5 lbs.

45-Amps, $259.95

MFJ-4245MV Switching power supply gives 45A surge/40A continuous. 9-15 VDC out. 85-260 VAC in. Low ripple, highly regulated. 5-way posts, cigarette lighter, quick connects. 5 lbs., 7½Wx4¾Hx9D".

25-Amps, $169.95

MFJ-4225MV Switching power supply gives 25A surge, 22A continuous. Adjustable 9-15 VDC output, 85-260 AC input. Large 3" dual Amp/Volt meters, binding posts, cigarette lighter socket. 3.7 lbs., 5¼Wx4½Hx6D".

$159.95

30A, 4-16V Adjustable, *PowerPoles*™, and binding posts, Volt/Amp Meter ...

Ham Radio's Best Seller!

MFJ-4230MV, $149.95 *Binding Posts* on back.

MFJ-4230MPF, $159.95 *PowerPoles*(R) on front of unit.

MFJ-4230DMP, $189.95 Like MFJ-4230MVP but has bright orange digital Volt/Amp display.

MFJ-4230MVP is ham radio's best compact switching power supply -- just 5Wx2½Hx6D" and 3 lbs. Takes up little room on your operating position and perfect for home station, field day, DXpeditions, camping, hiking or for your next business trip or vacation. Gives 25A continuously or 30Amps surge at 13.8 VDC. Voltage is front panel adjustable 4-16 VDC. Selectable input voltage of 120 or 240 VAC at 47-63 Hz lets you carry it with you and use it worldwide. Front panel rocker switch lets you choose Amp/Volt meter for continuous monitoring. Cool operation with excellent 75% efficiency. Extra low ripple and noise is less than 100 mV. It's quiet! Continuous air flow gently cools the power supply and a heat sensor increases fan speed if the temperature rises above 70 degrees celsius. Over-voltage and over-current protection fully protects your transceiver and has ALARM LED. DC output is 5-way binding posts on front ***and*** *PowerPoles*™ on back. Power your HF, VHF, UHF rig and accessories with ease.

25-Amps, $129.95

MFJ-4125 gives 25A surge, 22A continuous. 13.8 VDC switcher. 5-way binding posts on front and quick connects on back. 3.5 lbs.

35-Amps, $199.95

MFJ-4035MV 19.2 lb. transformer, 35A max, 30A continuous. 1-14 VDC out, 110 VAC in. Highly regulated, 1% load, 1 mV ripple. 5-way posts, cig lighter. 9½Wx6Hx9¾D".

28-Amps, $129.95

MFJ-4128. 28A surge, 25A continuous. 13.8 VDC. AC input is 85-135/170-260 VAC. 5-way binding posts, cigarette socket.

25-Amps, $139.95

MFJ-4125P. 25A surge, 22A cont. 13.8 VDC switcher. 2-pair *PowerPoles*(R), 5-way posts, quick connects. 3½ lbs.

15-Amps, $99.95

MFJ-4115. 17A surge, 15A cont. 13.8 VDC. 110/ 220 VAC. 3¾Wx2¼Hx7¾D", 1.5 lb. 5-way posts.

MFJ-4215MV, $119.95. Like MFJ-4115 but has backlit volt/amp meters.

MFJ *PowerPole*(R) Splitters

MFJ-1104, $59.95 *PowerPole*(R) Splitter, 30 Amp fused input, outputs fused at 25, 10, 5A. Open fuse indicator. 2¾Wx3¼Hx1½D".

MFJ-1107, $79.95 40A fused binding posts input, 4 fused *PowerPole*(R) outputs, two 2.1 mm center positive power jacks.

MFJ-1106, $74.95 One in, six out *PowerPoles*(R). 30A total. 7 sets of mating conectors included.

MFJ High Current DC Multi-Outlet Strips

Power multiple transceivers/accessories from a single DC power supply

MFJ-1118, $119.95 Power two HF and/or VHF rigs and six accessories from rig's 12 VDC supply. 35A high-current and 15A accessory binding posts, Voltmeter, on/off switch. Master fuse, RF bypass. 12½Wx2¾Hx2½D".

