

QST



DIGITAL EDITION



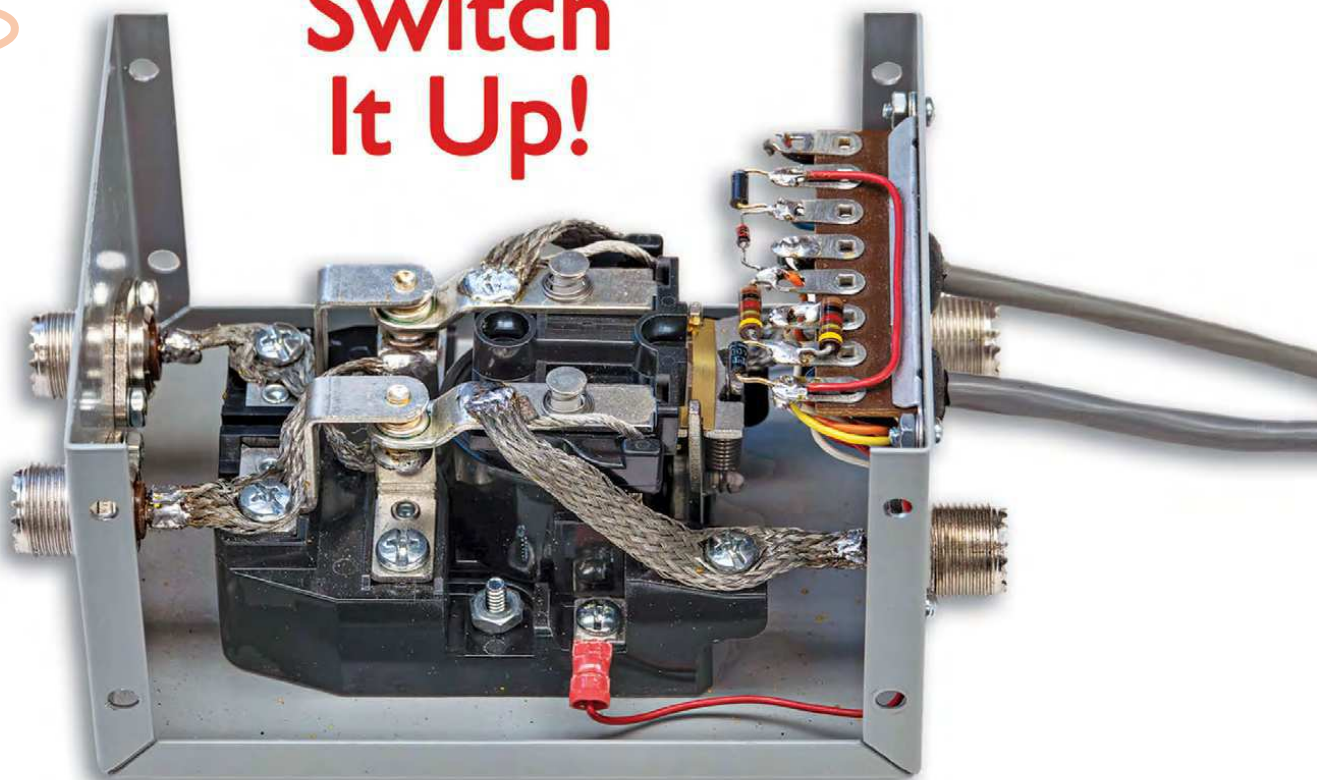
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Amateur Radio®

March 2024

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DEVOTED ENTIRELY TO AMATEUR RADIO

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QST Reviews

PreppComm MMX
Multiband Morse
Code Transceiver

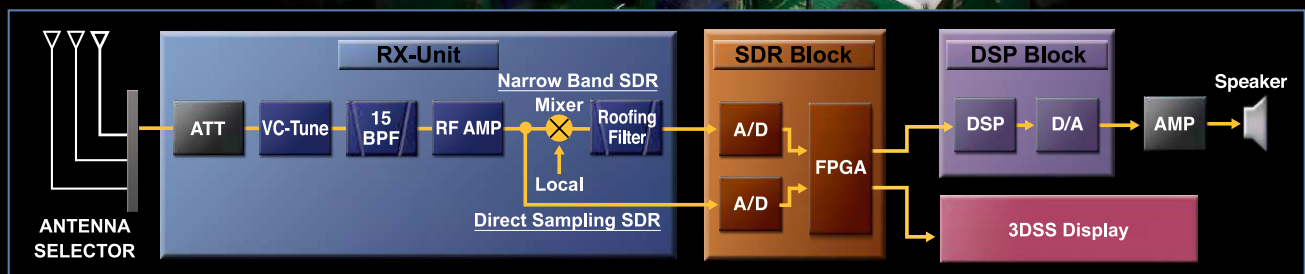
Icom AH-730
Automatic
Antenna Tuner

Chelegance
JNCRadio M-104
Four-Band HF
Portable Antenna Kit

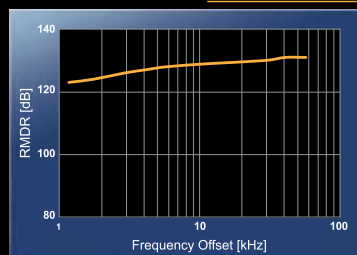
FTDx101 TECHNICAL HIGHLIGHT

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

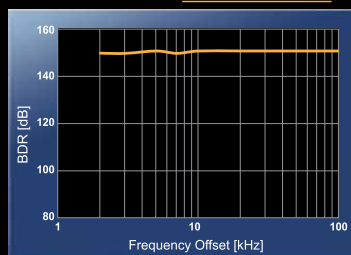


2kHz RMDR **123dB+**



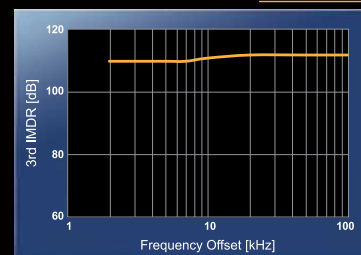
14MHz Band Reciprocal Mixing Dynamic Range (RMDR)

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

YAESU
Radio for Professionals

YAESU USA
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For the latest Yaesu news, visit us on the Internet: <http://www.yaesu.com>

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FTDx101 TECHNICAL HIGHLIGHT

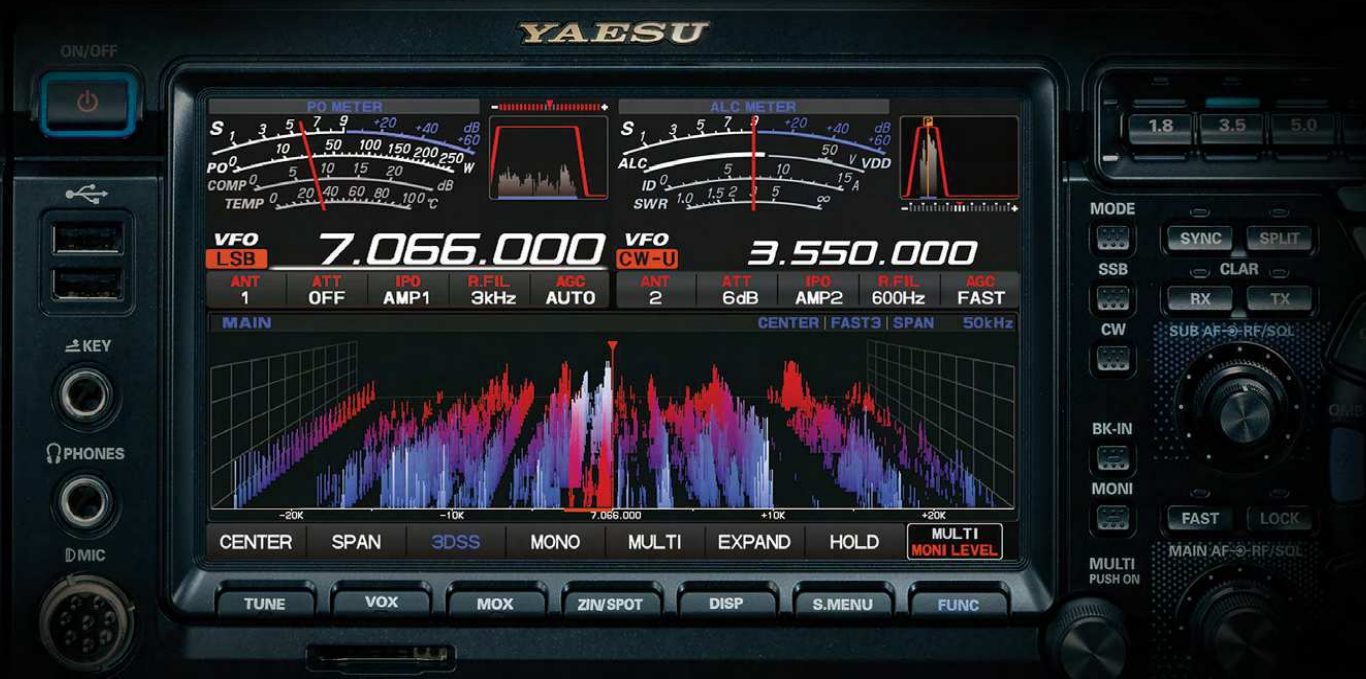
3DSS (3-Dimensional Spectrum Stream)

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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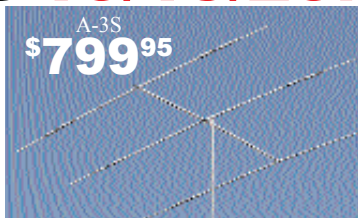
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Cushcraft 10/15/20M Tribander Beams

Only the best tri-band antennas become DX classics, which is why the Cushcraft World-Ranger A4S, A3S, and A3WS go to the head of the class. For more than 30 years, these pace-setting performers have taken on the world's most demanding operating conditions and proven themselves every time. The key to success comes from attention to basics. For example, element length and spacing has been carefully refined over time, and high-power traps are still hand-made and individually tuned using laboratory-grade



A-3S
\$799⁹⁵



A-4S
\$899⁹⁵

It goes without saying, the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these sold years ago are still in service! Conservative mechanical design, rugged over-sized components,

stainless-steel hardware, and aircraft-grade 6063 make all the difference.

The 3-element A3S/A3WS and 4-element A4S are world-famous for power-house gain and super performance. **A-3WS, \$649.95, 12/17 M. 30/40 Meter add-on kits available.**

instruments. All this attention to detail means low SWR, wide bandwidth, optimum directivity, and high efficiency -- important performance characteristics you rely on to maintain regular schedules, rack up impressive contest scores, and grow your collection of rare QSLs!

Cushcraft MA-6B 6-Band Beam

Small Footprint -- Big Signal

2-Elements on 20/17/15/12/10/6 Meters!!!



MA-6B
\$1099⁹⁵

Cushcraft's latest MA-6B gives you 2-elements on 6 bands! Solid signal-boosting directivity in bantam size/weight.

It mounts on your roof or mast using standard TV hardware. It's perfect for exploring exciting DX without the high cost and heavy lifting of installing a large tower and a full-sized array. 7' 3" boom has less than 9' of turning radius. Contest tough -- handles 1500 Watts.

The unique MA-6B is a two-element Yagi on 20/17/15/12/10/6 Meters. It

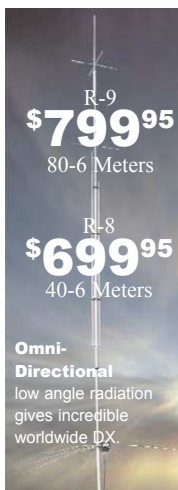
delivers solid power-multiplying gain over a dipole on all bands. Automatic band switching and a super easy installation in a compact 26 pound package.

When working DX, what really matters are the interfering signals and noise you don't hear. That's where the MA-6B's impressive side rejection and front-to-back ratio really shines.

MA-5B, \$759.95. Like MA-6B but 5 bands: 20/17/15/12/10 Meters. 12/17M is a single element trapped dipole.

Cushcraft R9 ... 80-6M Vertical

... No Radials... 1500W



R-9
\$799⁹⁵

80-6 Meters

R-8
\$699⁹⁵

40-6 Meters

Omni-Directional
low angle radiation gives incredible worldwide DX.

Cushcraft high performance R9 vertical gives you 9 bands without radials!

It's omni-directional low angle radiation delivers exciting and easy worldwide DX on all 9 bands: 75/80, 40, 30, 20, 17, 15, 12, 10 and 6 Meters with low SWR. QSY instantly -- no antenna tuner needed.

Use full 1500 Watts SSB/CW and Digital when the going gets tough to break through pileups/poor band conditions.

The R9 is super easy to assemble, installs

just about anywhere, and its low profile blends inconspicuously into the background in urban and country settings alike.

Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury with all RF-energized surfaces safely out of reach.

Rugged Construction: Thick fiberglass insulators, all-stainless steel hardware and 6063 aircraft-aluminum tubing is double or triple walled at key stress points to handle any-

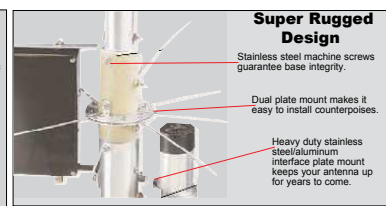
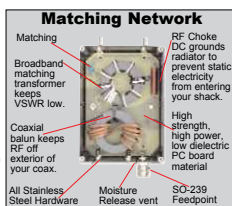
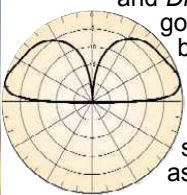
thing Mother Nature can dish out.

31.5 feet tall, 25 lbs. Mounting mast 1.25 to 2 inches. Wind surface area is 4 square feet.

R8, \$699.95. Like R9 antenna but less 75/80 Meters.

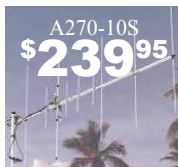
R-8TB, \$119.95. Tilt-base lets you tilt your antenna up/down easily by yourself to work on.

R-8GK, \$99.95. Three-point guy kit for high winds.



Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios



A270-10S
\$239⁹⁵

Dual-band VHF rigs are the norm now, so why not compliment your FM station with a dual-band Yagi? Not

only will you eliminate a costly feed line, you'll realize extra gain for digital modes like high-speed packet and D-Star! Cushcraft's A270-6S provides 3 elements per band and the A270-10S provides 5 for solid point-to-point performance. Both pre-tuned. Assembly is a snap using fully illustrated manual.



A270-6S
\$199⁹⁵

Cushcraft Famous Ringos Compact FM Verticals

W1BX's famous Ringo antenna has been around for a long time and remains unbeaten for solid reliability. The Ringo is broad-banded, lighting protected, extremely rugged, economical, electrically bullet-proof, low-angle, and more -- but mainly, it just plain works! To discover why hams and commercial two-way installers around the world still love this antenna, order yours now!

Call your dealer for your best price!

www.cushcraftamateur.com

Cushcraft

Amateur Radio Antennas

308 Industrial Park Road, Starkville, MS 39759 USA

Open: 8-4:30 CST, Mon.-Fri.

Call: 662-323-5803 • mfcustserv@mfcnterprises.com

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AR-2
\$109⁹⁵



AR-6
\$159⁹⁵



AR-10
\$179⁹⁵

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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!

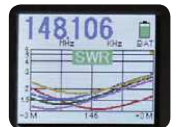
Auto band-sweep function:

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!

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

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!

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Write for QST

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



Our Cover

While looking for a way to easily check VSWR before getting on HF, Mark Persons, W0MH, designed a relay that allows convenient antenna checking and tuner adjustments without putting noticeable power on the air to cause interference. His four-port RF switch handles the radio, a dummy load, the antenna, and an antenna analyzer. You can add this flexibility to your station too — get the construction details in Mark's article, "An Easy Way to Use a Relay to Switch RF in an HF Station." [Mark Persons, W0MH, photos]



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The Most Complete Printed Directory of On-the-Air Repeaters!



Repeaters are almost everywhere. There are more than 20,000 repeaters in the United States alone. The best way to find repeaters in your area or while traveling is with the **2024 ARRL Repeater Directory®**.

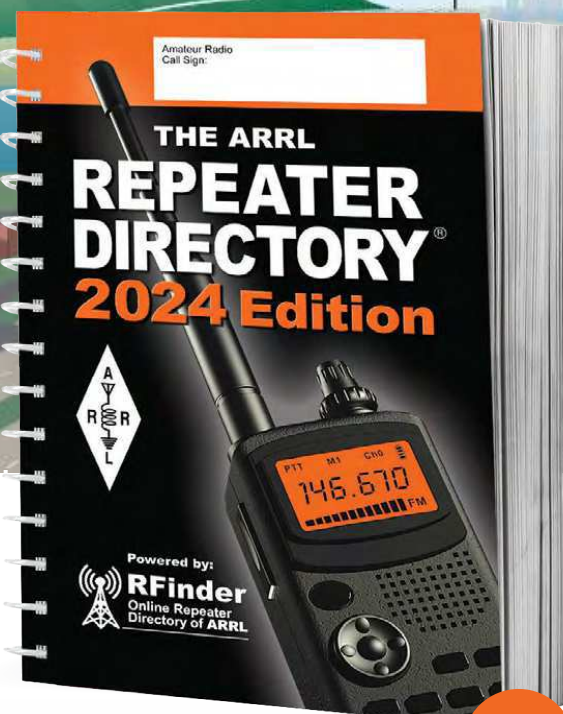
Look up repeaters and see their input and output frequencies, plus find out whether they are analog FM repeaters, or one of the digital machines.

- 26,500 listings organized by state/province, city, and operating mode
- Digital repeaters, including FUSION, D-STAR, DMR, NXDN, and P25 systems
- HF, VHF/UHF, and microwave band plans
- Convenient 6x9 spiral bound format lies flat

New hams often use the *Repeater Directory* to find local activity after purchasing a new handheld radio. Public service volunteers often keep a copy nearby.

ARRL Item No. 1854 | Retail Price \$19.95

Repeater listings appearing in *The ARRL Repeater Directory®* are provided by RFinder Inc. If a repeater has been omitted or a listing is inaccurate, contact RFinder directly.



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throughout the US and Canada

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For the last 23 years, as inventors and innovators of mechanically tuned, frequency optimized Yagi, Vertical and Dipole antenna systems, SteppIR has been the unquestioned high-performance antenna for serious radio amateurs.

PERCEPTION

Some folks will say that having a mechanical antenna will lead to more breakdowns over the lifetime of the product.

REALITY

All antennas are mechanical devices in one form or another – and ALL antennas can certainly fail when subjected to Mother Nature's wrath. Our products have been consistently reliable over the last 23 years when compared to competitive products, with the added benefit of significantly superior performance. Additionally, with bend-but-don't-break elements and because all the mechanical parts are protected, our antennas are the very best for extreme weather environments – where many fixed length antennas will fail, ours thrive.

PROOF

The advantage of a mechanically adjusted, length optimized antenna when compared to fixed length, frequency limited antennas, is profound – if you don't believe us, get on the air, and ask the thousands of SteppIR owners residing in all areas of the world, for their opinion!

SteppIR Antennas offer superior performance AND reliability!

Station QTH of LZ2BE

¡Bienvenidos a SteppIR!



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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



**RF PARTS™
COMPANY**

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NR770H Series



SG7900A



X300A / X50A



X700HNA

The Standard By Which All Others Are Judged

Second Century

Beware the Ides of March

This line from Shakespeare's Julius Caesar signifies impending doom. Today, it is used in popular vernacular as advanced warning of a threat. And for radio amateurs today, the threats to our hobby abound.

The threats we know, that lie within, are well-known to us: interference getting into, or out of, the shack; RFI; a literally hot mic; a refrigerator control panel locking up, or a powered-off television jumping to life and behaving strangely. Ensuring that antennas are properly grounded and that RF chokes are used on feed lines and in the shack is an easy way to challenge the threat.

Another threat comes from exposure to RF. Have you used the ARRL RF Exposure Calculator to determine if your combination of antenna, placement, and power is safe? It is a responsibility you must fulfill to ensure the safety of your station. It is also important to understand where the high voltage points are on an antenna to protect yourself and others from injury.

Beyond the self-created threats we must manage comes the RFI from poorly designed electronics that are sold today. Starting within your own house can be an eye-opener: LED lightbulbs, wall-wart-style power supplies, internal power supplies within a desktop computer, battery chargers — the list goes on and on. Tracking down the RFI within your own domain is fairly easy.

Moving beyond your property becomes a more serious challenge. Neighbors using any of the above may be easy to track down, but the problems they create may be impossible to solve. Elements of commercial power lines may cause interference and be difficult to track down precisely and solve. If you're stumped and need help, this is one area where the Technical Information Service (TIS) of the ARRL Lab can help.

Looking at the bigger picture, we see threats to our spectrum from interference. At the 2024 ARRL Annual Meeting of the Board of Directors, the strongest position yet was taken in opposition to the Shortwave Modernization Coalition — a group advancing the interests of stock traders. The stations being constructed and oper-

ated use high power and propose to transmit adjacent to our bands. We will be exploring ways our Volunteer Monitors can observe their signals and record interference.

Perhaps our longest-standing efforts have been toward finding solutions to the threats that community-based rules and regulations pose to putting up an antenna and getting on the air. We've been working diligently in Washington to find a solution. But Washington is now a very different place than it was when we started requiring specialists on both sides of the aisle to assist in our efforts. And our scope has also changed as more government agencies require our attention and interaction in promoting and protecting our privileges.

How can you help? There are many ways! Some key suggestions include: Run a clean station by minimizing RFI, and look out for your fellow radio amateurs, and politely let them know if they might have an issue. Be alert to potential threats and limitations being posed by your city or state, and consider contributing to the ARRL funds we designate for Spectrum Defense and Legislative Advocacy.

In closing, this is arguably the greatest benefit you receive as an ARRL member: the national and international advocacy to protect our bands from all threats. Be radio active: protect our privileges by using them! Be a connector: help other hams solve their RFI problems. And don't forget the ARRL Lab is here to assist in your efforts.



David A. Minster, NA2AA
Chief Executive Officer

hy-gain Rotators...the 1st choice of hams!

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 ant-enna movement. North or South center of rotation scale on meter, low voltage control, max mast size of 2 1/16".

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** with 6 memories.



Tailtwister T-2X . . . \$1099.95

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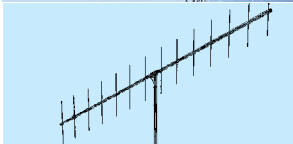
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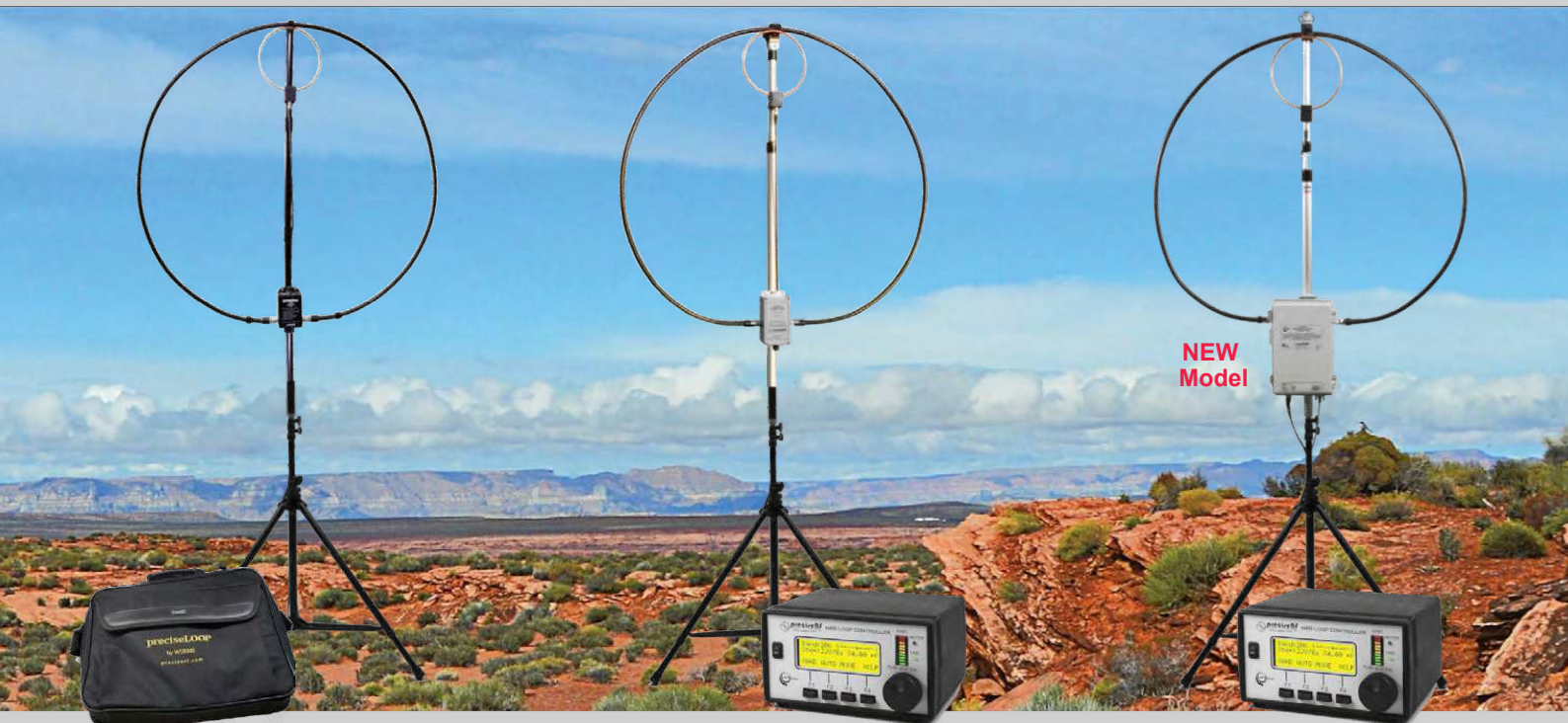
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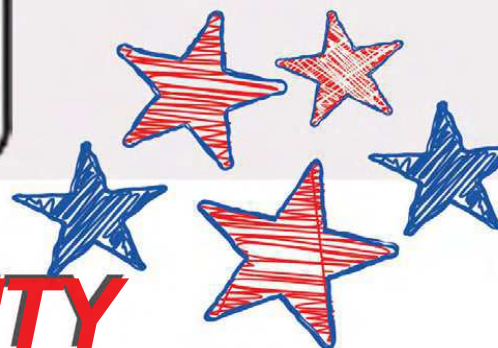
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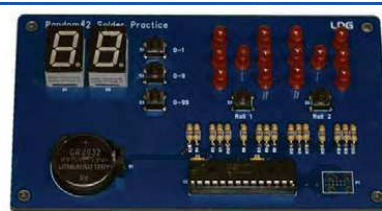
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Member Spotlight

Steve Herman, W7VOA

Steve Herman, W7VOA, was drawn to communications technology early in life. “I can remember pretending that cardboard boxes were TV cameras and trying to do radio play-by-play for baseball as a little kid,” he said. Those early fantasy broadcasts led to using walkie-talkies with his brother. “Somehow, we were able to pick up WWV... That led me to figure out what this mysterious signal was.” Steve’s excitement for radio grew further when he discovered the shortwave receiver in his grandmother’s kitchen radio. From her home in Cincinnati, Ohio, the Voice of America (VOA) station in Greenville, North Carolina, came in. Steve said, “This was amazing to me, to be able to pick up — in the daytime — a distant radio station.”

A Life Inspired by Working DXCC

Steve moved to Las Vegas, Nevada, when he was in middle school, where he and a friend tinkered with crystal radios. His Novice license was administered by a mentor in his neighborhood, but upgrading to his General was a different experience. “You had to go down to the FCC and take a code test in a government building,” he said. “For being 12 years old at the time, it was super intimidating!” Steve quickly upgraded to General and, with the help of his electrician father, had a 40-foot telephone pole topped with a rotatable three-band Yagi installed in the front yard of his family home.

With his lawn-ornament antenna and a 500 W Swan 500C HF transceiver, Steve made a lot of contacts with Asian hams. “I would be able to come home from school and regularly work DX,” he said. As he pursued ARRL operating awards, the social studies education that came with ham radio started him on a path that still guides him today.



“These countries, to me, were more than just a prefix and ticking off a box for DXCC — I wanted to know about the cultures of the country, the languages, and so I think working so many Japanese stations from Nevada in the early 1970s led me to an interest in Japan, where I ended up living for a total of 16 years.”

Merging Radio and Journalism

Steve’s global curiosity, fostered through radio, led him to a career as a journalist. He worked in radio and television in Las Vegas before his first tenure in Japan, which began in 1981. Steve has come full circle from his grandmother’s kitchen radio set — for the last 2 decades, he has been a journalist for VOA. After tenures as chief of several Asian bureaus and more than 4 years at the White House, Steve currently serves as the VOA’s Chief National Correspondent.

VOA is chartered to explain the American worldview to audiences outside the US, many of which may hold significant

differences. Steve relies on his experience in ham radio to approach that task. “Ham radio — despite the cultural, linguistic, societal, and political differences — is something that brings us all together,” said Steve.

Further Ham Pursuits

In his travels as a correspondent, Steve would frequently apply for a ham radio license in his host country. “I operated mini DXpeditions in many countries, including Afghanistan, Bangladesh, and Bhutan.” With his schedule for covering the 2024 US elections gearing up, Steve keeps a dual-band handheld with him so he can get on local repeaters at the end of the day.

His home station, in the Virginia suburbs of Washington, DC, is modest. “I do spend a lot of time on FT8 and FT4 on HF. I’m intrigued by all these new digital modes,” Steve said. He also enjoys operating CW and doing Parks on the Air® activations, and has recently experimented with meteor scatter. “So, even after more than 50 years in the hobby, I’m [still] doing new things,” he said.

Steve serves as President of the Stafford Amateur Radio Association, an ARRL Affiliated Club. He is also an author and college professor. “My first teaching experience was teaching a code class for the Las Vegas Radio Amateur Club [as a teenager].” He says he never plans to fully retire and hopes to find more opportunities to educate and mentor young hams when the time allows.

Steve is the author of *Behind the White House Curtain: A Senior Journalist’s Story of Covering the President — and Why It Matters*, and he wrote the “Last Word” essay in the May/June 2021 issue of ARRL’s *On the Air* magazine.

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ALS-1306 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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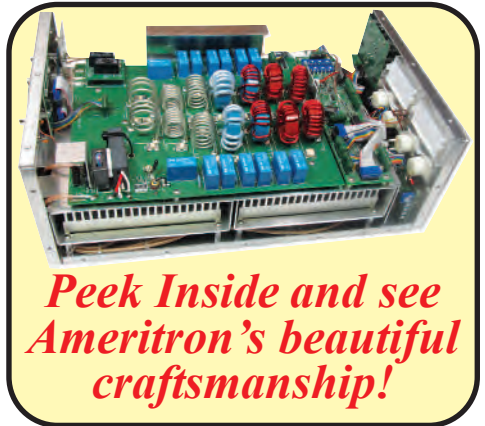
Ameritron ALS-1306 amplifier has modular construction for *easy-servicing*, unlike other amplifiers that are so tightly packed they are un-serviceable.

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ALS-1306 is powered by a 50 VDC switching power supply. Has a pre-wired cable to plug into the ALS-1306.

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1200 Watts PEP Output on all bands 1.5-54 MHz including 6 Meters

ALS-1306 runs up to 1200 Watts of clean SSB output power (just 100 Watts drive gives you the full rated 1200 Watts

ALS-1306

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Suggested Retail

output) for *continuous* coverage between 1.5-54 MHz. 10/12 Meters is included.

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

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

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

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K4 KEY FEATURES

Optimized for ease of use

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Full remote control via Ethernet



The K4 interfaces seamlessly with the KPA500 and KPA1500 amplifiers

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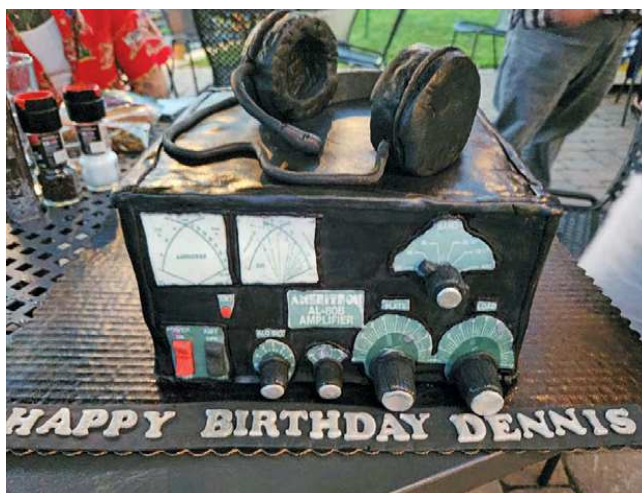
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Up Front

Associated with ARRL

In all the excitement of his daughter's wedding, Kent Miller, K4MK, didn't look closely at his boutonniere. Afterward, he noticed the attached ARRL member diamond. His artistic daughter included a personalized insignia on each groomsmen's boutonniere representing their profession or an organization they are associated with. [Kent Miller, K4MK, photo]



An Edible AL-80B

Dennis Kronenberg, N8IVN, recently celebrated a milestone birthday. Wanting to create a unique memory, his wife, Linda, shared photos of his shack with cake artist Melina Sifford, and together they created this masterpiece. [Dennis Kronenberg, N8IVN, photo]



Who Knew Butterflies Used Ham Lingo?

Ed Schuller, K6CTA, spotted this butterfly, apparently sending love and kisses to all, during a visit to Argentina. The *Diaethria anna*, also known as Anna's eighty-eight, is found in tropical forests of Central and South America. [Ed Schuller, K6CTA, photo]

The Love of CW

After playing the bass professionally for decades, Jock Irvine, N1JI, finally decided to have a custom instrument handcrafted for himself by Stambaugh Designs in Rochester, New Hampshire. He wanted to incorporate his love of CW into the design, so he had them inlay a Morse code letter J in the instrument's redwood top. The wood was reclaimed from the stump of a redwood tree that was cut down about 100 years ago. [Jock Irvine, N1JI, photos]



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

Dual In-Line



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

In-Line Module



- 5W amplified DSP noise canceling In-Line module - 8 filter levels 8 to 40dB
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- Audio bypass feature - 3.5mm mono inputs and outputs
- Headphone socket
- Audio input overload feature

NEDP1901-KBD

Low level audio install module for Yaesu FT-817, FT-897, FRG-100, Icom 706 MKIIG, Kenwood TS-50, TS-440, Realistic dx-394, Alinco DX70, DX-77 and many other radios or receivers



Compact In-Line



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

New

NEDSP1962-KBD
5W amplified DSP noise canceling extension speaker retrofit pcb module



NES10-2MK4

- 5W DSP Noise Canceling Speaker - 8 filter levels
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Correspondence

Letters from Our Members

Station Complications after Moving

My wife and I decided to move, and once we were settled in, I thought that my station would be easy to put together and I could quickly get on the air.

Our new home has an HOA. One of the nice things about the community is that the internet is included. The house has an attic with plenty of room for a magnetic loop antenna (MLA). So, I purchased a 40- through 10-meter MLA and an antenna rotator.

Running the coaxial feed line and control cables was not easy. I had conduit runs installed in the walls to the attic area where the antenna would be. Once the cable was installed and connected to the transceiver, I turned it on and made a few contacts. Then my wife let me know that the internet was not working. Every time I transmitted, it knocked out the router. I powered the router back up and discovered all the bands I was trying to use were affecting the router. I put RF chokes on the power connections to the router, the modem, and the connection between the router and the modem. As it turned out, the problem was the power connection to the modem.

However, I had another problem. The MLA has a rotator, and when transmitting on some bands, it put the rotator controller into memory mode and stopped rotating depending on the direction the antenna was positioned. Then, it had to be initialized. After putting the chokes on the feed line and the router, I found the antenna rotator controller was only affected on the 40-meter band. I put another choke on the antenna control cable at the control unit in the shack.

I like to run digital modes using Ham Radio Deluxe (HRD) *DM-780* and *WSJT*, but when I operated, no signals were decoded. I bought a new

computer with Windows 11, and all the sound card settings appeared to be set correctly. I sent a message to HRD support and was advised that Windows 11 has a configuration that automatically reduces or cuts the power to the USB ports to conserve energy. So, it can cause the rig control to disconnect from the radio, which causes the software to fail. I had to disable all the power options for all the USB ports on my computer, and I didn't have any more problems!

Michael Stansbery, WD8EBS
Pickerington, Ohio

A Treasured Memory

Seeing the December 1973 cover of *QST* in the "100, 50, and 25 Years Ago" column in the December 2023 issue of *QST* brought a smile to my face. That picture of a Christmas tree adorned with QSL cards was partly responsible for getting me back into ham radio 50 years ago!

I was licensed in 1958 as WV2BWS and active through high school, but life intervened, and I was off the air for several years. One day, I happened to be on a plane, and the person sitting next to me was reading that issue of *QST*. I mentioned I was a ham and asked what his call sign was, and he pointed to the very top QSL card on the tree. He was Harry Dannals, W2HD, the President of ARRL at the time! We talked about radio for the whole flight, and I was hooked again. When I got home, I set up a station and have been active ever since. To this day, I remember that issue of *QST* with great fondness. Thanks for the refresher.

Andy Faber, AE6Y
Monte Sereno, California

Clear, Concise, and to the Point

The article titled "Lessons Learned from Drafting After-Action Reports" by Brian Haren, W8BYH, in the "Public Service" column of the December 2023 issue

of *QST* is excellent and well worth the read. His recommendations are obviously from the real world and not just theory. He writes clearly, and the article is succinct without confusing statements and requires just two pages. He removes complexity without lowering the bar!

Denis Battrum, N5KX
Liberty, Missouri
Life Member

Leaving Code Behind Brought Enjoyment

I just finished reading Mr. Baumgartner's, K0FMB, letter "Thoughts on the Demise of CW Requirements" in the December 2023 issue of *QST*, and his experience is very similar to mine. I earned my Novice license in 1972 and worked on my Morse code speed to get to General. The technical aspects of the hobby came easily to me, but Morse code was always a thorn in my side. When I realized how much I disliked working stations via CW, I dropped out of the hobby.

In 2012, at the urging of one of my associates, I looked into the hobby again and found that the Morse code requirement had been dropped! So, I studied and earned my Technician license, then quickly advanced to the General and then Extra class. My primary mode of operation is voice, but I also have worked digital and SSTV modes. I occasionally think about getting back into Morse code, but after listening to some stations for a while, I realize my interest is just not there.

Brent Seale, KK4NAW
Thayne, Wyoming

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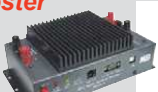


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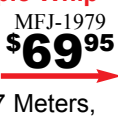
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W1AW Schedule

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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.

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

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

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

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



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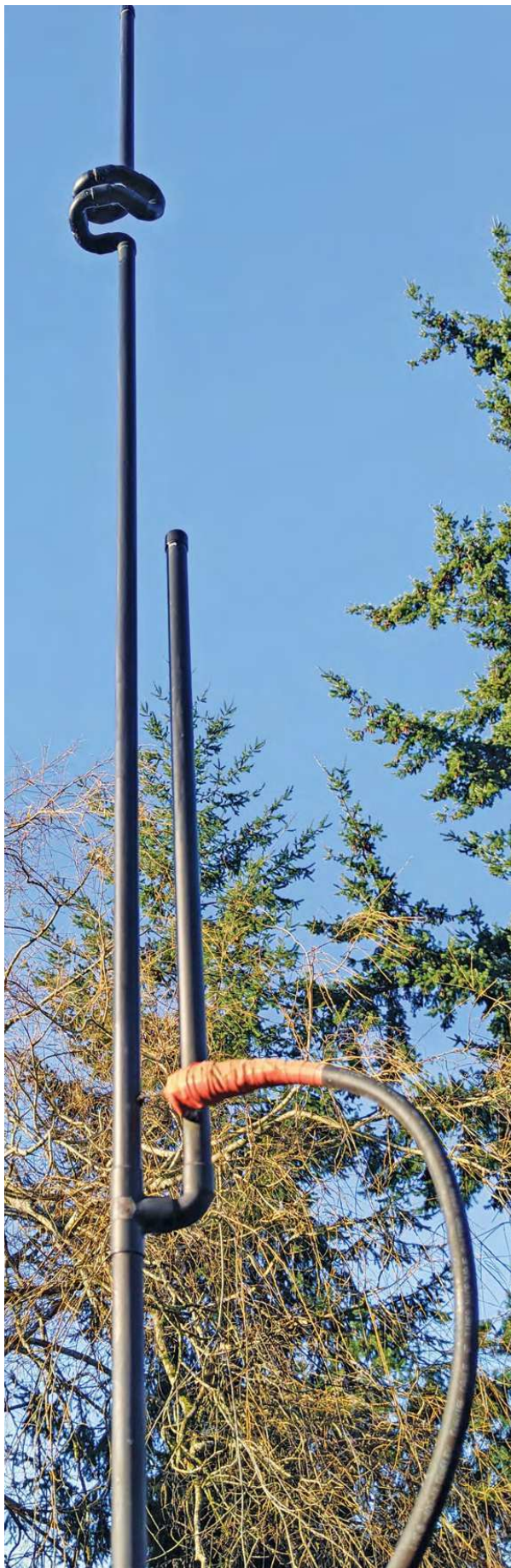
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ADS#16221



The Saxophone Antenna: A True Dual-Band UHF and VHF J-Pole

A unique J-pole that covers the 144 and 440 MHz bands with excellent performance.

Kosta Kropivny, PhD, VA7KL

Building a J-pole antenna that performs well on the VHF and UHF bands can be challenging. The monoband collinear J-pole, or super J-pole, is an improvement of a regular J-pole. It combines two $\lambda/2$ radiating sections with a collinear phasing stub between them. However, if tuned on UHF, this antenna won't resonate on VHF unless you make the J element $\frac{3}{4} \lambda$ instead of $\frac{1}{4} \lambda$. Also, you can't get a 50 Ω impedance on both bands when feeding the antenna from the bottom end.