MFJ-1129, $169.95 10 outlets. Installed fuses: two 1A, three 5A, three 10A, two 25A, one 40A. Outlets 1, 2, 4-8 are *PowerPoles*(R). Outlet 3 is a 35A high current post, outlet 9, 10 are 15A posts. Switch, voltmeter. 12½Wx1¼Hx2½D".

MFJ-1116, $99.95 Like MFJ-1118 but 15A total, 8 pairs 5-ways."On" LED, 0-25 VDC voltmeter.

MFJ-1128, $159.95 12 fused *Power Poles*(R), three 1A, four 5A, four 10A, one 25A, one 40A. Switch, Meter.

MFJ-1112, $79.95 Like MFJ-1116 but 6 pairs 5-way posts, no meter/switch. 12½Wx2¾Hx2½D".

MFJ-1126, $129.95 8 fused *PowerPoles*(R): a 1A, three 5A, two 10A, one 25A, one 40A. Switch, Voltmeter. 9Wx1½Hx2¾D".

MFJ-1117, $94.95 High-current. Powers four HF/VHF radios simultaneously -- 2 at 35A each, 2 at 35A combined. 8Wx2Hx3D".

MFJ-1124, $109.95 4 pairs 35A PowerPoles(R), 2 pairs 35A high current posts.

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759

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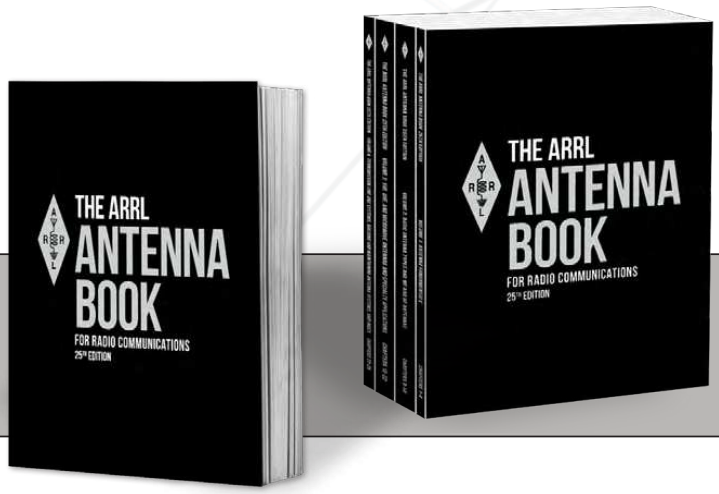

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MFJ G5RV Antennas

Operate all bands 10 thru 160 Meters with a single wire antenna!

MFJ-1778 **$89.95** ***The famous G5RV antenna is the most popular ham radio antenna in the world!***

It's an efficient, *all band* 102 foot long antenna -- shorter than an 80 Meter dipole. Has 32.5 foot ladder line matching section ending in SO-239 connector for your coax feedline.

Use horizontally or as Inverted Vee or Sloper with just one support. 1500 Watts.

Operate all bands 80-10 Meters with an antenna tuner and even 160M with ground.

Fully assembled with *ceramic* end and fiberglass center insulators. *Hang and Play™* -- add coax, rope to hang and you're on air!

MFJ-1778M, $79.95. *Half-size*, 52 foot *G5RV JUNIOR for limited space.* 40-10 Meters with tuner. Full 1500 Watts.

MFJ All Band Classic Doublet

MFJ-1777 **$129.95**

MFJ 102 foot *all band* doublet covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator relieves stress on 100 foot ladder line. *Glazed ceramic* end insulators. 1500 Watts.

RF Isolator

MFJ-915 **$49.95**

MFJ-915 *RF Isolator* prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. 1.8-30 MHz, 1500 Watts. 5x2 inches.

MFJ-919, $84.95. 4:1 current balun,1.5 kW.

MFJ-913, $49.95. 4:1 balun, 300 Watts.

True 1:1 Current Balun & Center Insulator

MFJ-918 **$49.95**

True *1:1 Current Balun/ Center Insulator* forces equal radiator currents in dipoles for true dipole radiation pattern. Reduces coax radiation and field pattern distortion -- your signal goes where *you* want it. Reduces TVI, RFI and RF hot spots. *Don't build a dipole without one!* 50 hi-permeability ferrite beads on high quality RG-303 *Teflon*® coax and *Teflon*® SO-239. 1.5kW 1.8-30 MHz. Stainless steel hardware. 14 gauge stranded copper wire is *directly* connected to your antenna. 5x2 inches. Heavy duty weather housing.

2-Position Antenna Switch

MFJ-1702C, $69.95. 2-position antenna switch, lightning surge protection, center ground. SO-239s.

Lightning surge protectors. MFJ-270, $27.95. 400W. **MFJ-272, $37.95.** 1500 W. Gas discharge tube shunts 5000 amps peak.< 0.1 dB loss. 1 GHz. SO-239s.

MFJ-16C06, $9.95. 6-pack *glazed ceramic* end/center ant. insulators.

MFJ-16B01, $24.95. Molded high-strength center insulator. SO-239.

MFJ-16D01, $9.95. 450 Ohm fiberglass end/center insulator with ladder line stress relief and SO-239 mount.

MFJ-18H100, $69.95. 100 feet, 450 Ohm ladder line, 18 gauge copper clad.

80-10 Meter End-Fed Half Wave antenna

Cover all HF bands with one single wire and no tuner!

MFJ-1982HP, $129.95

No tuner needed!

All band 80-10M EFHW antenna

Get-on-the air on all bands 80-10 Meters with just one wire and one support (pole or tree) and no tuner or long counterpoise.

Installs anywhere in minutes! Rugged *insulated*-wire radiator prevents detuning when contacting limbs/branches. *"No-snag"* end insulator slides over branches, leaves.

Toss over a high limb for inverted-V or sloper or go vertical with an inverted-L.

Dark jacketed wire is virtually invisible -- *don't let antenna restrictions keep you off the air!* Great for emergencies.

EFHWs naturally resonate on the 1/2-wave fundamental frequency and odd/even harmonics. Covers 80/40/30/20/17/15/12/10 Meters without traps, stubs or resonators.

Broad-band matching transformer at feed point gives SWR so low you may never need a tuner. Compensating inductor optimizes SWR. 800 Watts SSB/CW. 132 feet jacketed antenna wire.

More 80-10 Meter Models

MFJ-1982MP, $99.95. Like MFJ-1982HP but handles 300 Watts.

MFJ-1982LP, $89.95. Like MFJ-1982MP but handles 30 Watts.

EFHW 40-Meter Models

MFJ-1984HP, $109.95. Like MFJ-1982HP but 40-10M. 66 feet jacketed wire.

MFJ-1984MP, $89.95. Like MFJ-1982HP, but handles 300 Watts.

MFJ-1984LP, $79.95. Like MFJ-1982MP, but handles 30 Watts.

Dual Band Dipoles

MFJ-17758 **$129.95** 80/40 Meters

MFJ-17758, $129.95. Operate 80/40 Meters with a short 85 foot dipole. *Full-size* on 40 Meters with ultra-efficient end-loading on 80 Meters. 1500 Watts. Super-strong custom molded center insulator with SO-239 connector and hang hole. Ceramic end insulators. 7-strand, 14 gauge hard copper wire. *No tuner needed!*

MFJ-17754, $89.95. Like MFJ-17758 but is only 42 feet. Operate 40/20 Meters. *Full-size* on 20 Meters, ultra-efficient end-loading on 40 Meters. 1500 Watts.

Single Band Dipoles

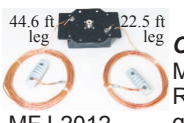
MFJ-1779A **$99.95** 160M, 265 ft.

MFJ-1779B **$79.95** 80-40M, 135 ft.

MFJ-1779C **$59.95** 20-6M, 35 ft.

Ultra high quality center fed dipoles give years of trouble-free service. Custom injection-molded UV-resistant center insulator has built-in SO-239 and hanging hole. *Glazed* ceramic end insulators. 7-strand, 14-gauge hard copper antenna wire. 1500 Watts. Use horizontally or as sloper or inverted vee. Simply cut to length with provided cutting chart.

OCFD Dipoles



MFJ-2012 **$109.95** 1500 Watts

MFJ-2010 **$89.95** 300Watts

No tuner needed! MFJ *Off-Center Fed Dipoles* use MFJ's exclusive *ExactRatio™* RF broadband transformer to give low SWR and maximum bandwidth on 40/20/10/6 Meters. A Guanella current balun kills feedline radiation, pattern distortion, SWR shifts, RFI and noise pickup. Install anywhere and get the same predictable performance regardless of feedline length. You get ground reinforced gain over verticals. Use horizontally, inverted vee, sloper. 98% efficient, 14 gauge, 7-strand copper wire, ceramic end insulators.