Igor Goncharenko, DL2KQ, proposed a wire antenna at <http://dl2kq.de/ant/3-85.htm> (check your browser for Russian translation) that uses a $\frac{3}{2} \lambda$ radiating element on UHF and consists of two $\frac{5}{8} \lambda$ elements separated by a $\lambda/4$ phasing stub and a $\frac{3}{4} \lambda$ J element. DL2KQ proved that an impedance of 50 Ω on both bands can be achieved by bending the J-element wire along its length. On VHF, this antenna works as a slightly shortened J-pole with the inductance of the phasing stub in the middle. On UHF, it works as a super J-pole with a $\frac{3}{4} \lambda$ J element. On both bands, this wire antenna radiates at low angles. However, it's narrowbanded, so it must be tuned to the desired UHF and VHF band segments.

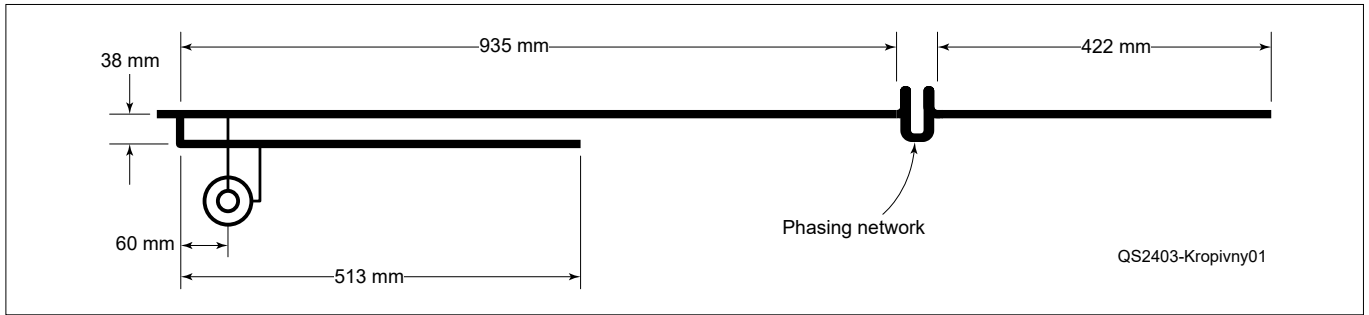


Figure 1 — Dimensions of the saxophone antenna. This drawing is not to scale.



Figure 2 — Phasing stub components.



Figure 3 — The assembled phasing stub.

Parts and Construction

I've further developed this antenna with thick pipes using MMANA-GAL (<http://gal-ana.de/basicmm/en>) and building a dozen prototypes (see the lead photo). The optimal design of the dual-band UHF and VHF J-pole is shown in Figure 1. All of the measurements are from pipe center to pipe center.

The elements are made from a type-L copper pipe with an inner diameter of $\frac{1}{2}$ inch and an outer diameter of $\frac{5}{8}$ inch. You'll need a hot torch, flux, and solder, and you should solder the junctions outdoors or in a well-ventilated area. The RF N-type connector ground is soldered directly to the J element (as shown in the lead photo). Components for the phasing stub are given in Table 1 and are shown in Figure 2. The assembled phasing stub is shown in Figure 3. The dimensions are optimized for 146 and 446 MHz. The exact shape of the phasing stub is not very important, but its overall length must be 320 millimeters. This should work correctly when using the pipe fittings specified. The length of the phasing stub mainly af-

Table 1 — Copper Water Pipe with an Internal Diameter of $\frac{1}{2}$ Inch and an External Diameter of $\frac{5}{8}$ Inch		
Quantity	Description	Lowe's Part Number
1	$\frac{1}{2}$ -inch $\times$ 10-foot copper pipe	#LH04010
2	$\frac{1}{2}$ -inch caps	#W 07007L
1	$\frac{1}{2}$ -inch tee	#W 04006L
3	$\frac{1}{2}$ -inch, 90-degree elbows	#W 01622L
6	$\frac{1}{2}$ -inch, 90-degree female elbows	#W 01652L
2	$\frac{1}{2}$ -inch, 45-degree elbows	#W 03326L
1	Female N-type connector	

fects the UHF resonant frequency. The VHF resonance is mainly controlled by the positioning of the feed point and minor bending of the J-element tip. I call this a saxophone antenna, as I think the phasing stub resembles part of a saxophone.

MMANA-GAL simulations show that this antenna has a low angle of radiation on VHF and UHF bands. Figure 4 shows one of these antennas installed on a



Figure 4 — The roof-mounted saxophone antenna. The coiled choke balun shown is a poor choice. A much better solution would be two to three turns of the coax through a mix-31 toroid.

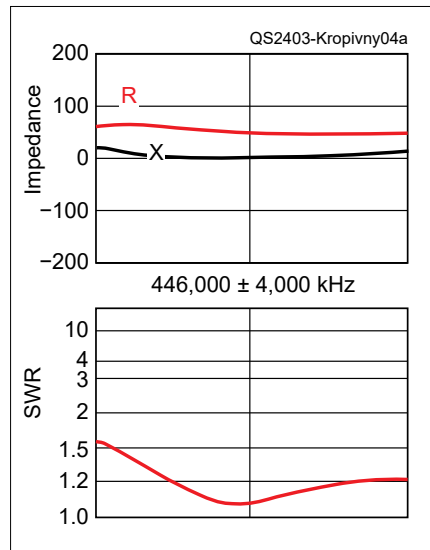


Figure 5 — UHF measurements.

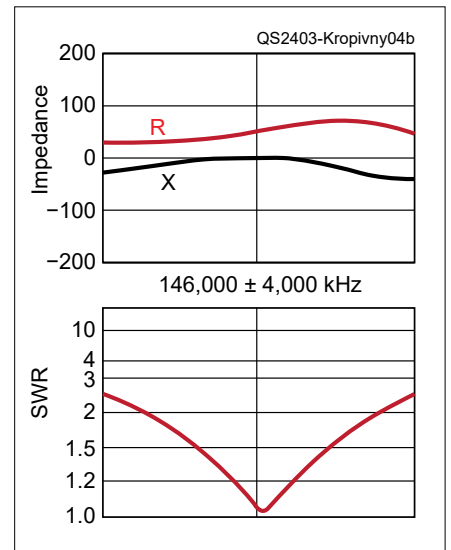


Figure 6 — VHF measurements.

chimney, and Figures 5 and 6 show the UHF and VHF measurements. The measured SWR and impedances correspond well to the MMANA-GAL simulated data. As you can see, the achieved bandwidth covers the full VHF band and the repeater region on the UHF band. I was able to make contacts with all operational repeaters in the area, which was previously unattainable with my 5 W Yaesu FT2DR with its short rubber duck antenna.

Conclusion

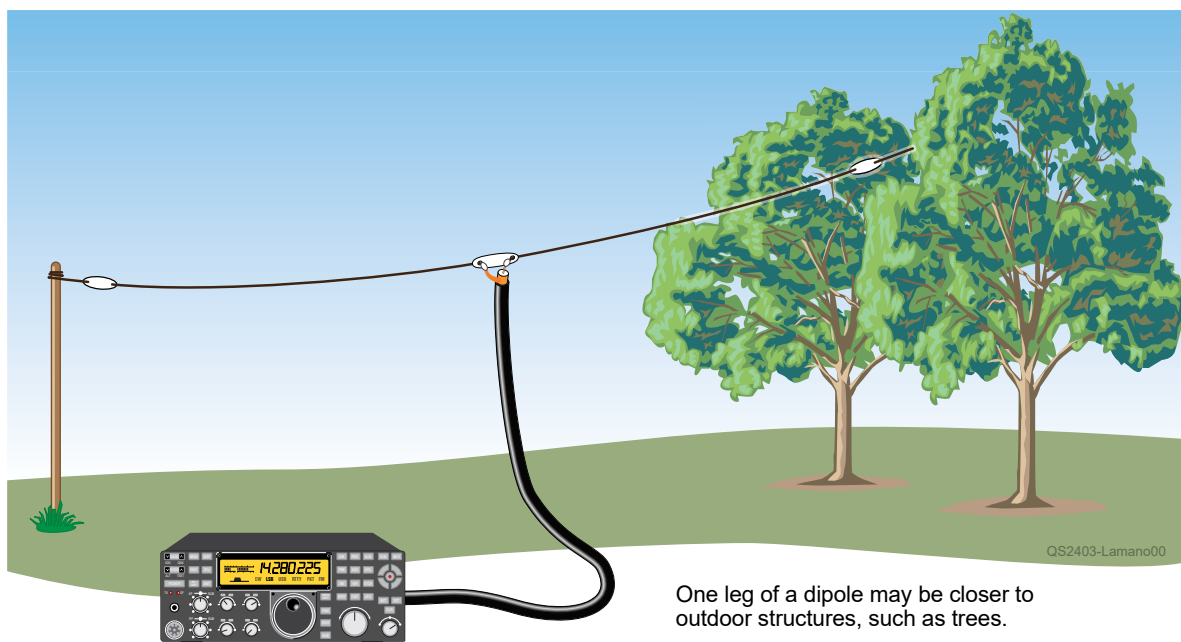
As computer simulation and practical experience shows, this thick, dual-band J-pole antenna brings together the advantages of a few well-known predecessors. In particular, it incorporates a low angle of radiation and a 1.5:1 SWR bandwidth of 4 MHz on VHF and 12 MHz on UHF, which results in long-term tuning stability. The antenna is less than 1.5 meters in height and is mechanically sturdy and self-supporting. Also, tuning is essentially independent for the two bands. Finally, this antenna is dc-grounded for static electricity and lightning protection.

All photos provided by the author.

Kosta Kropivny, PhD, VA7KL, earned his Advanced license in Canada in 2015. He became interested in radio in secondary school in the Ukraine, when he built a crystal radio with a variometer. Kosta continued his education at the Moscow Institute of Physics and Technology, where he obtained a master's degree in electronics, specifically in underwater antenna arrays. Later, while working for the Russian Space Agency, he obtained his PhD in air dynamics. Since moving to Canada 25 years ago, Kosta has been working as a senior engineer for a major telecom company. His ham radio interests include chasing DX, building antennas, and developing new algorithms for SSB transceivers. Some of his projects can be found on his website at www.va7kl.com. Kosta can be reached at admin@va7kl.com.

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





Common-Mode Current and Common-Mode Chokes

An overview of CM current, and what hams can do to correct it.

Larry Lamano, WA0QZY

When it comes to HF antennas, regardless of the type of feed line, one dipole leg may be closer to things like the ground, a tree, or a building (see the lead image). Coax-fed HF antennas are also inherently unbalanced because one side of the antenna goes to the coaxial braid or shield, and the other goes to the coaxial center. These factors unbalance the currents flowing in the legs of the antenna and the feed line. In this article, I will use the coax-fed antenna as an example to illustrate this concept. When current in the shield and the center conductor of the coax is not balanced, the difference is referred to as *common-mode* (CM) current. Radiation from balanced currents cancels outside of the coax, but the unbalanced CM current flowing between the antenna and the transmitter produces radiation. The coax effectively becomes an antenna that can cause interference to nearby electronics — and in severe cases, RF bites. Adding a grounding strap to where the coax enters your shack may not help, as it becomes another part of the unwanted antenna.

CM current changes the radiation pattern of the antenna. It can also detune the antenna, change the standing wave ratio, and add noise.

Minimizing current requires increasing the impedance in the current's path. In amateur radio antennas, we reduce current by placing a CM current choke or current balun in the CM current path; this tends to force equal currents in both halves of the

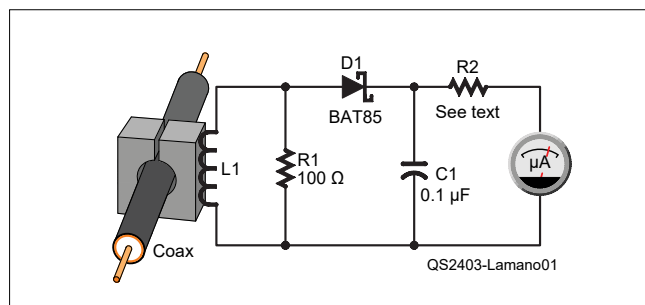


Figure 1 — A CM current meter. The clamp-on ferrite has 10 turns of small wire (L1) wound through it. When clamped on the coax, it becomes a high-ratio current transformer. The CM current reads on the meter after being rectified by D1. R2 sets the meter's sensitivity.

antenna. If these currents are equal, there will be no unwanted current flowing in the coaxial shield. Chokes are placed at the antenna's feed point for optimal efficiency.

There is debate about how much CM impedance is necessary to attenuate the CM current. Some say 500 Ω is enough, but the actual value depends on how much CM current there is to begin with. A Yagi on a tower may have much less current than an off-center-fed antenna near the ground. It's best to have the highest impedance reasonable to implement. In the examples that follow, we will use 2000 Ω to define the usable bandwidth of a choke.

Measuring CM Current

The first step in deciding what kind of choke you need is to measure the CM current at your chosen frequencies. Figure 1 shows an easy, inexpensive way to build a CM current meter, and further details with additional choke design references are provided at www.arrl.org/qst-in-depth. Securely clamp the split ferrite over your coaxial feed line. While transmitting and watching the meter, slide it across a half wavelength of the cable. The current will have a peak and null over that length. If you see nothing on the meter, you probably don't need a CM choke, but a half-scale reading indicating about 50 mA or more should be dealt with. After you install a choke, retest to see if the current has declined to an acceptable value.

Constructing an Effective CM Choke

There are many ways to create a CM choke. The most common choke type is a simple coil of coax at the antenna's feed point. It is a reactive choke, as it relies on the inductive reactance of the coil to present an impedance to the CM current. The coiled coax acts as an inductor, and its inductive reactance will choke the CM current without affecting the desired currents inside the coax.

It is often erroneously stated that if you wind the coil with sufficient choking impedance at 160 meters, it will work better at any higher frequency because the inductive reactance increases. However, it actually creates a parallel resonant circuit with an impedance characteristic shown in Figure 2. There is capacitance between the turns of a coil that forms a parallel resonant circuit with the coil's inductance. Every inductor has a self-resonant frequency (SRF).

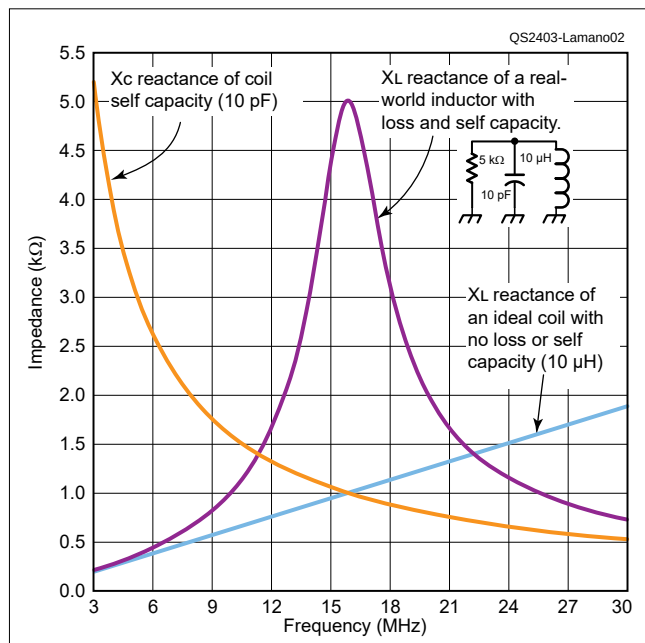


Figure 2 — A pure inductor of 10 μH would have the impedance depicted by the blue line. However, a real inductor could have 10 pF of self capacity, as shown by the orange curve. These are in parallel, and there is loss in the coil represented by the 5K resistor in parallel. The purple curve shows the actual impedance of the coil versus frequency. The impedance is high at resonance, but it drops on either side.

At that frequency, the currents through the inductance and the capacitance cancel, leaving only the resistive losses. Above the SRF, more current will flow through the coil's self capacitance and lower the overall impedance, as shown in Figure 2. That means that on 160 meters, a good choke with many turns and a high self capacitance will generally be a poor choke on 10 meters. Reactive chokes can be excellent near their resonant frequency because the impedance of a parallel LC circuit at resonance is high, but there is a relatively narrow band around resonance, where the impedance is high. A coil's SRF can vary by several MHz depending on what kind of coax is used and how it is wound. Simply stating, "Wind five turns with a 4-inch diameter," does not guarantee a choke's performance on a given frequency. Air core chokes are typically scramble-wound or solenoid-wound. It is difficult to get repeatable results with scramble winding, and solenoid-wound chokes have fairly repeatable results, but they require a form to wind.

You can measure the choking impedance of a coil versus frequency with an instrument like the



[Click Here for the Bonus Video!](#)



Click here to see a video of a friendly choke-building competition among ARRL staff members who have different levels of experience. The goal was to increase the technical confidence of newer licensees by letting them each build a basic choke. Contestants included ARRL Foundation Development Associate Mimi Guerrat, KC1TJW (center); W1AW Station Manager Joe Carcia, NJ1Q (right); ARRL Acquisitions Editor Mark Derks, KC1RVQ (rear center), and ARRL Book Editor Makenzie Ozycz (left). The ARRL Lab served as the judge, measuring the effectiveness of the chokes at 20 meters. Watch the video to see who won.



ARRL Book Editor Makenzie Ozycz (right), who is currently studying for her Technician-class exam, holds the form as ARRL Foundation Development Associate Mimi Guerrat, KC1TJW (left), winds a choke.



ARRL Lab Digital RF Engineer John McAuliffe, KD2ZWN, explains the test rig he will use to judge the effectiveness of the chokes.



ARRL Acquisitions Editor Mark Derks, KC1RVQ (left), a General-class ham, builds a choke with binocular-shaped ferrite cores, with advice from ARRL Lab Digital RF Engineer John McAuliffe, KD2ZWN (right).

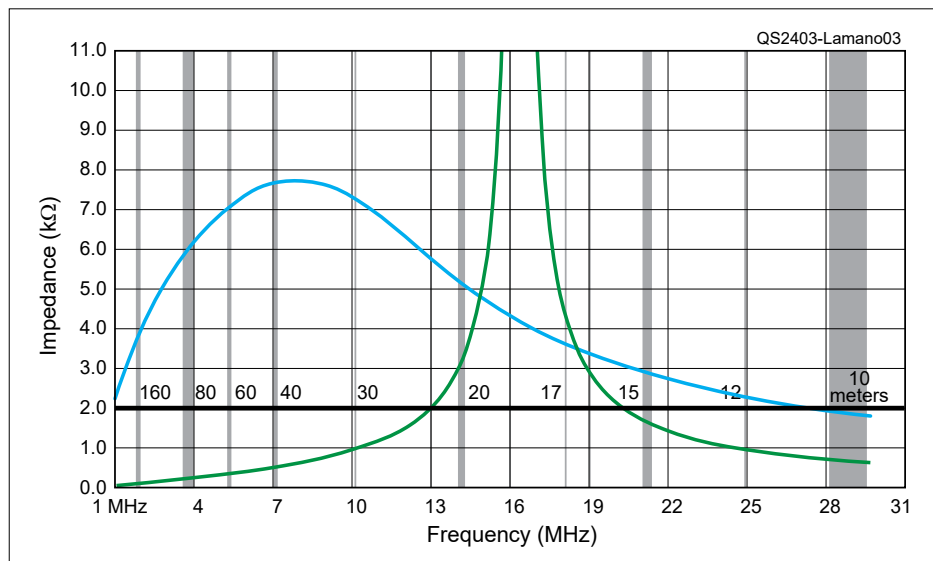


Figure 3 — The total impedance of an air-wound (green curve) and a ferrite toroid-wound (blue curve) choke balun. The black line at 2000 Ω shows the target impedance for effective CM current choking. The vertical gray bars show the limits of the amateur bands.

NanoVNA. Doing so allows you to determine the resonant frequency and bandwidth of the choke. For the measurements shown in Figure 3, I used a NanoVNA-F v3.1 with firmware v1.0.5 along with the free *NanoVNA Saver* v0.4.0 software. Set your NanoVNA to S21 Through mode to measure the impedance of what is connected between the two ports. In *NanoVNA Saver*, set the display to **S21 |Z| SERIES**. Connect the shield at each end of the choke to the NanoVNA ports, thereby placing the choke between the two ports. For each port, use a short piece of wire terminated in an alligator clip. There is no need to connect the ground sides of the NanoVNA ports.

The green curve in Figure 3 represents the measured choking impedance of a scramble-wound air core choke, and the horizontal line represents our target impedance of 2000 Ω . This reactive choke consists of six turns of LMR-240 coax with a diameter of approximately 6 inches. The choking impedance declines rapidly on either side of resonance. The high-frequency performance worsens the closer the turns are to each other, as this increases the interwinding capacitance. It's clear that it isn't only an inductor, but a parallel resonant circuit with a narrow bandwidth. At 2000 Ω , this choke would be adequate only on the 20- and 17-meter bands. Reactive chokes can work well as single-band or sometimes as adjacent-band chokes, but they are inductive below resonance and capacitive above

resonance. As such, they can increase CM current if — at some frequencies — their impedance is of opposite polarity to what is seen looking back down the coax. A document discusses this concept further at www.arrl.org/qst-in-depth. If you desire a wide-band choke, resistance is needed because resistance is independent of frequency. In practice, this means passing the coax through a lossy ferrite core instead of an air core. The most common ferrite mixes for the HF bands are types 31 and 43. Their resistances allow chokes to have much broader frequency ranges. The blue curve in Fig-

ure 3 shows the same coax used in the previous measurements, but passed through a Fair-Rite 2631626202 core, and with the turns spread apart to lower the interwinding capacitance. The peak impedance is less than that of the reactive chokes, but there is a much wider band (160 – 12 meters) where the impedance is more than 2000 Ω . Even at 10 meters, the impedance may be acceptable.

See QST in Depth for More!

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

- ✓ Additional details about building a CM current meter, with references on choke design
- ✓ An explanation of how a choke can worsen CM current

Larry Lamano, WA0QZY, an IEEE Senior Life Member, was first licensed in 1966. He earned a BSEE and an MSEE from the University of Missouri at Rolla in 1973 and 1975, respectively, with emphases on communication systems, transmission lines, and antenna theory. Larry's first job was with Collins Radio, and his last one was with Apple. Since leaving Apple in 2001, he has been doing analog and digital consulting. Larry has always enjoyed designing and building things with the goal of understanding underlying theories. He can be reached at wa0qzy@gmail.com.

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





An Easy Way to Use a Relay to Switch RF in an HF Station

Check antenna VSWR before going on the air.

Mark Persons, W0MH

I was looking for a way to easily check antenna voltage standing wave ratio (VSWR) before going on the air with an HF radio. It was cumbersome to disconnect the antenna and connect an MFJ-259 antenna analyzer. I used a similar process when testing my radio into a dummy load. I needed a four-port RF switch to handle the radio, a dummy load, the antenna, and an antenna analyzer. I couldn't find what I wanted, so I built my own (see the lead photo). My station now includes a selector to choose one of four antennas and a companion switch to operate the relay that I describe here. This project will ease the operation and flexibility of any station.

My experience as a radio broadcast engineer led me to understand that a standard open-frame 30 A, 240 V ac power relay would be right for the job. For perspective, 1500 W into 50 Ω is 5.48 A_{rms} of RF current with 274 V_{rms}. I've successfully used this relay many times with 1000 W AM broadcast stations. In that situation, there is 4000 W of peak power under 100% modulation conditions. It was perfect for selecting a main or auxiliary transmitter to the antenna. The standard configuration is the main transmitter to the antenna and the auxiliary transmitter to a dummy load. Then, at the flip of a switch, the auxiliary is on the antenna

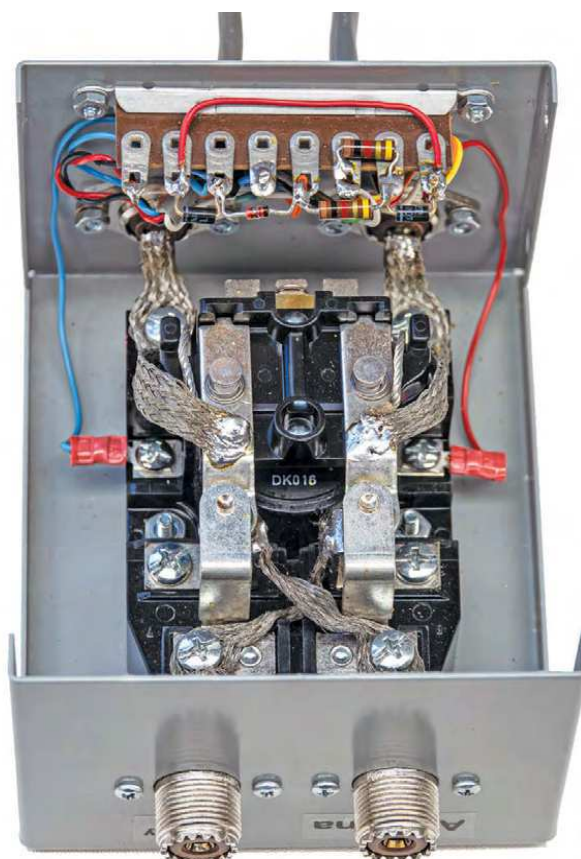
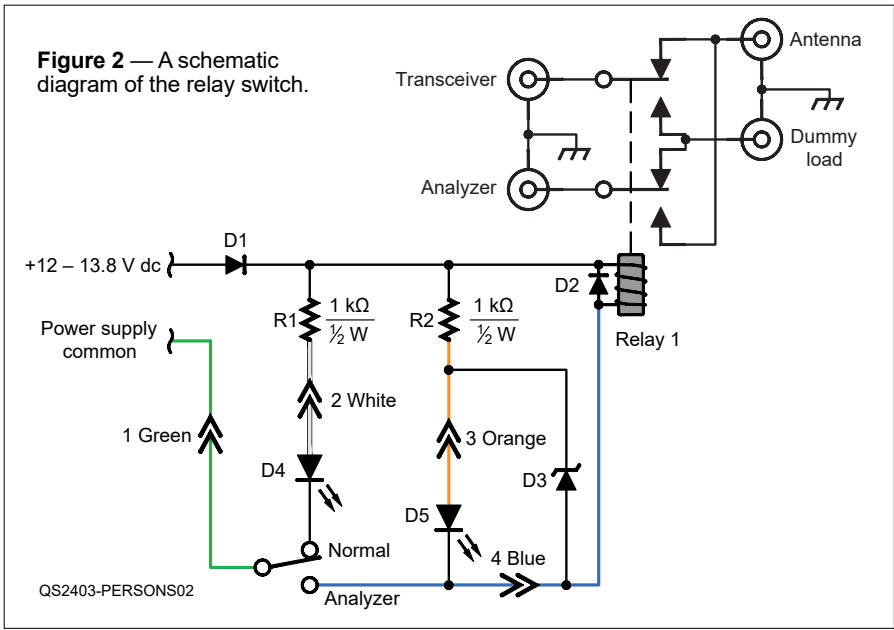


Figure 1 — Here you can see the braided wire to the connectors and the cross connections to the relay.

and the main transmitter is connected to the dummy load for maintenance.

The Build

I started this project with a 5 × 4 × 3-inch painted metal box. It has just the right amount of room to get wiring from the relay to SO-239 RF chassis connectors. I used braided wire to reduce inductance and



(see Table 1). See Table 2 for a parts list for this project build.

Figure 1 shows cross connections using more braided wire. It's important to leave space between the two to prevent an accidental short circuit. RF loss through the device is insignificant. I added extra screws and scraped away paint near the screw heads to keep the box pieces as RF tight as possible. I also put felt-pad feet on the bottom of the box to prevent accidental scratching.

Point-to-point control and status wiring is on a solder terminal strip. The logic connectors I used were Cinch Jones P-306-CCT and S-306-CCT from my junk box. You

can use almost any connector that has at least four conductors. The 12 V dc power comes from the station power supply, and less than 0.25 A of current is required. It should be fused accordingly at the station's 12 V power distribution block. In Figure 2, you'll see that D1 is a steering diode to prevent problems if the power is connected backward. The schematic also shows logic wire colors and terminals on connectors.

Table 1 — Isolation and Matching

Frequency (MHz)	Port-to-Port Isolation (dB)	Return Loss (dB)	VSWR
1.90	61	53	1.004
3.80	54	51	1.005
7.20	49	50	1.006
14.2	42	42	1.016
21.3	35	37	1.041
28.4	34	34	1.014
52.0	31	30	1.138

Table 2 — Parts List

Schematic Part	Schematic Signifier(s)
1N4004 diodes	D1, D2
3.3 V, 1 W Zener diode, 1N4728	D3
Green LED	D4
Red LED, LTL-4213-FL	D5
1 kΩ, 1/2 W resistors	R1, R2
Additional Parts	
Single-pole-double-throw rotary switch with knob	
SO-239 chassis mount connectors	
Four-pin logic connector and mating connector	
Hammond 1411L aluminum utility box, 5 × 4 × 3 inches, DigiKey	
Tyco Electronics PRD-11DY0-12 double-pole-double-throw 12 V dc relay, DigiKey	

Operating and Troubleshooting

My daily routine involves selecting an antenna with the left switch shown in Figure 3. A red light blinks when I turn the switch on the right to Analyzer, signaling that the radio is connected to the dummy load while the antenna analyzer is looking at the antenna. When operating on 80 meters, I check the dipole to see if its characteristics are as expected. When I select the All-Band antenna option, I tweak the antenna tuner for the lowest VSWR. All of this happens with very little

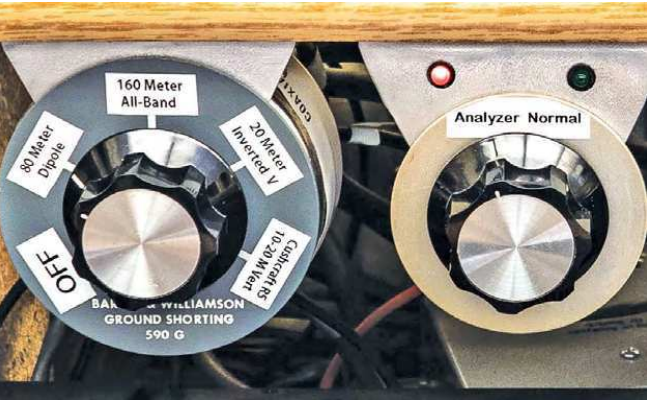


Figure 3 — The switch for my radio and antenna analyzer.

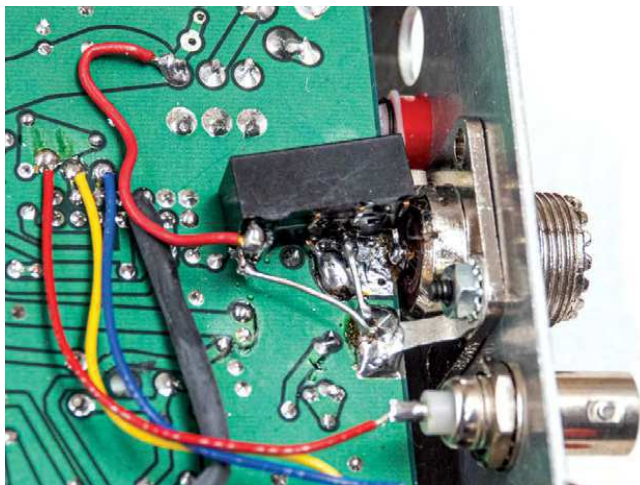


Figure 4 — The protection relay I added to my antenna analyzer.

RF power going to the antennas. When I turn the switch on the right to Normal, it connects my radio to the antenna and the analyzer to the dummy load. Then I'm ready to go on the air with confidence that the antennas are okay.

I found that the analyzer meters were hitting full scale while I was running 1000 W into the antenna. I fixed this by installing a small relay at the analyzer RF input to isolate it. The dead-bug style of wiring is not pretty, but it works (see Figure 4).

In Summary

The relay described here will allow convenient antenna checking and tuner adjustments without putting noticeable power on the air to cause interference. You can take pride in adding flexibility to your station using this relay.

All photos by the author.

Mark Persons, W0MH, is an ARRL Life Member and a Certified Professional Broadcast Engineer with the Society of Broadcast Engineers. He retired after more than 60 years of building projects and turning the dials on transmitters. Mark's website is www.mwpersons.com. He can be reached at teki@mwpersons.com.

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December 2023
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*Jim Peterson,
K6EI*

In his article, "My Introduction to Parks on the Air," Jim shares the fun he had turning a short family get-together into a productive Parks on the Air activation with only sporadic operation.

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My Introduction to Parks on the Air

This ham turned a laid-back trip into his first Parks on the Air (POTA) activation.

Jim Peterson, K6EI

I enjoy chasing DX from my home station, and I occasionally daydream about launching my own DXpedition to a rare location. Though going on such an adventure is unlikely for me, my sister and her husband invited my wife and me to spend 3 days with them at Point Cabrillo Light Station State Historic Park in Mendocino, California. It dawned on me that our March 2022 stay in one of the park's rental cottages would be a perfect chance to participate in POTA. This way, on a smaller scale, I could experience the thrill of putting a DX entity on the air with an easier approach.

Preparing to Activate a Park

Having never participated in POTA before, my first step was to create an account on the POTA website at <https://pota.app/#/signup>. After I made an account, I looked up the park reference code for Point Cabrillo Light Station State Historic Park (K-3536) and scheduled my operation at <https://pota.app/#/activations>. By publicizing the dates, bands, and



Jim Peterson, K6EI, activating Point Cabrillo Light Station State Historic Park for Parks on the Air (POTA).

mode that I planned to use, the POTA website made it possible for other hams to become aware of the activation and prepare to contact me.

Amateur radio was going to be my secondary priority, so I decided to pack an Elecraft KX3 transceiver to use on the HF bands whenever we weren't hiking or exploring the local towns. I also chose to limit my operation to FT8.

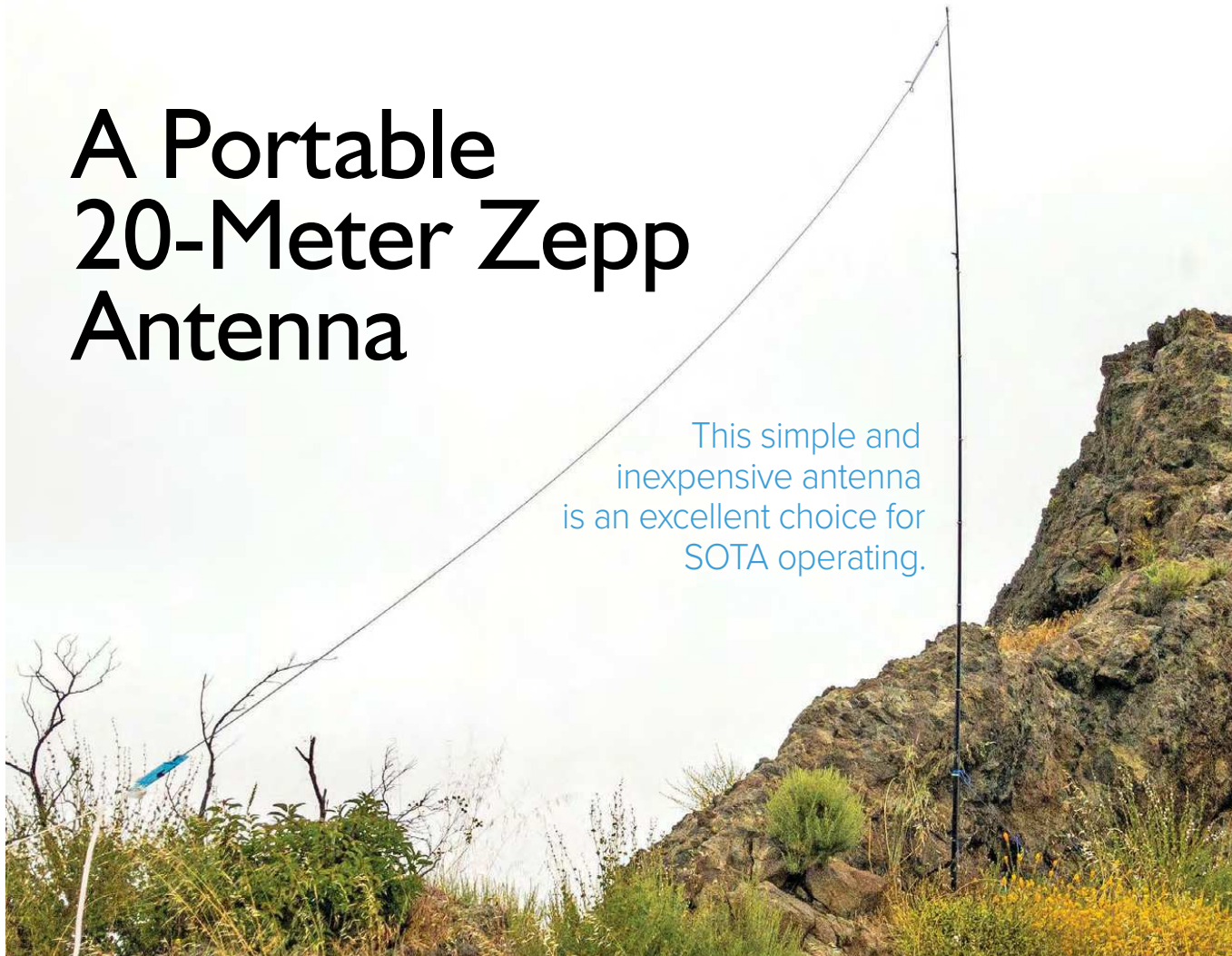
I needed to bring simple, stealthy wire antennas, so I opted to try a MyAntennas end-fed half wave (EFHW) antenna that covered 40, 20, 15, and 10 meters, and a Buckmaster off-center-fed (OCF) dipole that covered 80, 40, 20, 17, 12, and 10 meters.



Figure 1 — The legs of the dipole extending from the cottage.

A Portable 20-Meter Zepp Antenna

This simple and inexpensive antenna is an excellent choice for SOTA operating.



The author's 20-meter portable Zepp antenna on SOTA peak W6/SC-285 near Agoura Hills, California.

Charlie Richards, KN6CX

As a ham radio and hiking enthusiast, I try to combine both activities whenever I can. During hikes, I require an antenna that suits 20-meter low-power operating and complements my 20-meter QCX-mini CW transceiver. I chose a Zepp for its low cost, light weight, and ease of setup (see the lead photo). It is an end-fed half-wave antenna with a quarter-wave, 300 Ω transmission line transformer for impedance matching. Refer to *The ARRL Antenna Book* and/or the *EZNEC2* instruction manual to learn more about how a Zepp works.

How to Build It

The materials you'll need to build a Zepp antenna are shown in Table 1. My antenna's wire and transmission line dimensions for the CW portion of 20 meters are shown in Figure 1. These dimensions resulted in a standing wave ratio (SWR) of less than 1.2:1 in the CW portion of the band and less than 1.5:1 across

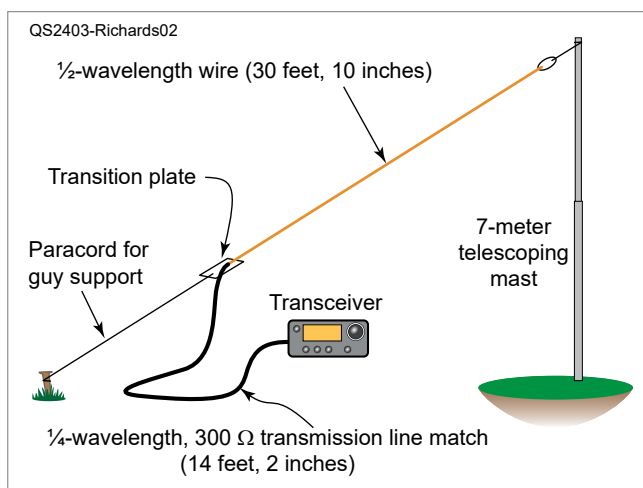


Figure 1 — The portable Zepp's structure and components.

the entire band. You may want to start with a 33-foot-long antenna wire so you can trim it to achieve the best SWR over your chosen frequency range.

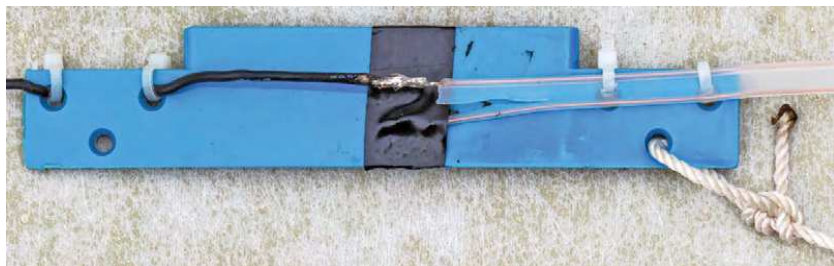


Figure 2 — Transition plate details. Note the open end of the 300 Ω transmission line.



Figure 3 — The completed portable Zepp antenna prior to being deployed.

Table 1 — Zepp Antenna Components	
Item	Description
Antenna wire	18-gauge stranded copper is recommended
Matching line	300 Ω TV twinlead
Transition plate	Plastic from a standard electrical box
RF connector	PL-259 or a BNC connector
Mast	Spiderbeam 23-foot telescopic fiberglass pole
Paracord	Any insulating cord used for support

I soldered the half-wave antenna wire and the quarter-wave, 300 Ω matching line together, and then I secured them to a plastic transition plate via cable ties (see Figure 2). I soldered only one side of the 300 Ω line to the half-wave antenna wire and left the other side open. Next, I soldered the transceiver end of the 300 Ω line to a 3- to 4-inch coaxial cable stub connected to the RF connector, and then I used shrink-wrap for insulation. I tied paracord to the transition plate to provide an attachment point for a stake or another attachment point; this relieves stress on the 300 Ω line and allows the antenna wire to serve as one of the guy lines. Figure 3 shows the completed antenna ready for transport.

How It's Set Up, and How It Performs

As mentioned earlier, the SWR of this antenna is excellent. I modeled it with EZNEC2 (www.eznec.com). As expected, the radiation pattern is almost omnidirectional when the antenna slope is like that of a typical field setup. I use this antenna while it's connected directly to my transceiver, but if you desire more distance from your transceiver, add a 1:1 choke to the antenna connector interface.

To set it up, extend the mast and use stainless-steel adjustable pipe clamps (available at any hardware store) at the mast section joints to keep the mast from collapsing. Secure the transition plate to something close to your operating position. Finally, tie the cord that is attached to the transition plate to the top of the mast. Guy wires, spaced roughly 120 degrees apart, can be tied

to the mast at about chest height and secured to tent stakes, rocks, bushes, or anything else available. If a pipe or other mast support is available, the guy lines may be unnecessary. The mast can then be erected and secured, with the antenna wire pulled taut. The mast flexibility prevents excessive stress on the antenna wire.