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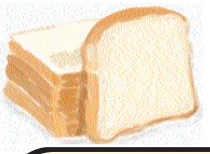


"Best thing since sliced bread!"

More hams use MFJ analyzers than all others in the world!

MFJ-259D . . . World's Most Popular Antenna Analyzer!

MFJ-259D **$349.95** *New and improved, now covers 280 KHz-230 MHz!*

***World** famous* MFJ-259D gives you a complete picture of your antenna's SWR and Complex Impedance.

MFJ-259D is a complete ham radio test station including frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance/Reactance Analyzer, Coax Analyzer, Capacitance/Inductance Meter and more!

Read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

Determine velocity factor, coax cable loss in dB, length of coax and distance to short/open.

Read SWR, return loss and reflection coefficient at any frequency simultaneously.

Read inductance (uH) and capacitance (pF) at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

Built-in frequency counter, Ni-MH/Ni-CD charger circuit, battery saver, low battery warning, smooth reduction drive tuning.

Super easy-to-use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR, Complex impedance displayed instantly!

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. Use 10 AA or Ni-Cad or Ni-MH batteries (not included) or 110 VAC with MFJ-1312D, $19.95. Rugged metal cabinet, 4x2x6¾". **MFJ-249D, $329.95.**

MFJ-249D does everything MFJ-259D does with digital display only.

MFJ-269D . . . 280 KHz - 230 MHz plus 415-470 MHz, 12-bit A/D

New and improved. Now covers 280 KHz to 230 MHz and 415 to 470 MHz and 2200 Meter band!

Instantly gives you a complete picture of your antenna.

Read SWR, return loss, reflect-ion coefficient, match efficiency at any frequency simultaneously.

Read Complex Impedance (100 KHz to 230 MHz) as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads parallel equivalent resistance and reactance (Rp+jXp).

Determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

MFJ-269D **$449.95**

Coax Calculator™ calculates coax line length in feet given degrees and vice versa for any frequency, velocity factor.

Measure SWR and loss of coax with *any* characteristic impedance (280 KHz to 230 MHz) from 10 to over 600 Ohms.

Measures inductance in uH and capacitance in pF at RF frequencies, 100 KHz to 230 MHz.

High contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

12-bit A/D converter gives much better accuracy and resolution than common 8-bits -- *MFJ-269D exclusive!*

Built-in frequency counter, battery saver, low battery warning, Ni-Mh/NiCd charge circuit. 4Wx2Dx6¾", 2 lbs. Use ten aA batteries or 110 VAC with MFJ-1312D, $19.95.

MFJ-269DPRO™ SWR Analyzer

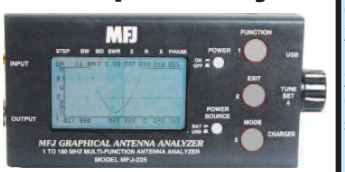
MFJ-269DPro, $519.95. Like MFJ-269D, but UHF range covers ***430 to 520 MHz***. For commercial work.

MFJ-223 1-60 MHz *Color Graphic* VNA Analyzer

Pocket-sized Color VNA Analyzer has a vivid TFT multi-color display and covers 1-60 MHz. Get data for SWR, resistance, reactance, and impedance magnitude. Continuous DDS frequency coverage with 100 Hz resolution. Full selection of tuning steps and sweeps. Movable marker calls up alpha-numeric data for any point on any plot -- memory captures current data when analyzer is off. Single and Swept frequency operating modes, truly accurate SWR, R, X, Z measurements, seamless DDS coverage, smooth skip-free encoder tunes fast or slow, powerful +5-dBm stimulus generator overrides interference, vivid 1600-pixel/inch color graphics on 2x2" non-glare TFT. Built-in lithium battery.

MFJ-223 **$399.95**

MFJ-225 1.5-180 MHz *continuous* Two-Port Graphic Analyzer



Out in the field, the MFJ-225 is a compact completely *self-contained handheld graphing analyzer*. On the bench it becomes a full-fledged two-port (S21) desktop machine when teamed up with your PC. Using powerful IG-miniVNA freeware, you'll run de-tailed data analysis and print out stunning color-graphic plots to document your work! Built-in back-lighted *3-inch LCD graphic* display. Make fine adjustments using full-screen easy-to-view SWR bar-graph, capture vivid swept displays for SWR, impedance, re-turn loss, phase angle, more. DDS generator.

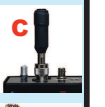
MFJ-225 **$399.95**

SWR Analyzer Accessories

A. MFJ-29D/MFJ-39D, $39.95. Carrying Pouch for MFJ-259D/269D.

B. MFJ-92AA10, $59.95. 10-Pk 2500 mAh Ni-MH Supercells.

C. MFJ-66C, $59.95. Dip coils, set of two covers 1.8-230 MHz.



D. MFJ-731, $134.95. Tunable Analyzer Filter, 1.8-30 MHz, for strong RF fields.

E. MFJ-917, $39.95. 1:1 Current balun for SWR Analyzers to test balanced line antennas, other loads.

F. MFJ-7737, $8.95. PL-259 to BNC Female.

G. MFJ-7727, $9.95. PL-259 to SMA Female.

H. MFJ-5510C, $19.95.12VDC cigarette lighter adapter.

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Full Digital Power!

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas, wire connection and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *Instant Recall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

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600 Watt MFJ Automatic Antenna Tuner

MFJ-994B, $419.95. Like MFJ-993B but handles 600 Watts SSB/CW/Digital, matches 12-800 Ohms. 10,000 memories. Doesn't have LCD, antenna switch, balun, audio SWR meter. 10Wx2¾Hx9D inches.

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SWR/Wattmeter, 10000 VA Memories

Extra *wide matching range at less cost.* MFJ's *exclusive* dual power level: 300 Watts for 6-1600 Ohms; 150Watts for 6-3200 Ohms. Cross-Needle SWR/Wattmeter.

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200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR. Bright LCD Display.

MFJ-929
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200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

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$199.95

200W SSB/CW and Digital. Low-profile automatic tuner is great for those tiny new rigs. Just tune and talk! Includes interface cable, 2-year warranty. 6½Wx2⅞Hx8⅜D".

MFJ *Remote* AutoTuners

Get greatly reduced losses and high efficiencies with long coax runs and high SWR antennas. ***Full Digital Power!***

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MFJ-993BRT, $399.95. 300W.
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Cover 160-10 Meters with antenna tuner. 102 ft. long. Use as inverted vee or sloper, 160 Meters as Marconi. 1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators.

MFJ-1778
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MFJ-949E $279.95

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Why? Because the world's leading tuner has earned a worldwide reputation for being able to match just about anything.

Full 1.8-30 MHz Operation

Tune your antenna for minimum SWR! Works 1.8-30 MHz on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas...Use coax, random wire, balanced lines. Has heavy-duty 4:1 balun for balanced lines.

Custom inductor switch

Custom designed inductor switch, 1000 volt tuning capacitors, Teflon® insulating washers and proper L/C ratio gives you arc-free no worries operation up to 300 Watts PEP transceiver input power.

The MFJ-949E inductor switch was custom designed to withstand the extremely high RF voltages and currents that are developed in your tuner.

8-Position Antenna switch

Antenna switch lets you select two coax fed antennas, random wire/balanced line or dummy load through your MFJ-949E or direct to your transceiver.

Lighted Cross-Needle Meter

Full size 3-inch lighted Cross-Needle Meter. Lets you easily read SWR, peak or average forward and reflected power simultaneously. Has 300 Watt or 30 Watt ranges.

QRM-Free PreTune™

MFJ's QRM-Free PreTune™ lets you pre-tune your MFJ-949E off-the-air into its built-in dummy load! Makes tuning your actual antenna faster and easier.

Plus Much More!

Full size built-in non-inductive 50 Ohm dummy load, scratch-proof Lexan multi-colored front panel, $10^5/_8$ x $3^1/_2$ x 7 inches. Superior cabinet construction and more!