I have successfully activated 15 summits for Summits on the Air (SOTA) using this antenna with my low-power QCX-mini. I have made solid contacts from the SOTA sites — all in southern California — to stations across North America, and I've even made DX contacts with stations in Japan and Europe. I am pleased with the Zepp's performance, and I look forward to many more activations. This antenna provides a great way to enjoy ham radio and the great outdoors at the same time.

All photos provided by the author.

Charlie Richards, KN6CX, has been a ham since he was 12 years old. Though he is now retired, he worked as a systems engineer in the aerospace industry for more than 40 years. Charlie is originally from Mississippi, and he currently resides in southern California and is a member of the Conejo Valley Amateur Radio Club based in Thousand Oaks. He can be reached at ccrich5280@outlook.com.

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



Product Review

PreppComm MMX Multiband Morse Code Transceiver

Reviewed by Paul Danzer, N1II
n1ii@arrl.net

This 11-ounce CW unit might be considered a Swiss Army knife for both your shack and portable operations. There are several versions available; the reviewed one is the full-up unit consisting of a memory keyer with both key input and included keyboard input. The code reader has automatic speed measurement and will also capture incoming call letters. You can choose to use your home rig with the keyer portion or with the internal transceiver. Several configurations are available; you can purchase the MMX with a single-band transceiver, a dual-band version, or the tri-band (80-, 40-, and 20-meter) unit. You can see the band modules inside the MMX in Figure 1.

The 3.5-inch color touchscreen can display 10 lines of outgoing characters and incoming characters in addition to showing control commands and status. The keyer includes most of the features of standalone keyers with both programmability and recognition of a set of common pro-signs (such as AR, SK, BK, and others).

In Table 1, you will find the manufacturer's specifications with the Lab test results for this unit. There are a few things you should know before you plug it in and turn it on. First, there is no final amplifier protection, so attach a dummy load or matched antenna before you apply power. In addition, with the automatic call sign recognition (including your own), you might save a bit of frustration by skimming through the shorter of the two supplied instruction PDFs and then watching the first five brief videos supplied online. Once you get an idea of the automatic features, automatic code recognition, and steps to make a QSO, you can start at the beginning and turn on the unit.

Figure 1 — Internal view of the PreppComm MMX, showing the three band modules (80, 40, and 20 meters).



Bottom Line

The PreppComm MMX is a great compact Morse code decoder/encoder that can be used either with a key or with the included keyboard. It offers a wide range of possibilities; you can use it as a standalone HF CW QRP transceiver (up to three bands) or use it to operate CW in your station with another transceiver.



Table 1
PreppComm MMX Multiband Morse Code Transceiver, serial number M-1250

Manufacturer's Specifications

Frequency coverage: receive, 2.45 – 5.6 MHz, 4.9 – 10.22 MHz, 9.8 – 20.9 MHz; transmit, 3.5 – 4.0 MHz, 7 – 7.3 MHz, 14 – 14.35 MHz.

Power requirement: 12 – 16 V dc; transmit, 380 – 430 mA; receive, 80 – 120 mA.

Modes of operation: CW, transmit and receive. AM and SSB, receive only.

Receiver

CW sensitivity: noise floor (MDS), better than –118 dBm / 0.03 μ V.

Blocking gain compression dynamic range: Not specified.

Reciprocal mixing dynamic range (RMDR): Not specified.

Two-tone, third-order IMD dynamic range.

Transmitter

Power output: 80 m 2 W, 40 m 3 W, 20 m 1.5 W @ 13.8 V dc.

Spurious and harmonic suppression: Not specified.

CW keyer range: up to 60 WPM.

CW keying characteristics: Not specified.

Transmit phase noise: Not specified.

Size (height, width, depth): 1.3 (without lid) or 2.25 (with lid) x 5.2 x 3.8 inches.

Weight: 11 ounces with lid.

Measured in the ARRL Lab

As specified.

At 13.8 V dc: transmit, 408 mA; receive, 112 mA (no signal, max. volume, backlight on), 72 mA (backlight off).

As specified.

Receiver Dynamic Testing

–119.1 dBm / 0.28 μ V.

Noise limited at RMDR value.

14 MHz, 20 kHz offset: 87 dB.

Noise limited at RMDR value.

Transmitter Dynamic Testing

At 13.8 V dc, 80 m 2.3 W, 40 m 4.7 W, 20 m 1.4 W.

All bands >53 dBc; meets the FCC limits for spurious emissions.

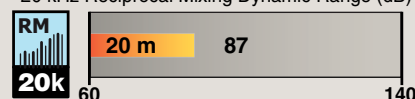
As specified.

See Figures A and B.

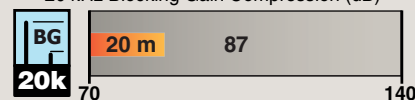
See Figure C.

PreppComm MMX Multiband Morse Code Transceiver Key Measurements Summary

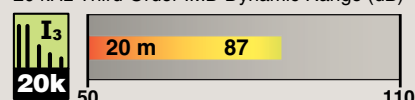
20 kHz Reciprocal Mixing Dynamic Range (dB)



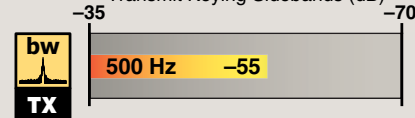
20 kHz Blocking Gain Compression (dB)*



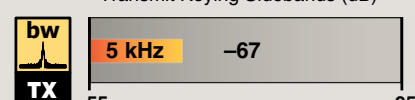
20 kHz Third-Order IMD Dynamic Range (dB)*



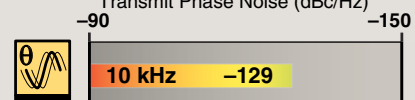
Transmit Keying Sidebands (dB)



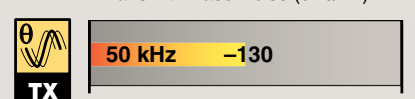
Transmit Keying Sidebands (dB)



Transmit Phase Noise (dBc/Hz)



Transmit Phase Noise (dBc/Hz)



KEY: QS2403-PR171

* Blocking gain compression and third-order IMD dynamic range noise limited at reciprocal mixing dynamic range value.

What's in the Package?

The main unit includes a protective cover, which can also be used as a stand. There is also a small envelope containing a wiping cloth for the LCD screen and a power connector. The connector has on one end a barrel plug, which is the size that is used on many QRP and small instrument power supply cord ends. The other side has a polarity-marked pair of spring connector terminals that can be used at the end of a power cord. Several other accessories and packages are listed on the PreppComm web page (www.preppcomm.com/products/mmx-multiband-morse-code-transceiver).

There is no obvious instruction material in the carton, but there is a USB-terminated keyboard, slightly smaller than most standard keyboards. Included in the keyboard box is an information sheet that lists two websites. The first one (www.preppcomm.com/pages/document-library) brings up the MMX Product

Data Sheet, the MMX Morse Code Transceiver Quick Start Guide, and the MMX Morse Code Transceiver Reference Manual. The second link (www.youtube.com/@preppcomm) brings up a set of instructional videos. There are a total of eight instructional videos plus a number of user-contributed videos.

Making Connections

All external connections are made through jacks on the rear and left side panels. On the rear, starting near the right side of the unit, is the 3.5-millimeter headphone jack that will drive a standard set of headphones. Toward the other end of the rear panel is the RF output jack, which mates with an SMA connector. The rest of my QRP equipment uses BNC connectors, so I bought a set of 12 BNC-to-SMA connectors with all possible combinations of male/female polarities. If

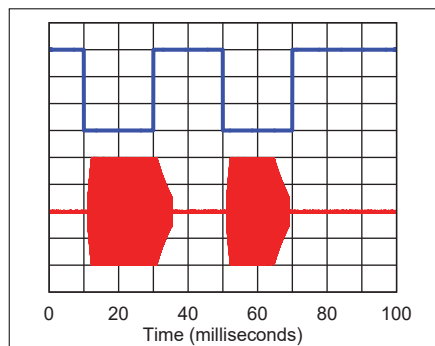


Figure A — CW keying waveform for the MMX showing the first two dits using external keying. Equivalent keying speed is 60 WPM. The upper trace is the key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 2 W output on the 14 MHz band. The first-dit rise time is 0.8 ms; the fall time is 4 ms. The second-dit rise time is 0.8 ms; the fall time is 4 ms. The first dit on delay is 1.5 ms; the off delay is 3.6 ms. The second dit on delay is 1.5 ms; the off delay is 2.6 ms.

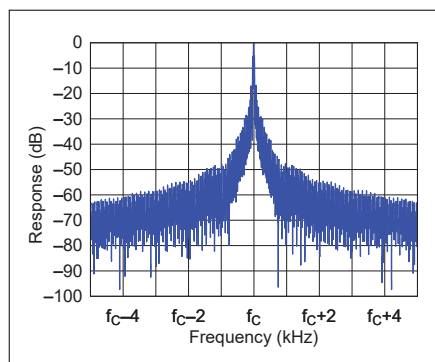


Figure B — Spectral display of the PreppComm MMX transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 2 W PEP output on the 14 MHz band, and this plot shows the transmitter output ± 5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is 10 dB per division.

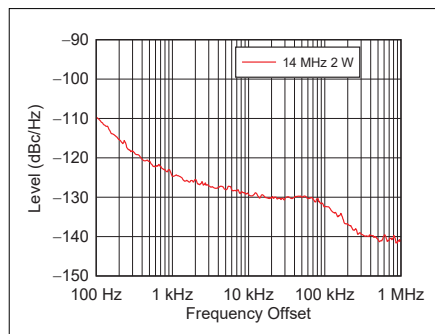


Figure C — Spectral display of the PreppComm MMX transmitter output during phase-noise testing. Power output is 2 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows phase noise 100 Hz to 1 MHz from the carrier. The reference level is -90 dBc/Hz, and the vertical scale is 10 dB per division.

you are not going to use the internal transceiver, the SMA female connector on the unit is not needed. Finally, the barrel power socket is toward the left edge.

On the left side of the case are three more jacks. The first is a standard USB socket for the keyboard, the next is a 3.5-millimeter audio connector labeled **AUDIO IN**, and the last is another audio connector labeled **KEY IN/OUT**.

How these connectors are used depends on your decision to use the internal transceiver or only the keyer-related functions and your home rig. Both the Quick Start Guide and the full Reference Manual will give you the information you need. The only unusual connections are made through the **KEY IN/OUT** jack. The sleeve of the stereo plug needed is used for a ground shield. For **KEY OUT**, the tip is used; for **KEY IN**, the ring is used. These have separate functions depending on the selection of the internal transceiver or the external rig, with a warning not to try to use the same cable for both functions.

Make the Unit Yours

There is a start-up procedure you go through the first time you turn on the unit. As mentioned before, connect either a matched antenna or a dummy load before connecting the power. It may be easy to accidentally transmit, and this can damage the internal transmitter.

The connections for the unit and initial turn-on procedure are given in detail in the Quick Start Guide, for using either the internal transceiver or the external rig.

The initial turn-on brings up a splash screen followed by the main screen. You are instructed to press the **MENU** button — but first you have to find the button! Hint: there is no button, but this is a touchscreen. Toward the lower right corner of the screen, there is an area with the label **MENU**. All buttons in the printed material are pressable areas on the LCD screen. Note that pressing a button in the middle of a sequence may not elicit an immediate response. If you press it in the middle of a sequence, a response (often a change of the button's color) will not occur until the current sequence is finished.

Pressing the **MENU** button at this point brings up the main menu (see Figure 2), from which you select **LOCAL STATION SETUP**. A press on this legend brings up a set of questions and windows to enter information.

The first entry is your call sign. This is followed by your name, QTH, rig type, antenna type, and license level. This last entry will limit the frequency band edges that the internal transmitter will tune to. Finally, there is a **FINISH** button.

At this point you will be instructing the unit to be set to either the internal transceiver or an external rig. The frequency button (one line up from the bottom of the main screen, toward the right) cycles between selection of one of the three bands — if you have a tri-band unit — and **EXTERNAL**. The selection of **EXTERNAL** shuts off the transceiver and prepares the unit to use an external rig.

Now, you may want to go back to the main menu to measure your typing speed. A full explanation of this function is given in the Reference Manual (page 23). It allows the unit to set your output text as readable



Figure 2 — The PreppComm MMX main menu has six choices, including the internal HELP system.

words. If you manually set the output Morse code text rate faster than you can type, often the transmission will be disconnected individual letters, not words. This makes it very difficult for the person (or machine) at the other end to understand what you are sending.

The typing speed test (see Figure 3) sets the output code speed to match but not overrun your typing speed. If you desire, you can manually enter any speed you want.

It's Almost Time to Get on the Air

Knowing that the MMX will provide a keyboard for Morse code output and Morse code in to printed text display, the MMX has, in its basic organization, a number of automation features to both initiate and respond to a QSO in almost a hands-off mode. The Quick Start Guide has a one-step-at-a-time set of instructions, divided into receiving and transmitting. If you set the frequency to the **EXTERNAL** mode, you can practice

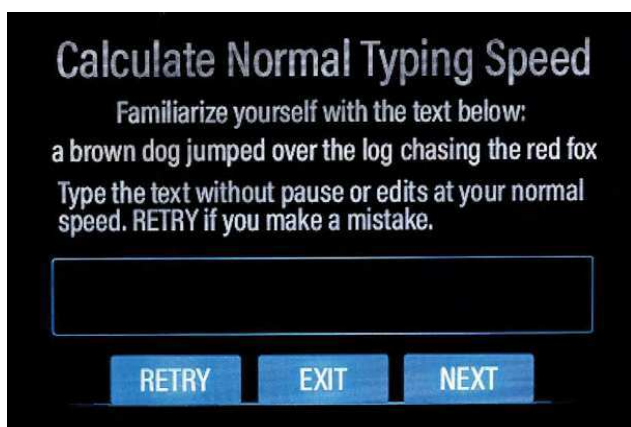


Figure 3 — The PreppComm MMX output code speed is set to the limit, found as a result of this typing speed measurement.

the transmit commands without radiating. Alternatively, you can leave the transmitter set to a band and use a dummy load.

Transmitter Commands

The **CALL** button is on the main screen. After selecting the default transmission speed (by pressing the space bar), the transmitter sends out a sequence of several repetitions of CQ followed by your call sign twice. This will continue indefinitely until you press the **CALL** button again. Then the current sequence will end, followed by a "K."

You can manually enter the call sign letters of a station you wish to call by pressing the **CCS** button. Then press **CALL**, and a calling sequence will be transmitted. Suppose WA1WTB answers. To call him back, press the **NO CCS** button, and press **CALL** again. You will transmit his call sign a few times followed by "DE" and your call sign. This sequence will be repeated until you press **CALL** again. Then the current sequence will continue to its end, and it will add "KN" to finish the call.

The Quick Start Guide steps you through four basic transmission functions or sequences: general call, directed call, answer-validate, and answer. Going through the example in the guide will lead you to the idea of canned QSO starts (initiation) and manual finishes. You probably will want to practice these sequences before you go live on the air. If you wish, you can customize each of these sequences using the Rig Programming Language (RPL). The RPL is discussed in detail, with examples, at the end of the Reference Manual.

Receiver Commands

There is an extensive set of receiver commands, including receiver incremental tuning, frequency selection, volume, frequency memories, and others. A small picture of the keyboard can be found in the Quick Start Guide, and a larger version is in the Reference Manual. The pictures have the various keyboard receive-related keys with text callouts, and you will probably want to print out a hard copy as a guide when you begin to operate.

The left- and right-arrow keys in the lower right-hand corner of the keyboard are used to tune the receiver frequency; the arrow keys are also used for the steps of tuning (for example, the tuning rate change is controlled by the up and down arrows). The rate can be changed from 1 Hz to 100,000 Hz in steps of 10. If the steps are set to 100 kHz, this could be useful in tuning the band. If you are tuned past the band edges, or the sub-band your license permits, the green **ENABLED**

light will not go on, as a reminder that you cannot transmit on this frequency.

Two gain control keys adjust both the heard volume (period and comma) and the volume of the decoder (left and right angle brackets). The space bar controls the decoder response to lost lock. When the decoder loses lock due to a frequency change, QSB, QRM, or any other reason, it will keep trying to decode based on its previous activity. At this point, tell the automatic decode to drop the past history and start fresh. A press of the space bar tells the decoder to drop this continuation, start fresh, and look for a new lock. This step is necessary!

Because the internal transceiver is based on a direct conversion circuit, often a signal can be heard at the carrier frequency plus and minus the equivalent of a beat note. If you select the “wrong” signal, your receiver will be centered at twice the beat note from your transmitter. The guides provide a rule: to answer a call, move your receive frequency one step up. If the beat note now sounds lower, you are okay. If it sounds higher, press the **D** key and then move the frequency one step down. By using this rule, you will be on the correct sideband without having to do any mental gymnastics each time.

To copy a station with the automatic decode function, tune until the green **CW IN** light is blinking on the front panel. Then press the space bar to tell the decoder to start processing.

One other unusual receive control is the **ESC** key. This switches between the human-created CW (HCW) decoder mode and the computer-assisted Morse code texting system (CTX) decoder mode. HCW is the normal mode of operation. CTX is a specialized mode that runs only at 30 WPM. It was apparently designed for communication between two stations equipped with the MMX. It appears, though not tested, that using the RPL programming, two equipped stations can exchange a set of information automatically.

With Your Home Rig

If you choose, you can use your home rig with the MMX decoder and keyboard. This has the advantage of keeping the rig control functions you are familiar with — frequency, selectivity, power, and so on. To do this, press the frequency button on the front panel several times until it reads **EXTERNAL**, rather than a frequency. The **KEY OUT** jack is connected to the **KEY IN** jack of your rig and the audio from your rig split — half to a set of headphones and the other half (i.e., a parallel connection) to the **AUDIO IN** jack of the MMX. The keyboard is plugged into its normal jack on the MMX.

Warning: You must use the SSB filter rather than the CW filter on your rig. Otherwise, the 1300 Hz note may be out of the passband and not audible. In general, operation with the MMX is pretty much the same as with the internal transceiver.

A Few Other Notes

Usually, the MMX stores the settings and values you have picked and restores them through a shutdown/power-up sequence. In addition to the stored pro-signs, you can store a set of frequencies in memory to be recalled when you want them.

There is no tune position directly with the MMX. You have several choices — you can send a number of the letter “T” in series or just use your external key. If you plug in a manual key, it has to be wired, as shown in the Reference Manual. A simple RPL code string to transmit a repeated “T” until you press the function key again can double as a tune command.

The RPL allows you to set many rig functions, including changing the supplied **CALL** and **ANS** microprograms for use in contests or for net operations. You can also use the RPL for storing fixed text messages.

Using the **KEY IN** jack, you can send code to the decoder. This code is seen as text on the screen and allows you to see how a station at the other end will see your output. Unfortunately, this does not allow you to plug a set of paddles directly into the jack. It might, however, be compatible with certain keyers that provide a voltage-free on/off set of contacts.

One further limit is the keyboard. Although the connector looks like a standard USB connector, most current keyboards will not work correctly with the MMX for historical (USB-related) reasons. This is detailed in the instructions.

On-the-Air Testing

Because the unit tested here included a transceiver, I devoted a few hours to seeing how it worked as a QRP radio. I made a few QSOs when the band had low activity. Although the receiver is a direct conversion design, there is no schematic provided, and performance suggested the direct conversion detector stage is preceded by an RF amplifier stage.

During high-activity periods here (Friday and Sunday evenings), performance in the presence of other close-by signals was not surprising — neither good nor bad. This is not a verification or measurement of the manufacturer’s claimed receiver performance; it just means I enjoyed using the QRP rig as long as there was no 20 dB over S-9 signal close. This may not be a prob-

Lab Notes: PreppComm MMX Multiband Morse Code Transceiver

Because the PreppComm MMX is designed primarily for CW signals, you'll notice the lack of many of the usual receiver tests we perform in the ARRL Lab. This unit employs a selective decoder with a narrow 120 Hz wide filter, which allows the MMX to "hear" a CW tone while rejecting a lot of what may be around the tone. Because of this design, most of the audio-related receiver measurements we make on traditional receivers simply do not apply to the MMX. The ability to take this small unit into the field with a resonant antenna and make CW contacts without knowing the code comes with a bit of a compromise in sensitivity and CW wave shaping, but it is surely an interesting device to have with its unique set of features as a transceiver and code-learning tool. — *George Spatta, W1GKS, ARRL Laboratory Manager*

lem if you use this unit as a QRP with a portable antenna, but when connected to a home station antenna, it may be different. Fortunately, you have the option to use it differently in the station by connecting it to your main radio without using the internal transceiver.

Most of the on-the-air testing was spent learning how to effectively use the automatic call sign recognition and the built-in programming language. Although I needed quite a bit of time to learn the system and the

programming language, the results can be summed up very quickly — it was fun!

Conclusion

The MMX makes a neat, low-size, low-weight package. Operating with the internal transceiver (12 V nominal, 16 V maximum), it draws slightly less than 450 mA, peak on transmit. Using the automation features requires a bit of practice, but the most basic steps for calling, recognizing a set of call letters, and answering are quick to learn. Many QRP operators have gotten used to choosing a sideband on receive, and with a signal above the noise level, it's not difficult to work with.

As with any automatic decoder, the ability to correctly decode depends on a number of things, including the received signal strength, the accompanying noise and QRM, and the sending ability of the operators at the far end. I found the space bar (to tell the decoder it is off base and should try again) to be a handy feature that saves having to tune off or take other action to break the decoder from trying to stay on an undecipherable signal.

Manufacturer: PreppComm, 130 McGhee Rd., Ste. 220, Sandpoint, ID 83864, www.preppcomm.com.
Price: Single-band version, \$449; dual-band version, \$499; triple-band version, \$549.

Icom AH-730 Automatic Antenna Tuner

Reviewed by Mark Wilson, K1RO
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Icom's AH-730 automatic antenna tuner is designed for use with Icom transceivers that have a four-pin Molex **TUNER** jack on the rear panel. Compatible transceivers include the IC-718, IC-7100, IC-7300, and IC-7610 from the current lineup, as well as older radios such as the popular IC-746 and IC-756 series. It's a weatherproof remote tuner designed for use on 160 through 6 meters with a wire that's 23 feet or longer. You can use a wire or whip shorter than 23 feet with reduced frequency coverage, such as 40- through 6-meter operation, with Icom's AH-2B mobile antenna.

The AH-730 package includes the tuner, a 32.8-foot control cable, and hardware for several mounting options (see Figure 4). Power is supplied from the radio through the control cable.

New and Improved

The AH-730 replaces Icom's popular AH-4 automatic



Bottom Line

The Icom AH-730 is a weatherproof remote tuner designed for use with a wire that's 23 feet or longer or with Icom's AH-2B mobile antenna. It covers 160 through 6 meters and integrates seamlessly with compatible Icom transceivers.



Figure 4 — The AH-730 package includes a 32.8-foot control cable with connectors for the tuner and compatible Icom radios, along with stainless-steel hardware for a variety of mounting options.

tuner. Compared to the AH-4, the AH-730 has some important upgrades and improvements. The new model is specified for 1.8 through 50 MHz, adding 160-meter operation to the AH-4's range. The input power rating is 150 W PEP (100 W continuous), compared to 120 W PEP for the AH-4. The new tuner is about 2 inches wider and 4 inches longer than the old model, and it is noticeably heavier (5.5 pounds versus 2.6 pounds). Table 2 lists the AH-730 specifications.

Perhaps the most noticeable difference between the old and new models is that the feed-line and control cable connections are now external to the unit. Users had to open the AH-4 to connect the feed line and control cable and then reassemble the case. The control cable included with the AH-4 is 16.4 feet long — half the length of the cable that comes with the new model.

The AH-730 also has an IPX4 water resistance rating, which means that it is resistant to water splashes from any direction. It's okay to leave it out in the rain, but it should be installed where it won't be submerged.

The AH-730 has pigtails on the bottom of the case for the feed line and the control cable, making it quick and easy to set up the tuner and to disconnect cables for transport or storage. There's also a terminal with a wing nut on the bottom of the unit for attaching a ground wire or counterpoise, such as a radial system or vehicle body (see Figure 5).

On the top side of the tuner case (shown in Figure 6) is the output connection — an insulator with a

Table 2
Icom AH-730 Automatic Antenna Tuner

Manufacturer's Specifications

Frequency range	1.8 – 54 MHz (>23-foot antenna)
Maximum input power	150 W PEP, 100 W continuous
Tuning power required	5 – 15 W
Tuning time	Average 2 – 3 seconds, maximum 15 seconds
Power supply requirement	13.8 V dc $\pm 15\%$, <0.7 A (supplied by radio through control cable)
Tuning accuracy	Less than 2:1 VSWR except with antennas $\frac{1}{2} \lambda$ or a multiple of $\frac{1}{2} \lambda$ long
Number of tuned memories	45
Dimensions (height, width, depth)	3.1 $\times$ 9.1 $\times$ 13.4 inches
Weight	5.5 pounds
Compatible antennas	Long wire and vertical whip antennas



Figure 5 — Pigtails for the feed-line and control cable connections and a ground post are located on the bottom of the AH-730 enclosure.



Figure 6 — The top of the AH-730 enclosure has a post for attaching the antenna wire.

threaded post and another wing nut. Connect a suitable antenna wire or the Icom AH-2B mobile antenna here. Icom supplies a crimp-type ring terminal, flexible cap, and weatherproofing tape for this connection.

Using the AH-730

Mounting plates along the top and bottom edges of the enclosure allow several mounting options with the provided stainless-steel hardware. The enclosure can be mounted to a pole or mast with U-bolts and saddles, or attached to a board or metal plate with wood screws or machine screws and nuts (see Figure 7).

The tuner connects to the radio with the provided control cable and a user-supplied feed line (in my case, a 25-foot piece of RG-58 with PL-259s on each end). If the 32.8-foot control cable is not long enough for your installation, you can extend it with an identical cable that Icom offers separately (part number OPC-1465). A green wire at each end of the cable can be used for a ground connection between the tuner and the radio. The instructions say to make this connection if RF feedback occurs. For permanent installations, it's a good idea to waterproof the control cable and feed-line connections as well as the antenna wire connection on the top of the enclosure.

There are no indicators or controls on the AH-730. When it's plugged into the TUNER socket, the radio's

internal tuner is disabled. Press and hold the front-panel TUNER button for a second or two to start tuning. When the standing wave ratio (SWR) is reduced to 2:1 or less, TUNE shows on the display and the antenna system is ready to use. Although it's always a good idea to make adjustments on a clear frequency, radiated power during the short tuning process is less than 300 mW, minimizing potential interference with other operators.

If the tuner cannot find a tuning solution 2:1 or less within 15 seconds, the TUNE indicator goes out. In almost all cases, the AH-730 found a tuning solution within a couple of seconds, and the tuned SWR was close to 1:1. On the higher-frequency bands, I could make fairly large frequency excursions without retuning.

The tuner has memories to store the most recent 45 tuner settings, so tuning is nearly instantaneous when you press TUNE after returning to a previously used band segment. You do have to initiate the tuning procedure with each band change (it doesn't automatically follow the Icom radio), and the memories are stored only until power is turned off.

On the Air

I used the AH-730 with several different antennas. Originally, I was interested in the tuner for multiband portable operation with the Eagle One vertical antenna reviewed in the June 2023 issue of QST. As shown in Figure 8, I secured the AH-730 to the antenna's mounting pole using the supplied U-bolts and saddles. With the Eagle One antenna's 31-foot vertical element con-



Figure 7 — An option is to mount the enclosure using wood screws or bolts and nuts. Here is the AH-730 attached to one of my deck supports and feeding an 85-foot end-fed wire.

Table 3 Icom AH-730 Resistive Load and Loss Testing						
VSWR/Impedance	160 M	80 M	40 M	20 M	10 M	6 M
10:1/5 Ω loss (%)	21%	29%	43%	47%	83%	NT
Tuned SWR	1.1	1.2	1.3	1.2	1.1	
8:1/6.25 Ω loss (%)	11%	18%	32%	32%	68%	NT
Tuned SWR	1.1	1.2	1.3	1.2	1.2	
4:1/12.5 Ω loss (%)	7%	11%	20%	25%	64%	NT
Tuned SWR	1.1	1.2	1.3	1.3	1.1	
2:1/25 Ω loss (%)	3%	5%	13%	19%	45%	NT
Tuned SWR	1.1	1.2	1.2	1.1	1.3	
1:1/50 Ω bypass loss (%)	0%	0%	2%	4%	4%	5%
Bypass VSWR	1.2	1.2	1.2	1.1	1.1	1.9
2:1/100 Ω loss (%)	6%	4%	11%	12%	44%	62%
Tuned SWR	1.1	1.2	1.2	1.2	1.3	1.6
4:1/200 Ω loss (%)	7%	6%	10%	17%	67%	69%
Tuned SWR	1.1	1.2	1.2	1.1	1.1	1.4
8:1/400 Ω loss (%)	4%	7%	11%	20%	69%	84%
Tuned SWR	1.1	1.2	1.2	1.2	1.2	1.3
10:1/500 Ω loss (%)	6%	8%	12%	22%	75%	89%
Tuned SWR	1.1	1.2	1.1	1.2	1.2	1.3
NT = No tuning solution found						
All loss percentages accounted for % of reflected power at tuned SWR.						

Lab Notes: Icom AH-730 Automatic Antenna Tuner

Sometimes you are forced to use a less-than-ideal antenna that is not resonant on the band(s) on which you wish to operate. These constraints will often cause the SWR of the antenna to be higher than one can safely operate their transmitter into. When operating into a compromised antenna with a high SWR, a good way to match it to the 50 Ω impedance of your transceiver is to use a remote automatic tuner like the AH-730 at the antenna feed point. This is the most efficient way to match to an antenna with a high SWR because the feed line is being operated near its 50 Ω impedance. (SWR-related cable losses can also be high when the antenna SWR is high even if your built-in tuner provides a 1:1 match at the rig.)

The ARRL Lab performs resistive tests on antenna tuners to determine if they can match a wide range of high and low impedances on the bands for which the unit is specified (see Table 3). This provides a data set that can be used to compare tuners. In real-world use, especially with random wire or other non-resonant antennas, the impedance is never purely resistive. In order to get a sense of how an antenna with reactance will tune, the Lab also tests a couple of scenarios with different magnitudes of reactance to simulate a 43-foot vertical antenna.

Phil Salas, AD5X, who has performed many antenna tuner tests for the ARRL Lab over the years, describes the precision test setup he built and test methods in “Antenna Tuner Loss Measurements” in the March/April 2021 issue of *QEX*. A perfect antenna tuner would take the RF power from a transmitter, transform the impedance seen at the antenna to 50 Ω , and then send the power to the antenna. Tuner designs can come close to this ideal, but to do so, they need large roller inductors and typically use large variable capacitors, which, of course, make for a large — and expensive — antenna tuner. A manually operated tuner can also be used at the station operating position, so it does not change the SWR on the feed line, which at a high SWR can have losses that exceed the losses expected with any tuner.

In practice, unfortunately due to real-world limitations of components, especially the quality factor of inductors, there is always some power loss through the tuner.

Manually operated antenna tuners typically have lower losses than automatic antenna tuners that switch in various values of fixed inductors and capacitors, but the convenience of being able to automatically match to a wide range of antennas often makes the increase in loss worth the trade-off.

Tuner losses are simply heat generated by the imperfect components used in the tuner. Surprisingly, this can result in an increased ability of the tuner to match a wider range of impedances (see Table 4). Tuners will see the highest RF currents and inductances from short antennas. The losses through the tuner will be higher while matching these types of antennas. (With the AH-730, the internal losses of the tuner allow the transmitter to tune into both an open [infinite impedance] load or a shorted [0 Ω of impedance] load.) Either condition would normally present an infinite SWR value to your transceiver’s final amplifiers. This could be a “gotcha” in that you could potentially have an open or shorted antenna, but you would still see a match. The other way to look at this is that if, in fact, you did have either one of those conditions, the tuner would still create a match that would spare your transmitter from potential harm. However, keep in mind that if your tuner does find a match into an extremely high or low impedance, all your power will be dissipated within the tuner. In this case, you may damage the auto tuner if you transmit into it with full power. So, if you don’t hear any signals either before or after a tune-up, you might want to check your antenna system before you start transmitting.

All antenna tuners are compromises. What trade-offs are best for you? At first glance, a 50% loss through an antenna tuner being operated into an antenna that would have a high SWR might sound concerning, but a 50% loss is only half of an S-unit, so the convenience of having an automatic tuner and the ability to match a very wide range of antennas might be a good choice for most hams. If you need to get something on the air and have an antenna “just work,” then the compromise of matching ability versus efficiency should be acceptable. — *George Spatta, W1GKS, ARRL Laboratory Manager*

For details about the test fixtures and methods used by Phil Salas, AD5X, to test antenna tuners for the ARRL Lab, visit www.arrl.org/qst-in-depth.

Table 4
AH-730 Antenna Tuner Loss Measurements with Antenna Simulator Box

Rp	Cs	Rp/50	Sim. Ant.	Tuned SWR	RF In/Out	Ideal Loss	Actual Loss	Loss %
∞^*	∞	50	50 Ω load	1.1	3.2/3.2	0 dB	0	0
15 Ω	36 pF	11.5 Ω	8 ft 40 m	1.8	3.3/.13	6.4 dB	14 dB	67%
20 Ω	91 pF	14.3 Ω	25 ft 80 m	1.3	3.3/.48	5.4 dB	8.4 dB	46%
25 Ω	130 pF	16.7 Ω	33 ft 80 m	1.3	3.3/.73	4.8 dB	6.6 dB	29%
40 Ω	200 pF	22.2 Ω	43 ft 80 m	1.3	3.3/1.2	3.6 dB	4.4 dB	13%
50 Ω	390 pF	25 Ω	90 ft 160 m	1.2	3.1/1.36	3 dB	3.6 dB	7%
50 Ω	560 pF	25 Ω	100 ft 160 m	1.1	3.1/1.4	3 dB	3.5 dB	7%

All loss percentages accounted for % of reflected power at tuned SWR.

*Loss of the antenna simulator box on 160 – 40 meters.

nected to the antenna terminal on top of the tuner, and my vehicle frame connected to the ground terminal, I was able to find a tuning solution on all ham bands from 1.8 to 50 MHz. I used this combination during several park activations and made contacts on 10 bands.

At my home station, I used wood screws to mount the AH-730 on a piece of plywood attached to one of my deck supports. I ran an 85-foot wire from an insulator attached to my deck out to a tree at the back of my property. The wire is about 8 feet above the ground at the deck and 30 feet up at the far end. I also ran two 33-foot radials from the AH-730 ground lug. The AH-730 easily tuned this antenna on all bands from 160 through 6 meters.



Figure 8 — The AH-730 package includes U-bolts for attaching the enclosure to a mast such as the support for the Eagle One vertical antenna on its trailer hitch mount.

I made hundreds of SSB, CW, and FT8/FT4 contacts with this simple wire and was impressed with how well it worked on all bands. For example, during the CW weekend of the CQ World Wide 160-Meter Contest, I operated for a few hours each evening and made nearly 300 contacts in 40 states/provinces and 12 DX countries. At the other end of the spectrum, I made 20 FT8 contacts in eight grids in the ARRL January VHF Contest on a flat 6-meter band.

I also have a 135-foot inverted-V dipole fed with balanced line that I normally use with a manual tuner in my station. The AH-730 had no difficulty tuning that antenna on all bands.

Final Thoughts

Icom's AH-730 remote auto tuner is a good choice for someone who wants to operate on multiple bands with a compatible Icom radio and simple antenna such as an end-fed wire, 43-foot vertical, or dipole fed with balanced line. It quickly found a tuning solution with the antennas I tried, and worked well enough to make a lot of contacts across the bands.

Manufacturer: Icom America, 12421 Willows Rd. NE, Kirkland, WA 98034, www.icomamerica.com. Price: \$549.99.

Chelegance JNCRadio M-104 Four-Band HF Portable Antenna Kit

*Reviewed by John Leonardelli, VE3IPS
jleonardelli@arrl.net*

I have been searching for a lightweight HF multiband antenna that I can easily carry during air travel and fit into the side pocket of my backpack for portable use. After conducting some research, I came across the JNCRadio M-104 multiband antenna kit. It consists of a base-loaded vertical antenna with band coils for 40, 20, 15, and 10 meters, a base unit using the PL-259 format connector, a counterpoise ring terminal (for adding your own counterpoise), and a 3.94-foot (1.2-meter) telescopic whip. The power rating of 50 W PEP is perfect for my portable operations. Additionally, it includes a six-sided coupler to connect the whip directly to the antenna base without a coil. The assembly process is straightforward, with all components easily screwing

together. I ordered mine from www.chelegance.com, and it arrived within 7 days with UPS shipping.

Chelegance was established a few years ago to address the need for cost-effective portable antennas and relevant amateur radio products, featuring designs from BG8BXM and BD8ABC. I noticed that the counterpoise wire is not included, but Jesse, BD7LLY, promptly responded to my inquiry and informed me that it is op-

Bottom Line

The Chelegance JNCRadio M-104 is a low-cost, compact, and lightweight HF portable antenna, making it the ideal antenna for travel when luggage weight and size are limited.



tional. They have observed many users utilizing this antenna for fixed mobile operations.

The overall construction of the antenna is excellent, and it comes in a compact plastic box measuring 7 × 4.3 × 1.2 inches (see the lead photo). Two primary features attracted me to this antenna: its small and lightweight design (weighing only 11 ounces) and its compatibility with a mobile mount (see Figures 9 and 10).

Portability and On-the-Air Operations

I recently traveled to Boston for business, and because I would be there for a few days, I decided to bring my Yaesu FT-818 multiband radio for possible Parks on the Air field operations and chatting on the repeaters while on the move. It was crucial for me to have a compact antenna that I could discreetly deploy, as I always travel with carry-on luggage. Both the radio and the antenna fit easily into my Think Tank travel backpack, and I have never encountered any issues with airport security. However, the coils do catch the attention of the X-ray machine, so I always place my radio and antennas in the security bin for a quick and hassle-free inspection. Trust me, if you don't, security will conduct a physical inspection that can cause delays.

Because I rented a car, I was able to use a Diamond K400 mount that I had packed (don't forget the Allen key) along with the M-104 antenna for HF operations. I also brought a cigarette lighter cord for the radio, ensuring I was fully prepared. On a beautiful day, I drove down to the waterfront district of Boston to visit the USS



▲ **Figure 9** — The JNCRadio M-104 on a Diamond K400 series bracket mobile mount.



► **Figure 10** — The JNCRadio M-104 on a Comet mobile magnetic mount.

Constitution and the Christopher Columbus Waterfront Park. I had also packed a small clamp bracket that I made using an SO-239 connector and a counterpoise wire for use at the park. I typically use either #26 Silky wire or a 33-foot rubberized test lead wire.

During my operation, I made a local contact on 40 meters and several contacts with stations in Texas on 20 meters. As expected with short HF antennas, I knew beforehand that I would need to adjust the length of the counterpoise wire to achieve a desirable SWR. I made adjustments incrementally, a few inches at a time, until the SWR was around 1.5:1.

It's worth noting that the telescopic whip itself is too lightweight to be used while driving on the interstate highway, so I utilized it only at roadside tourist rest stops. I made a quick rest stop on my way to Salem, New Hampshire, on Highway 93. It took me only 30 seconds to swap out a Larsen 2-meter mobile whip with the M-104 antenna and 20-meter band coil, and was on the air.

Table 5
Chelegance JNCRadio M-104 Four-Band HF
Portable Antenna Kit

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

Maximum SSB power input	50 W
Maximum digital power input	20 W
Band coverage	40, 20, 15, and 10 meters
Antenna impedance	50 Ω
Antenna connector	PL-259
Minimum antenna length	55.12 inches
Package dimensions	7.09 × 4.33 × 1.18 inches
Weight	11 ounces

While I could hear many European stations on 20 meters, I wasn't able to make successful contacts using just 5 W. However, I did manage to work a station in Kentucky with a 5 × 5 signal. Needless to say, I was extremely pleased with the performance of the antenna.

On a warm day, I decided to take a walk and set up the antenna with my Icom IC-705 at the local park to take some photos for this review. I used a small 3D-printed bracket for the antenna mount and adjusted the SWR by shortening the counterpoise wire while utilizing the Icom's built-in SWR meter (see Figure 11). During my operation, I heard N4SMS calling CQ from Schofield Middle School Radio Club, and I received him at 59 while he had me at 57 on 20 meters. With 10 meters becoming the Magic Band again, I also picked up several CW beacons on this band. Additionally, this antenna serves as a great shortwave listening antenna. Simply screw in the band coil, extend the whip, and enjoy tuning the bands. After several operating events, I have found that this antenna lives up to its promises, and its convenient size makes it a valuable addition to my radio kit. One of the features of the antenna that I appreciate the most is its telescopic whip, which can be fully extended and paired with the appropriate coil. It makes the setup easier than adjusting tap points and measuring the whip length.

I also deployed the antenna with a custom bracket mounted on the side of the Icom IC-703 backpack for a tabletop operation. The same scenario applied for the Icom IC-705, and I could adjust the SWR by changing the attached counterpoise length. With the radio antenna tuner, I was even able to use the 15-meter coil on the 17-meter band.

For the counterpoise, I made use of #26 Silky stranded wire, terminating it on the supplied spade lug. I coiled it up and stored it in a small ziplock plastic bag, which can also fit in the antenna kit's plastic box.

During my usage, I developed a quick and easy hack. I attached a 44-foot-long wire to the base mounting unit



Figure 11 — A 3D-printed bracket with an SO-239 connector with the M-104 antenna. It works as expected on the Icom IC-705.

(without coils or whips) using a washer and an M6 metric nut. I then tossed the wire into a 10-foot-tall tree, effectively enabling near vertical incidence skywave communications on 60 meters. I can also shorten the wire to 32 feet for 40 meters.

Additionally, I can use the antenna without the coil. By using the telescopic whip and the six-sided coupler, I can cover the 2-meter to 70-centimeter range. Additionally, if I attach a 5- to 6-inch wire with an alligator clip, I can even utilize it for 6-meter operations. This antenna proves to be highly versatile.