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MFJ-989D Legal Limit Tuner

MFJ-989D $539.95

New, improved MFJ- 989D legal limit antenna tuner gives you better efficiency, lower losses and a new true peak reading meter. Easily handles full 1500 Watts SSB/CW, 1.8-30 MHz, including MARS/WARC bands. Six position antenna switch, dummy load. New 500 pF air variable capacitors. New improved AirCore™ Roller Inductor. New high voltage current balun. New crank knob. $12^7/_8$W x 6H x $11^5/_8$D inches.

MFJ-986 Two knob Differential-T™

MFJ-986 $479.95

Two knob tuning (differential capacitor and AirCore™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross- Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^3/_4$W x $4^1/_2$H x 15 in.

MFJ-962D Compact kW Tuner

MFJ-962E $399.95

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MFJ-969 300W Roller Inductor Tuner

Superb, AirCore™ Roller Inductor tuning. Covers 6 Meters thru 160 Meters! 300 Watts PEP SSB. Active true peak reading lighted Cross-Needle SWR Wattmeter, QRM-Free PreTune™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $10^1/_2$W x $3^1/_2$H x $9^1/_2$D inches.

MFJ-969 $319.95

MFJ-941E Super Value Tuner

Most for your money! 300 Watts PEP, 1.8-30 MHZ, lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. $10^1/_2$W x $2^1/_2$H x 7D in. **MFJ-941EK, $209.95.** Tuner Kit -- Build your own!

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Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6 x $6^1/_2$ x $2^1/_2$ in.

MFJ-971 $179.95

MFJ-901B Smallest Versa Tuner

MFJ's smallest (5 x 2 x 6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

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MFJ-902B Tiny Travel Tuner

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MFJ-16010 $109.95

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80-10 Meters, 25 Watts. 12 position inductor, tune/bypass switch, wide-range T-network, BNCs. 4W x $2^5/_8$H x $1^1/_2$D inches. **MFJ-9201, $79.95**

MFJ-9201 $79.95

MFJ-921/924 VHF/UHF Tuners

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8 x $2^1/_2$ x 3 in.

MFJ-921/924 $149.95

MFJ-931 Artificial RF Ground

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $299.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

MFJ-931 $159.95

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MFJ POTA helpers

80-10 Meters with single EFHW antenna, no tuner needed!

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• **Get on the air** 80-10 Meters with a single wire *EFHW* and one center or end support. Fast, easy set-up/take-down for portable use.
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• **No long counterpoise**, radials or feedline required
• **Nearly invisible,** no-tangle black *Teflon* insulated radiator wire.
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MFJ-1984HP, $109.95. *800 Watts*, high power, 40-10 Meters. 66 feet.
MFJ-1982LP, $89.95. *30 Watts* QRP, 80-10 Meters. 132 feet.
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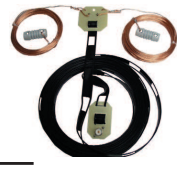
G5RV Antenna

MFJ-1778, $89.95. 80-10 Meters G5RV is 102 foot wide copper wire, 32.5 feet ladder line center to SO-239.



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MFJ-1898, $149.95. Get 60/40/30/20/17/15/12/10/6-Meters in one portable *continuously tuneable* antenna!!! Great for POTA, SOTA, DXPeditions or just in your backyard. Collapses to 1.25x11.5 inches in two sections. Fully extended it's a whopping 103 inches! Easy to tune. Tuning section base unscrews to reveal a nifty tuning chart (like a ruler). Handles 125 Watts PEP SSB. Quick and painless band changing.

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MFJ Weather-Proof Window Feedthrough Panels

Weather-proof window feedthrough panels bring HF/VHF/UHF antennas, balanced lines, random wire antennas, ground, DC/AC power and Rotator/Antenna Switch Cables into your hamshack without drilling through walls!

made in USA

MFJ Weather-Proof Window Feedthrough Panels mount in your window sill. Lets you bring all your antenna connections into your hamshack without drilling holes through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontal or vertical. Connectors are mounted on inside/outside stainless steel plates and attached to a 4 ft. long, 3½" high, 3/4" thick pressure-treated wood panel.

Real Western Red Cedar wood is naturally resistant to rot, decay and insects -- lasts longer, maintenance free. Pitch and resin free for a wide range of beautiful finishes or leave it in its naturally beautiful raw finish. Edges sealed by weather-stripping. Seals and insulates against all weather conditions. Includes window locking rod.