Furthermore, this antenna can be deployed on tabletops in homeowners association situations where antennas are a problem. By using a small camera tripod, an SO-239 bracket, and its counterpoise, I can be on the air. It is small and discreet, blending in seamlessly on top of a patio table. This setup is also ideal for FT8 users and other weak-signal digital modes as well.

Conclusion

Overall, this antenna is a valuable addition to my antenna collection. It can be used easily in portable and mobile configurations, and it has consistently demonstrated excellent radiating performance despite its compact size. I am highly satisfied with this investment, as it provides HF communications for the portable operator in a multiband antenna that can fit in a vest pocket.

Manufacturer: Chelegance JNCRadio, www.chelegance.com. Price: \$70.

See QST in Depth for More!

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

- ✓ Test fixtures and methods used by Phil Salas, AD5X, to test antenna tuners for the ARRL Lab

Ask Dave

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

Key Operating Practices

Balun Coax and Line Loss

Q Doug Tucker, KD9PQI, asks: I am upgrading my antenna system and amplifier for HF and am wondering if my “ugly balun” reduces signal strength. I formed the balun by winding RG-8X coax around a tube. I have 18 wraps on a 4-inch-diameter tube, which works out to about 18 feet of coax used for the balun. Is this length of coax included in the calculation of line loss per 100 feet? If so, my total coax length is going from about 40 to 58 feet just by adding the balun. I have not tested the standing wave ratio (SWR) on HF yet. However, I now have a good SWR of 1.2:1 on 2 meters and 70 centimeters and would rather not change the balun if it’s not causing substantial loss.

A Yes, the additional 18 feet of RG-8X is included in the feed line’s total length. Fifty-eight feet of RG-8X is a long run for 2 meters and 70 centimeters. This cable is better for HF, though I’ve used it successfully on 2 meters.

Line losses can make the SWR look better. SWR is a function of the amount of power put into the transmission

line and the amount returned. If power is lost in the transmission line, the amount returned will seem artificially low, thus giving a better SWR reading. For VHF and UHF, you should look into a more robust coax, such as RG-213 or LMR-400.

The purpose of the ugly balun, often called a “choke balun,” is to greatly reduce the common-mode current on the outside shield of your coax. This helps reduce radio frequency interference from returning to your station and causing issues. These chokes should be placed in the feed line near the antenna. Figure 1 shows an ugly balun as a common-mode choke for a 2-meter J pole. You can consider other means, like placing several ferrite beads over the coax near the antenna feed point, given that coaxial cable is expensive. You can use a transformer-style 1:1 balun.

Several radios, such as the Yaesu FT-991A, will operate on HF, 6 and 2 meters, and 70 centimeters, and thus have two antenna connections on the back, so you will end up with at least two antenna systems. A lot of people, including myself, create dipoles or multiband antennas that don’t include a balun. All of my antenna cables are brought to lightning surge protectors at my ground rod. This connection shunts common-mode currents to ground. I have not had trouble with stray RF energy in my station.

Contacting the International Space Station

Q Paul Schoeny, KC9MOQ, asks: I have a Yaesu FT-4XR handheld dual-band 5 W transceiver, and I’m thinking of getting a gain antenna. How can I contact the International Space Station (ISS)?

A It is possible to contact the ISS with your handheld, but it is not likely. Astronauts are busy running experiments that have been scheduled long in advance. Amateur Radio on the International Space Station (ARISS) is consid-



Figure 1 — An “ugly balun” for a J-pole made by wrapping several turns of coax around a short length of plastic pipe. On 2 meters, this provides enough inductance to keep common-mode current from coming down the coax. This coax coil does not affect what is inside the coax except to add length to the transmission line. This simple coax coil is called a balun because the J-pole is a balanced antenna, and the coax is unbalanced. The coil keeps the balanced antenna currents separated from the coax’s outer shield, thus connecting the balanced antenna to an unbalanced feed line.

ered one of those experiments, but it is used heavily to provide educational contacts between the ISS and various school groups around the world.

The ISS is in low Earth orbit, and like most popular amateur satellites, it tracks quickly across the sky. This means that you must always move your gain antenna to point at the ISS. In their free time, astronauts will call on the voice repeater and talk with whoever they hear. There is also a packet repeater aboard the ISS that operates on 2 meters. Given that the chances of an astronaut being off duty and making random contacts at the same time the ISS is over your location are slim, you will need to have an antenna system that tracks the ISS all the time. Perhaps the easiest way to try to contact the ISS is to talk to other terrestrial hams through the ARISS voice or packet repeaters and go from there.

The ARISS website provides comprehensive resources to help you in your quest. Everything you need to know about contacting the ISS using amateur radio is discussed at www.ariss.org/contact-the-iss.html. Astronauts' schedules are mostly public on NASA's website. Perhaps these factors will line up and give you a successful contact.



Sorting Out Repeaters

Q Doug Grimmius, W7AKG, asks: I am interested in hitting repeaters from the longest possible distance on 2 meters to see how many miles I can transmit. Often, repeaters are connected into systems, so it can be a bit confusing as to exactly which one I hit or the exact repeater that I am talking to. If I am calling a known FM repeater that is listed as 100 miles away on www.repeaterbook.com, and I have included the appropriate continuous tone-coded squelch system (CTCSS) tone, and I get a contact or response, does that mean my signal hit the intended repeater?

A In your home state of North Carolina, there are more than 600 repeaters. Many of these are linked systems, meaning they share common audio. You can go on any of the linked repeaters, and someone somewhere else can listen on a different repeater. Given you live in the mountains, line-of-sight communications can be difficult but certainly not impossible.

Each repeater has input and output frequencies, often called the “frequency pair,” assigned by your state’s frequency coordinator. The frequency coordinator has only so many pairs to assign, so one of the coordinator’s jobs is to keep repeaters with the same pair geographically

separated. Sometimes, this is impossible, so repeaters on the same pair will have different CTCSS codes so you don’t go into the wrong one. The frequency pair and CTCSS code combination makes each repeater unique, so if you can make a contact using that information, you can be sure of which repeater you are using. If it is a linked system, the person you talk with may be coming into the system from an entirely different repeater.

When you use a repeater, it listens for your FM carrier signal and decodes your CTCSS code. Then, it connects the received audio to its transmitter. Almost always, the repeater will keep this link open for a few seconds following the carrier’s disappearance. If you press your radio’s transmit button briefly, you will hear the repeater’s output carrier for a second or two afterward. This is known as “kerchunking,” and it can drive regular repeater users nuts. Just because you can kerchunk a repeater does not mean your signal is strong enough for the repeater receiver to hear good audio. Where I live, I can kerchunk the Cedaredge repeater, but my audio doesn’t make it through. I need higher power. So, just because you can kerchunk a repeater 100 miles away, it isn’t enough to say you’ve made contact. You need to actually speak with someone.

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.

Strays

QST Congratulates...

◆ Al Ward, W5LUA, for being the first to receive the Worked All States Award on 33 centimeters. On October 21, 2023, Al made his final contact with Peter, KA6U, via EME. Al had been on the hunt for 38 years, as he first started collecting contacts on the 33-centimeter band in 1985.

◆ Jerry Page, W7KPL, for receiving the Captain James Cook Award from the New Zealand Association of Radio Transmitters. Captain James Cook was a British explorer famous for his three voyages between 1768 and 1779. The award is issued to continue the memory and contributions of Captain Cook. It requires making contacts with stations based in the areas where Cook stopped during his voyages. Jerry was awarded the Sailor Class, which is given to operators who have contacted other operators in Yorkshire, Oceania, New Zealand, and Australia. Jerry has also made contacts on all the islands that Captain Cook explored.

Hints & Hacks

O-Rings to the Rescue; A New Life for an Old Tuning Control; Cat Cables for Audio

Fix a Floppy D-104 Head

For more than 50 years, I have used and loved the Astatic microphones in all of their iterations. I've collected many of the standard D-104s, the bullet-headed DN-50s, the 10-DA models, and others, along with the regular UG-8 or T-UG8 bases. Using Heil Sound D-104 conversion kits, I've given new elements to most of the microphones in my shack.

As time goes on, wear and tear causes the heavy heads of these microphones to flop around. I found that it helps to tighten the mounting screws of the three-pin connectors on the bases and heads, but the heads still wobble.

I later discovered that a small O-ring placed under the collar portion of the



Figure 2 — A flat jeweler's screwdriver can be used to push the O-ring onto — and then behind — the threads of the knurled nut. [Robert W. Lobenstein, WA2AXZ/9, photo]

microphone fixes the problem. It takes some effort to get the O-ring on because it's smaller than the mounting shaft (see Figure 1). Once it's on, you can use a flat jeweler's screwdriver to gently push the ring up and into the threaded part of the collar (see Figure 2). With the microphone head back on the base shaft, the O-ring acts like a faucet gasket and applies pressure to eliminate the wobble. I used a Danco #7 O-ring, which is available from many retailers. — 73, Robert W. Lobenstein, WA2AXZ/9, wa2axz@arrl.net

Drake L-4B Vernier Drive Replacement

My venerable Drake L-4B amplifier has done yeoman's duty since I purchased it in 1979. But over the last few



Figure 1 — The black O-ring in its initial position below the knurled nut, which is the collar portion of the microphone. [Robert W. Lobenstein, WA2AXZ/9, photo]

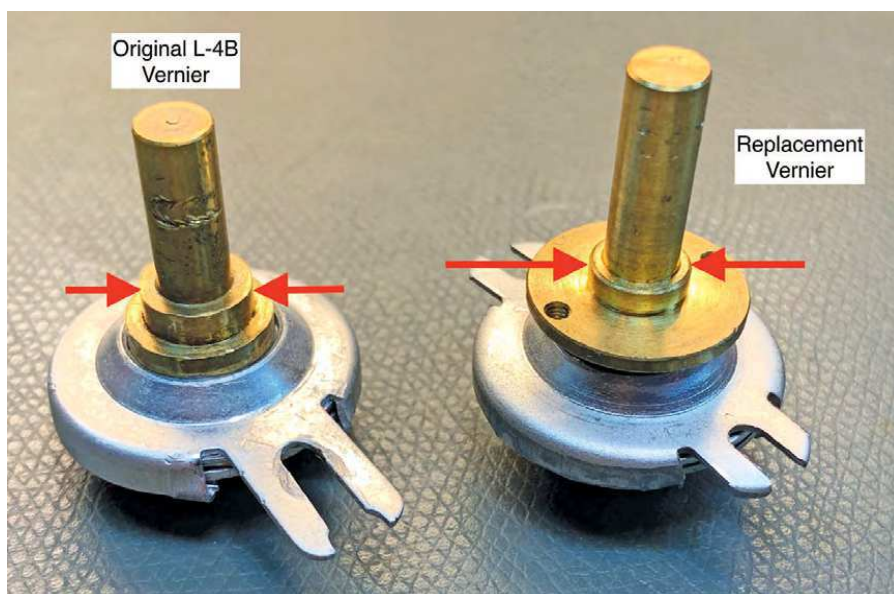


Figure 3 — The old vernier control is on the left, and the new vernier control is on the right. There is a clear difference between their sizes. [Dino Papas, KLØS, photo]



Figure 4 — The new vernier has two holes through which I threaded the wires and secured the pointer. [Dino Papas, KLØS, photo]



Figure 5 — The repaired tuning control is back in service. [Dino Papas, KLØS, photo]

years, I noticed that in a section of the plate tuning control arc, the control has been slipping. I figured it was time to either repair or replace the vernier drive mechanism.

Fortunately, I had a couple of vernier reduction drives in my junk box for other projects, and I swapped the old drive for a new one. You can find new drives at suppliers such as Max-Gain Systems (www.mgs4u.com). Though it was different in appearance, the replacement vernier perfectly fit in the original's panel space, and there was enough space for the mounting screw to securely mate.

However, the diameter of the collar that the red tuning pointer attaches to was too small to hold said pointer in place (see Figure 3). I initially increased the collar's circumference with silicone fusion tape to give the pointer a surface to attach to, but that didn't work. The better solution turned out to be right in front of me; the replacement vernier has two holes through which I could pass pieces of solid ground-type wire. I wrapped them around the body of the pointer to securely attach it (see Figure 4). Before I tightened the wire twists and trimmed the excess, I made sure the pointer was correctly oriented in the tuning arc. The tuning knob hides the fix (see Figure 5).

The new vernier works as smoothly as the old one did when the amplifier was new, and the red pointer is solidly attached and tracks correctly. My trusted old friend is now ready to operate for another 40 years. — 73, *Dino Papas, KLØS, kl0s@arrrl.net*

Cat5e Cable for Audio Runs

I needed a long cable to run microphone audio across my ham shack. I didn't have shielded audio cable on hand, and I needed more than one audio channel. Despite this, I had a generous supply of Cat5e network cable, which has four twisted pairs in a small jacket. What many people don't realize is that a twisted pair is an excellent self-shielding cable.

I chose one pair for each desired audio channel. When you remove the jacket, you will see that there are four color-coded pairs: green, blue, orange, and brown. Each solid color has



Figure 6 — Cat5e cable contains four pairs of color-coded wires, each with an accompanying white/color partner in a twisted pair. [www.cmples.com]

a corresponding partially white partner (see Figure 6). I used the partially white wire as the ground in each audio channel, and I used the colored conductor for the audio signal.

This solution worked well, even with high levels of RF in my shack. You can also add ferrite beads at either end of the cable like you normally would for shielded audio cable. If you're like most hams, you probably build your own network cables for home installation and have some spare Cat5e cable. — 73, *Tony Brock-Fisher, K1KP, barockteer@aol.com*

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

QST invites you to share your hints with fellow hams. Send them to hh@arrrl.org. Please include your name, call sign, complete mailing address, daytime telephone number, and email address on all correspondence. Whether you are praising or criticizing an item, please send the author(s) a copy of your comments.

Technical Correspondence

Back Feeding Dangers; Ultraviolet Degradation of PVC

When considering the dangers of back feeding local power lines while powering a house with a generator, some believe that simply opening the main breaker will prevent any hazards. However, this is not always true. There can be current paths that the house occupants aren't aware of. For example, there are thousands of service equipment panels in the US that were installed under a rule that allowed up to six main service disconnecting means (such as a fused switch) for a single electrical service. The most common form installed in homes was a split bus panel (see Figure 1). Such panels are no longer compliant with the US National Electric Code and are no longer manufactured.

In a split panel installation, there is no main breaker or comparable disconnecting means in the panel enclosure that can be used to isolate the utility feed from the building wiring. Instead, up to five of the largest loads in the house are connected directly to the utility supply conductors via the breakers or fused pullouts installed on the bus bars at the top of the panel. A sixth circuit breaker connected to those same upper bus bars serves as a disconnect for all of the other branch circuits connected to the lower bus bars below the split.

These panels eliminated the need for what — at that time — was an expensive main breaker. However, because the split panel has no single disconnecting means from the utility supply, the only way to safely back feed such a panel is to pull the meter at the service entrance, which should not be done by an untrained person. There is a risk of an arc fault blast when you fault the meter's connection blades to the meter socket enclosure during removal.



Figure 1 — An example of a split bus panel. These panels contain two separate sets of bus bars. [www.waypointinspection.com]

You could back feed the bottom panel by locking out its controlling breaker in the top set of bus bars, but you also would have to modify the panel's internal wiring. This should be done only by a fully trained electrician, as it can lead to a catastrophic failure when power is restored.

Another sneak current path occurs in electrical conservation controls. Some of these supply a portion of power to the home through a second meter, at a different rate of pricing. All of the heavier loads mentioned earlier can be supplied either full or part time by that second meter, but the most common loads supplied that way are air conditioners, heat pumps, and water heaters. There is a common failure mode in water heaters that will cross-connect the two supplies. If that happens, opening the main breaker in the main service equipment panel will not completely disconnect the home from the power utility's drop or underground lateral.

An additional sneak current path is more common than most people think: power-theft connections. You could have such a connection if

you are not the first owner or occupant of your house. They are installed to obtain power without passing it through the power utility's meter. It is possible to find holes drilled into the back of a service head fitting that were meant to attach unprotected tap conductors to the service entry conductors ahead of the meter. Sometimes, such conductors will serve a major portion of the home loads. Because these conductors are tapped off ahead of the meter, they are also on the utility side of the service disconnecting means. So, even if you think you've fully isolated your home before firing up your generator, you may be in for a surprise.

Finally, when a smaller generator is used to back feed a home's wiring, an additional hazard arises from the 120 V ac output of such a generator. I have encountered improvised cord sets and other lash-ups that were designed to energize both of the ungrounded, current-carrying bus bars of the service equipment panel. In the absence of the 240 V ac difference between the two energized conductors, the grounded current-carrying conductor of a multi-wire branch circuit carries the *sum* of the currents flowing on the two energized conductors, rather than the *difference*! A #14 AWG conductor is capable of safely carrying 15 – 25 A continuously under ideal conditions, depending on the type of insulation. But if the loads on the two conductors sum to something greater than that of the grounded current-carrying conductor (which would be the neutral if the circuit were energized at 120/240 V ac single-phase current), it may carry up to 30 A. That condition could overheat the insulation and/or lead to a connection failure, followed by arcing and fire. — *Tom Horne, W3TDH, hornetd@gmail.com*

PVC Degradation with UV Exposure

A simple solution to ultraviolet (UV)-induced degradation of PVC is to use gray, UV-resistant, electrical conduit-type PVC in Schedule 40 dimensions. Plumbing pipe and components in both Schedule 40 and Schedule 80 dimensions are also commonly available; fittings between the two types are interchangeable, except for pressure-tight threads.

White and other colors of PVC pipes, unless specifically labeled, are protected from UV degradation by chemicals added during manufacturing, such as titanium dioxide for white or carbon black for black. To our knowledge, all PVC not specifically labeled as UV-resistant should be protected by a coating per the manufacturer. However, UV damage to any PVC may not be a concern in amateur radio applications regardless of applied coating(s), due to minimal effects.

Our casual observation is that all PVC, even if rated as UV-resistant, will fade over time when exposed to full sunlight. We've not had a known instance of white Schedule 40 PVC pipe used outdoors failing under normal water pressure.

PVC is available in many colors (gray, beige, clear, black, white, or orange, among others) and Schedules (interpreted in plumbing components as pressure ratings resulting in increased wall thicknesses and reduced inside diameters). In the electrical trades, the gray UV-resistant PVC conduits and fittings are designed and intended for weather exposure.

Some plumbing PVC (generally beige, not to be confused with CPVC) is rated as UV-resistant. Gray electrical conduit PVC has Schedule 40 dimensions, and the fittings are fully interchangeable (not in drain-waste-vent types, which are a lighter weight and smaller size). In plumbing, gray PVC pipes and fittings may not be technically rated and stenciled

as UV-resistant, but they seem to work fine outdoors. Plumbing PVC also comes in (generally gray) Schedule 80 threaded fittings, such as adapters, nipples, and threaded-one-end nipples.

Hams can find a wealth of PVC pipes and fittings available at www.spearsmfg.com. Spears does not produce a UV-resistant PVC, but Eagle does. Some areas may sell PVC only by locally branded manufacturers. Availability of some types of PVC or components may also be limited by local codes and trade practices. Home improvement stores may have only common or commodity stocks in limited choices.

Gray and beige pipes and fittings may reduce or eliminate visibility problems related to stealth antennas. If white plumbing fittings are used with other colors of PVC, painting may not be deemed necessary. Transition fittings, such as glued PVC-to-copper, are available, as are glued or threaded PVC unions. Electrical conduit-threaded fittings will have straight threads (plumbing fittings will have tapered threads, especially on the female fittings), which may make assembly and disassembly easier.

The rigidity of long runs of PVC pipe can be increased by finding the right combination of different component sizes that can be inserted one into another. A lightweight solution to too-flexible PVC pipe is to use a much smaller piece of pipe cut into lengths, with couplings placed intermittently. For example, a 20-foot piece of 1.5-inch Schedule 40 PVC can be strengthened and made more rigid by using a similar length (0.75 inch) of PVC pipe cut into segments, and then reconnected with couplings and inserted into the larger-diameter pipe — all while being lighter in weight than tubing, and electrically inert.

We've found bladed PVC shears to be superior to sawing. A jab-saw handle that accepts hacksaw or reciprocating saw blades is handy for those cuts that a shear can't accomplish. To disassemble threaded fittings, you will need two pipe wrenches, chain wrenches, strap wrenches, or Channellock's oil filter/PVC pliers. Teflon tape will make threaded assemblies easier to manage. Liberally apply quality cleaner-primer and PVC-specific glue, and your antenna will survive both sunlight and wind. — *Yolane, WI5T, and Timothy, KE5VAS, Hartsfield, timothy.hartsfield@usace.army.mil*

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Materials for this column may be sent to tc@arrrl.org. Please include your name, call sign, complete mailing address, daytime telephone number, and email address on all correspondence. Whether you are praising or criticizing a work, please send the author(s) a copy of your comments. The publishers of QST assume no responsibility for statements made herein by correspondents.

An American Ham in TF Land

One ham's story of crossing off a very popular bucket list item.



James Kooistra, KB8VUC, chasing the aurora near Gullfoss Falls in Iceland.

James Kooistra, KB8VUC

After experiencing several tragedies over the last few years, I decided it was time to do all the things that get put off until we have the time or money but never seem to come to fruition. The occasion of my 50th birthday seemed like a good opportunity to check off one of the major items on my bucket list — seeing the aurora borealis (also known as the northern lights) in person. While they can be a bane to the HF DXer, their visual beauty can't be denied. In Michigan, there is an occasional chance to see the glow on the horizon if you drive upstate 4 hours and go north of the Mackinac Bridge between the upper and lower peninsulas of Michigan. I have tried this numerous times but was always stymied by clouds or moonlight.

Planning and Preparations

I started searching for deals to a destination that looked promising. Iceland seemed like the right mix of affordability, the relative lack of a language barrier, and travel time in a seated position on a flight that my aging knees and back could stand. Then, I set out to see what operating privileges I would have (if any) in this destination.

As it turns out, upgrading to the General license 15 years ago put me in a great position to operate in a European country! As the United States has agreed to

the European Conference of Postal and Telecommunications Administrations (CEPT) Electronic Communications Committee (ECC) Recommendation T/R 61-01, my US General license is equivalent to a CEPT Novice license under ECC Recommendation (05)06. Because there are some variations among CEPT countries, I highly recommend looking at the excellently detailed “Countries with CEPT License” PDF provided by the German Amateur Radio Club (see <https://files.darc.de/index.php/s/CKT38kZP6miK7xf>). Another resource of great help was www.ira.is/english, which includes a detailed list of local repeaters, the European Automatic Packet Reporting System (APRS) frequency, and contact information. Armed with this information, I was ready to operate as TF/KB8VUC.

I checked the local moon phase calendar and found the week of February 19 – 25, 2023, offered the best dark skies, should we be lucky enough for clear skies and aurora activity. I made room for my trusty Kenwood TH-D74A among my laptop, cameras, drone, and fireproof bag of lithium batteries in my carry-on bag.

After picking up our rental car, affixing a mini magnetic mount antenna, and firing up my handheld transceiver on a cigarette lighter power socket, my wife and I enjoyed a buffet breakfast and headed to bed for a 6-hour attempt to mitigate jet lag. We realized from

reading several travel forums and online videos that a complete circuit of the island with almost the same land mass as the state of Kentucky would take 10 to 12 days. Route 1 (or Ring Road) completely circles the country, but the northern sections are often impassible in the winter. So, we decided to focus on the southern coastal village of Vik, the interior Gullfoss Falls area, which is the midpoint on the Golden Circle route, the Snaefellsnes peninsula to the west, and a day in the capital city of Reykjavik.

We were blessed to see the northern lights on two occasions! On February 21, 2023, I just happened to get up at 3:00 AM, and when I looked out the window, I could see some green wisps directly overhead. I suited up in my parka, and the lights became a dazzling show in the electronic eye of my camera. A less intense show followed the next night at around 11:00 PM with hints of red and curtains of movement.

Experiencing a New Society and Culture

While we met plenty of locals and nearly everyone spoke perfect English, we were amazed by the number of international travelers from around the globe. On February 24, we traveled to Reykjavik. The top speed in the countryside was 90 kilometers per hour (roughly 55 mph). There were frequent ticketing speed cameras, but most were kindly preceded at some distance by a sign depicting a camera. Gasoline was available only in 95 octane and was indicated by a green pump handle. Diesel fuel had a black pump handle and was available at every pump. Our rented Dacia Duster ran on diesel and, fortunately, was efficient, as fuel was almost \$9 per gallon. Iceland's unit of currency is the króna. A króna-to-US-dollar conversion app was very helpful in understanding how much the delicious bacon-wrapped hot dogs available at every gas station we visited would cost. One additional quirk of Icelandic gas stations was the coffee. I'm used to US gas stations with five or six sweetener options, several flavors of chilled creamer, and 16 ounces for small, 20 ounces for medium, and 24 ounces for large cups, but not in Iceland! The only size cup we encountered was barely 8 ounces. Most gas stations offered white and raw brown sugar and, if you were lucky, a room-temperature container of mjólk — a dairy product like milk — to lighten it.

Meeting the IRA

When researching my operating privileges on www.ira.is months earlier, I came across a notice for the weekly club meeting at the Icelandic Radio Amateurs (IRA) headquarters in Reykjavik. I drove 15 minutes across town to the outskirts of the domestic airport, where I found a group of hams drinking tea and coffee



James Kooistra, KB8VUC, contacting K4NV from the Icelandic Radio Amateurs station, TF3IRA.

and snacking on cookies (not much different from their American counterparts). After rousing greetings around the room and perusing *CQ TF* (Iceland's ham radio publication) and *QST*, I presented a letter of greeting from my Allegan County Amateur Radio Club President John Hanse, AC8HZ, to the IRA President Jónas Bjarnason, TF3JB. While only a small portion of the IRA members were in attendance that night, they were all cordial, and a couple were excited to discuss their plans to attend Dayton Hamvention®! I was given a tour of the building, which included the QSL Bureau, Satellite, 2-meter/440 MHz, APRS, and HF operating positions. Then, I was invited to add some contacts to their log and had a quick QSO with K4NV back home in the US on 14.200 MHz. A round of goodbyes and "Hope to catch you on the air" preceded a quick flash-light view of their station's beam antenna before I headed back to my hotel to prepare for our last day of a much-too-short stay in this incredible country.

What an amazing experience it has been to travel. I am so blessed to have had face-to-face international camaraderie and gotten to see more of this beautiful world. I am also grateful to my wonderful wife, Jennifer, who kindly supports my adventures while she holds my hand, smiles, and says, "What's next?"

All photos by the author.

James Kooistra, KB8VUC, is an avid drone pilot, astrophotographer, and General-class amateur radio operator who enjoys digital modes. He has served on the Radio Amateur Civil Emergency Service and Amateur Radio Emergency Service® for several Michigan counties, search and rescue teams, SKYWARN®, and Hospitality Communications over his 30 years as an operator. James can be reached at kb8vuc@jpk.cc.

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



2022 Youth DX Adventure Trip

A dream-come-true opportunity for young hams to operate a superstation.

Brennan Long, K6BFL

I used to watch YouTube videos of hams participating in extreme radio pileups all over the world. I envisioned having the same experience someday when I got older and could build a bigger station. At the time, I didn't realize my dream would come true in 2022.

Several years ago, I came across the Dave Kalter Memorial Youth DX Adventure (YDXA), an organization run by a group of veteran hams who solicit applications from youth operators all over the country. The young hams who are selected join the veteran hams for about a week in an international location to operate from a premier DX station. I applied and was chosen to join the team in 2020. However, the trip was postponed until 2022 due to COVID-19.

Meet the Team

The location for this expedition was the Caribbean Contesting Consortium, PJ2T, superstation operated by Geoff Howard, W0CG, on the island of Curacao. This was truly a dream come true. Not only did I get to travel internationally, but I was going to be operating DX at one of the best stations on the planet. In addition to my mom, KE0LJE, and me, the trip consisted of Candace Scott, KE8MMS; her grandfather Terry, NV8E; TJ Hardin, KO4FFA, and his dad Thomas Hardin, KO4HKC. Our team leaders were Uli Thielke, DL8OBQ; Jim Storms, AB8YK; Don DuBon, N6JRL, and Ron Doyle, N8VAR. When I arrived on the island, I met most of the team in person for the first time. My fellow youth operators seemed just as excited as I was to join such an experienced ham radio team.

Operation Situations

After a short teaching period with the team leaders, Candace, TJ, and I felt like station veterans and started working people by the hundreds. Initially, internet service at the station was spotty, so FT8 was limited, but we were still able to operate SSB and CW. I was the only youth operator who knew



The 2022 YDXA team underneath the PJ2T antenna stack. From left to right: Brennan Long, K6BFL; Candace Scott, KE8MMS, and TJ Hardin, KO4FFA. [Ron Doyle, N8VAR, photo]

CW, so I focused on that while Candace and TJ operated SSB. We operated well into the night and had several hours of more than 200 contacts per hour. Our team was lucky to have access to the expertise of the team leaders for the week. Geoff, Uli, and the other team leaders gave us tips on how to be stronger operators. At one point, I was struggling with a large CW pileup, and Geoff kindly gave



This picture was taken as the YDXA team met for the first time in the Curacao airport. From left to right: Don DuBon, N6JRL; Terry Scott, NV8E; Candace Scott, KE8MMS; TJ Hardin, KO4FFA; Thomas Hardin, KO4HKC; Ron Doyle, N8VAR (kneeling); Melissa Long, KE0LJE; Brennan Long, K6BFL, and Jim Storms, AB8YK. [Brennan Long, K6BFL, photo]



From left to right: Candace Scott, KE8MMS; TJ Hardin, KO4FFA, and Brennan Long, K6BFL, at the PJ2Y station. [Terry Scott, NV8E, photo]

me some pointers on how to operate split. He also taught us the technical components of his amplifier so we could understand the equipment we were using.

Even with the loss of internet, we were able to break the previous YDXA team's QSO record of 6,583 in 3 days! We set out to match the previous QSO record, but we beat it by almost 2,000. Throughout the trip, Candace, TJ, and I competed for the most contacts or tried to get to 6,000, 7,000, or 8,000 contacts first. It led to high spirits and productive, competitive energy.

On the last full day in Curacao, it was storming, and we briefly lost power, so we went out to the capital

YDXA: A Brief History

In 2009, while finishing the CQ World Wide DX Contest in Costa Rica, Dave Kalter, KB8OCP (SK), wondered, "Wouldn't it be great if young hams could participate?" So, Dave; Don DuBon, N6JRL; Jim Storms, AB8YK; Todd DuBon, KD4YHY, and Keko Diez, TI5KD, shared ideas that could make this possible. They wanted to bring young hams (accompanied by a parent or guardian) ages 11 through 17 to Costa Rica to be the DX for 5 days, raise funds to make it affordable (with little cost to the youth and parent), and provide a safe environment to have fun. Shortly after brainstorming, they pitched their ideas to clubs and organizations, and a huge amount of support followed. The YDXA has taken young hams on trips since 2010!

city of Willemstad and explored. Willemstad is vibrant, and it was fun to shop, eat, and walk around the markets to see how the economy works on such a small island. Curacao is a lovely, small island with some of the nicest people you will ever meet. The islanders insist that you have a good time while there. By the time we left, we all felt accomplished and proud. The knowledge we gained was invaluable, and without the expertise of Don, Jim, Ron, and Geoff, the trip wouldn't have been possible. We will be forever grateful to these leaders for allowing us to have this experience of a lifetime, and I will never forget it.

Brennan Long, K6BFL, was first licensed at the age of 10 and earned his Extra-class license at age 13. He is a recent high school graduate and hopes to get into the field of computer science. Brennan enjoys operating most modes, but especially CW and SSB. He has a twin brother, Alex, KE0LJF. Brennan can be reached at k6bfl456@gmail.com.

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



Feedback

In the January 2024 issue of *QST*, transmit-receive turnaround times with AMS on the radio disabled were left out of Table 1 in the Yaesu FTM-500DR review in Product Review. These have since been added to the digital edition. *QST* regrets the omission.

Cultivating a Diverse Ham Community

A visually impaired ham shares advice on how clubs can become more inclusive; hams who have disabilities can contribute significantly!

Will Hascall, KC9OKM

Amateur radio, along with our society, is always changing. In fact, Part 97.1 (c) and (d) in the Electronic Code of Federal Regulations tells us that the Amateur Radio Service is obligated to advance our communication and technical skills, while inviting more people to join the Amateur Radio Service. There are ham operators all over the world and from every walk of life. The ham radio community becomes stronger and more resilient when we embrace everyone, including people with disabilities. Many clubs may not be aware that they're discouraging participation from disabled individuals.

Maintain a Welcoming Environment

Making a few changes to your group's communications doesn't need to take a great deal of work, and it could make a huge difference in the club's attractiveness to a more diverse population.

Having consistent messaging is key. If your club claims to be diverse, it must be reflected throughout their communications. Some members may not desire to be put in the spotlight, but they do want to be included. In your messaging — photographs, articles, and testimonials — show them being radio active just like every other member.

Many clubs work with schools to encourage youth to join the hobby and learn about the science and math of radio. Reach out to as many schools as you can, and find a science teacher willing to fold your presentation into their curriculum.



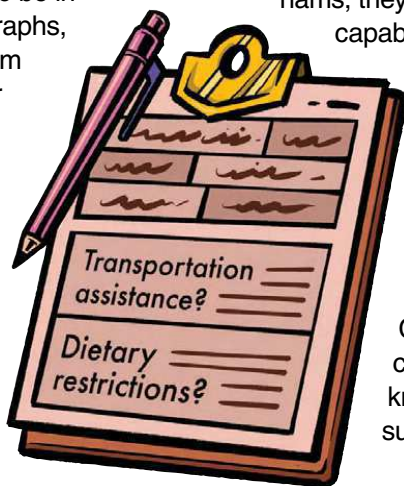
Making your promotional material more accessible can increase your chances of reaching a wider audience. For example, you may believe that your organization's website or social media presence is already widely readable, but they may be inaccessible to people with disabilities. Con-

sider following suggestions from organizations like WebAIM (<https://webaim.org>) that offer tips and training for promoting accessible web design. You might not need to print brochures in braille or large print, but it's a good idea to provide materials that are uncluttered and easily read by text-to-speech devices. You can also provide electronic copies of materials, such as agendas, meeting minutes, and brochures, upon request.

Get to Know One Another

Learning to work with diverse populations is just as important as learning how to smoothly construct and transmit an ICS-213 radiogram — the more practice you get, the better you'll be. It's crucial to gain experience with people from different cultures or who have disabilities before a planned event or emergency. As hams, they can provide access to different skills and capabilities. As members of the public, they may have different needs than others during an emergency. For example, you may help someone out of harm's way, but if they don't have their medication or necessary medical equipment, then you might put their lives at risk and create greater challenges for medical professionals.

Club meetings, hamfests, and conventions can be great places for members to get to know each other. However, if you can't drive, suffer from social anxiety, are neurodivergent,



or suffer from sensory disorders such as migraines, these aren't the best places.

Learning about the hams in your area starts with your organization. Many clubs have a form that collects members' basic contact information, such as their name, address, phone number, and call sign. Adding a few extra questions can ensure that potential members will be included more easily. Some examples are whether or not they need accommodations to get to club meetings or be able to better participate in them. If there are refreshments at meetings, include allergy and dietary preference questions. Ensure that every member can fill out the required form or be provided with someone who can help them.

Make sure that all licensed members who want access to club nets can participate. Radio nets can be a great way to learn more about the people in your organization, especially if there's a less formal portion of the net for questions that encourage participation. Try including a question of the week; one member asks all participants the same question, and all who want to answer have the opportunity to do so. This allows members to get experience talking on the radio, and it's an opportunity for everyone to learn more about each other.

If your organization has a newsletter, consider highlighting different members in each issue. This should focus on all members, not just the ones doing important things. This also allows people to express themselves and for members to learn more about one another.

Adapt to Everyone's Needs

Take time to consider the locations where you're gathering for meetings and radio-related and social events. Restaurants are a popular choice, but consider those who have less discretionary funds, have trouble dealing with loud or crowded places, or have mobility issues. Public parks, libraries, and college or university meeting rooms can be great places to use. They can be less crowded or less noisy, and might even allow you to bring food and set up radios.

If your club normally meets at a location that's not near a bus line, or outside the average cab rate range, consider relocating or providing alternative methods for attending. You might consider using internet conferencing tools like



Zoom and Google Meet, the telephone, or the local repeater. Recording meetings is also a useful tool for those who can't attend. If you know of members who want to attend meetings but don't, find out why and see if they can be accommodated.

The same goes for events. Many people, including those with disabilities, can and want to help out at public events and exercises but are often excluded because their needs aren't understood; they can provide skills and experience that can greatly add to any event.

Don't assume that members aren't participating because they don't want to. There may be good reasons that they're not as active as others. They may not be able to change their circumstances, but the organization has the ability to be more inclusive.

Looking Ahead

Most hams are helpful, generous, and kindhearted people. However, we need to be constantly evaluating our efforts with recruitment and retention, and provide the

necessary means for as many people as possible. This may mean that we need to change the way we've done things in the past.

Diversity makes us all stronger, more resilient, and much more interesting as a group. If your club or organization's recruitment methods aren't working, try something different;

diversify your methods and adapt to the way the world is now.

There are people who want to participate in the hobby more than they're able to. Find them, ask them what they need, and provide them with opportunities to participate. They will thank you, and you and your organization just may be better because of it.

Illustrations by Kevin Sterjo.

Will Hascall, KC9OKM, received his Technician-class license in 2000. Immediately after, he began operating ISS packet radio from his second-floor apartment and became involved with his local ARES and RACES groups. Will now holds an Amateur Extra-class license, and his main interests are digital, space, emergency communication, and portable operations. He is legally blind and is a Citizen Board Member for the Aging and Disability Resource Center of Central Wisconsin. Will can be reached at whascall@gmail.com.

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





Remembering the Cold War through Parks on the Air

While in Germany, this Italian ham used a small portable station to activate two historical landmarks.

Andrea Borgnino, IWØHK

During the last week of October 2023, I found myself in Berlin, Germany, for work. I had some time off, so I wanted to combine two of my great passions: radio and the history of the Cold War.

The signs of this historical period are most visible and profound in Berlin, primarily due to the presence of the famous 155-kilometer-long wall that practically divided it in two from August 13, 1961, until November 9, 1989. During my stay, I chose two historical sites that are included in the Parks on the Air® (POTA) program to activate using my low-power portable radio.

Antennas Atop a Mountain of Rubble

The first Berlin location I chose was a park located 1 kilometer away from the headquarters of Rund-

funk Berlin-Brandenburg, the public radio-television of Berlin and Brandenburg. Teufelsberg, or Devil's Mountain, is a hill created from the rubble that resulted from bombings during World War II. Today, it's completely covered with splendid oak trees within Grunewald Forest (POTA reference DA-0218).

The Teufelsberg listening station of the American National Security Agency in Berlin sits atop this 120-meter-high hill. Established in 1950, the station intercepted radio signals from East Germany during the Cold War. The station's base had dozens of antennas pointing eastward to intercept radio traffic on various frequencies ranging from shortwave to microwave. It was dismantled in 1992, but even today, remnants of the base and the antenna radomes that made the radio interception systems invisible can still be seen.

I activated the park that originated around the abandoned base and was thrilled to transmit my low-power Morse code signals in this historically significant location. I used a QRP Labs QMX multi-mode transceiver, a jewel that's active on FT8 and CW modes on the 80-, 60-, 40-, 30-, and 20-meter bands. This radio, designed by Hans Summers, GØUPL, is sold online as a kit or pre-assembled. It can be connected directly to a PC for digital activity on FT8 and FT4, or it can be used in CW telegraphy with a power output of 4 W. I used a 20-meter wire antenna connected to a 49:1 end-fed HF balun pulled up over a tree. Amid families flying kites, I called out my POTA signal with the call sign DL/IWØHK, and I made 15 CW contacts quite quickly (see the lead photo).



Andrea Borgnino, IWØHK, used his small POTA kit (a QMX transceiver, a 20-meter end-fed half-wave antenna, and an XTPower XT-16000QC3 power bank) for the first time during his Berlin activations, which were a success.

An Airport Laden with History

I made my second POTA activation at another symbol of the Cold War — directly on the runway of the former Tempelhof Airport. Among fog and frost, I was able to transmit low-power CW using the same QMX transceiver. This airport, situated in the south-

ern part of the central Tempelhof-Schöneberg district in Berlin, was operational from 1923 to 2008. It's particularly famous for hosting the base of the Berlin Airlift during the Cold War when the United States and their allies in Western Europe transported food and other necessities by plane to West Berlin, which was being blocked by the Soviet Union.

From June 1948 to September 1949, more than 270,000 flights transported 2 million tons of food and other supplies, including 1.5 million tons of coal for heating and power generation, resulting in the largest humanitarian airlift in history. At the peak of the operation, 1,398 flights were landing in Berlin every 24 hours. The Tempelhof Airport also hosted massive gatherings of military personnel and civilians during the Nazi era, and it served as a base for American Aviation until 1993. The airport has since closed, and its two runways and their surrounding lawns have become the Tempelhofer Feld provincial recreation area (POTA reference DA-0169), an enormous park used for various outdoor activities.



Despite the overcast weather, Andrea Borgnino, IWØHK, was able to activate the former Tempelhof Airport for POTA by making 11 contacts.

“After ending my transmissions, I walked through the immense park, imagining its past use and appreciating how often my passion for amateur radio manages to take me to incredible places.”

I activated the park early in the morning on a cold, gray day, but I still managed to install my end-fed half-wave antenna practically on the runway. Once again, I operated only CW, and in a short time, I made 11 contacts. I ended this activation early due to the cold, but the activation remains valid. After ending my transmissions, I walked through the immense park, imagining its past use and appreciating how often my passion for amateur radio manages to take me to incredible places.

The Joys of POTA

These two activations in Berlin were my first trial runs using my small POTA kit, which includes a QMX transceiver, a 20-meter end-fed half-wave antenna, and an XTPower XT-16000QC3 power bank — I'd say they were a success. This is an excellent little radio that I want to use again and carry with me on every work trip.

Moreover, the POTA program continually brings me to incredible places, in terms of nature and history. The magic of this activity lies in adapting one's portable station for every new situation, from city parks to large national parks among the mountains, and thus adjusting antennas and transmission modes to always be heard using low power. For me, it often involves using Morse code in CW.