Inside/outside stainless steel plates ground all coax shields. Stainless steel ground post brings ground in.

MFJ-4603
$129.95

MFJ-4603 Universal Window Feedthrough Panel

Four 50 Ohm *Teflon*(R) SO-239 coax connectors let you feed HF/VHF/UHF antennas at full legal power limit.

A 50 Ohm *Teflon*(R) coax N-connector lets you use any antenna up to 11 GHz including 450 MHz, UHF, satellite, moon bounce and 2.4/5.8 GHz Wi-Fi antennas.

A 75 Ohm, 1 GHz F-connector makes it easy to bring in telvision, satellite, HFD cable TV and FM radio signals.

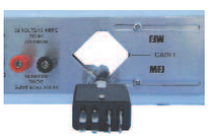
A pair of high-voltage ceramic feedthrough insulators lets you bring in 450/300 Ohm balanced lines directly to your antenna tuner.

Has random/longwire antenna ceramic feedthrough insulator.

5-way binding posts let you supply 50 Volts/15 Amps DC/AC power to your outside antenna tuners/relays/switches.

Stainless ground post brings in ground connection, bonds inside/outside stainless steel panels together and drains away static charges.

MFJ's exclusive *Adaptive Cable Feedthru*™ lets you bring in rotator/antenna switch cable, etc. without removing connectors (up to 1¼ x 1⅝ in.) Adapts to virtually any cable size. Seals out rain, snow, adverse weather.



3 Coax, Balanced Line, Random Wire

Best Seller! 3 *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Separate high voltage ceramic feed-thru insulators for balanced lines and long wire/random wire. Stainless steel ground post.

MFJ-4601
$89.95

6 Coax

6 high quality *Teflon*(R) coax connectors for HF/VHF/UHF antennas. Stainless steel ground post. Full 1500 Watts.

MFJ-4602
$104.95

4 Balanced Line, 2 Coax

4 pairs of high-voltage ceramic feed-thru insulators for balanced lines and 2 coax connectors.

MFJ-4600
$124.95

5 Cables, any-size

5 Adaptive Cable Feedthrus™. Pass any cable with connector: 2 cables with large connectors up to 1¼x1⅝ inches and 3 cables with UHF/N size coax connectors. Seals out weather.

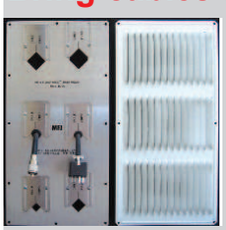
MFJ-4604
$134.95

All-Purpose FeedThru/CableThru™

Stacks MFJ-4603 and MFJ-4604! Gives you every possible cable connection you'll ever need through your window without drilling holes in wall -- including UHF, N and F coax connectors, balanced lines, random wire, ground, DC/AC power and cables of any size for rotators, antenna switches, etc.

MFJ-4605
$199.95

Bring cables thru eave of your house



MFJ-4616
shown with vent (not included) it replaces.
Six Holes
$49.95

made in USA

MFJ-4613
shown with vent (not included) it replaces.
Three Holes
$34.95

Replace standard house eave/sofitt air vents with these *MFJ AdaptiveCable*™ *Plates*.

Bring in coax, rotator, antenna switch, power cables, etc. of nearly any size up to 1¼x1⅝".

Sliding plates, rubber grommets adjust for virtually any cable size to seal out adverse weather, insects and varmints. Use existing vent hole, mounting screws and screw holes.

MFJ *AdaptiveCable*™ Wall Plates

MFJ-4614
(Four Holes)
$79.95

MFJ's exclusive weather-sealed *AdaptiveCable*™ *Wall Plates* let you bring nearly any cable -- rotator, antenna switch, coax, etc. -- through walls without removing connectors. Pass cable connectors up to 1¼x1⅝". Slide plates adjust hole size to weather-seal virtually any cable. Rubber grommet seals out rain, snow, adverse weather. Kit includes 18 gauge *stainless steel* plates for wall side, sliding plates, rubber grommets, weather stripping and hardware. Models for one, two and four cables.

MFJ-4612
(Two Holes)
$49.95

MFJ-4611
(Single Hole)
$34.95

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