These two activations in Berlin were special; transmitting my signals on shortwave from these locations reminded me of when, during the Cold War, these frequencies were used for all sorts of communication. Using this small kit today, reminiscent of the CW radio stations from the 1950s, seems like a unique way to remember those past times.

All photos by the author.

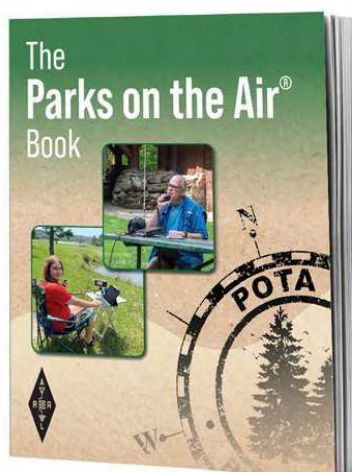
Andrea Borgnino, IW0HK, obtained his Class B operator license in Torino, Italy, in 1991, and upgraded to his current call sign in 2002. He mostly operates CW and digital modes on the HF bands. Andrea runs a QRSS-QRP beacon on the 10-meter band and a QRPP WSPR CW beacon on the 30-meter band. He's active in POTA and Summits on the Air (SOTA) and is the SOTA Association Manager for Italy. Andrea can be reached at a.borgnino@gmail.com.

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



Fresh air, beautiful scenery, wildlife, and new friends are waiting for you! *The Parks on the Air® Book* gives you a look at the setups and processes of 14 operators and offers advice and motivation for taking your radio out to a park. It's in a beautiful, full-color format, with photos that celebrate ham radio and the shared

resource of our state and national parks. *The Parks on the Air® Book* is available from the ARRL online store (www.arrl.org/shop) and ARRL dealers.



Getting the Most Out of PSK Reporter

Learn how to reap all the benefits of this advanced map.

Ira Brodsky, KC9TC

The internet has enriched amateur radio in numerous ways. A prime example is the advent of websites that show where your signal is heard. The versatile PSK Reporter website (<https://pskreporter.info/pskmap.html>) can give you a quick read on current propagation conditions, a detailed assessment of your station's performance (including how it compares to other nearby stations), and the best times and frequencies to reach that long-awaited DXpedition.

The use of PSK Reporter is intuitive. However, with a little extra knowledge, you can accomplish even more. For instance, you can generate a detailed report comparing the performance of different antennas. You can access websites that tap into PSK Reporter's live spot feed to create additional maps, analyses, and alerts. Or you can use PSK Reporter's archive to plan your operating activities around recent propagation.

Signal reporting websites provide opportunities for citizen science. PSK Reporter observes and records the impact of solar eclipses on radio propagation (see <https://hamsci.org/gssc-rules>). The website documents the effects of space weather such as solar flares, geomagnetic storms, and other sources of ionospheric disturbances.

PSK Reporter's Capabilities

PSK Reporter was created to automatically collect reception reports of digital transmissions and to make them available almost immediately to amateur radio operators and shortwave listeners. This became much easier with the introduction of second-generation digital modes, such as PSK31, that employ internet-connected PCs using software and sound cards to encode and decode data for transmission and reception (first-generation digital



The dark and light areas on this PSK Reporter map represent day and night times around the world. [Image courtesy of <https://pskreporter.info/pskmap.html>]

modes such as radioteletype [RTTY] and amateur teleprinting over radio were introduced before the web existed and required special hardware).

The same PC software used to send and receive digital modes can automatically collect data from successfully decoded transmissions and upload reception reports to PSK Reporter. The reception reports include the transmitting station's call sign and grid locator, the receiving station's call sign and grid locator, the frequency on which the transmission was heard, the time, and the received signal strength. PSK Reporter encourages users to enter six-character grid locators in their software settings to ensure more precise locating, and when needed, combs other sources for six-character locators to extend the four-character locators commonly sent over the air.

Let's assume an operator is running FT8 mode. The process usually starts when the operator calls CQ. PSK Reporter will begin to display reception reports within a few minutes, though depending on the quality of remote stations' internet service, it may take longer for some reports to wend their way to the PSK Reporter server. This information can be used to quickly determine whether the frequency band is open, what parts of the country or world it is open to, the level of activity, and the quality of signals. Data may be collected on multiple bands before deciding where to operate.

Thanks to the large number of operators around the world using software capable of uploading reception reports, a user who frequently calls CQ can get thousands of signal reports. One interesting way to evaluate your station's performance is to see how long it takes to be spotted in 100 countries. A reasonably well-equipped station can achieve this milestone within a week, and an exceptional station can do it within a day.

PSK Reporter covers all the US amateur radio bands from 135.7 kHz to 76 GHz, the 11-meter citizens band, the 8- and 5-meter bands (available in a few other countries), and the 4-meter band (available in several other countries). Station markers displayed on the map are color coded to indicate the frequency band. PSK Reporter can spot dozens of (primarily digital) amateur radio modes. Some logging programs will also upload spots entered manually for analog modes such as SSB.

Philip Gladstone, N1DQ, created PSK Reporter in 2008 to collect and display PSK31 reception reports supplied by the Windows software *DM780* that supports multiple digital modes. PSK31 transmits at 31.25 baud for keyboard-to-keyboard communication. Additional growth in PSK31 activity followed the introduction of the *fldigi* software that supports multiple platforms like Mac, Linux, Windows, and others. Later, *DM780* was integrated with the popular *Ham Radio Deluxe* program. When FT8 was introduced in 2017, it soared to 95% of spots reported within just 6 months.

Recent PSK Reporter statistics show active monitors (stations uploading spots) peaking at more than 7,000, active transmitters (stations spotted) peaking at more than 12,000 within any hour, and reports per second peaking at more than 400. Programs uploading the most spots in descending order are *WSJT-X*, *JTDX*, *MSHV*, *VarAC*, *JS8Call*, *OpenWebRX*, *KiwiSDR*, and *ROS*.

The PSK Reporter map (see Figure 1) is automatically refreshed every 5 minutes (you can manually refresh the map; however, if done too often, it will ask you to

"Moderate your requests" and impose a 5-minute wait). Each call sign is updated every 20 minutes or sooner if the station changes band or mode. The site also feeds data to DX clusters that report spots of active DX stations.

Recent statistics from the "Modes over last 2 hours" chart (see <https://pskreporter.info/cgi-bin/pskstats.pl>) show that FT8 is the most active mode followed by (in descending order) FT4, WSPR, CW, JS8 (an FT8-like messaging protocol), VarAC (an FT8-like mode based on the VARA protocol), PSK31, and ROS (another messaging mode).

Two other well-known signal reporting sites are the Reverse Beacon Network (RBN) and **www.WSPRnet.org**. RBN differs from PSK Reporter because it relies on dedicated spotters, many of whom use high-end software-defined radios and most of whom are located in North America and Europe. RBN displays and archives CW, RTTY, and PSK31/PSK63 spots. RBN also spots FT8 and FT4 stations and sends the spots to packet clusters. It does not display or archive FT8/FT4 spots. WSPR differs from PSK Reporter because it displays only WSPR mode activity. WSPR employs one-way transmissions, typically 2 minutes in duration, using minimal power (often 1 W or less) to gather data on propagation. Some operators use WSPR to monitor propagation conditions continuously. PSK Reporter also displays and archives WSPR reception reports.

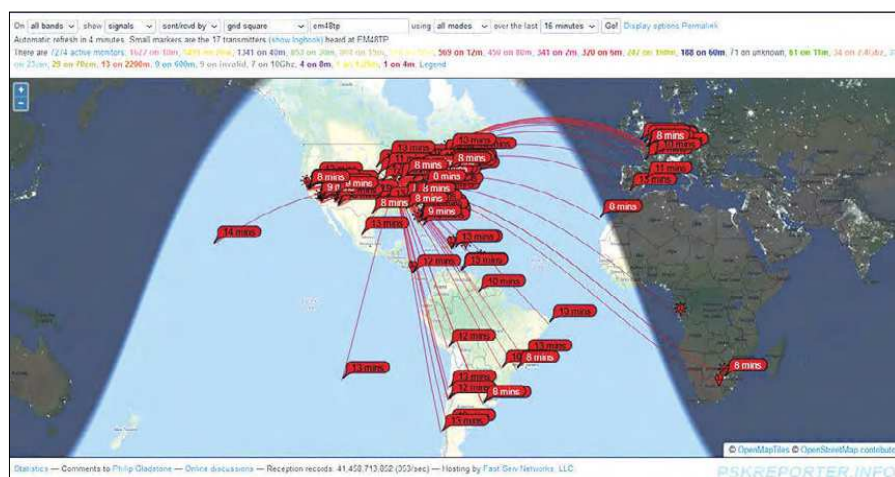


Figure 1 — PSK Reporter map display showing signals sent and heard by a nearby station within the last 15 minutes. Stations sharing the same six-character grid locator are within the same rectangular area, roughly 3 by 4 miles, in the continental US. [Ira Brodsky, KC9TC, photo]

Tips for Using PSK Reporter

Be sure to enable spot uploading in your software. Use computer-aided transceiver (CAT) control, and make sure it is working properly to ensure correct frequency reporting. If you are using *WSJT-X*, specify the antenna used on each band.

PSK Reporter hosts a webpage (<https://pskreporter.info/cgi-bin/psk-freq.pl?>) that gives the frequencies (in Hz) you will most likely find digital activity in your area. Add the mode and your grid locator immediately after the question mark in the URL, such as `<mode=FT4&grid=EM48>`.

The dropdown menus above the map permit you to select the frequency band (or all bands), the mode (or all modes), and the time period. You can also select signals (received by, sent by, or received/sent by) or countries (received by), where “by” refers to the call sign entered, the country of the call sign entered, the grid locator entered (two, four, or six characters), or anyone. For some configurations (signals by grid locator or country of call sign), the time period is limited to the last 15 minutes. For signals by call sign or anyone, the time period is selectable for periods ranging from the last 15 minutes to the last 24 hours. If you select **COUNTRIES** rather than **SIGNALS**, you are limited to countries heard by the call sign entered; the map displays one station for each country received over the last 24 hours, and a link to a database of countries heard over the last week is provided.

At the top of the PSK Reporter page, to the right of the dropdown menus, click **DISPLAY OPTIONS**, and check the **HIDE FAINT MONITORS** box for a less cluttered view. Under the **MAP TYPE** dropdown menu, switch from **MERCATOR** display to **AZIMUTHAL EA** (equal area) or **AZIMUTHAL ED** (equidistant) to view signal paths as straight lines.

To find the best frequencies and times to reach a DXpedition, enter the station’s call sign in the search box and select **ALL MODES** (or the specific mode of interest) in the dropdown menu to the right of the search box. Click on **SHOW LOGBOOK** beneath the search box to download a searchable ADIF file for



Figure 2 — FT8 Live map display (in optional dark mode) showing signals sent and heard in grid locator EM48 on the 15-meter band over the last 5 minutes. Note the sliders at the bottom of the map for controlling the age, SNR, and frequency band of the spots. [Ira Brodsky, KC9TC, photo]

the last 24 hours or 7 days. You can also zoom into your location on the map to see when other stations in your area spotted the DXpedition and the modes and frequencies.

To compare the performance of two antennas, use (your call sign)-1 with one antenna and (your call sign)-2 with the other. You can send VVV (your call sign)-1 with *WSJT-X* by selecting and editing the default CQ message on the main FT8 operating screen. The small markers are the stations you received, and the markers calling out times are the stations that received your signal.

Related Tools and Websites

PSK Reporter’s raw spot feed on FT8 Live (see Figure 2; <https://ft8.live>), created by Arron McLaughlin, ZL1AN, offers additional features. You can limit one or both stations (i.e., the transmitting station and the receiving station) to specific call signs, countries, or grid locators. Sliders near the bottom of the map allow you to apply additional spot filters for age (newest to oldest), signal to noise ratio (SNR), and frequency band. The menu provides quick access to FT8, FT4, PSK31, CW, WSPR, and RTTY modes, but it also covers the other PSK Reporter modes. The page display has an optional dark mode.

The website also identifies potential Summits on the Air (SOTA) stations (<https://sotawatch.sota.org.uk/en>). This is done by accessing a list of SOTA

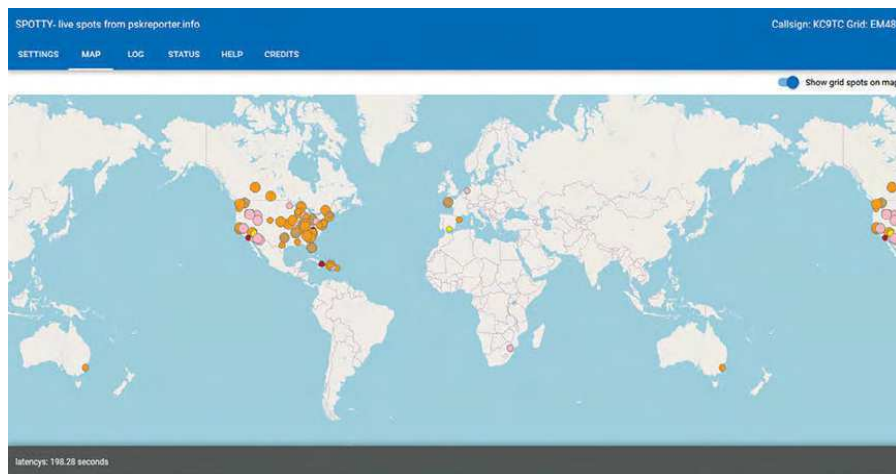


Figure 3 — Map display at Spotty showing stations heard in grid locator EM48 within 60 seconds. New markers automatically appear as markers older than 60 seconds drop off the map. [Ira Brodsky, KC9TC, photo]

alerts using the SOTA API (<https://api2.sota.org.uk/docs/index.html>) when the FT8 Live page is first loaded. If a spotted transmitter call sign matches a call sign on the list, it shows up as a triangle on the map and on a list of SOTA activators in the bottom right corner. After an extended period, you may want to reload the page to pick up any new SOTA alerts.

A website called Spotty (see Figure 3; <http://spotty.modern-industry.com>), created by Mike Karliner, G8LKD, allows you to track spots for a specific call sign or grid locator (minimum four characters). Clicking on an individual spot displays the receiver call sign, transmitter call sign, receiver grid (to as many as 10 characters — more resolution than you are ever likely to need), frequency band, and (optionally) SNR at the receiver. Spotty is particularly handy for seeing where you are currently being heard. New spots appear almost immediately, while older spots drop off the map after the time-to-live period (set by you in seconds), as the map uses streaming data. There is normally no need to refresh the page.

Spotty also has a real-time log. The **STATUS** tab shows the current number of spots by band and in total for the specified call sign or grid locator (based on the current time-to-live setting). Spotty doesn't break out modes, but if you are looking at spots of your own call sign, you already know the mode.

For Website Developers

You can access a live feed of PSK Reporter spots using the protocol discussed at <http://mqtt.pskreporter.info>. This can be done with an MQTT client

program such as the MQTT Explorer application available for Windows, Mac, Linux, and Ubuntu platforms. Users are encouraged to narrow down the feed to the items of interest (such as mode, frequency, band, and so forth) using the provided topic filters because the full feed is bandwidth intensive.

For Application Developers

To enable your application to submit spots, download the software development kit (SDK) at <https://pskreporter.info/pskreporter.zip>. The SDK contains

a document describing the PSK Reporter API (also available at <https://pskreporter.info/PSKReporter.pdf>) and a dynamic link library for integration with Windows applications (Windows 2000 and above). Programs such as *fldigi*, *MSHV*, and *JTDX* have implemented the spot submission protocol, and their code is available under the General Public License version 3. A description of the protocol can be found at <https://pskreporter.info/pskdev>.

Conclusion

Signal reporting websites such as PSK Reporter help amateur radio operators make more efficient use of their equipment, antennas, and on-air time. They also help scientists better understand the ionosphere and radio propagation. By accepting spots from amateur radio operators and shortwave listeners, and providing a live feed of the data it collects for analysis and display, PSK Reporter contributes to our understanding and efficient use of a valuable natural resource, the radio spectrum.

Ira Brodsky, KC9TC, was first licensed in 1968 and holds an Extra-class license. He has worked in the telecommunications field for more than 40 years as a sales engineer, a product line director, and an independent industry analyst specializing in wireless data. Brodsky has authored five books and more than 100 articles. He has earned the DX Century Club Award and the Worked All States Award, and he also enjoys satellite and portable operations. He can be reached at ibrodsky64@gmail.com.

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



ARRL Responds to FCC Proposals

ARRL responded to the Federal Communications Commission's (FCC's) request for comments on removing the symbol (baud) rate restrictions that apply to data communications on the LF bands and the VHF and UHF bands below 450 MHz. The FCC also requested comments on the bandwidth limits applicable to those bands.

The FCC's action follows their 2023 decision to remove the baud rate limits on the 160- to 10-meter amateur bands. Those limits were replaced with a 2.8 kHz bandwidth limit — a move ARRL had long advocated for.

The FCC's Further Notice of Proposed Rulemaking sought comments on updating the other amateur bands on which its baud rate limits continue to throttle faster data rates. The subject bands are the LF bands (2200 and 630 meters) and the VHF and UHF bands below 450 MHz. In its comments, ARRL strongly agreed



with the FCC's proposal to remove the baud rate limits on the remaining bands.

ARRL's comments also noted that CW operation is protected in the lower 100 kHz of the 6- and 2-meter bands, and it will continue to be so protected. Otherwise, all modes are permitted in the remainder of the subject VHF and UHF bands, with only the data modes subject to bandwidth restrictions below 450 MHz that vary by band. The bandwidth restrictions uniquely applicable to data modes have resulted in the other modes being permitted to use many times the bandwidth of data modes in an intermixed fashion, which is determined by those using the bands. But, for the data modes, the limits have limited experimentation, with techniques already in use in other countries on amateur VHF and UHF bands.

ARRL concluded that the FCC should also remove the bandwidth limits that apply uniquely to the data

modes on the subject bands, and instead, amateurs should rely on voluntary band plans and local agreements, as they already do with regard to the mix of the other modes. Such modes range from Morse code (CW) signals of 50 Hz or so (depending on speed), to amateur television that employs signals of 6 or more MHz. ARRL also noted that the limited propagation range on the subject bands enables local cooperation that is not possible on the HF bands, where propagation enables signals to cover the globe.

The bands addressed in this rule-making are as follows:

- ♦ 135.7 – 137.8 kHz (2200-meter) and 472 – 479 kHz (630-meter) bands
- ♦ 50.1 – 54 MHz (6-meter) and 144.1 – 148 MHz (2-meter) bands
- ♦ 219 – 220 MHz (1.25-meter digital) bands
- ♦ 222 – 225 MHz (1.25-meter) and 420 – 450 MHz (70-centimeter) bands

ARRL Is New Publisher of Gordon West, WB6NOA

ARRL is the new publisher of the *Amateur Radio License Preparation* books and related resources authored by Gordon West, WB6NOA. Gordon West's popular books, classes, and audio courses have been a mainstay of amateur radio licensing for more than 40 years. Generations of hams have learned from Gordon West, and the impact of his knowledge and experience will continue with the reach and resources of ARRL.

Current editions of Gordon West's popular license preparation books are available from ARRL and ARRL publication dealers, including:

- ♦ *Technician Class FCC Element 2 Amateur Radio License Preparation*, 10th Edition 2022 – 2026
- ♦ *General Class FCC Element 3 Amateur Radio License Preparation*, 11th Edition 2023 – 2027
- ♦ *Extra Class FCC Element 4 Amateur Radio License Preparation*, 8th Edition 2020 – 2024

Ordering information and supplementary resources are available at www.arrl.org/gordon-west.

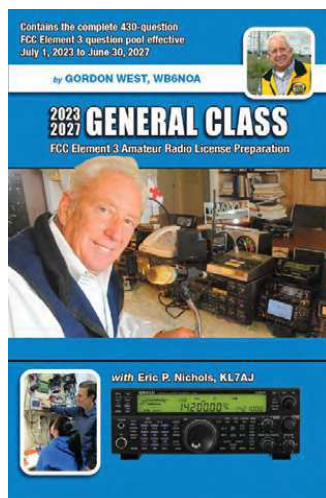
The books, including future editions, will continue to be authored by Gordon



Gordon West, WB6NOA. [Bob Inderbitzen, NQ1R, photo]

West in collaboration with Technical Editor Eric P. Nichols, KL7AJ. Nichols is a regular contributor to ARRL publications and has written several ARRL books. He has been working on Gordon West's books since 2013.

ARRL Education and Learning Manager Steve Goodgame, K5ATA, also announced that Gordon West has been named ARRL National Instructor. Goodgame leads ARRL programs that benefit amateur radio volunteer instructors and professional educators. "Gordon West will serve as the ambassador for the new ARRL National Instructor Program," said Goodgame. "The program will place greater emphasis on connecting prospective hams with opportunities to find ARRL Affiliated Radio Clubs and classes. The National Instructor Program will also support ARRL volunteer instructors with new resources for teaching amateur radio courses and for developing licensees."



The cover of the *General Class FCC Element 3 Amateur Radio License Preparation* book, 11th Edition 2023 – 2027, authored by Gordon West, WB6NOA.

Gordon West has been an amateur radio operator for more than 60 years, and he holds an Amateur Extra-class license. He also holds an FCC Commercial Operator License, the First Class General Radiotelephone Certificate with Radar Endorsement. A frequent guest and presenter at ham radio conventions, Gordon West is well-known by the amateur radio community for his unique educational style and commitment to developing instructors. His work has benefited thousands of new amateur radio licensees. He is an ARRL Life Member, and he has earned many recognitions, including the ARRL Instructor of the Year Award and the Dayton Amateur Radio Association Amateur of the Year Award. The Gordon West Ambassador of the Year Award is presented annually at Orlando HamCation to an amateur who has made outstanding contributions to the amateur radio community.

2024 Orlando HamCation® Awards

The Orlando HamCation Awards committee has announced the 2024 recipients of the Carole Perry Educator of the Year and the Gordon West Ambassador of the Year awards. Both awards were presented at the 2024 Orlando HamCation, which hosted this year's ARRL Florida State Convention on February 9 – 11.

Lewis Malchick, N2RQ, is the recipient of this year's Carole Perry Educator of the Year Award. Malchick holds an Amateur Extra-class license and is a co-founder of the ARRL School Club Roundup, an event with which he's been active for more than 25 years. He taught chemistry at Brooklyn Technical High School, where he's now an advisor to the school's Amateur Radio and Wireless Technology Club, W2CXN. Malchick is also the trustee for the Stuyvesant High School Amateur Radio Club, W2CLE, and the chairperson of the Long Island Mobile Amateur Radio Club (LIMARC) Education Committee. He has participated in five Amateur Radio on the ISS (ARISS) contacts,



and he has spent much of his life educating both children and adults about amateur radio.

The Carole Perry Educator of the Year Award was first awarded at the 2019 Orlando HamCation to its namesake, Carole Perry, WB2MGP, in honor of her work as an educator who teaches students about ham radio. It is given annually to individuals who've made outstanding efforts to advance youth in amateur radio.

This year's Gordon West Ambassador of the Year Award winners are Fred, AB1OC, and Anita Kemmerer, AB1QB. The Kemmerers hold Amateur Extra-class licenses and are active in the Nashua Area Radio Society (NARS) to promote amateur radio instruction, youth outreach, and

science, technology, engineering, and math (STEM) education. Together, they've created and helped grow Ham Bootcamp, a program encouraging hams to learn new skills. They assist with NARS's training and licensing events, along with Tech Night, which complements club meetings. Their participation in STEM activities includes high-altitude balloon launches, foxhunts, and ARISS contacts.

Fred Kemmerer is the Director of the ARRL New England Division, and he chairs and contributes to several subcommittees. Anita Kemmerer serves the Division as an Assistant Director for mentoring and new ham development. The Gordon West Ambassador of the Year Award was first introduced at the 2023 HamCation in honor of Gordon West's inspiring contributions to the amateur radio community.

HamCation has been sponsored by the Orlando Amateur Radio Club, W4PLB, since 1946, and it is held annually on the second weekend of February.

ARRL Kids Day a Success in Nebraska

The Bellevue Amateur Radio Club and the Science Club at Yates Illuminates teamed up to offer youth in Omaha, Nebraska, an opportunity to get on the air for ARRL Kids Day.

The event occurred on January 6, 2024, at Yates Illuminates, a former elementary school that is now a cultural and community center. Amateur radio operators Dudley Allen, KDØNMD; Terry Gampfer, NØBXQ; Frank Jozwiak, KBØEOR, and Mike Terneus, WBØBEE, who served as volunteer operators and extremely patient coaches, nurtured the kids' curiosities about radio. There were dozens of participants as young as 4 years old, as well as young-at-heart Bob Hutton, age 91, who used the special event call sign to talk to amateur radio operators around the world.

Parents were impressed with Kids Day. One said,

The event organized by the Yates Illuminates Science Club was a perfect blend of education, technology, and community spirit. My kids were thrilled to delve into the world of amateur radio, thanks to the expert guidance of the Bellevue Amateur Radio Club. They learned about radio technology and how to contact other young radio enthusiasts across the country. This hands-on experience in communication technology was not only fun but also incredibly educational.

The final highlight of the day came as each child received their certificate of completion. Africa, Asia, Europe, and North America were all represented

as the country of birth or the original nationality of the youth participants, and they talked with amateurs as far away as England and Canada.

The Yates Illuminates Science Club will continue to help youth learn the basics of electrical circuits, electronics, and radio propagation, as well as how to make homebrew antennas. Foxhunts, the integration of a course in radio, and other applied scientific learning opportunities (such as wildlife tracking and rescuing, aviation and space research, and communications) are also planned.

More stories and photos from ARRL Kids Day can be found on the ARRL Contest Soapbox at www.arrl.org/contests/soapbox.

Marty Engstrom, N1ARY, Silent Key

Avid amateur radio Marty Engstrom, N1ARY, of Fryeburg, Maine, became a Silent Key on January 4, 2024. He was 86 years old. Generations of New England television viewers may know him as "Marty on the Mountain" from his WMTW-TV weather reports at the station's transmitter site on Mount Washington in New Hampshire.

Engstrom was known to quip that he was not intentionally in the weather business. "I'm a TV engineer, not a meteorologist!" he would say. Engstrom served the viewers of New England for 38 years. He began at the station in the mid 1960s after a career in the US Air Force, according to a memorial on the WMTW website (www.wmtw.com/article/marty-on-the-mountain-long-time-wmtw-employee-dies-age-86/46290306). He retired in 2002.

In 2003, Engstrom released his autobiography, *Marty on the Mountain: 38 Years on Mt. Washington*, in which he discussed his passion for amateur radio.

As a well-known radio amateur in his area and beyond, Engstrom's voice was easily recognizable. According to Bill Mann, W1KX, "You could recognize his heavy Maine accent before he even identified."

According to those who knew him, Engstrom frequently served his community through amateur radio. After a major ice storm in 1998, hams in Oxford County, Maine, banded together to form an emergency communications



Avid radio amateur Marty "Marty on the Mountain" Engstrom, N1ARY, of Fryeburg, Maine, became a Silent Key on January 4, 2024. [Marty Engstrom Facebook photo]

group. "Marty's low-key approach to various situations, even the more stressful ones, helped the group stay focused. His wealth of knowledge of transmitters and antennas was a tremendous benefit to the less-experienced hams," said Wayne Strout, N1YIS. "Marty actively worked as a member of our group with drills and training for both the Community Emergency Response Team and Amateur Radio Emergency Service."

Engstrom served for some time as the treasurer of the Yankee Amateur Radio Club and had been a longtime ARRL member at the time of his passing.

Public Service

Responding to an Unexpected Dust Storm

On May 1, 2023, 72 vehicles crashed into each other on Interstate 55 (I-55) in Illinois due to a sudden, perilous dust storm. Ron Ochu, KO0Z, spoke with a first responder at the scene, Deputy Director of Operations at the Montgomery County Emergency Management Agency (EMA) Dan Hough, KD9LON, and shares Dan's experience in this month's column.

In May of last year, central Illinois experienced a drought. Topsoil was drying out, and strong winds were blowing from west to east. Normally, these conditions are not so pronounced, and the amount of dust, if any, is miniscule. However, the events of May 1, 2023, proved otherwise.

A Perfect Storm

A half-mile-wide dust cloud caused by 35 to 45 mph winds blowing across newly plowed topsoil stretched across I-55. Highway motorists could see the dust storm ahead, but weren't able to judge its depth and density.

A combination of the dry conditions, newly tilled topsoil, a low-lying segment of the road, and gusting winds created a wind tunnel, and visibility

was nearly nonexistent. It didn't take long before 72 vehicles crashed into one another. Eight people lost their lives, and 37 people were injured.

Calling in Support

Not having a coordinated response was the first obstacle to overcome. KD9LON's Cybersecurity & Infrastructure Security Agency AUX-COMM training kicked in. He noted that many Emergency Medical Services (EMS) clinicians and firefighters were doing an excellent job aiding injured and trapped motorists, but he wasn't sure which agencies were helping and where along the accident

perimeter help was being rendered. Even determining the accident perimeter was a challenge due to visibility and communication issues. Securing the accident scene, delivering medical aid, and establishing a unified command were the priorities, as per Incident Command System protocol.

Assess, Adapt, and Overcome

Communication is vital for having an effective command in a dynamic emergency. Radio transmissions were leaving the accident scene, but radio reception was limited. The dust built static charges that were so strong, reception within the storm made receivers useless — even 100 W transceivers had difficulties communicating. And with limited radio communications, first responders were shouting into the wind, resulting in their mouths quickly filling up with dirt. Evidently, some transmissions reached dispatchers who were able to hear some radio traffic. KD9LON praised the telecommunicators' abilities to piece together enough information to anticipate first responder needs and dispatch resources to the scene.

KD9LON's EMA vehicle had N95 masks for responders, but he had to



Dan Hough's, KD9LON, vehicle was less than 10 feet away from an ambulance flashing its emergency lights, but he couldn't see it through the thick dust storm.



The vehicular wreckage that the dust storm caused could be seen hours later, once the air began to clear.

send a runner to the county EMA for more. Additional protective eyewear was needed, so Dan contacted a nearby public school to borrow some from their science department. Local chemical and fertilizer companies also sent protective eyewear. Portable toilets were acquired, and the American Red Cross and a local grocery store sent bottled water and food for responders.

An ambulance served as a temporary command post at the beginning of the emergency, but as the day went on, the Unified Command Post (UCP) was dispatched to the scene from about 50 miles away. The UCP is equipped with communications gear, meeting rooms, and planning areas. It wasn't until a hydraulic mast with a TV camera was lifted above the dust storm by the UCP that the true extent of the accident could be determined. Emergency managers were also able to get a visual on responding agencies and to better coordinate their efforts into an even more effective command response.

Aftermath

KD9LON was physically and emotionally exhausted, but he didn't want to leave the scene. "We were required to be there the whole time," he said. "We didn't have the opportunity to leave because people needed us."

Responding agencies gathered for a hotwash after the incident. Some lessons learned included the need to create detailed plans on rerouting traffic around a closed section of the interstate with minimal impact to communities and the need to develop a better alternative communications plan when radios become inoperative. As part of this hotwash, the National Weather Service was asked to supply any weather-related information (www.weather.gov/ilx/01may2023-dust).

Illinois Governor JB Pritzker invited all 150 first responders to the state capitol to personally thank them for their tireless and courageous response efforts.

Wrap-Up

Although ham radio wasn't directly involved with the incident's response effort, KD9LON credits the skills he's acquired as Macoupin County Amateur Radio Club's net control and as a SKYWARN storm spotter, as well as his experience in Parks on the Air® pileups, as an integral part of the resources he provides as an EmComm professional.

If you're interested in helping your community as a first responder or full-time EMA volunteer, you can reach out to your local fire department, volunteer EMS, EMA, police auxiliary force, as well as to groups like the American Red Cross, to find out how you can help. Volunteers are needed nationwide.

A plethora of EmComm articles exist about go-kits, training, etc. But there are fewer articles describing responder sensory overload; all five senses are involved. In this event, blinding dust, acrid smoke and heat from burning vehicles, deafening wind gusts, and choking dust were just a few of the obstacles first responders needed to contend with that day. To learn more about the environmental and sensory difficulties that responders faced in this event, read "Sensory Difficulties in a Dust Storm Response" by Ron Ochu, KO0Z, in the January/February 2024 issue of *On the Air* at www.arrl.org/ota.

All photos provided by Dan Hough, KD9LON.

Field Organization Reports

December 2023

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.

616 W9RY	K8AMH WO2H	120 KY2D WA1URS	99 KC1HHO	87 NT1N
470 N9VC	156 WM2C	K9LGU WB9WKO	98 W8IM KG5NNA	85 KB1TCE W7MIN
450 AD8CM	155 KD8UUB KE5YTA	WC4FSU W4CMH K7OED	97 WB8SIQ	84 K4FHR N1PZP
400 WA3EZN	150 W2PAX WB8DJG	KF5OMH K1HEJ NA7G	96 K4NWX KT4WX	82 KB4OLY
345 W7EES	N1ILZ	N7IE		
324 WA7PTM	140 N0DMP W44VGZ	119 N2DW	94 KF0BPN	81 N0ET
270 WM5N	WB9QPM	115 N3GE	93 WB8YYS W2OOD	80 AE2EY KR4ST KA8BJA AJ7B
245 N2LC	135 A19F AG9G KC9FXE	110 KA9MZJ AD4DO KM4WHO	92 KB1NMO K1XFC	79 W4PXE N1CVO
240 KT2D	KE8RS	KR4PI KF5IOU NW3X	91 W2ARP	78 W7PAT
206 W9GRG	130 WA3QLW K8MDA	KD0HHN K1UAF	90 N4NOA KB9GO	77 N2TSO
205 AC8NP	N2JBA KW1U N1UMJ	W1INC N1IQI W1RVY	KC9UC KF7GC N8MRS	76 W5XX
200 W9EEU	WZ0C	108 KC8T	W8GSR KL7RF	75 K5OB
199 W5WMC	126 AC0KQ	105 K5ANP	K8KRA KB8HJJ W8MAL	74 W3ZR
188 KV8Z	125 KB9IME	102 N7UWX	N8OD AB9ZA W1FEA	73 K1STM
183 KO4KUS	KT5SR	100 W1KX NX9K	89 KG5AOP KB5PGY	70 K6RAU
175 W0PZD	123 K1CFI	KZ8Q WB4RJW		
N8SY	122 WV5Q	KB8GUN KA5AZK N1LAH	88 KB0DTI	
170 KC8WH		KC1KVY W1TCD		
KE8ANW				

The following stations qualified for PSHR in previous months, but were not acknowledged in this column yet. (Nov. 2023) W9RY 296, WB9QPM 140, A19F 135, KA9MZJ 110. (Oct. 2023) W4CMH, KR4PI 140, W2PAX 130, K4FHR 85, KR4ST 80, W2ARP 76. (Aug. 2023) W9EEU 248, KA9QWC 120, AB9ZA 90, W9BGJ 78. (July 2023) W9BGJ 78.

Section Traffic Manager Reports

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

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported: AR, CT, ENY, EPA, GA, KY, MDC, MI, MO, ND, NFL, NLI, NNJ, NNY, NV, OK, SCV, SNJ, STX, TN, VA, WMA, WPA, 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 1,932, KY2D 1,757, W2AH 1,560, WB9WKO 946, KW1U 832, WA3QLW 771, K8ED 642, N9CK 620, N9VC, W2PAX 548, AG9G 509, KB9GO 507.

Contest Corral

March 2024

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

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

Start Date-Time	Finish Date-Time	Bands	Contest Name	Mode	Exchange	Sponsor's Website
2 0000	3 2359	1.8-28	ARRL International DX Contest, SSB	Ph	RS, SP or pwr	www.arrrl.org/arrrl-dx
2 0000	10 2359	See rules	Novice Rig Roundup	CW	Name, QTH; (optional rig)	www.novicerigroundup.org
2 0600	2 0800	7,14	Wake-Up! QRP Sprint	CW	RST, serial, suffix of previous QSO	qrp.ru/contest/wakeup/333-wakeup-eng
3 0700	3 1100	3.5	UBA Spring Contest, CW	CW	RST, serial, UBA section (if ON)	www.uba.be
3 1200	3 1400	7	SARL 40m SET	Ph	RS, serial	www.sarl.org.za
3 1200	3 2200	3.5	NSARA Contest	CW Ph Dig	RS(T), Nova Scotia county or serial	nsara.ca
3 1800	3 2200	3.5	WAB 3.5 MHz Phone	Ph	RS, serial, WAB square or country	wab.intermip.net/Contests.php
4 2000	4 2130	3.5	RSGB 80m Club Championship, Data	Dig	RST, serial	www.rsgbcc.org
5 0200	5 0400	3.5-28	ARS Spartan Sprint	CW	RST, SPC, pwr	arsqrp.blogspot.com
5 1900	5 2100	3.5	AGCW YL-CW Party	CW	RST, serial, "YL" (if YL), name	www.agcw.de
7 0000	8 0300	7	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or pwr	qrpcontest.com/pigwalk40
7 1800	7 2200	28	NRAU 10m Activity Contest	CW Ph Dig	RS(T), 6-char grid	nrau.net
9 0000	9 2359	3.5-28	YB DX RTTY Contest	Dig	RST, serial	rtty.ybdxcontest.com
9 0800	10 1000	50,144,432	SARL VHF/UHF FM Contest	Ph	RS(T), 6-char grid	www.sarl.org.za
9 0800	10 1000	1.8-28	SARL Field Day Contest	CW Ph Dig	RS(T), # of transmitters, category, SA province or "DX"	www.sarl.org.za
9 1000	10 1000	3.5-28	RSGB Commonwealth (BERU) Contest	CW	RST, serial	www.rsgbcc.org
9 1200	10 1100	3.5-28	DIG QSO Party, SSB	Ph	RS, mbr or none	diplom-interessen-gruppe.info
9 1200	10 1200	3.5-28	EA PSK63 Contest	PSK63	RSQ, EA province code or serial	concursos.ure.es
9 1200	10 1200	28	South America 10m Contest	CW Ph	RS(T), CQ zone	sa10m.com.ar
9 1400	9 2000	3.5-28	AGCW QRP Contest	CW	RST, serial, pwr, mbr or "NM"	www.agcw.de
9 1500	10 1500	1.8	Stew Perry Topband Challenge	CW	4-char grid	www.kkn.net/stew
9 1500	10 2100	3.5-28,50	Oklahoma QSO Party	CW Ph Dig	RS(T), OK county or SPC	k5cm.com/okqp.htm
9 1800	10 0559	3.5,7	Tesla Memorial HF CW Contest	CW	RST, serial, 4-char grid	www.radiosport.yu1srs.org.rs
9 1900	10 1900	1.8-28	Idaho QSO Party	CW Ph Dig	RS(T), ID county or SPC	www.idahoqsoparty.org
10 0000	10 0359	3.5-14	North American Sprint, RTTY	Dig	Other's call, your call, serial, name, SPC	ncjweb.com/Sprint-Rules.pdf
10 0700	10 1100	144	UBA Spring Contest, 2m	CW Ph	RST, serial, UBA section (if ON)	www.uba.be
10 0700	10 1700	3.5-28	FIRAC HF Contest	CW	RST, serial, "F" (if mbr)	www.firac.de
10 1800	11 0100	All	Wisconsin QSO Party	CW Ph Dig	WI county or SPC	www.warac.org
11 0000	11 0200	1.8-28	4 States QRP Group Second Sunday Sprint	CW Ph	RS(T), SPC, mbr or pwr	www.4sqrp.com
13 2000	13 2130	3.5	RSGB 80m Club Champ., CW	CW	RST, serial	www.rsgbcc.org
13 2300	17 2300	3.5-14	AWA John Rollins Memorial DX Contest	CW	RST, equipt type, year	www.antiquewireless.org
16 0000	16 2359	1.8-28,50	PODXS 070 Club St Patrick's Day Contest	Dig	SPC	www.podxs070.com
16 0200	18 0159	3.5-28	BARTG HF RTTY Contest	Dig	RST, serial, 4-dig UTC	www.bartg.org.uk
16 1200	17 1200	1.8-28	Russian DX Contest	CW Ph	RS(T), oblast or serial	www.rdx.org
16 1200	17 1200	3.5-28,144	F9AA Cup, SSB	Ph	RST, serial	www.site.urc.asso.fr
16 1200	17 1200	1.8-28	Africa All Mode Int'l DX Contest	CW Ph Dig	RS(T), serial	www.sarl.org.za
16 1400	16 1800	144,432	AGCW VHF/UHF Contest	CW	RST, serial, pwr, mbr or "NM"	www.agcw.de
16 1400	17 2359	All	Virginia QSO Party	CW Ph Dig	Serial, VA county or SPC	www.qsl.net/sterling/VA_QSO_Party
17 0700	17 1100	3.5	UBA Spring Contest, SSB	Ph	RS, serial, UBA section (if ON)	www.uba.be
17 2300	18 0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or pwr	qrpcontest.com/pigrun
18 1800	18 2059	3.5,7	Bucharest Digital Contest	FT4	RST, serial	yo3test201x.blogspot.com
18 2000	18 2130	3.5-28	RSGB FT4 Contest	FT4	Signal report	www.rsgbcc.org
21 0000	22 0300	14	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or pwr	qrpcontest.com/pigwalk20
21 0030	21 0230	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or pwr	naqcc.info/sprint_rules.html
21 1900	21 2000	3.5-14	NTC QSO Party	CW	Max 25 WPM; RST, mbr or "NM"	pi4ntc.nl/ntcqp
23 0000	23 2359	1.8-28, VHF	FOC QSO Party	CW	RST, name, mbr (if any)	g4foc.org/qsoparty
23 0000	24 2359	1.8-28	Maidenhead Mayhem Sprint	CW Ph Dig	2-char grid field	w9et.com/rules.html
24 0000	24 0400	3.5-14	North American SSB Sprint	Ph	Other's call, your call, serial, name, SPC	ssbsprint.com/rules
24 0600	24 1000	50	UBA Spring Contest, 6m	CW Ph	RS, serial, UBA section (if ON)	www.uba.be/en
28 2000	28 2130	3.5	RSGB 80m Club Champ., SSB	Ph	RS, serial	www.rsgbcc.org
29 1900	30 0300	3.5-28	Sasquatch Stomp	CW	RST, SPC, mbr or ZIP code, name	www.pnwqrp.org/sasquatch-stomp
30 0000	31 2359	1.8-28	CQ WW WPX Contest, SSB	Ph	RS, serial	www.cqwp.com

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

The 2023 IARU HF World Championship Results

The popular worldwide event was held July 8 – 9, 2023.



Members of the Korean Amateur Radio League's, HLØHQ, headquarters station participated in the 2023 IARU HF World Championship. They logged more than 1,000 contacts during the 24-hour event. [Hyeong-In Kim, HL2CFY, photo]

Full Results Online

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

The next IARU HF World Championship will be held the second full weekend of July (July 13 – 14, 2024).

2023 IARU Special Station Scores

Scoring of IARU station logs provided by World Wide Radio Operators Foundation (WWROF). Entries received after the log submission deadline are listed in *italics*.

IARU Headquarters Stations

Call	Score
DA0HQ	28,788,375
TM0HQ	27,759,336
GR2HQ	25,290,824
EF4HQ	25,233,900
S50HQ	21,844,186
YT0HQ	20,730,728
SN0HQ	18,949,435
9A0HQ	18,937,854
SK9HQ	18,550,575
OH1HQ	18,447,858
OP0HQ	17,565,040
HG0HQ	14,329,890
EI0HQ	13,930,424
YR0HQ	13,496,850
E7HQ	11,989,281
OE0HQ	11,555,166
LT4RCA	10,495,800
OZ1HQ	10,355,152
II9HQ	9,843,108
PA6HQ	9,713,388
W1AW/KH6	9,191,260
8N0HQ	7,302,592
CX1AA	5,758,622
HB9HQ	5,558,757
OM3HQ	5,540,787
ER7HQ	4,583,348
R4HQ	4,225,347
PJ2HQ	4,149,090
ZF1A	3,401,196
A47HQ	3,061,152
V31HQ	3,040,232
LZ0HQ	2,898,126
UN1HQ	2,816,128
Z30HQ	2,605,670
DX0HQ	2,506,581
CR5HQ	2,421,000
VE7RAC	2,399,868
PY1HQ	2,155,192
A71HQ	1,950,484
ZL6HQ	1,810,874
B8HQ	1,744,200
OA4O	1,675,790
7A3HQ	1,014,650
HB0HQ	939,455
C37HQ	879,320
V85HQ	774,837
E2HQ	736,332
OY1CT	730,873
ZP5AA	705,180
S77HQ	465,045
HL0HQ	339,438
NU1AW	312,354
TI0HQ	261,900
AT1HQ	129,495
9M2A	112,317
VR2HK	72,616
4O1HQ	61,880
B9HQ	41,150
ST0HQ	38,874
XE1LM	36,225
B3HQ	22,793
VK3WIA	17,732
ZS9HQ	3,450

IARU Administrative Council Stations

Call	Score
W5ZN	1,607,968
SM6EAN	298,820
VE6SH	59,358

IARU R1	
HB9JOE	162,432
PA2LS	118,544
IV3KKW	54,901
DJ3HW	49,140
DB3KO/P	1,500

IARU R2	
PT2ADM	37,630
YS1MS	35,409
VE3YV	4,288

IARU R3	
JH1NBN	230,538
JA1CJP	213,744
VJ3O	37,100

Top Ten — US and Canada

Single Operator, Mixed Mode, High Power

KQ2M	3,209,088
VE3AT	3,091,968
N9RV	3,031,796
NR3X	2,679,446
K4ZW	2,482,002
N2NT (N2NC, op)	
	2,281,599
K0EJ	1,645,492
N2PP	1,054,489
K7NT	936,616
N4OX	861,840

Single Operator, Mixed Mode, Low Power

N8II	386,880
N9NB	363,020
VE5SF	263,538
K0EA	237,159
VE3KOT	221,361
K5FUV	182,269
KI2D	169,048
AI6O	150,280
VE3NFN	121,368
N7ZZ	110,448

Single Operator, Mixed Mode, QRP

W3PAX	7,700
N0LMLQ	4,202
VA3IIF	1,632

Single Operator, Phone Only, High Power

N1UR	1,858,335
N2QV	1,380,016
NG1M	464,750
W7WA	350,592
KB8O	288,259
N4MM	178,128
W0CN	171,112
N5GF	103,752
K9MWM	79,054
KV8P	66,960

Single Operator, Phone Only, Low Power

K5DHY	98,210
KS2G	88,884
AB1F	88,361
VE2HIT	63,535
VA3KRT	62,040
N2ESP	61,367
KF7CG	58,473
VE3RVZ	52,287
WA4JA	48,288
N6OKU	47,450

Single Operator, Phone Only, QRP

W6QU (W8QZA, op)	
	15,180
WW0WB	2,726
K3RWN	450

Single Operator, CW Only, High Power

VE3JM	2,831,633
W1KM	2,454,192
WX0B (AD5Q, op)	
	2,153,288
N4AF	2,101,112
NA8V	2,050,800
W6YX (N7MH, op)	
	1,529,331
N6TV	1,431,872
K6NA	1,244,680
W9RE	1,064,217
KZ5D	671,240

Single Operator, CW Only, Low Power

K7SV	1,108,306
K1VUT	785,325
K9ZO	695,266
VE3TM	693,744
N7VM	577,273
W7YAQ	536,112
W1OK	442,636
WJ9B	373,296
K5MR	354,078
WB4TDH	308,176

Single Operator, CW Only, QRP

VE3SIF	34,136
K1WAT	22,632
K8CN	14,473
W7LG	10,980
K2EKM	10,944
WS9V	7,252
AA4SD	2,280
N6HI	1,116
KE4WKH	676
KJ4YM	572

Single Operator Unlimited, Mixed Mode, High Power

KM3T (@KC1XX)	
	2,915,689
K4RO	2,360,271
W3UA	1,744,470
K9OM	1,321,567
W1GD	1,293,558
K1AR	1,122,480
K1JB	929,856
XM3I	857,534
N6AR	830,248
K4RUM	751,238

Single Operator Unlimited, Mixed Mode, Low Power

N4XL	823,686
WO1N	550,844
W7CXX	433,380
W4RN	366,540
N8VV	323,420
WN4AFP	310,954
W9AV	256,875
NK4O	210,180
NF3R	208,080
W6FB	202,240

Single Operator Unlimited, Mixed Mode, QRP

K8ZT	27,097
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Single Operator Unlimited, Phone Only, High Power

W3LL	738,282
VE2NTT	684,199
NA4DA	349,325
W9NZ	179,080
W4KW	173,880
W3FR	141,588
WA2DNI	111,940
W0PMO	104,386
N8IVN	83,284
W4SDX	69,969

Single Operator Unlimited, Phone Only, Low Power

K3PA	302,445
VA3IDD	176,176
KI5MM	127,182
W2NTV	91,188
AJ4HP	80,630
KD2JOE	74,338
KC1OT	65,880
VE1FSM	57,204
VE3RGO	50,416
KD9GY	43,920

Single Operator Unlimited, Phone Only, QRP

VE3BFU	1,920
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Single Operator Unlimited, CW Only, High Power

K1LZ (NA1NA, op)	
	4,916,190
N3RS	2,681,503
K9NW	2,237,964
AB3CX	2,052,500
W7RN (WD6T, op)	
	2,004,912
AD4EB	1,954,940
N3AD	1,795,526
VE9AA	1,645,742
VE3NNT	1,549,575
K3MM	1,240,036

Single Operator Unlimited, CW Only, Low Power

N2YO	1,050,448
N4AO (WC4E, op)	
	652,462
W3KB	620,100
WA1FCN	507,232
K7TK	502,803
N9NC	487,648
KG9X	457,760
N2GA	453,492
WY7M	358,980
K0AD	358,956

Single Operator Unlimited, CW Only, QRP

W1FJ	173,799
N4IJ	80,464
KO1H	51,675
KJ5T	37,674
WQ6X	37,471
KU4A	16,320
K9AXT	4,756
AB8FJ	826
K2GMY	100
AH7RF/W5	1

Multioperator, Single Transmitter, High Power

K5TR	3,226,744
K0RF	2,918,720
K8AZ	2,874,586
K9RS	2,558,730
ND7K	2,283,175
NV9L	2,026,976
N7DX	1,778,334
N4SS	1,532,640
K3AJ	1,296,126
NX6T	1,116,744

Multioperator, Two Transmitter, Low Power

W1FM	249,736
K4OV	197,415
NN4SA	74,675
KN4JJA	2,470

Top Ten — Worldwide

Single Operator, Mixed Mode, High Power

P3N (R2AA, op)	
	5,905,575
UP0L (UN9LW, op)	
	3,528,945
KQ2M	3,209,088
VE3AT	3,091,968
E77EA	3,091,340
N9RV	3,031,796
NR3X	2,679,446
UT5UGR	2,636,064
K4ZW	2,482,002
N2NT (N2NC, op)	
	2,281,599

Single Operator, Mixed Mode, Low Power

OL5Y	1,201,980
HG5C (HA5BMS, op)	
	1,113,888
LW1F (LU5FC, op)	
	785,634
RU7M	660,080
UF5A	627,792
UA6GO	618,616
BD4VGZ	450,076
EW1P	434,700
N8II	386,880
N9NB	363,020

Single Operator, Mixed Mode, QRP

HA5BA	300,990
LZ5Y (LZ1YE, op)	
	271,377
OK6OK	205,587
9A2EY	125,294
ED4H (EA4HWT, op)	
	114,140
EW8G	97,194
CT7/DH8BQA	97,100
HA3GC	83,062
SP4NKJ	77,112
7K1CPT	74,290

Single Operator, Phone Only, High Power

RA3OA	1,973,925
N1UR	1,858,335
ED3C (EA3IBV, op)	
	1,737,252
N2QV	1,380,016
TF/4X6TT	1,368,354
IK3UNA	1,253,736
R3RZ	944,547
DM0Y (DL3BQA, op)	
	857,667
RW9LL	796,146
S51CK	728,728

Single Operator, Phone Only, Low Power

CT2HOV	584,463
PG00T	584,259
Y07SR	523,525
MIOI	466,992
SN7T	274,866
DM5B (DG6IMR, op)	
	261,660
OK6AB	241,242
YO6GUU	200,200
DM2BR	194,296
DL6MRM	180,400

Single Operator, Phone Only, QRP

ES6RW	307,338
YO9FNP	194,950
IZ4AIF	84,125
HB9EGA	80,949
PY6GOE	45,551
M17DGO	44,400
SP5LCT	43,452
PY2PPZ	27,477
HA1TI	26,322
BG6VBM	19,467

Single Operator, CW Only, High Power

EF6T (EA3M, op)	
	4,355,917
CT3KN	3,016,293
VE3JM	2,831,633
RG6G	2,664,221
LY5W	2,585,862
W1KM	2,454,192
WX0B (AD5Q, op)	
	2,153,288
N4AF	2,101,112
NA8V	2,050,800
W6YX (N7MH, op)	
	1,529,331

Single Operator, CW Only, Low Power

4Z4AK	1,873,800
DL3JAN	1,245,312
LA2AB (LA7MFA, op)	
	1,154,860
K7SV	1,108,306
M5W	986,040
OM7K (OM7RU, op)	
	930,602
MI5I (GI0RQK, op)	
	846,183
K1VUT	785,325
HA7UI	780,966
J11RXQ	742,980

Single Operator, CW Only, QRP

HA6NL	411,309
UT4UBZ	235,376
US5VX	154,559
S53AR	138,040
PE2K	96,915
YL3FW	95,865
UA6AK	93,345
G3YMC	73,602
YO4BEW	67,935
F6CWA	62,480

Single Operator Unlimited, Mixed Mode, High Power

OH1F (OH1TM, op)	
	4,341,216
ED8M (EA8DIG, op)	
	4,135,400
YU5R (YT2AAA, op)	
	3,061,016
RM5F	2,925,738
KM3T (@KC1XX)	
	2,915,689
YT9X (YT0C, op)	
	2,579,910
K4RO	2,360,271
YL7X (YL2LY, op)	
	2,260,244
I18K	2,207,428
HA6P	2,200,436

Single Operator Unlimited, Mixed Mode, Low Power

HG5D (HA8QZ, op)	
	2,113,056
DD2D (DK8ZB, op)	
	1,910,640
SP9XCN	1,374,064
M3AWD	1,314,396
EU2F	1,213,056
LY7R (LY2BKT, op)	
	1,040,856
YL1ZF	861,492
N4XL	823,686
RV9UP	813,696
R3DCX	811,360

Single Operator Unlimited, Mixed Mode, QRP

DK3WE	1,008,768
IZ8JFL	353,336
HA8IB	261,994
YU1LM	175,696
PC2F	60,043
UD2F	43,472
IC8TEM	41,580
JK1TCV	38,872
HA1WD	37,968
DL1DXA	34,713

Single Operator Unlimited, Phone Only, High Power

CR3Y (OM2KW, op)	
	4,790,030
OR1X	2,447,404
SN7D (SQ7D, op)	
	1,832,182
IB8A (I8QLS, op)	
	1,730,476
IK0PHY	1,657,065
EA3CI	1,636,404
IB9A (IZ2WFL, op)	
	1,580,544
PY5QW	1,397,568
MD7C (M5RIC, op)	
	1,285,492
PY4JW	1,050,658

Single Operator Unlimited, Phone Only, Low Power

TA3NE	837,216
SP3H	759,528
M1T (M0KYB, op)	
	440,977

R9RA	439,425
UA9R	426,351
SV3RPQ	410,304
SO7E	316,998
8S8S (SM5XSH, op)	
	313,789

K3PA	302,445
F8ADY	265,073

Single Operator Unlimited, Phone Only, QRP

YO8WW	316,784
HA5BGG	65,436
CT2GSN	39,101
UZ7M (UT9MZ, op)	
	34,532
MM7BWK	13,804
YO5DSG	6,815
PV5ALE	3,456
VE3BFU	1,920
YO4LUP	1,292
YO8KNN (YO8OLY, op)	
	288

Single Operator Unlimited, CW Only, High Power

K1LZ (NA1NA, op)	
	4,916,190
9A5D (9A3VM, op)	
	4,140,242
OK7W	3,919,392
UW1M	3,908,514
P3X (5B4AMM, op)	
	3,764,565
HA5JI	3,547,566
HG3N (HA3LN, op)	
	3,304,233
R8TT	3,134,784
UA4M (UA4LCH, op)	
	2,970,968
RN3QO	2,816,715

Regional Leaders

Boxes list call sign, score, and class: MSHP = Multioperator, Single Transmitter, High Power; M2LP = Multioperator, Two Transmitter, Low Power; SO-CW-HP = Single Operator, CW Only, High Power; SO-CW-LP = Single Operator, CW Only, Low Power; SO-CW-QRP = Single Operator, CW Only, QRP; SO-MIX-HP = Single Operator, Mixed Mode, High Power; SO-MIX-LP = Single Operator, Mixed Mode, Low Power; SO-MIX-QRP = Single Operator, Mixed Mode, QRP; SO-PH-HP = Single Operator, Phone Only, High Power; SO-PH-LP = Single Operator, Phone Only, Low Power; SO-PH-QRP = Single Operator, Phone Only, QRP; SOU-CW-HP = Single Operator Unlimited, CW Only, High Power; SOU-CW-LP = Single Operator Unlimited, CW Only, Low Power; SOU-CW-QRP = Single Operator Unlimited, CW Only, QRP; SOU-MIX-HP = Single Operator Unlimited, Mixed Mode, High Power; SOU-MIX-LP = Single Operator Unlimited, Mixed Mode, Low Power; SOU-MIX-QRP = Single Operator Unlimited, Mixed Mode, QRP; SOU-PH-HP = Single Operator Unlimited, Phone Only, High Power; SOU-PH-LP = Single Operator Unlimited, Phone Only, Low Power, and SOU-PH-QRP = Single Operator Unlimited, Phone Only, QRP.

West Coast Region (Pacific, Northwestern, and Southwestern Divisions; Alberta, British Columbia, and NT Sections)	Midwest Region (Dakota, Midwest, Rocky Mountain, and West Gulf Divisions; Manitoba and Saskatchewan Sections)	Central Region (Central and Great Lakes Divisions; Ontario East, Ontario North, Ontario South, and Greater Toronto Area Sections)	Southeast Region (Delta, Roanoke, and Southeastern Divisions)	Northeast Region (New England, Hudson, and Atlantic Divisions; Maritime and Quebec Sections)
N9RV 3,031,796 SO-MIX-HP	VE5CPU 20,020 SO-MIX-HP	VE3AT 3,091,968 SO-MIX-HP	NR3X 2,679,446 SO-MIX-HP	KQ2M 3,209,088 SO-MIX-HP
K7NT 936,616 SO-MIX-HP	VE5SF 263,538 SO-MIX-LP	VE3TAZ 110,630 SO-MIX-HP	K4ZW 2,482,002 SO-MIX-HP	N2NT (N2NC, op) 2,281,599 SO-MIX-HP
W1PR 73,656 SO-MIX-HP	K0EA 237,159 SO-MIX-LP	KE8E 2,616 SO-MIX-HP	K0EJ 1,645,492 SO-MIX-HP	N2PP 1,054,489 SO-MIX-HP
KX7M 23,329 SO-MIX-HP	AI6O 150,280 SO-MIX-LP	VE3KOT 221,361 SO-MIX-LP	N4OX 861,840 SO-MIX-HP	W2XL 129,312 SO-MIX-HP
N7XCZ 13,908 SO-MIX-HP	KA0PQW 95,586 SO-MIX-LP	VE3NFN 121,368 SO-MIX-LP	A14WW 58,656 SO-MIX-HP	K3MD 77,562 SO-MIX-HP
WA7BNM 88,690 SO-MIX-LP	AF5CC 92,803 SO-MIX-LP	N7ZZ 110,448 SO-MIX-LP	N8II 386,880 SO-MIX-LP	K12D 169,048 SO-MIX-LP
K7LR 43,290 SO-MIX-LP	N0LMQ 4,202 SO-MIX-QRP	K8WU 26,268 SO-MIX-LP	K5FUV 182,269 SO-MIX-LP	N1NQD 66,595 SO-MIX-LP
K6RAD 36,437 SO-MIX-LP	W0CN 171,112 SO-PH-HP	W8FSM 17,670 SO-MIX-LP	K4XUI 88,683 SO-MIX-LP	W3KN 48,934 SO-MIX-LP
WA8ZNC 29,568 SO-MIX-LP	K9MWM 79,054 SO-PH-HP	VA3JIF 1,632 SO-MIX-QRP	KB4CG 74,052 SO-MIX-LP	KA2FIR 48,587 SO-MIX-LP
N6AJUS 10,752 SO-MIX-LP	KD0JLE 50,854 SO-PH-HP	KB8O 288,259 SO-PH-HP	N4MM 178,128 SO-PH-HP	N1ET 34,808 SO-MIX-LP
W7WA 350,592 SO-PH-HP	WX0Z 34,476 SO-PH-HP	KV8P 66,960 SO-PH-HP	N5GF 103,752 SO-PH-HP	W3PAX 7,700 SO-MIX-QRP
AC7GL 43,120 SO-PH-HP	VE4SG 6,253 SO-PH-HP	VA3ZNQ 65,100 SO-PH-HP	K4JC 59,290 SO-PH-HP	N1UR 1,858,335 SO-PH-HP
A16LY 20,068 SO-PH-HP	K5DHY 98,210 SO-PH-LP	KE8NBC 29,546 SO-PH-HP	W2LAT 31,125 SO-PH-HP	N2QV 1,380,016 SO-PH-HP
NC6R 11,128 SO-PH-HP	KI0R 18,172 SO-PH-LP	VA3CQG 13,570 SO-PH-HP	K4QQG 28,576 SO-PH-HP	NG1M 464,750 SO-PH-HP
K6DAV 6,055 SO-PH-HP	NW5Q 17,212 SO-PH-LP	VA3KRT 62,040 SO-PH-LP	N2ESP 61,367 SO-PH-LP	WA2GOT 37,315 SO-PH-HP
N6OKU 47,450 SO-PH-LP	KF0HCN 16,072 SO-PH-LP	VE3RVZ 52,287 SO-PH-LP	KF7CG 58,473 SO-PH-LP	KC3RRF 12,626 SO-PH-HP
K7HKR 24,080 SO-PH-LP	AF5MN 14,484 SO-PH-LP	W8LYO 45,600 SO-PH-LP	N4MM 178,128 SO-PH-HP	KS2G 88,884 SO-PH-LP
W1DGL 11,656 SO-PH-LP	WW0WB 2,726 SO-PH-QRP	KE8VGU 45,580 SO-PH-LP	W9TCV 28,712 SO-PH-LP	AB1F 88,361 SO-PH-LP
VA6AGR 7,326 SO-PH-LP	WX0B (AD5Q, op) 2,153,288 SO-CW-HP	VE3GJP 32,040 SO-PH-LP	KV4ZY 23,030 SO-PH-LP	VE2HIT 63,535 SO-PH-LP
NX7W (N7FLT, op) 6,992 SO-PH-LP	N5AW 231,261 SO-CW-HP	VE3JM 2,831,633 SO-CW-HP	N4AF 2,101,112 SO-CW-HP	VE2IAA 36,991 SO-PH-LP
W6QU (W8QZA, op) 15,180 SO-PH-QRP	K0FX 165,846 SO-CW-HP	NA8V 2,050,800 SO-CW-HP	KZ5D 671,240 SO-CW-HP	N2MTG 28,993 SO-PH-LP
W6YX (N7MH, op) 1,529,331 SO-CW-HP	W4IFI 141,373 SO-CW-HP	W9RE 1,064,217 SO-CW-HP	WQ5L 294,560 SO-CW-HP	K3RWN 450 SO-PH-QRP
N6TV 1,431,872 SO-CW-HP	N3BB 112,728 SO-CW-HP	K8GL 222,789 SO-CW-HP	KQ4R 291,211 SO-CW-HP	W1KM 2,454,192 SO-CW-HP
K6NA 1,244,680 SO-CW-HP	K5MR 354,078 SO-CW-LP	K8MP 213,072 SO-CW-HP	NN4SS 132,712 SO-CW-HP	K1IMI (N4CW, op) 512,325 SO-CW-HP
N16W 499,872 SO-CW-HP	KD2KW 148,248 SO-CW-LP	K9ZO 695,266 SO-CW-LP	K7SV 1,108,306 SO-CW-LP	K3UL 445,704 SO-CW-HP
AJ6V 358,203 SO-CW-HP	N0AX 141,588 SO-CW-LP	VE3TM 693,744 SO-CW-LP	WB4TDH 308,176 SO-CW-LP	N2MF 387,834 SO-CW-HP
N7VM 577,273 SO-CW-LP	N5XE 59,004 SO-CW-LP	W1NN 306,880 SO-CW-LP	K3JT 225,872 SO-CW-LP	K1KI 352,428 SO-CW-HP
W7YAQ 536,112 SO-CW-LP	NN5T 43,200 SO-CW-LP	KV8Q 247,572 SO-CW-LP	WA5SOG 206,790 SO-CW-LP	K1VUT 785,325 SO-CW-LP
W9JB 373,296 SO-CW-LP	N5OBC 70 SO-CW-QRP	VE3MA 168,405 SO-CW-LP	K4EJ 168,300 SO-CW-LP	W1QK 442,636 SO-CW-LP
VE6BBP 217,536 SO-CW-LP	K0MD 384,375 SOU-MIX-HP	VE3SIF 34,136 SO-CW-QRP	K1WAT 22,632 SO-CW-QRP	K2NV 120,450 SO-CW-LP
W6ZL 69,408 SO-CW-LP	KV0I 219,950 SOU-MIX-HP	W59V 7,252 SO-CW-QRP	K2EKM 10,944 SO-CW-QRP	W2QL 94,820 SO-CW-LP
N6HI 1,116 SO-CW-QRP	K0BJ 209,095 SOU-MIX-HP	K9OM 1,321,567 SOU-MIX-HP	AA4SD 2,280 SO-CW-QRP	N2EY 94,340 SO-CW-LP
NK6A 142,236 SOU-MIX-HP	W5GCX 23,750 SOU-MIX-HP	XM3I 857,534 SOU-MIX-HP	KE4WKH 676 SO-CW-QRP	K8CN 14,473 SO-CW-QRP
N6WT 125,248 SOU-MIX-HP	N75SM 20,374 SOU-MIX-HP	VA3DF 648,945 SOU-MIX-HP	K4RO 2,360,271 SOU-MIX-HP	W7LG 10,980 SO-CW-QRP
K6KR 119,040 SOU-MIX-HP	W7CXX 43,380 SOU-MIX-LP	W72P 416,608 SOU-MIX-HP	N6AR 830,248 SOU-MIX-HP	KM3T (@KC1XX) 2,915,689 SOU-MIX-HP
N7RVD 85,351 SOU-MIX-HP	WB5N 153,258 SOU-MIX-LP	KW9A 370,980 SOU-MIX-HP	K3IE 750,800 SOU-MIX-HP	W3UA 1,744,470 SOU-MIX-HP
NQ7R 75,938 SOU-MIX-HP	K5TXM 14,175 SOU-MIX-LP	N8VV 323,420 SOU-MIX-LP	WO4O 598,526 SOU-MIX-HP	W1GD 1,293,558 SOU-MIX-HP
VE6TL 200,703 SOU-MIX-HP	N5DIT 10,150 SOU-MIX-LP	W9AV 256,875 SOU-MIX-LP	N4IQ 461,600 SOU-MIX-HP	K1AR 1,122,480 SOU-MIX-HP
KW6AA 165,998 SOU-MIX-LP	VE5UO 3,588 SOU-MIX-LP	VA30KG 110,776 SOU-MIX-LP	N4XL 823,686 SOU-MIX-LP	K1JB 929,856 SOU-MIX-HP
WN6W 57,494 SOU-MIX-LP	W0PMO 104,386 SOU-PH-HP	W8TB 100,092 SOU-MIX-LP	W4RN 366,540 SOU-MIX-LP	WO1N 550,844 SOU-MIX-LP
AD7XG 19,278 SOU-MIX-LP	K0TRL 32,697 SOU-PH-HP	K9PG 74,847 SOU-MIX-LP	WN4AFP 310,954 SOU-MIX-LP	NF3R 208,080 SOU-MIX-LP
KN6VVQ 18,585 SOU-MIX-LP	AB5KM 9,396 SOU-PH-HP	K8ZT 27,097 SOU-MIX-QRP	NK4O 210,180 SOU-MIX-LP	W2RDS 108,966 SOU-MIX-LP
K6GFI 61,320 SOU-PH-HP	W5ENH 1,938 SOU-PH-HP	W9NZ 179,080 SOU-MIX-HP	W6FB 202,240 SOU-MIX-LP	K2AL 81,046 SOU-MIX-LP
N7GCO 56,700 SOU-PH-HP	W5RIR 1,460 SOU-PH-HP	VA3LR 40,172 SOU-PH-HP	NA4DA 349,325 SOU-PH-HP	K17WX 72,720 SOU-MIX-LP
W7ZZ 30,855 SOU-PH-HP	K3PA 302,445 SOU-PH-LP	VA3PC 24,220 SOU-PH-HP	W4KW 173,880 SOU-PH-HP	W3LL 738,282 SOU-PH-HP
K0NG 25,668 SOU-PH-HP	K15MM 127,182 SOU-PH-LP	N9TCA 13,020 SOU-PH-HP	W4SDX 69,969 SOU-PH-HP	VE2NTT 684,199 SOU-PH-HP
K6DW 17,952 SOU-PH-HP	N7MZW 28,584 SOU-PH-LP	W8MQT 5,952 SOU-PH-HP	KG2MM 58,509 SOU-PH-HP	W3FR 141,588 SOU-PH-HP
WZ8T 41,749 SOU-PH-LP	K0TJT 3,348 SOU-PH-LP	VA3IDD 176,176 SOU-PH-LP	N5GI 28,203 SOU-PH-HP	WA2DNI 111,940 SOU-PH-HP
K7JKM 3,776 SOU-PH-LP	W5IOH 2,064 SOU-PH-LP	VE3RGO 50,416 SOU-PH-LP	AJ4HP 80,630 SOU-PH-LP	N8VN 83,284 SOU-PH-HP
VE6CLG 1,160 SOU-PH-LP	N5RZ 1,014,189 SOU-CW-HP	KD9GY 43,920 SOU-PH-LP	NN4RB 39,648 SOU-PH-LP	W2NTV 91,188 SOU-PH-LP
N6AJR 1 SOU-PH-LP	N5OT 404,716 SOU-CW-HP	WA9YI 6,300 SOU-PH-LP	K4SBZ 37,905 SOU-PH-LP	KD2JOE 74,338 SOU-PH-LP
W7RN (WD6T, op) 2,004,912 SOU-CW-HP	N0AT 359,992 SOU-CW-HP	WS6K 2,987 SOU-PH-LP	AA5NT 27,885 SOU-PH-LP	KC1OT 65,880 SOU-PH-LP
N7AT (K8IA, op) 892,234 SOU-CW-HP	N5TJ 344,908 SOU-CW-HP	VE3BFU 1,920 SOU-PH-QRP	A14DB 16,885 SOU-PH-LP	VE1FSM 57,204 SOU-PH-LP
VE7LWW 806,080 SOU-CW-HP	W0VX 284,768 SOU-CW-HP	K9NW 2,237,964 SOU-CW-HP	AD4EB 1,954,940 SOU-CW-HP	KA2KON 40,502 SOU-PH-LP
KA6BIM 761,280 SOU-CW-HP	WY7M 358,980 SOU-CW-LP	VE3NNT 1,549,575 SOU-CW-HP	N4UU 1,095,024 SOU-CW-HP	K1LZ (NA1NA, op) 4,916,190 SOU-CW-HP
K7QA 594,384 SOU-CW-HP	K0AD 358,956 SOU-CW-LP	WA8Y 758,625 SOU-CW-HP	W4NZ 970,632 SOU-CW-HP	N3RS 2,681,503 SOU-CW-HP
K7TQ 502,803 SOU-CW-LP	KG5U 342,384 SOU-CW-LP	W19W 745,998 SOU-CW-HP	KM5G 891,613 SOU-CW-HP	AB3CX 2,052,500 SOU-CW-HP
AA2IL 267,960 SOU-CW-LP	K0TG 191,513 SOU-CW-LP	VE3CT 693,357 SOU-CW-HP	NR4M 532,922 SOU-CW-HP	N3AD 1,795,526 SOU-CW-HP
W7VO 150,216 SOU-CW-LP	AD1C 145,152 SOU-CW-LP	KG9X 457,760 SOU-CW-LP	N2YU 1,050,448 SOU-CW-LP	VE9AA 1,645,742 SOU-CW-HP
K6WSC 64,314 SOU-CW-LP	KJ5T 37,674 SOU-CW-QRP	N8BJQ 274,464 SOU-CW-LP	N4AO (WC4E, op) 652,462 SOU-CW-LP	W3KB 620,100 SOU-CW-LP
WA0WWW 47,357 SOU-CW-LP	AH7RF/W5 1 SOU-CW-QRP	WB8JUI 213,332 SOU-CW-LP	WA1FCN 507,232 SOU-CW-LP	N9NC 487,648 SOU-CW-LP
WQ6X 37,471 SOU-CW-QRP	K5TR 3,226,744 MSHP	WT9U 204,800 SOU-CW-LP	AD8J 337,824 SOU-CW-LP	N2GA 453,492 SOU-CW-LP
K2GMY 100 SOU-CW-QRP	K0RF 2,918,720 MSHP	KY0Q 168,980 SOU-CW-LP	K1GU 188,874 SOU-CW-LP	K2LE 357,336 SOU-CW-LP
ND7K 2,283,175 MSHP	N0MA 578,493 MSHP	KU4A 16,320 SOU-CW-QRP	N4UJ 80,464 SOU-CW-QRP	W1WBB 249,690 SOU-CW-LP
N7DX 1,778,334 MSHP	W7SU 1,330 MSHP	AB8FJ 826 SOU-CW-QRP	K9AXT 4,756 SOU-CW-QRP	W1FJ 173,799 SOU-CW-QRP
NX6T 1,116,744 MSHP		K8AZ 2,874,586 MSHP	AD4ES 926,491 MSHP	KO1H 51,675 SOU-CW-QRP
N6WM 923,544 MSHP		NV9L 2,026,976 MSHP	K4OV 197,415 M2LP	K9RS 2,558,730 MSHP
KT7E 645,392 MSHP		N4SS 1,532,640 MSHP	NN4SA 74,675 M2LP	K3AJ 1,296,126 MSHP
		VA3YLR 25,200 MSHP	NN4JJA 2,470 M2LP	K3CCR 448,812 MSHP
		VE3VM 13,888 MSHP		W3ZGD 174,352 MSHP
				K3JO 62,985 MSHP
				W1FM 249,736 M2LP

The April 2024 ARRL Rookie Roundup — Phone

1800 UTC – 2359 UTC, Sunday, April 21



Rookies of all ages can participate in the ARRL Rookie Roundup. Matt Marshall, W3MBX, participated in the 2023 Rookie Roundup. It was his first time operating in a contest, and he said that he had so much fun that he's looking forward to participating in Field Day. [Matt Marshall, W3MBX, photo]

Complete rules, logging sheets, and links for submitting your score can be found at www.arrl.org/rookie-roundup.

The Rookie Roundup event is meant to encourage newly licensed operators to get on the HF bands and experience competitive amateur radio. This is a great way for clubs to get their newer members on the air, and the perfect opportunity to mentor new licensees.

Rookies make as many contacts as possible during this 6-hour event. Rookies work everyone, and non-Rookies work only Rookies. The exchange is your name, call sign, a two-digit year, and state (US or Mexican), Canadian province, or "DX."

You can enter as a Rookie if:

- ♦ You made, or will make, your first-ever contact this year or during the previous 3 calendar years (send the last two digits of the year of your first contact in your exchange); or
- ♦ You haven't made any contest contacts using the contest mode (Phone) before (send the last two digits of the current year in your exchange).

If you are a non-Rookie, send the last two digits of the year of your first license.

Rookies can enter as a Single Operator, or invite Rookie friends over and operate as Multioperator. Up to five Single Operator Rookies can also enter from their individual stations and submit their total score as a team.

As a non-Rookie, you can join the fun by calling "CQ Rookies," encouraging the Rookie operators to call you.

All scores must be reported within 72 hours after the event. No late entries will be accepted.

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 December 2023 activity report of the VM Program.

♦ An advisory notice was sent to an operator in Florida for abuse of the GreenCube satellite operating on 435.310 MHz, and the operator was reminded that all frequencies are shared under FCC rules.

♦ An advisory notice was issued to an operator in California for deliberate interference on 28.425 MHz, and to an operator in Kentucky for operation on DSB with a bandwidth of 14 kHz for the purpose of interfering with existing communications. The Kentucky operator, as well as an operator in Georgia using 3.965 MHz with a 10 kHz bandwidth, were advised that 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. Both operators were informed that FCC forfeitures for such operation normally start at \$7,000.

♦ An advisory notice was sent to an operator in Missouri for lengthy transmissions up to 45 minutes without identification, and the operator was reminded that Rule 97.119(a) requires

station identification at the end of transmissions and every 10 minutes during transmissions.

♦ Technician-class operators in Texas, Maryland, and Michigan were sent advisory notices concerning FT8 operation on 7.074 MHz. Technicians have no data privileges on 40 meters, but are allowed to operate CW. A Technician-class licensee in Illinois was issued an advisory notice for FT8 operation on 20 meters. Technicians have no privileges on that band.

♦ A Technician-class licensee in Michigan received an advisory notice for FT8 operation on 15 meters. Technicians have only CW privileges on that band.

♦ An advisory notice was issued to an operator in Texas for operation on 17 meters and claiming in a net check-in that he held General-class privileges. The matter was reported to the FCC.

♦ A repeater user in Illinois was informed that the request to stay off the repeater operated by the Six Meter Club of Chicago would be enforced by the FCC.

The totals for November monitoring were 2,124 hours on HF frequencies, and 2,817 hours on VHF frequencies and above, for a total of 4,941 hours. — *Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH*



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
Dain Webster, K7SXN	25
Ron Kinney, KC0ZPS	25
Michael J. Kerezsi, W3ASW	40

October 2023

Joseph P. Kononchik, KS1I	20
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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, W0AF	30

December 2023

Matthew K. Jamison, KI5PGL	10
Andrew C. Kirk, WB2C	10
Richard F. Phillips, AE0QH	10
Erica W. Zavaleta, W7WXR	10
Russell L. Bast, Jr., AD2BO	20
James W. Carter, K7IOL	20
Alfred F. Hanzl, K2AL	20

January 2024

George Wayne Moore, W8SUN	20
Congratulations to all of the recipients.	

March 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.

March Qualifying Runs will be transmitted by W1AW in Newington, Connecticut, at the times shown on 1.802.5, 3.581.5, 7.047.5, 14.047.5, 18.097.5, 21.067.5, 28.067.5, 50.350, and 147.555 MHz. The West Coast Qualifying Runs will be transmitted by K6KPH on Saturday, March 23, at 2 PM PDT (2100 UTC) on 3581.5, 7047.5, 14047.5, 18097.5, and 21067.5 kHz. Unless indicated otherwise, sending speeds are from 10 to 35 WPM.

Amateur radio operators who participate in Qualifying Runs may submit proof of 1 minute of the highest speed they have copied in the hope of qualifying for the Certificate of Code Proficiency, or an endorsement to their existing certificate. Legibly copy at least 1 minute of text by hand, and mail the sheet to: W1AW Qualifying Runs, 225 Main St., Newington, CT USA 06111. Include \$10 (check or money order) if this is a submission for your initial Code Proficiency certificate; \$7.50 if you are applying for an endorsement (available for speeds up to 40 WPM). Your test will be checked against the actual transmissions to determine if you have qualified.

Members of the North Fulton (Georgia) Amateur Radio League (<https://nfarl.org>) are offering to subsidize the total cost of a Code Proficiency certificate or endorsement submission for any individual age 21 years and

younger, and who reside in either the US or Canada. Participants who wish to make use of this offer should indicate on their Qualifying Run submissions they are age 21 or younger, and certify as such via their signature. Eligible participants are not required to send any fee with their Code Proficiency submissions.

For more information about Qualifying Runs, please visit www.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 — March 2024

(All times are in Eastern Daylight Time. Blue indicates Eastern Standard Time.)

Monday	Tuesday	Wednesday	Thursday	Friday
	3/5 7 PM – 0000Z (3/6 – UTC) 35 – 10 WPM	3/6 4 PM – 2100Z 10 – 35 WPM	3/7 10 PM – 0300Z (3/8 – UTC) 10 – 40 WPM	3/8 9 AM – 1400Z 10 – 35 WPM
	3/12 10 PM – 0200Z (3/13 – UTC) 10 – 35 WPM	3/13 7 PM – 2300Z 10 – 40 WPM	3/14 9 AM – 1300Z 35 – 10 WPM	
3/18 7 PM – 2300Z 10 – 35 WPM	3/19 9 AM – 1300Z 10 – 35 WPM		3/21 10 PM – 0200Z (3/22 – UTC) 35 – 10 WPM	3/22 4 PM – 2000Z 10 – 40 WPM
3/25 10 PM – 0200Z (3/26 – UTC) 10 – 40 WPM	3/26 7 PM – 2300Z 10 – 35 WPM	3/27 9 AM – 1300Z 35 – 10 WPM	3/28 4 PM – 2000Z 35 – 10 WPM	

Club Station

Keeping Your Club Active with Special Events

Special events are a great way to keep your club active, help your community, and build awareness of your club and its capabilities. In this month's column, Northern Arizona DX Association, W7TB, member Bob Wertz, NF7E, shares some tips for how to put on a successful special event.

The Northern Arizona DX Association has created and conducted many successful special events, including but not limited to Route 66 on the Air (now in its 25th year), Lunar Legacy, Meteor Crater, Pluto Discovery Anniversary 10-Year, the 100th Anniversary of the Grand Canyon National Park, and the Distance Challenge that's held at Quartzfest each year. These special events help bring our club members together as a team, while providing hams of all skill levels with a variety of opportunities for operating.

Your Starting Point

There are a number of things to consider when planning special events. First, you need to come up with an idea that will be interesting to hams and that will help your local community. One way to do this is to go to your city, county, state, or local organizations and find out what they're planning to celebrate throughout the year, including significant historical events and anniversaries that may be coming up. Go to local visitor centers or the Chamber of Commerce and talk to them about upcoming events.

We did this in 2015, when Lowell Observatory in Flagstaff, Arizona, announced they were planning a celebration of the 85th anniversary of the discovery of Pluto and were looking for community involvement in the event. Fellow club member Jack Lunsford, NT7MM, and I attended the observatory's community meeting to see if we could help spread the word about the celebration. They were quite pleased with our willingness to participate, and they offered us a place to operate inside the Pluto Discovery Telescope dome. Not only did we make a lot of contacts at this special event, but after setting up our antennas outside the dome, we had an enormous number of visitors.

When the event was over, we had contacted all 50 states and more than 130 counties. We created a report of our results and gave it to Lowell Historian Kevin Schindler, who said he had no idea we could contact so many seem-



W7TB's special event celebrating the 100th anniversary of the Grand Canyon National Park was set up in the parking lot. This included putting the event banner onto a parked Peterbilt truck that belongs to club member Mickey Meredith, WV4MM.

ingly unreachable places. Lowell Observatory staff were so pleased with our results, they invited us back to participate in their 10-year Pluto Discovery Countdown to its 100th anniversary. This event began in 2021 and will continue every February until 2030. Visit www.nadxa.com/w7p_pluto_2030.html for more information.

The Planning Stage

It's important to give your club at least 6 months to plan a special event. Put together a team of a minimum of three or four club members with various talents, and assign someone to act as a media person who will handle publicity, including notifying QST, QRZ, Facebook, amateur radio groups, radio stations, and newspapers.

Have some banners made for the event that include the special event name and your club name and logo, among other details you may find necessary. We're careful not to



During one of W7TB's special events at the Lowell Observatory, Larry Gilbert, WB7EUJ, explained how contacts are made all over the world using ham radio to many interested visitors.

use exact dates on our banners so that they can be used year after year. You may be able to find a company that will make your banners for free for you; our local Pepsi distributor makes large banners for our events free of charge as a way to support community organizations.

You'll also need to decide where to hold your event. Some of ours are operated on site (like at the Lowell Observatory) or from members' home locations. This gives members the flexibility to operate the event as their time permits; we encourage all of our members to participate.

Including a QSL for your special event is important. If it's handled correctly, you can cover the cost to create the cards by requesting a self-addressed stamped envelope or a minimum donation of \$1 or \$2 to cover postage, envelopes, etc. In most cases, you can recover your cost of printing the QSL card, plus a little extra. All QSL requests are usually answered within 30 days after the event.

Have your QSL cards made up before the event starts, and assign one or two members to handle the QSL requests. Per event, we usually spend about \$50 for 500

cards. If it doesn't increase our mailing costs, we include flyers from the organization we're supporting with our QSL cards. These might share something about the event, the city, or the organization, and are supplied to us.

Post-Event Tasks

Once the event is over, we create a detailed report of the number of contacts we made, including each state and country, as well as any interesting comments we might have received from those contacts that the event organizations would like to hear about. We also like to include some of the QSL cards with the report. Remember, your club may know the results of your efforts, but it's just as important that the community knows, too!

As a thank-you to our local Pepsi distributor for making our banners for free, we send them photos of us using them. This is a great way for the distributor to remember us — and it's good publicity.

Try holding your own local special event! It won't be long before you see that it's a great way to keep your club active and involved, and it will surely bring your club together as a team.

All photos by the author.

Write for "Club Station"

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

ARRL Special Service Clubs

ARRL offers the Special Service Club (SSC) program for clubs that demonstrate that they're working to improve the amateur radio community by completing special projects, holding license classes, and working with local groups on events, among other activities. Visit www.arrl.org/ssc-application for more information about this program. Below is a list of new and renewing SSCs as of December 21, 2023.



New SSCs

All Things ARA, W8ATR Carroll, OH

Renewing SSCs

Police Amateur Radio Team,
WB1GOF Westford, MA

Radio Amateurs of the
Gorge, W7RAG Mount Hood Parkdale, OR
Uniontown ARC, W3PIE Uniontown, PA
Bellbrook ARC, W8DGN Bellbrook, OH
South Bay ARA, KU6S Fremont, CA
Falmouth ARA, K1RK Falmouth, MA

Ham Media Playlist

YL Raisa — Spreading the Joy of Radio Around the Globe

Amateur radio is a worldwide hobby, and Raisa Skryn-
nikova, R1BIG, known as YL Raisa, has traveled far
and wide. In addition to being licensed in Russia as
R1BIG, Raisa is also licensed in Finland as OH7BG,
and in Canada as VO1BIG. She was first exposed to
the wonderful world of radio by way of an amateur radio
direction finding contest, which sparked her interest
and inspired her to try other forms of amateur radio.

A World of Inspiration

Raisa was fortunate to have had great mentors on
her journey. Jukka Heikinheimo, OH2BR; Boris
Gnusov, UA1DJ/OH5Z, and Alex Sheynis, UA1AJD,
helped her explore amateur radio and study for her first
license test. Raisa's first operating experience was as a
second operator of the OH73ELK station in Finland.
The contacts she made and the way the radio worked
fascinated her, reinforcing her desire to get her own call
sign. Raisa passed her Novice exam in Russia and
was issued the call sign UB1AOA. She later upgraded
and got her current call sign,
R1BIG. Raisa also obtained her
Canadian license so she could
operate a remote station there from
her home in Russia.

Raisa lives in St. Petersburg, Rus-
sia, and experiences the same
struggle many hams face: she lives
in a 27-story building with plenty of
interference. Raisa compares it to
a hive of bees constantly buzzing.
As a result of this, she likes to oper-
ate outdoors when the weather is
agreeable, or from friends' shacks
when it's too cold. When neither of
those options is available, she has
the opportunity to work remotely
from Canada, thanks to Rob
Noakes, VE3PCP.

Videos with a Flair for Education

When Raisa joined YouTube in November 2018, she
had no idea how popular her channel would become.
The first few videos she posted were about the process
of getting licensed, then she jumped right into the con-
test scene. In her video, "Ham Radio Contest – My
First!" (<http://tinyurl.com/Raisa-contest>), Raisa
heads back to OH73ELK and works with the team
there to participate in her first contest. The team racked
up 1,000 contacts — Raisa was hooked.

Raisa creates several types of videos for her channel.
She films most of them while operating portable, due to
her not having a shack in her home. While Raisa's
content undergoes editing after filming, she usually
includes snippets of her preparing to film, letting view-
ers see her personality and get a sense of how much
fun she's having in the field. One such video is titled
"How a YL can set up a portable HF station in the Rus-
sian woods" (<http://tinyurl.com/2pmucmhy>), where



Raisa and OH73ELK contest team members celebrate completing 1,000 contacts during a CQ World Wide WPX contest.



Raisa connected with Haruka, JJ1ROE, to practice the Japanese pronunciation of common answers to questions that might be asked on the air. In this photo, Haruka teaches Raisa how to say “Your report is five and nine” in Japanese.

we see Raisa quickly explain what gear she’s using, then go through the process of getting the antenna in the air. The fact that she’s enjoying herself is obvious, as she jokes with us through the camera. To wrap up this video, we get to see Raisa make some contacts with another YL.

In her video “Ham Radio Ladies – how to invite More YL Operators to join Amateur Radio!” (<http://tinyurl.com/Raisa-yl>), Raisa discusses the issue of there being so few women on the air. She lets viewers, especially women and girls, know that the barrier of entry is not difficult. She also explains that amateur radio helps her learn geography and other languages. In one of the few parts of her video that’s not in English, Raisa shares some of the contacts she has had with other YLs.

Raisa enjoys helping others learn. In a video titled “CQ Japan! QSO tutorial in Japanese | YL Haruka teaches YL Raisa” (<http://tinyurl.com/Raisa-Haruka>), Raisa connects with Haruka, JJ1ROE, in Japan to learn some basic Japanese phrases. Viewers get to see them practicing the pronunciation of common answers to questions that might be asked on the air. This video ends with getting to know Haruka through a video montage that shows some of her other interests. Raisa’s favorite type of video to create is one that has an instructional component to it.

YouTube Content Motivation

Much of Raisa’s reason for creating her YouTube channel was due to the realization that there are far fewer women on the air than men. Raisa focuses her efforts on helping other women understand the opportunities

that are available to them in amateur radio; she is passionate about getting more women and girls interested and engaged in the hobby.

YL Raisa is developing naturally and organically; however, it would be unfair to say that there aren’t any struggles. Despite not being a native English speaker, Raisa creates all of her content in English. She does this because English is the language of international communication among radio amateurs. However, some of her compatriots criticize her for not using her native language to create content. Raisa spoke very little English when she began creating videos, but she

uses her content creation as a means and motivation to continue learning it.

Community Enjoyment

Raisa has many amateur radio dreams and aspirations. She wishes to go on a DXpedition, travel to the US to attend Dayton Hamvention, and meet some of her on-air friends in person. Raisa is usually the only YL in the room when attending club meetings, but has found that members are extremely supportive and willing to help grow the ranks of women and girls in amateur radio.

YL Raisa has built a YouTube following of approximately 15,000 subscribers. You won’t see unboxing videos or reviews; instead, Raisa focuses on sharing the joy she gets from being a part of the amateur radio community. If you’re looking for a channel where you can watch some feel-good videos about ham radio, YL Raisa is the channel for you.

Strays

QST Congratulates...

Don Keith, N4KC, on publishing his 40th and 41st books. His book *Snapshot* from the *Hunter Killer* series, co-written with George Wallace, came out in May 2023. This is the eighth book in the military thriller series. His other book, *Richard Bong: America’s #1 Ace Fighter Pilot of World War II*, was released in June 2023. This book tells the true story of a young Army Air Forces pilot who shot down more enemy aircraft in World War II than anyone else. These books, and others that Don has written, are available to purchase from his website at www.donkeith.com. Check out Don’s ham radio website at www.donkeith.com/n4kc.

How's DX?

FT#G — The Glorioso Islands

The Glorioso Islands are a France-administrated archipelago located about 200 kilometers (124 miles) northwest of Madagascar (5R) and about 341 kilometers (212 miles) east of the Comoros (D6). Grande Glorieuse, the largest island in the archipelago and site of a 1,300-meter (4,265-foot) airstrip, is about 3 kilometers (1.9 miles) in diameter, and its highest elevation point is roughly 12 meters above sea level. Île du Lys is located around 8 kilometers (5 miles) northeast of Grande Glorieuse and is about 600 meters (1,969 feet) in diameter. The archipelago also has multiple rock islets, including the Wreck, South, and Verte Rocks.

Frenchman Hippolyte Caltaux started a coconut plantation on Grande Glorieuse in 1880. In 1892, France claimed the Glorioso Islands, which would later become part of Mayotte. Throughout the early to mid 1900s, companies based in Seychelles (S7) utilized the islands for natural resources. The islands currently feature a permanent meteorological station manned by the Foreign Legion Detachment in Mayotte; the station is vital to forecasting cyclones in the area.

DXCC History

The Glorioso Islands were not on the original postwar DXCC list. However, the June 1963 "How's DX?" column announced the addition of the Gloriosos, qualifying contacts made on or after June 25, 1960. It was added under the old separation rule, as Madagascar separated the Gloriosos from its parent, Réunion Island (FR). The first accredited operation from the archipelago was FR7ZC/G in April 1963. It was conducted by Gus Browning, W4BPD, days after his Tromelin Island (FR7ZC/T) operation. Browning was booked on a DC-3 flight from Tromelin to Madagascar to "catch a boat to the Glorioso Islands," reported Don Chessner, W4KVX, in the April 1963 issue of *The DX Magazine*.

During the 1960s, 1970s, 1980s, and 1990s, there were as few as three and as many as seven Glorioso DXpeditions per decade. Most operations were conducted by radio technicians who happened to be hams, and they went on the air only in their spare time. Perhaps the



most significant operation around this time was in April 1980 by a German DX team that included Ann Hannappel, DF3KX; Baldur Drobica, DJ6SI; Gero, DJ3NG; Hans Hannappel, DK9KX, and Wilfried, DJ5RT. They used the call signs FR0ACB, FR0ACC, and FR0RX.

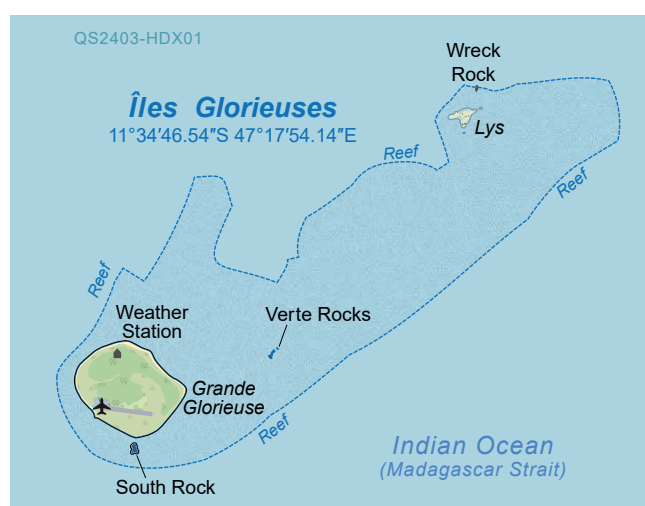
In 2005, the call sign prefix for all of the French Scattered Islands in the Indian Ocean, which include the Gloriosos, Tromelin, Juan de Nova, Europa, and Bassas da India, changed from FR to

FT. The islands are under the authority of the French Southern and Antarctic Lands (TAAF).

The FT prefix was first used in September 2009 with the FT5GA DXpedition by French operators Bernard Jung, F5LPY; Yves Collet, F5PRU; David Bonnet, F8CRS; Freddy Laigu, F5IRO, and Philippe Koch, F4EGS. They made about 50,549 contacts, and 15,254 of them were unique call signs. The Glorioso Islands currently rank number seven on Club Log's DXCC Most Wanted List, and on the west coast of North America, they are number two.

Upcoming Glorioso DXpedition

In June 2023, Marek, FH4VVK, announced a fall 2023



A map of the Glorioso Islands, also known as Îles Glorieuses. As of press time, the archipelago ranks number seven on Club Log's DXCC Most Wanted List.

one-man DXpedition to the Gloriosos as FT4GL. An official announcement was expected at the 2023 International Amateur Radio Exhibition, HAM RADIO, in Friedrichshafen, Germany, but Marek has been awaiting approval from the French government. He set up an X account, @FT4GL, in the meantime. Two of his supporting team members will be David Bonnet and Freddy Laigu from the last Gloriosos DXpedition, as well as Jean-Marc Vigier, F5RQQ. In late October 2023, Marek announced that the FT4GL operation was postponed due to incompatible scheduling with a TAAF advisory committee that oversees the Gloriosos. Marek's team is now targeting March 2024 for their DXpedition, and they "will keep the DX community informed."

With the Glorioso Islands being so rarely on the air, it's best for DXers to be aware of all potential operations. Keep an eye on FT4GL's QRZ web page at www.qrz.com/db/ft4gl, or your favorite DX news outlet, for further updates.

DX News from Around the Globe

ZK3 — Tokelau

In late November 2023, experienced DXpeditioner Hrane Milosevic, YT1AD, announced that he will once again lead a team to Tokelau, this time in February 2024. Tokelau is currently number 48 on Club Log's DXCC Most Wanted List. The last operation there was ZK3A in October 2019, which was also conducted by Hrane and his team. They will also be in Fiji (3D2AD) and Samoa (5W8A) around that time, but emphasis will be on ZK3M — and possibly ZK3A — between February 7 and March 1. Hrane's 2024 team will include Milos Simeunovic, YT3M; Krassimir Petkov, K1LZ; Velimir Deric, K3JO; Stevan Stepanov, YU3AA; Serge Shalya, R7KW; Chris Dimitrijevic, VK3FY; Manu Siebert, LU9ESD; Anatoly Polevik, RC9O, and Olya, UA9OYL. When he made the announcement, Hrane was looking for up to four more operators. Visit Hrane's DXpedition web page (www.yt1ad.info/dxped.html) or your preferred DX newsletter for updates.

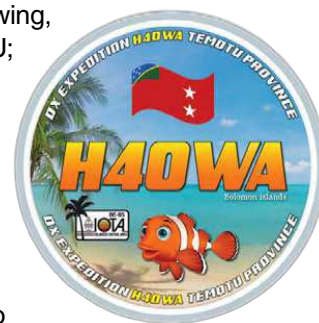
TY — Benin

Luc Thibaudat, F5RAV; Abdel Mesbah, 7X2TT (M0NPT), and Gerard, F5NVF, have operated multiple times as C5C from The Gambia. This time, they are planning to operate as TY5C from Cotonou, Benin, on March 1 – 30, 2024. Activity will be on the HF bands as well as QO-100 and other satellites on CW, single sideband (SSB), and FT8. The team hopes to help resident operators get on the air and support the local ham station, TY0HQ. You can QSL via Luc. For more information and updates, keep checking the DX bulletins and the TY5C QRZ web page at www.qrz.com/db/ty5c.

H40 — Temotu Province

Rob Fanfant, N7QT; Paul Ewing, N6PSE; Scott Jasper, NE9U; Jay Slough, K4ZLE; Jay Lopes, AC7DC; Bruce Bern, K3NQ; Don DuBon, N6JRL, and David Flack, AH6HY, are heading to Lomlom, Temotu Province.

They plan to be active as H40WA from February 22 to March 7. H40 currently ranks number 43 on Club Log's DXCC Most Wanted List. The H40WA team will "make a significant effort on the low bands during this activation." This effort will include running 1.5 kW on 80 and 160 meters, and they'll use CW, SSB, and FT8 via Fox and Hound. They will not use MSHV. For more details, check their website at www.intrepid-dx.com/h40wa.



JD1/M — Minami Torishima

There are two DXCC entities designated JD1: the Ogasawara Islands (sometimes referred to as the Bonin Islands) and Minami Torishima (also known as Marcus Island). The Ogasawara Islands are easily accessible from mainland Japan, and they have a collective population of more than 2,000 people, including several hams. On the other hand, Minami Torishima is accessible only to the Japan Meteorological Agency — with some exceptions. Take Kanno, JG8NQJ, works on a rotating schedule at the weather station on Minami Torishima. He will be there from mid-January to mid-April 2024, operating in his spare time as JG8NQJ/JD1. The island is number 34 on Club Log's DXCC Most Wanted List. Take can be found almost exclusively on CW, with some occasional FT8. His typical modus operandi is operating between 0700Z and 1000Z during the weekdays, and then occasionally around 2100Z – 2300Z during weekends. He will be running 50 W from an Icom IC-706 and an HB9CV antenna for 18 and 21 MHz. You can QSL via Susumu "Sin" Sanada, JA8CJY, and Logbook of The World.

Wrap-Up

That's it for this month, with special thanks to Sin, JA8CJY; Paul, N6PSE; Rob, N7QT, and Hrane, YT1AD, for helping with this month's column. Watch your favorite DX news outlet for any updates to these DXpeditions. Don't forget to send your DX news, photos, and club newsletters to bernie@dailydx.com. Until next month, see you in the pileups! — Bernie, W3UR

The World Above 50 MHz

Possible Best New Zealand Opening of Solar Cycle 25



On 50 MHz, there was a strong and widespread opening from North America to New Zealand in the evening on December 2, 2023; it was one of the best openings of its kind so far during Solar Cycle 25. From Kansas, Larry Lambert, NØLL (EM09), worked 23 stations in New Zealand between 2324 UTC on December 2 and 0237 UTC on December 3. K1HTV had a single decode of ZL1AKW giving a report to KBØNAV. John Lock, KFØM (EM17), worked eight New Zealand stations and copied a total of 15. John noted that ZL1RS, ZL1RQ, and ZL1AKW had the most consistent signals, but he did not copy any other South Pacific DX locations, such as Australia. AAØMZ (EM29) said it was “a great ZL opening.” Paul Sobon, NOØT (DM88), worked many New Zealand stations while running only 80 W and a six-element loop-fed array (LFA) Yagi elevated 50 feet. KFØM observed that a well-situated sporadic-E cloud over the DM grids provided the link to New Zealand.

XV9T 50 MHz EME Activity

One of the most demanding modes in amateur radio is 6-meter Earth-Moon-Earth (EME). Eddy, XV9T, is now on 50 MHz EME from Vietnam and CQ zone 26. Eddy

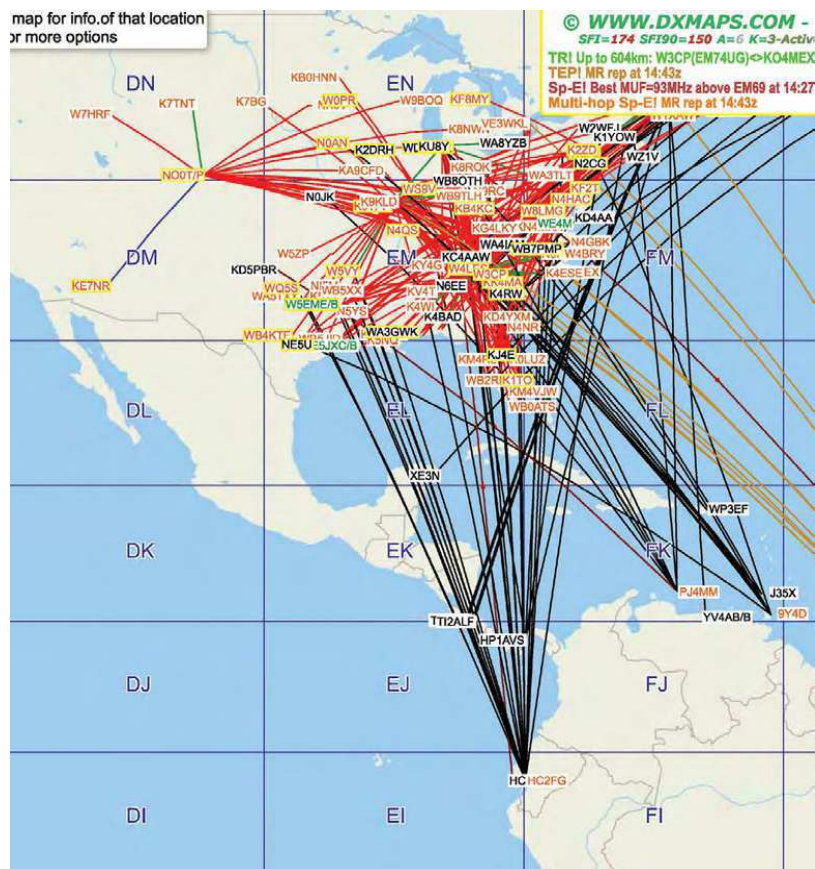
uses an eight-element LFA InnovAntennas Yagi up 11 meters with low-loss feed line. Even more notable is the fact that he is an almost totally blind amateur radio operator. However, Eddy has some limited central vision with the help of a 20X loupe, enabling him to use *WSJT* on FT8 and Q65. Tim Blank, NØTB, was instrumental in getting Eddy set up on EME, as he used *TeamViewer* to install *WSJT* on his computer. Eddy now uses a variation of *WSJT* known as *WSJT-Z*, which is a GNU-licensed clone of *WSJT-X*. It has a modified user interface and automated features. Eddy is usually operating during moonrise because there is local noise during moonset at his location. His station is on a hilltop with a negative horizon at -0.4 degrees. NØTB copied Eddy before his local moonrise. Eddy worked K2ZD, NØTB, N9IW, N7IP, W6UC, and others. W7GJ and KJ9I worked XV9T in 2010. K2ZD said XV9T was his 6-meter DXCC contact #225.

On the Bands

50 MHz. The winter sporadic-E season was disappointing throughout December 2023, but a few notable openings took place. On November 30, Rich, K1HTV (FM18), reported that Wynand, V51WW, was in for him at around 1635 UTC. Additionally, W3IP and K4SO worked V51WW. Rich exchanged emails with Wynand, who said V51JH copied many North American stations that Wynand could not. A coronal mass ejection impact occurred on December 1. Steve Sacco, NN4X (EL98), had a strong opening to Western Europe, while K1HTV worked LA3MHA via skew path. Nelson, KD2CYU (FN20), worked stations in Portugal and the Canary Islands, as well as LA3MHA, F1MXE, and J35X between 1300Z and 1600Z. Mike White, K7ULS (DN41), worked TI5KLH and TI2CC. On December 2, K1HTV had “five decodes on 4X4DK.” Ron Todd, K3FR (FM18), worked three stations in Cuba, including CO7MS (FL01), with his indoor antenna! Larry Lambert, NØLL (EM09), had stations in Hawaii in at 2120Z. Mike, W3IP, copied KH6HI (BL01). Larry copied WØVTT on aurora CW, and KD2CYU picked up V51MA and V51WW. In Europe, KD2CYU worked DK1MAX in addition to stations in

UTC	dB	DT	Freq	Message
1417	-24	2.8	1672	XV9T W6UC DM05
1419	-25	2.8	1670	XV9T W6UC DM05
1421	-23	2.9	1670	XV9T W6UC R-27
1423	-25	2.9	1670	XV9T W6UC 73
1423	-32	2.8	1523	XV9T K2ZD FN21
1427	-21	2.9	1573	XV9T N9IW EN65
1431	-19	2.9	1573	XV9T N9IW R-22
1433	-22	2.9	1573	XV9T N9IW 73
1441	-29	2.8	1523	XV9T K2ZD R-29
1451	-24	3.2	1858	XV9T N7IP CN85
1453	-32	3.2	1861	XV9T N7IP R-28

Eddy Visser, XV9T, worked many stations during the last week of December 2023. [Lance Collister, W7GJ, photo]



A DX Maps screenshot for 50 MHz, taken on December 24, 2023. [www.dxmaps.com]

Spain and Sardinia, Italy. In the morning on December 3, I, N0JK, was in Key West (EL94). While using a dipole, I copied CO2QU (EL83) via tropospheric propagation at around 1430Z.

The Geminid meteor shower was beneficial for many operators on 6 meters. N0LL operated from EN01 and EN20 on the 6-meter band; he made 22 contacts from EN01 and 43 from EN20. His best meteor-scatter DX was K1SIX (FN43) while he was in EN20, as their stations were roughly 2,000 kilometers apart. The Geminids were predicted to peak on December 14, but the peak seemed to occur a day later for Larry.

On December 18, N0LL decoded ZL7DX 10 times at around 2200 UTC. Larry was away from the radio at that time. He noted that ZL7DX worked N0PB (EM39) and N0LWF (EN10). NO0T (DM88) also copied ZL7DX and worked four New Zealand stations, as well as HC2FG. In the evening on December 18 and 19, there was a strong winter E_s opening for the midwest states. N7BHC (EL15) and other Texas stations were in strong. I, N0JK (EM28), logged XE2YWH (DL92) at 0250Z. There was also E_s to south Texas and Mexico on December 23, as

NA5C and XE2X (EL06) were in to my location. There was a combination of F2 and E_s on December 24. PJ4MM (FK92) and HC1MD/2 (EI97) were in for me at 1420Z, followed by KK4MA (EM93) on E_s at 1433Z. KD2CYU said, "Santa brought us some DX," on December 24. He logged HP1AVS, various stations in Ireland, F4VPC, IW3IFJ, and VE1PZ. K3FR copied HP1AVS, and K3SWZ (FN22) worked ZL1RS at 2347Z. K5QE (EM31) reported making 40 6-meter contacts during the ARRL EME Contest.

144 MHz. Ron Klimas, WZ1V (FN31), made aurora contacts on 2-meter CW with K9MU (FN44) and W0ZQ (EN34) on December 2, 2023. Steve, NN4X (EL98), was successful on 2 meters during the Geminids meteor shower. He worked 25 stations via MSK144 on December 13 – 14, and he said many hams in the ON4KST chat commented on the favorable conditions. Steve's best DX was VE3DS (FN03) at a distance of 1,698 kilometers, which led him to observe the north – south path preference for the Geminids. He copied — but did not work — N0PB (EM39).

1296 MHz. Alex, CT9/EA8DBM, was active on 23-centimeter EME from Madeira Island on November 19 – 27, 2023. He said, "I used a 1.8-meter folding dish with reflective material made of fabric and a 200 W solid-state power amplifier. I made 65 initials and 85 total contacts." K5QE (EM31) made 116 contacts in 46 grids during the ARRL EME Contest. Pete Sias, N0OY (EM18), made 12 contacts via EME in December 2023 with 30 W and a 28-foot parabolic dish antenna.

Here and There

James, 9V1YC, received a 2-day experimental license to test on 6 meters on January 2, 2024. If there was no interference to government services, the experimental license may have been extended.

Locals, rovers, and portable EME stations operating from New Mexico on 432 and 902 MHz should be aware of power restrictions on those bands. There are 902 MHz "quiet zones" around the White Sands Missile Range, and there is a power restriction of 50 W on 902 MHz within 150 miles of the range. There is also a statewide power limit of 50 W on 70 centimeters in New Mexico. These restrictions are covered in part 97 of the FCC rules.

Convention and Hamfest Calendar

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

Abbreviations

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

Arizona (Phoenix) — Mar. 2 **D F H Q R T V**

7 AM – 11 AM. *Spr*: Arizona Red Cross Communications Club, Arizona ARC, Amateur Radio Council of Arizona. DeVry University, 2149 W. Dunlap Ave. *TI*: 147.280 (162.2 Hz). *Adm*: \$5. www.k7arc.org

Arizona (Tucson) — Apr. 6 **D F H Q R T**

6 AM – 11 AM. *Spr*: Radio Society of Tucson. Calvary Tucson Church, 8711 E. Speedway Blvd. *TI*: 147.160 (141.3 Hz). *Adm*: Free. www.k7rst.club/2023/10/tucson-spring-hamfest-saturday-april-6-2024

Arkansas (Dardanelle) — Mar. 2 **D F H Q R S T V**

8 AM – 3 PM. *Spr*: Arkansas River Valley Amateur Radio Foundation. Dardanelle Community Center, 2059-2099 State Hwy. 22. *TI*: 146.82 (131.8 Hz). *Adm*: \$10. www.arvarf.com

Connecticut (Southington) — Apr. 7 **D F H V**

7 AM – noon. *Spr*: Southington ARA. Southington High School, 720 Pleasant St. *TI*: 147.345 (151.4 Hz) and 444.200 (151.4 Hz). *Adm*: \$7. Email: k1hsn@cox.net

ARRL SOUTHERN FLORIDA SECTION CONVENTION

March 16, Stuart, Florida

D F H Q R S T V

8 AM – 2 PM. *Spr*: Martin Co. ARA. Martin Co. Fairgrounds, 2616 SE. Dixie Hwy. *TI*: 147.060 (107.2 Hz). *Adm*: Free. www.stuarthamfest.com

Illinois (Dixon) — Mar. 17 **D F H V**

7:30 AM. *Spr*: Sterling Rock Falls ARS. Sauk Valley Community College Gym, 173 IL Rte. 2. *TI*: 146.850 (113.8 Hz). *Adm*: \$8 Advance, \$10 door. Email: w9mepclub@hotmail.com

Illinois (Godfrey) — Mar. 23 **D F H S V**

7 AM – noon. *Spr*: Lewis and Clark Radio Club. Lewis and Clark Community College, 5800 Godfrey Rd. *TI*: 145.230 (79.7 Hz). *Adm*: \$4 Advance, \$5 door. www.k9ham.org/hamfest

Indiana (Brazil) — Mar. 30 **F H R**

8 AM – noon. *Spr*: Wabash Valley ARA, Inc. Clay Co. 4-H Fairgrounds, 6550 N. IN-59. *TI*: 146.685 (151.4 Hz). *Adm*: \$10. www.w9uuu.org/hamfest/hamfest_2024.pdf

Iowa (McClelland) — Mar. 2 **D F H R**

8 AM – noon. *Spr*: SW. Iowa ARC. McClelland Town Hall, 117 Main St. *TI*: 442.225 (136.5 Hz). *Adm*: \$5. www.swiradio.org

Michigan (Kalamazoo Township) — Mar. 9 **D F H V**

8 AM – noon. *Spr*: Southern Michigan ARS. Wings Event Center, 3600 Vanrick Dr. *TI*: 147.000 (94.8 Hz). *Adm*: \$8. www.w8df.com/hamfest

Minnesota (Buffalo) — Mar. 23 **F H Q R V**

8 AM – noon. *Spr*: Maple Grove Radio Club. Buffalo Civic Center, 1306 Co. Rd. 134. *TI*: 147.000 (114.8 Hz). *Adm*: \$10. Email: k0ltc@k0ltc.org

Missouri (Mount Vernon) — Mar. 23 **D F H R S V**

8 AM – 1 PM. *Spr*: Ozark ARS. The MARC, 822 W. Mt. Vernon Blvd. *TI*: 146.970 (162.2 Hz). *Adm*: \$10 Advance, \$15 door. www.w0oar.com

New Hampshire (Hampton) — Apr. 6 **F H R T V**

8 AM – noon. *Spr*: Port City ARC. St. James Masonic Lodge, 77 Tide Mill Rd. *TI*: 145.150 (127.3 Hz). *Adm*: \$5. www.w1wqm.org

New Hampshire (Henniker) — Mar. 17 **D F H R S V**

8 AM – 2 PM. *Spr*: Contoocook Valley Radio Club. Henniker Community School Cafetorium, 51 Western Ave. *TI*: 146.895 (100 Hz). *Adm*: \$5. www.k1bke.org

ARRL ROANOKE DIVISION CONVENTION

April 6, Raleigh, North Carolina

D F H Q R S V

8 AM – 3 PM. *Spr*: Raleigh ARS. Jim Graham Building, 4285 Trinity Rd. *TI*: 146.640. *Adm*: \$11 Advance, \$13 door. www.rarsfest.org

Ohio (Perrysburg) — Mar. 17 **D F H R S V**

8 AM – 2 PM. *Spr*: Toledo Mobile Radio Association. Owens Community College, 30335 Oregon Rd. *TI*: 147.87 (103.5 Hz). *Adm*: \$10. www.w8hhf.org

Pennsylvania (Elizabeth) — Apr. 7 **D F H R V**

8 AM – noon. *Spr*: Two Rivers ARC. Elizabeth VFD Bingo Hall, 101 S. 1st Ave. *TI*: 147.12 (131.8 Hz). *Adm*: \$5. www.trarc.net

Pennsylvania (Greensburg) — Mar. 9 **D F H R T**

8 AM – 1 PM. *Spr*: Westmoreland Emergency Amateur Radio Service. Greensburg Masonic Lodge, 349 Donohoe Rd. *TI*: 147.180 (131.8 Hz). *Adm*: \$5. www.wc3ps.org

South Carolina (Batesburg-Leesville) — Apr. 6 **T**

8 AM – 1 PM. *Spr*: Ridge ARC. Shealy's Bar-B-Que parking lot, 340 E. Columbia Ave. *TI*: 147.255 (123.0 Hz). *Adm*: Free. www.w4rrc.org

Tennessee (Sevierville) — Mar. 16 **D F H R S T**

8 AM – 2 PM. *Spr*: Sevier Co. ARS. Sevier Co. Fairgrounds, 754 Old Knoxville Hwy. *TI*: 146.940. *Adm*: \$5. www.seviercountyars.com

Tennessee (Trenton) — Mar. 16 **D F H R T V**

8 AM – 2 PM. *Spr*: Area Wide ARA. National Guard Armory, 1460 Industrial Park Dr. *TI*: 146.865 (127.3 Hz). *Adm*: \$5. Email: hcArc.na8x@gmail.com

Texas (Irving) — Mar. 2 **D F H R V**

8 AM – 2 PM. *Spr:* Irving ARC. Betcha Bingo Hall, 2420 W. Irving Blvd. Ste. 125. *Tl:* 146.720 (110.9 Hz). *Adm:* \$5. www.irvingarc.org

ARRL WEST TEXAS SECTION CONVENTION

March 16, Midland, Texas

D F H Q R S V

8 AM – 4 PM. *Spr:* Midland ARC. MLK Community Center, 2300 Butternut Ln. *Tl:* 147.300 (88.5 Hz). *Adm:* Free. www.hamfest.w5qgg.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 **April 1** to be listed in the **June** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's website for possible late changes, driving directions, and other event details. Please note that postal regulations prohibit mention in QST of games of chance, such as raffles or bingo.

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

Write for QST

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

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

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

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

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

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

Strays

Paul Wesling, KM6LH, gave a talk to the West Valley Amateur Radio Association, W6PIY, titled “The Origins of Silicon Valley: Roots in Ham Radio,” at one of their meetings. His talk described the early days of ham radio and how those activities (and people) led to Silicon Valley. The technology development and innovation he described began in 1909, and led to TransPacific Communications, the nation's first scheduled broadcast, Eitel-McCullough tubes, klystrons, microwave radar, the silicon transistor, ICs, venture capital, the internet, new management practices, and more. This talk was a version of the Institute of Electrical and Electronics Engineers (IEEE) Distinguished Lecture that Paul, an IEEE Life Fellow, gave at the ARRL Centennial Convention and has given to audiences around the world.

You can view the video of the presentation at www.youtube.com/watch?v=dHS4xj3k9CA.



Apple Co-Founder Steve Wozniak, then WA6BND (left), and Paul Wesling, KM6LH (right), at Silicon Valley's West Valley Amateur Radio Association meeting. [Paul Wesling, KM6LH, photo]

Special Event Stations

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

Feb. 15, 0000Z – 2359Z, K2C, Brooklyn, NY. **Childhood Cancer Awareness Day**. 21.375. QSL. James Gallo, 149 Marine Ave. 6F, Brooklyn, NY 11209. www.qrz.com/db/k2c

Feb. 17, 1500Z – 1900Z, N4HLH, Sullivan's Island, SC. Trident Amateur Radio Club. **H.L. Hunley Submarine Special Event Station — N4HLH 2024**. 7.117 7.262 14.262 28.462. QSL. N4HLH/Trident Amateur Radio Club, P.O. Box 60732, North Charleston, SC 29419. www.tridenthams.org/hl-hunley

Feb. 17, 1500Z – 2100Z, WØARC, Washington, IA. Washington Area Amateur Radio Club, Inc. **Washington's Birthday Celebration**. 7.071 7.200 14.071 14.275 21.074 21.310 28.071 28.350. QSL. Mark Lukins, ABØDX, 802 N. 2nd Ave., Washington, IA 52353. *Look for us on DX Summit*. www.waarc.net

Feb. 22, 1600Z – 2359Z, NI6BB, San Pedro, CA. Battleship Iowa Amateur Radio Association. **Battleship Iowa's 81st Anniversary Celebration On the Air**. 40, 30, 20, 17, 15, 12, and 10 meters. QSL. See website for QSL information. w6hb@biara.org or www.biara.org

Mar. 8, 0000Z – 2359Z, your call, any POTA park (or hunt POTA from home). Young Ladies Radio League. **International Women's Day YL POTA Party**. All modes and any frequency within your license class. QSL. QSL available from operator contacted. *This is a world-wide event. Submit POTA activations to the POTA database*. www.ylrl.net

Mar. 8 – Mar. 10, 1500Z – 0300Z, K4L, Sevierville, TN. American Legion Post 104 Amateur Radio Club (AL4US). **American Legion 105th Birthday**. 20 and 40 meters; 7.250 14.250. Certificate. AL4US, 403 W. Main St., Sevierville, TN 37864-4242. E-certificate available with a valid email address. www.tnpost104.org/al4us

Mar. 9, 1700Z – 2359Z, NI6IW, San Diego, CA. USS Midway Museum. **Commemorating the Launch of USS Midway**. 7.250 14.320; 14.070 PSK31, D-STAR on PAPA System repeaters. QSL. USS Midway Museum COMEDTRA, 910 N. Harbor Dr., San Diego, CA 92101. www.qrz.com/db/ni6iw

Mar. 9 – Mar. 10, 1800Z – 0300Z, N3APS, Orinda, CA. Expatriate Marylanders Radio Club. **120th Anniversary of the Adoption of the Current Maryland Flag**. 14.320 21.440 28.440. QSL. M.G. Vurek, P.O. Box 617, Orinda, CA 94563. www.qrz.com/db/n3aps

Mar. 12 – Mar. 14, 1400Z – 2100Z, W4LX, Fort Myers, FL. Fort Myers Amateur Radio Club. **Commemorating Buckingham Army Airfield**. 14.240 21.350 28.340. Certificate & QSL. FMARC, P.O. Box 061183, Fort Myers, FL 33906. www.fmarc.net

Mar. 14, 0000Z – 2359Z, N3P, Burlington, NJ. David Sarnoff Radio Club. **Pi Day**. 7.031 7.227 14.031 14.314. QSL. Donald Corrington, 7 Pinewald La., Burlington, NJ 08016-3421. www.n2re.org

Mar. 15, 1600Z – 2200Z, AF4CB, Cartersville, GA. Carl Boyd Post 42 American Legion Amateur Radio Club. **Celebrating the 105th Birthday of the American Legion**. SSB: 7.242 14.342; FT8: 7.074 14.074. QSL. Joel Myers, 513 Cassville Rd., Cartersville, GA 30120. www.post42cartersvillega.org

Mar. 15 – Mar. 16, 2100Z – 2100Z, K4KDJ, Blacksburg, VA. Virginia Tech Amateur Radio Association. **100 Year Anniversary**. 7.150 7.220 14.256 14.340. QSL. Virginia Tech Amateur Radio Association, 290 College Ave., Blacksburg, VA 24060.

Mar. 16, 1400Z – 2000Z, W4BKM, Macon, GA. Macon Amateur Radio Club. **Cherry Blossom Special Event Station**. 7.225 14.240. Certificate. Macon Amateur Radio Club, P.O. Box 4862, Macon, GA 31208-4862. www.maconamateurradioclub.wordpress.com

Mar. 16, 1400Z – 2000Z, N4SRC, Kissimmee, FL. Solivita Radio Club. **16th Anniversary Solivita Car Show**. 14.255 28.435. QSL. Solivita Radio Club, 307 Bell Tower Crossing W., Kissimmee, FL 34759. www.solivitaradioclub.weebly.com

Mar. 17 – Mar. 23, 0100Z – 2359Z, W1G, Wheelwright, MA. GERATOL WAS Net. **50th Anniversary**. 40 meters SSB; 3.668. QSL. Kevin Lynch, P.O. Box 124, Wheelwright, MA 01094. n1kl@arrl.net

Mar. 23 – Mar. 24, 1600Z – 0000Z, N6A, Amargosa Valley, NV. Ham Radio Outlet Anaheim. **Baker to Vegas Relay Race for Law Enforcement**. 7.225 14.225. QSL. Glenn Arrant, 14723 Puma Trl., Valley Center, CA 92082.

Mar. 23 – Mar. 24, 1700Z – 0100Z, VC3GB, Owen Sound, ON. Georgian Bay Amateur Radio Club. **Celebrating 50 Years as a Club**. 14.263. QSL. Georgian Bay Amateur Radio Club, 142 Paradise Bay, Annan, ON N0H 1B0, Canada. www.gbarc.ca

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

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

ARRL VEC Volunteer Examiner Honor Roll



The ARRL VEC Honor Roll recognizes the top 10 Volunteer Examiners in each ARRL Division according to the total number of ARRL exam sessions in which they have participated since their accreditations. Considering each session requires an average time commitment of 2 to 4 hours or more, the thousands of hours these VEs have invested represent extraordinary dedication! Whether you are one of our VE Teams that tests once a week, once a month, or once a year, we want to express our warmest appreciation to all volunteers for your generous contribution to the ARRL VEC program.

If you are an ARRL VE, you can view your session stats online at www.arrl.org/ve-session-counts.

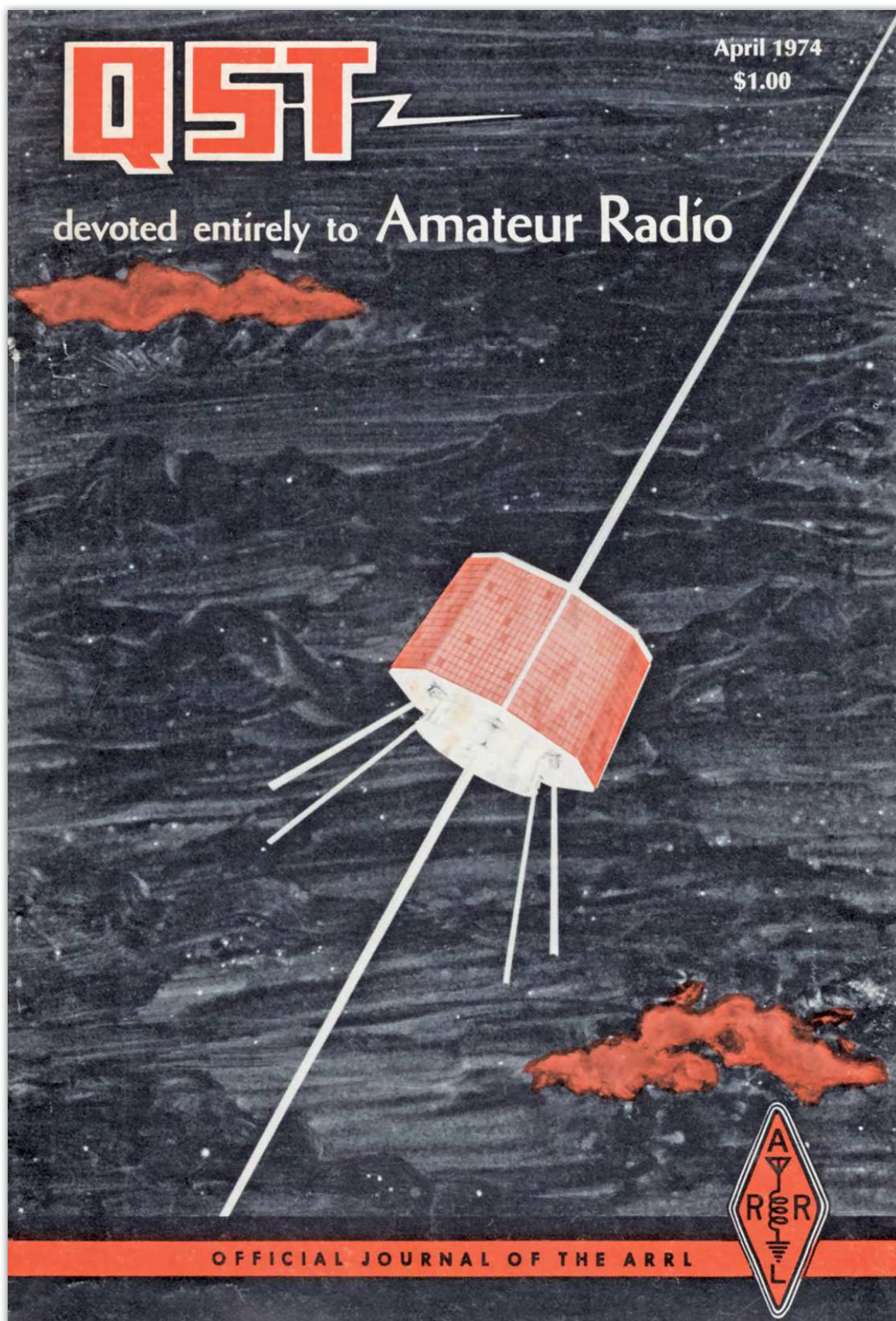
If you are not a VE, become one today! See www.arrl.org/become-an-arrl-ve.

Volunteer Examiner	Sessions	Accreditation Date	Volunteer Examiner	Sessions	Accreditation Date	Volunteer Examiner	Sessions	Accreditation Date
Atlantic			Hudson			Roanoke		
James McCloskey, NS3K	345	14-Nov-94	Paul Maytan, AC2T	747	06-Sep-84	Judy Friel, AC4RG	317	01-Feb-91
Jobst Vandrey, AC0LP	324	23-Jun-08	Alan Crosswell, N2YKG	511	26-Oct-94	Alan Ronald Moeck, WA2RPX	264	27-Sep-94
George Brechmann, N3HBT	310	01-Apr-91	Fritz Boigris, KB2O	496	26-Oct-84	David Snyder, W4SAR	253	01-May-93
Edward Genoino, WA2NDA	298	10-Jul-85	Sid Markowitz, K2GG	448	27-Sep-94	Terry Sanner, WV8V	251	06-Sep-84
Cully Phillips, N3HTZ	223	01-Sep-91	John Kiernan, KE2UN	311	01-Jul-91	Larry Withrow, AF4HX	228	17-Dec-98
Michael Harla, N2MHO	219	12-Apr-06	Walter Lesnowich, W2EE	295	06-Mar-08	Henry Wyatt, II, K4YCR	211	28-Jan-98
William Klepser, Jr., WB2AIV	215	09-Jun-99	Thomas Carrubba, KA2D	292	01-Sep-93	David Poe, W8IW	210	13-Mar-07
Ralph Abbott, WA3ELQ	195	30-May-05	Robert Casino, N2GDY	283	03-Jun-08	Edwin Williams, KN4KL	209	01-Jan-92
Robert Charles Worek, AG3U	189	26-Jul-06	Carlos Prior, KE2TT	261	01-Jun-90	John Kanode, N4MM	202	07-Jun-85
Gary Reed, N2QEE	186	31-Mar-09	Donald Younger, W2JEK	257	30-Jul-86	Thomas Lewis, W4SIS	194	14-Nov-97
Central			Midwest			Rocky Mountain		
Ed Wagner, AB9FN	415	01-Jul-02	David Bartholomew, AB0TO	797	22-Mar-02	Robert Vosper, KZ1B	507	09-Jul-10
Allan Bukowski, N9ZD	352	01-Jun-92	Kevin Naumann, N0WDG	700	17-Nov-02	Robert Hamilton, N0RN	425	19-May-87
Eldon Boehm, NK9U	338	21-Nov-86	Harry Steger, Jr., W0HMS	651	26-Aug-08	Jeffrey Weinberg, W0QO	336	01-Apr-93
Donald Hlinsky, N9IZU	331	01-Mar-91	Roland Kramer, W0RL	554	21-Jun-01	David Avery, N0HEQ	302	13-Jan-88
Brian Eder, WB9UGX	305	01-Jan-92	Chris Hunt, N0YH	378	05-Aug-20	David Sharpe, K10HG	259	02-Feb-98
Robert Begeman, W9KVK	292	01-Jun-92	Kenneth Simila, KC0VMY	313	18-Feb-07	Gary Zabriskie, N7ARE	249	20-Nov-84
Timothy Pechtold, AA9BV	280	01-Nov-92	Ralph Waldren, N0OTS	299	03-Jan-20	Martin Soffran, NM5MS	240	21-Mar-94
James Rinehart, K9RU	264	01-Aug-91	John Mountain, Jr., KJ0MTN	252	28-Sep-09	Peter Brisbane, NM5PB	232	20-Jan-14
Frederick Baguhn, W9GOC	260	16-May-02	Edwin Berkel, AE0EB	245	06-Jan-15	David Bratcher, AK0MR	201	23-Sep-08
David Pritchard, W9QL	254	12-Apr-01	Charles Wilmes, KW0K	220	28-Apr-09	Denis Campbell, AA0YX	185	02-Feb-96
Dakota			New England			Southeastern		
Jeffrey Goodnuff, W0KF	343	17-Jun-03	**Paul Lux, K1PL	2042	25-Jan-85	***Gary Pike, KA4KBX	7514	03-Sep-09
John Schwarz, Jr., AE0AL	328	26-Oct-94	*Bob Phinney, K5TEC	1652	20-Jan-14	***Justin Pike, KJ4AXF	5780	12-Nov-12
Shep Shephardson, N0NMZ	310	12-Mar-01	Gregory Paul, KC1MND	547	03-Jun-20	***Collin Pike, KJ4AXB	5732	26-Apr-11
Douglas Nelson, AA0AW	249	01-May-90	Phillip Temples, K9HI	519	12-May-89	***Anna Pike, KD4PCU	4130	18-Aug-09
Daniel Royer, KE0OR	245	01-Jul-91	Robert Beaudet, W1YRC	409	01-Aug-90	**Patrick Pike, KJ4AXD	2835	13-Oct-15
Larry Larson, KR0K	229	16-Mar-09	Bruce Anderson, W1LUS	393	11-Feb-88	**Ryan Krenzschek, W4NTR	2077	04-Jan-13
James Rice, II, N0OA	227	04-Dec-00	Barbara Irby, KC1KGS	358	05-Aug-19	John Reynolds, W4TXA	517	08-Jun-16
Dennis Ackerman, KB0OQQ	221	15-Jul-96	William Poulin, WZ1L	341	01-Sep-91	Robert Fauci, N1UVO	431	28-Mar-18
Robert Tracy, N0TC	195	30-Jul-86	Stefan Rodowicz, N1SR	315	20-Nov-84	Pablo Soto, KP4SJ	399	01-May-92
Karl Eriksen, WA2DEE	176	08-Jan-90	James Mullen, K11W	293	01-Mar-91	Val Jacyno, AK4MM	388	08-Nov-11
Delta			Don Wilson, K1IN	293	01-Apr-92	Southwestern		
Monvel T. Maskew, Jr., K9FQ	765	18-Jul-18	Northwestern			*Bill Martin, A10D	1074	01-Nov-84
Loma Westmoreland, KU5J	738	31-Jan-21	Richard Morgan, KD7GIE	448	11-Aug-00	David Morrill, N7TWT	509	20-Jul-00
Bryan McCammon, K15HAV	413	03-Sep-20	Scott Robinson, AG7T	438	01-Aug-91	Richard Buck, KC7OCT	346	21-May-97
John Waters, III, KC5FYA	310	14-Sep-21	Loren Hole, KK7M	381	06-Sep-84	Donald Kramer, Sr., WA6UVW	339	08-May-98
Bobbie Williams, W1BEW	286	01-Jun-92	John Clarke, AC7WW	369	20-Jan-03	Bruce Ziemienski, WA6BZ	321	25-Mar-02
Joe Lowenthal, WA4OVO	286	25-May-06	S. Riley McLean, W7RIL	345	02-Sep-99	Ali Hassan, AA6WC	288	01-Jun-90
Roger Gray, N5QS	275	01-Mar-93	David Brooks, N7HT	326	10-Jun-87	Norman Pilawski, WT6Y	282	17-Feb-87
Dawn Gray, N5QT	256	01-Mar-93	Joseph Barry, K7SQ	305	21-Jun-95	Frank Westphal, K6FW	274	06-Sep-84
Terry Partigianoni, W5TMP	254	27-Nov-07	Brandin Hess, WB1BR	296	24-Sep-15	Gary Hamman, K7GH	260	01-Aug-92
Rodney Webb, W4WRE	247	21-Mar-17	Wayne Schuler, A19Q	277	01-Sep-91	Dave Martin, AC7FF	257	04-Apr-14
Robert White, A14GI	225	18-Jul-05	Erin Henrickson, ND7B	270	06-Jan-23	West Gulf		
Great Lakes			Pacific			*Franz Laugermann, K3FL	1530	01-Dec-91
*Charles Tyrrell, KE8PCB	1201	03-Sep-20	Brian Torr, N6IY	881	06-Sep-00	*Tanner Jones, W9TWJ	1235	31-Jul-07
*David Potter, KE8OHG	1027	03-Jun-20	Morris Jones, AD6ZH	568	27-Nov-01	Daniel Quigley, N7HQ	793	24-Apr-20
Earl Paazig, W8BR	664	16-Apr-02	Dieter Stussy, KD6LVW	458	27-Jan-94	Gerald Grant, WB5R	530	04-Jan-85
Bruce Osmon, KE8LT	575	16-Nov-18	Bill Nichols, NN7K	368	01-Sep-93	Adolph Chris Koehler, K5VCR	523	29-Sep-95
Charles Hall, W8HF	286	01-Jun-92	Larry Loomer, K16LNB	364	03-Dec-08	John Paterson, Jr., KC5LAA	512	16-Mar-09
William Bogle, Jr., KE8FZY	270	08-Jul-20	Gordon Fuller, WB6OVH	363	06-Sep-84	David Fanelli, KB5PGY	494	01-Oct-91
Lance Harvala, AB8Y	254	06-Nov-19	Robert Perlman, W6BP	361	26-Aug-08	Wilbert Cannonier, KK5JJ	475	03-Nov-95
Archie Mack, Sr., AF4EB	250	19-Aug-97	Jim Brunk, N6BHX	308	13-Jul-95	Janet Crenshaw, WB9ZPH	422	02-Oct-97
Stanley Arnett, II, AC8W	234	06-Sep-84	Dennis Simon, KB7UTV	294	10-Dec-13	Michael Nault, W5OFT	414	06-Sep-01
Chris Anderson, K8VJ	228	09-Feb-90	Joseph Speroni, AH0A	290	20-Nov-84			

Congratulations to David Potter, KE8OHG, from Prudenville, Michigan (Great Lakes Division), who is the latest VE to participate in 1,000 sessions!

*Denotes participation in over 1,000 sessions. **Denotes participation in over 2,000 sessions. ***Denotes participation in over 3,000 sessions.

A Look Back



Monitoring an SSB Amplifier Chain for Linearity

BY WIN WAGENER,* W6VQD

ONE OF THE better means of monitoring the linearity of a chain of ssb linear amplifiers to establish the proper gain levels and avoid flat topping, is to observe a suitable triangular modulation pattern. This pattern is obtained when an rf sample from the antenna feed line is fed to the vertical plates of an SB-610 oscilloscope, and an early sample of the envelope of the low-level ssb signal is placed on the horizontal plates. See the block diagrams in Fig. 1.

The resulting patterns on the SB-610 oscilloscope appear as shown in Fig. 2. The formation of these patterns results from the application of two signals on the two axes, as shown in Fig. 3. The output rf is on the Y axis, or vertical plates, and the rectified envelope of an early sample of the ssb signal in the amplifier chain is on the X axis, or horizontal plates, of the scope. They combine on the X - Y coordinates as in Fig. 3, just as they do on the face of the CR tube in the monitor.

If the amplifier chain is linear, the rf amplitude in the antenna line should rise and fall exactly in step with the amplitude of the ssb signal applied to the first stage of the amplifier chain. Please note

that the straight lines OA and OB are in no way related to the shape of the envelopes of the input and output signals. As long as the signals rise and fall together the lines OA and OB will be straight.

The instructions for the operation of the SB-610 say to put the rf output of the exciter in and out of two coaxial connectors (phono jacks marked "exciter") and the rf output of the power amplifier in and out of two coaxial connectors en route to the antenna (see Fig. 1A). This enables the SB-610 to sample the rf line from the PA to antenna, and sample the rf line from the exciter to the PA. The SB-610 rectifies the exciter rf to get an envelope signal, and this is applied to the horizontal plates through the internal horizontal amplifier. However, with this connection the SB-610 monitors only the linearity of the amplifier. If the exciter is putting out a nonlinear signal, or is flat-topping, the SB-610 can't show this, and you could be beguiled into thinking the linearity of your signal on-the-air was beautiful, because only the linearity of the PA is being monitored.

Corrective Measures

Now, if instead of taking the sample signal for the horizontal plates from the exciter output, one

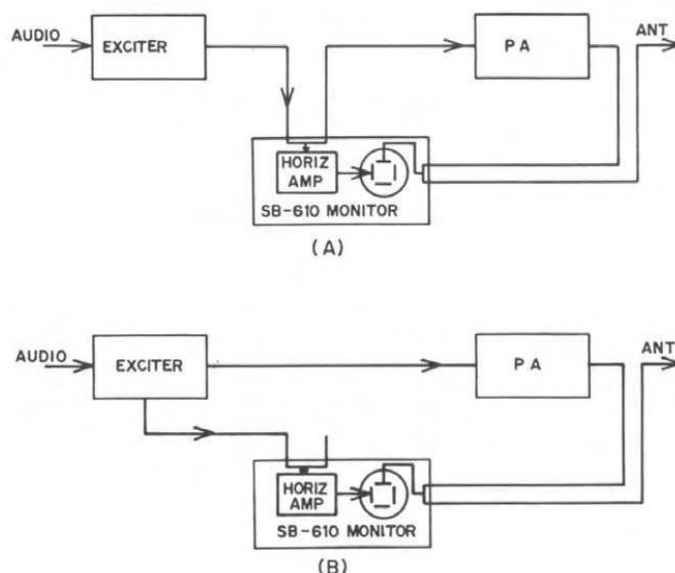


Fig. 1 — Block diagrams of monitoring connections for the SB-610 scope. Checking the linearity of the amplifier stage only is shown at A. Checking over several stages is shown at B.

were to take this sample from an early stage within the exciter, the pattern on the scope would show the combined linearity of all succeeding stages, including the PA. I chose to take the sample of the ssb signal at the intermediate frequency of my Swan 350 (see Fig. 1B). The envelope shape of the ssb signal at the i-f should be the same as the envelope shape at the final frequency, because the mixer only translates the desired signal to a different frequency. In the case of the Swan 350 I took a sample of the signal from the plate of the first amplifier tube following the crystal filter, and inserted it into an "exciter" jack of the SB-610, in order to go through the demodulator diode and horizontal amplifier of the SB-610.

At this moment my troubles with the SB-610 began. In order to get an adequate signal on the horizontal plates I had to run the built-in horizontal amplifier of the SB-610 wide open. I got a beautiful triangular pattern just like the one portrayed in Fig. 2A. I was very happy until one day I discovered that I got the same perfect pattern even if I removed the sampling line of my Swan from the "exciter" jack of the SB-610! It turns out that the stray rf pickup within the SB-610, from the antenna rf line to the vertical plates, was enough to give a suitable signal to the horizontal amplifier. Of course the pattern would be perfect, because the same rf envelope was applied to both the vertical and horizontal plates and the voltages to these plates would rise and fall together, because it was the same signal! Now the problem was to reduce the accidental stray coupling to the horizontal circuits to a negligible value.

The demodulator diode for the horizontal voltage is one of the two diodes built into a 6BN8 in the SB-610. The other diode in the 6BN8 is used as part of the clamper circuit to remove the cathode-ray spot when no signal is applied. To accomplish this the rf output of the final PA is fed to this diode. The two diodes are close together, as are the leads through the stem of the 6BN8. The cure was to take the horizontal-voltage demodulator circuit out of the 6BN8 and use a 1N55 diode, and to fully shield the rf portion of the horizontal-voltage circuit from the rf power of the PA output. When this was done the horizontal signal would drop to zero when the rf sampling line from the Swan 350 was removed from the SB-610. Thus now the horizontal signal resulted only from the desired low-level rf ssb signal in the Swan transceiver.

Fig. 2 — Single-sideband modulation patterns, showing perfect linearity, A, tolerable linearity, B, and bad flat-topping and splatter, C.

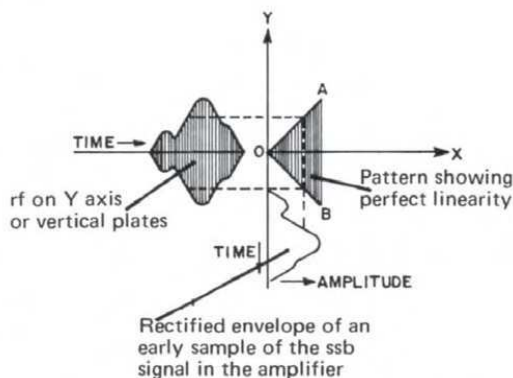
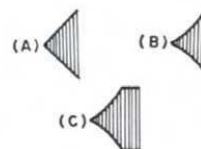


Fig. 3 — Applied rf and envelope voltages and resulting pattern on the axes of the SB-610 scope.

The sampling of the low-level i-f in the Swan followed the instructions of the SB-610 for sampling incoming receiver signals in the i-f line. I used a 3.2-pF capacitor connected to the output circuit of the first i-f tube after the crystal filter, and after the dc plate voltage of the tube was removed by the blocking capacitor. A shielded coax line carried this sample to the "exciter" jack of the SB-610. (Note: The sample is not applied to the vertical amplifier, as one would do to display received signals against a linear horizontal sweep.)

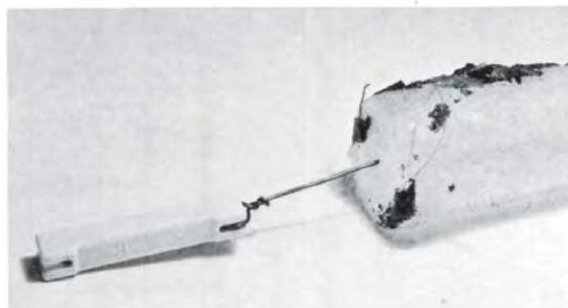
Results

In station operation it is a real satisfaction to monitor the linearity of all the important linear stages continually as one talks. It is also devastating to realize that one must be careful of the level of the audio, lest one flat-top momentarily on the peaks of one's voice. Any visible flat-topping, even momentarily, gives splatter outside the channel required for voice frequencies. The triangular modulation pattern allows one to see such momentary flat-topping.

QST

Strays

Recently we showed what happened to W1FBY's antenna installation when an ice storm hit Connecticut. Bob saved one of the chunks of ice by keeping it in a freezer until we could take this photograph. It measured slightly over three inches in diameter! Anyone want to calculate the weight of the ice on an 80-meter dipole 135 feet long?





Hints and Kinks

For the Experimenters



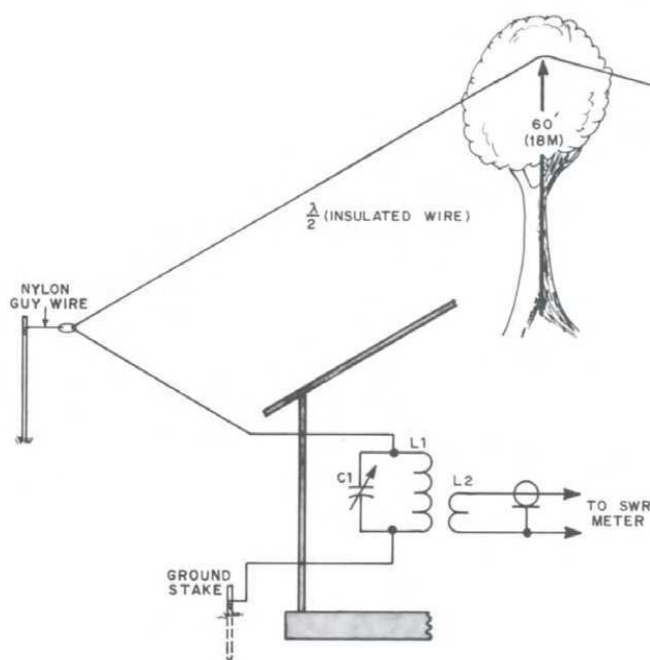
SOME ANTENNA IDEAS FOR 1.8-MHz PORTABLE OPERATION

Antennas for portable operation should be simple to erect and easy to adjust. The hf bands present few problems, but 160 and perhaps 80 meters require a bit more thought. A cottage was available to the writer, where the local operating competition was minimal, so this location was used during the last few ARRL 160-Meter Contests. Since frequent ice storms in the area made permanent antennas unadvisable, a Field Day approach to the problem evolved. Some of the more successful ideas may be of interest to amateurs in similar situations.

While a number of antennas were considered, the end-fed half-wave antenna had a number of desirable features. It can be bent into a variety of shapes and doesn't require a low-loss ground connection at the feed point. A single ground stake should suffice since a current node exists at the ends of a half-wave radiator. Other types of ground loss exist (unless an extensive radial system is used) but resistive losses at the feed point are minimized. Most of the useful radiation results from those parts of the antenna where the current distribution is the highest. In the half-wave case, this occurs in the middle third, which should be the highest part

of the antenna. An inverted-V arrangement can be used, but if it is symmetrical about the center, be sure the apex angle is greater than 90 degrees. The outer thirds can then be run off in some convenient direction and folded back if necessary. In fact, one of them can act as a lead-in to the matching network. A half wavelength on 160 meters may seem like a lot of wire to get up in the air but remember, only the middle third (approximately 90 feet) has to be strung between the highest support points.

Before the contest, the writer spotted an assortment of plastic-coated hookup wire at the local outlet of Allied Radio Shack. There were five rolls of various gauges with 100 feet on each roll. The price (less than \$4) was attractive. A roll of the heavier-gauge wire was used for the middle of the antenna where the current distribution is the highest, with the lighter-gauge wire spliced on each side. A line attached to an arrow was shot over some trees and then the wire was pulled through. The plastic coating on the wire eliminated the need for insulators. While existing structures can be used to support most of the antenna, one portable support is usually needed for the most convenient layout. Surplus MS-44 mast sections are handy for this purpose since they are practically self-supporting up to 25 feet.



Simple antenna and matching network suitable for 160-meter portable operation. Dimensions and component values are approximate only, and may vary with different installations.

C1 — Air variable, 150 pF (E. F. Johnson 154-8).

L1 — 70 μ H, 28 turns No. 18 enam. wire on 3-3/4-inch form, 3 inches long.

L2 — 4 turns No. 18 enam. wire on cold end of L1

The matching network shown in the drawing can be constructed easily from junk-box parts. With a receiver and the antenna connected, C1 is peaked up for maximum signal strength. Only slight adjustment with the transmitter on should be necessary to get the SWR to a minimum.

Although the height of the antenna might be considered low, the performance of this one was very satisfactory. Signal reports were superior to those with previous antennas used. But perhaps best of all, the entire system can be dismantled in a few minutes and the wire rolled up on a short piece of board for next time. — *W1YNC*

A BACKYARD 160-METER VERTICAL

The 160-meter band was the favorite one at my QTH this winter. The same could be said for many other amateurs and the simple antenna described here may be of interest.

Some of the old timers will tell the newcomer to 160 meters that the best antenna for local and DX work is the vertical. Since a full-size vertical would be very large, the question is finding a type that will fit into a closely packed residential area.

As a starter, I took an old 40-foot (12.2 meter) telescoping mast and insulated it from the ground. (This can be done by setting it on top of a large soft-drink bottle, or clamping it to a wooden post.) The antenna was fed at the base with RG-58A/U 52-ohm coaxial cable. The shield was wired to a radial system and a ground rod. A hint for the radials — buy some aluminum clothesline and cut a number of slits in your yard with a flat spade. Next, push the wire into the slits and tamp the grass back together. If there are any swampy parts of the yard, these seem to make the best ground areas.

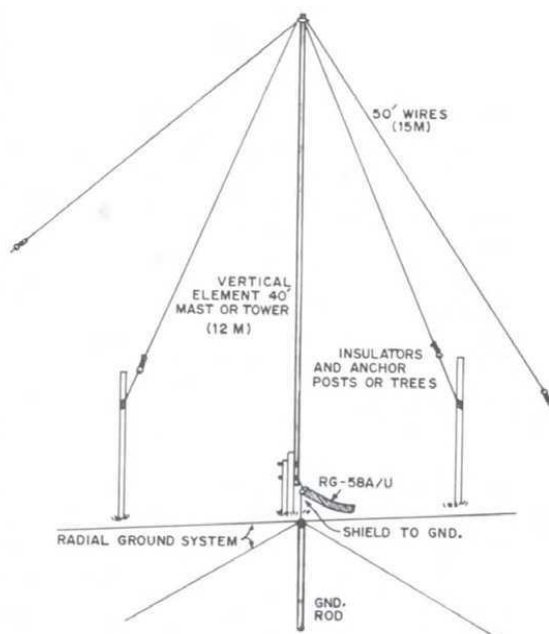
Rather than using a loading network at the base of the antenna, I constructed a capacitive hat to load it at the top instead. The top hat was made from four fifty-foot (15.2-meter) pieces of wire strung out from the top of the mast in guy-wire fashion. They are connected electrically to the top, and stretched until they are as close to a 90-degree angle with respect to the mast as is possible.

The system described works well with a 40-foot mast but other lengths could be used instead. However, the top hat may have to be adjusted in order to bring the system to resonance. While my vertical occupies very little space, it seems to perform as well as do many "full-size" antennas on 160 meters. — *Mike Mussler, WB8JJA*

IN-LINE POWER-METER MODIFICATIONS

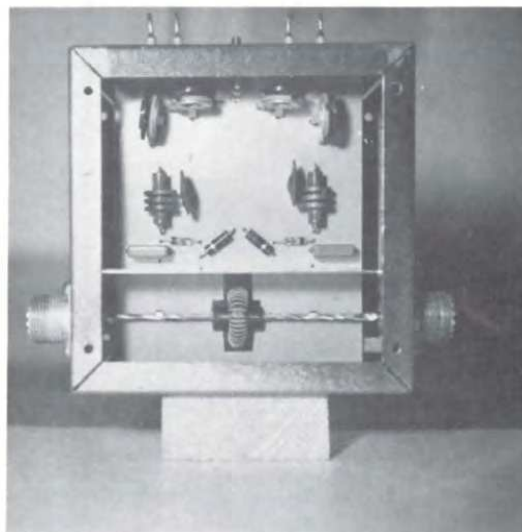
I built the in-line rf power meter described in the December, 1969, issue of *QST*. It does everything claimed for it and I have found it so well that I have recommended it to others. To me, it is more useful as a tuning indicator than as a power meter and for this purpose I have made a slight modification to take care of this need. This means the addition of an external potentiometer to control the sensitivity of the indicating meter.

The photo of the bridge shows a modification in the construction which I believe is worth



A space saving vertical for 160 meters. While not always possible, it is desirable to have the wires for the top hat run off at right angles to the mast.

considering. This should be helpful to others who plan to build one. You will note that the RG-8/U which supports the toroid coil, L1, is cut to run from J1 to J2 and this in turn supports the printed circuit board by virtue of soldered contacts to C1 and C2 lugs. An aluminum L bracket is no longer required. Two solder lugs are mounted under the retaining screws of each coax connector and the two free ends are soldered to the ground foil which does establish a good ground. I do have some doubts that copper foil can carry heavy currents such as may be encountered at 2 kW and a high SWR. This construction eliminates any doubts that may exist. Instead of the flashing copper shield I used aluminum to get away from possible electrolysis effects. — *T. C. Galbreath, W2AXX*



April 1974

Celebrating Our Legacy

My Radio Journey from Burma to the United States

My parents were born in Burma (now Myanmar), and during World War II, they had to evacuate to India, where I was born in 1943, and we returned to Burma in 1946.

I learned to solder and dismantle electronic gear, studied schematics, and helped my father, who got licensed in 1938, replace oil-filled capacitors on RCA AR-88 receivers. He had a Collins R-107 receiver, an RCA ET-4336 transmitter, and a few other pieces. There weren't any radio shops to buy gear, so everything was homebrewed and made with parts salvaged from the war surplus stock.

When I was 11, I became fascinated with Morse code and told my father I wanted to get my license. When I was 12, I took the test and passed rather easily. It was one of the happiest days of my life. Because I was living with my father, we had to share the station call sign XZ2KN.

All of our antennas were homebrewed for 10, 15, and 20 meters. We designed and built a four-element beam with a 44-foot boom and made a lot of contacts. We enjoyed hosting visiting hams, including King Hussein of Jordan, JY1, and US Senator Barry Goldwater, then K7UGA.

As the military and government were in turmoil, on January 10, 1968, we were informed that amateur radio was banned. With no prospects in sight, I decided to go to the United States. I arrived in Springfield, Illinois, in 1974 and found a ham who helped me get ready for the amateur radio test again, which led to me getting my first US call sign, WB9TTN.

Gurbux Singh, W6BUX
Chatsworth, California

A Long, Great Trip

My mentor and cousin, Dudley Field, K2DFZ (SK), got me interested in ham radio when I was 12. I got my Novice license in 1956 as KN2TRS and built a Heathkit AR-3 receiver, a Q-multiplier circuit, and a Heathkit AT-1. A year later, I got my Technician license with the call sign WA2AIC. Then I acquired a National NC-88, which I still have.

I took a hiatus from ham radio during college. Dudley encouraged me to get back into it, and I did, starting with handheld radios and repeaters. In the 1990s, I got my General license and became serious about HF again. Finally, I got my Extra-class license and now run a Kenwood TS-590 through two off-center-fed dipoles at right angles.

I continue to learn from Winlink, phase-shift keying, FT8, and activities with local emergency operations centers with my club, Eastern Shore Amateur Radio Club, K4BW.

After Dudley's passing, I made sure his license was reissued to his granddaughter. What a long, great trip it has been.

Eric Dodge, WA2AIC
Onancock, Virginia

Two Wires

My time in ham radio started with two wires. As a kid, I regularly played with wires, batteries, buzzers, and telegraph keys. One Christmas, my folks gave me an electronics project kit. I jumped right in, building crystal radios, code practice oscillators, and all sorts of things.

One project, a one-tube regenerative shortwave radio, refused to work. I set



Eric Dodge's, WA2AIC, National NC-88 (left), and the 1957 edition of *The ARRL Handbook* rests on top of it.

it up with a wire out the window and a ground wire to our steam radiator. I took it apart and put it together again and again with no results. You had to connect two wires to a separate tickler coil that slid in and out of the main coil. I finally read the fine print in the manual and realized that connecting them one way would cause the desired oscillation, and the other way would prevent it. I reversed the wires, connected the batteries, and heard some squeals and then a human voice!

Within a year, I became KN1VHO. I worked in radio broadcasting for 26 years, followed by 18 years in broadcast equipment manufacturing, and got the new call sign W1TAG. In 59 years, I've done all sorts of stuff, from LF to VHF operating. Now, my greatest interest is working CW and helping others find satisfaction in that part of the hobby — and it all started with getting two wires connected the right way!

John Andrews, W1TAG
Holden, Massachusetts

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

Classic Radio

Switching Sidebands without Frequency Shift in the '50s and '60s

Most SSB products of the 1950s and 1960s that allowed you to select the sideband shift had the carrier oscillator on the opposite side of the narrow passband filter and shifted the variable frequency oscillator (VFO) approximately the same amount to keep the operating frequency nearly unchanged. Collins Radio, Hallicrafters, Swan Electronics, and others used this practical method.

The amount that the VFO was shifted changed a small degree as the frequency of the VFO changed, so the correction is only exact at one frequency. This technique is accurate enough for most practical purposes, so the frequency correction is good enough for most operators. Some amateur radio equipment used a technique that had zero frequency shift when switching from the upper sideband (USB) to the lower sideband (LSB). The three methods that I know of to achieve zero frequency shift when changing sidebands are detailed below.

Phasing SSB Generation

One method used to attain no frequency shift when changing sidebands was inherently part of the first popular method of generating an SSB signal. The phasing method of SSB generation employed the cancellation of one sideband and the reinforcement of the other to generate the signal. Because no filtering was used, there wasn't any movement of the carrier oscillator to switch sidebands, and because no internal frequencies were shifted, no com-

one name stands out . . .



SSB-100F

Type of Emission: CW AM - LSB HSB
 Power Ratings: DC average input SSB-100 watts; AM input (two tone test)-80 watts.
 Peak envelope power input SSB-144 watts.
 Peak envelope power output SSB-100 watts.
 Harmonics and Spurious Responses: Spurious mixer products—40 db or more down. Third order distortion products—35 db or more down. TV interference suppression—40 db or more second harmonic, 60 db or more higher harmonics.
 Unwanted Sideband and Carrier Suppression: 50 db or more down, THROUGH LOW FREQUENCY CRYSTAL—LATTICE FILTER.
 Frequency Stability: Control Oscillator—(800 to 1300 kc)—±100 cycles after two minute warm up period. Output frequency—within 300 cycles after five minute warm up period. Dial accuracy—±2 kc after calibration.



SSB-1000

LOW DRIVE REQUIREMENT—3 watts PEP will drive the unit to full kilowatt.
 PI-NETWORK OUTPUT—Single knob bandswitch and high-efficiency silver-plated Pi-network output circuit. Matches wide range of antenna-impedances.
 HIGH HARMONIC ATTENUATION—High-Q plate and grid circuits and Pi-network output circuit provide maximum harmonic-attenuation.
 POWER RATING
 DC Input CW—1000 Watts
 AM—700 Watts
 Peak Envelope Power Input SSB-1000 Watts
 Peak Envelope Power Output SSB- 625 Watts
 FREQUENCY RANGE
 5 Bands: 80m 3,500 to 4,000 Kc
 40m 7,000 to 7,300 Kc
 20m 14,000 to 14,350 Kc
 15m 21,000 to 21,450 Kc
 11/10m 26,000 to 30,000 Kc
 Factory Wired & Tested



EE-3
 New ELECTRONIC KEY for finer CW

- Characters complete before next command can be obeyed.
- Smaller modern cabinet: 4" x 4½" x 7½".
- Receiver muting and audio transfer to headphones.

- Separate tone, volume and speed controls for 8 to 50 words per minute—located on front panel. Weight, ratio, and receiver muting threshold controls—located on rear of unit.
- Self contained with transformer, Selenium Rectifier, 2 dual tubes, 2 extremely quiet relays and miniature speaker.

See Your Local Distributor Today or Write for illustrated Catalogue

ELDICO Electronics
 A division of Dynamics Corporation of America
 72 East Second Street, Mineola, L. I., N. Y., Pioneer 6-5212

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This advertisement for Eldico Electronics appeared in the March 1957 issue of QST.

pensation was required. Thus, exciters that employed the phasing method of SSB generation didn't involve frequency shift; to switch sidebands, they simply changed the phase of one of the internal signals used in the cancellation of the unwanted sideband.

Amateur products that employed the phasing method of SSB generation included all the transmitters built by Central Electronics, including the 10A, 10B, 20A, 100V, and 200V; Central Electronics never used sharp filters for sideband selection in any of their products. Similarly, all of the transmitters made by Lakeshore Industries employed the phasing method of SSB generation, so none of their products had any frequency shift when changing sidebands. Eldico Electronics started with phasing SSB generation in 1951 with their SSB Junior exciter for 75-meter SSB, which was sold wired and aligned or as a kit. Eldico continued with kits until 1955, when they switched to crystal-lattice filter SSB generation with the appropriately named SSB-100F. They stopped marketing new equipment after the 1958 S-119 SSB station, which was mostly a knockoff of the Collins Radio S-Line. Heathkit also used this method in their 1959 SB-10 SSB adapter for the TX-1 Apache AM/CW transmitter kit.

Two-Frequency Shifted Bandwidth Filters

Another method, which was used by Drake on their transceivers and transmitters (such as the TR-3 and TR-4), used two crystal-lattice filters for SSB generation — one for LSB and one for USB — so the carrier oscillator always stayed on the same frequency and, as a result, there was no frequency shift when changing sidebands. The Drake 4-line trans-

“The phasing method of SSB generation employed the cancellation of one sideband and the reinforcement of the other to generate the signal. Because no filtering was used, there wasn't any movement of the carrier oscillator to switch sidebands, and because no internal frequencies were shifted, no compensation was required.”

mitters used the same method to select the desired LSB or USB. Like the TR-3 and TR-4, the T-4 family of transmitters employed two crystal-lattice filters with center frequencies, perhaps a bit less than 3.0 kHz apart, so one would shear off the upper and the other the lower sideband. This was a simple method to get a selectable sideband; the only issue was that it required two closely spaced crystal-lattice filters, which weren't inexpensive and could be hard to find with the center frequencies so closely spaced.

SBE IF Conversion Method

The LSB and USB selection method used by SideBand Engineers (SBE) founder Faust Gonsett was brilliant. This brings us to the third and final method that I know of — absolutely zero frequency shift between LSB and USB selection. This method was used by SBE on the SB-33 and SB-34 largely solid-state SSB transceivers. The SBE method always generated a USB signal at the first intermediate frequency (IF) of 455 kHz using a Collins Radio mechanical filter for SSB generation. A second IF of five times the carrier frequency was used; this was achieved by using an injection frequency of four times the carrier frequency to make a USB

signal at the second IF, and an injection frequency of six times the carrier frequency to generate an LSB signal at five times the carrier frequency. Thus, when generating a USB signal, the 455 kHz USB signal was added to a signal at about 1820 kHz to make a 2275 kHz USB signal. For LSB generation, a frequency of six times the carrier, or about 2730 kHz, was used to subtract the 455 kHz IF to again give a second IF of 2275 kHz with the inversion of the sideband that always occurred when subtracting the IF, as compared to adding the first IF, giving absolutely no frequency shift between USB and LSB.

This was a neat and clever solution to the typical frequency shift caused by moving the IF carrier frequency to the opposite side of the filter. The 2275 kHz IF helped improve possible image rejection at 20 and 15 meters by using a somewhat higher IF than 455 kHz. These frequencies are approximate, because the actual carrier frequency was set to be at the bottom edge of the 455 kHz mechanical filter, or at about 453.5 kHz. But using either the fourth or sixth harmonic of the oscillator to make exactly five times the low IF still worked to give absolutely no carrier or frequency shift.

100, 50, and 25 Years Ago

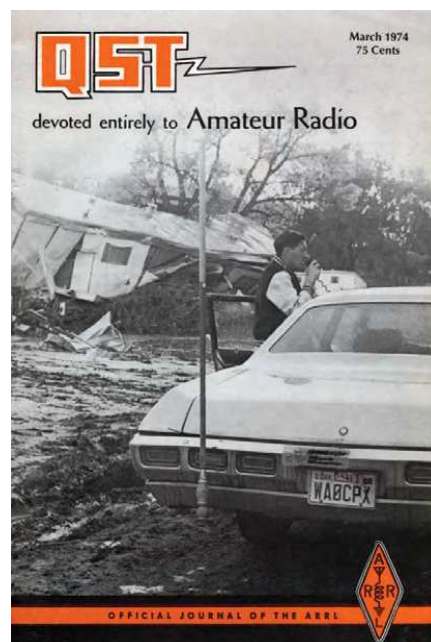
March 1924

- With the devil on one shoulder and a police officer holding his hand off the key, the cover shows a ham wrestling with whether or not to call a station just before the end of “quiet hours.”
- The case for developing radio waves below 200 meters for amateur use is discussed in “Editorials: The Short Waves.”
- Methods used in designing r.f. amplifiers and uses of regeneration in r.f. amplifiers, among other items, for a successful shortwave r.f. amplifier are discussed in “Radio Frequency Amplification” by Stuart Ballantine.
- S. Kruse, 10A, explains the difference between good and bad series condensers in “Antenna Series Condensers---Good and Bad.”
- An update on the MacMillan Expedition is reported in “MacMillan Expedition Nears Arctic Daybreak” by K.B. Warner, 1BHW.
- Radio amateurs can be helpful in locating radio interference caused by power lines. Perry O. Briggs, 1BGF, explains why you should cooperate with power companies in “Cornering That Buzzing Interference.”
- In “The Amateur Builder,” H.F. Mason, 1ID, gives some “Hints on Building Receiving Sets.”



March 1974

- The cover shows WA0CPX at the scene of destruction caused by a killer tornado. Continuing the theme, “Amateur Radio Public Service: Become Involved” by Bill Mann, WA1FCM, points out that disasters are not everyday occurrences, yet public-service activities are performed daily, and discusses some ways to participate.
- “It Seems to Us...Auto Patch” discusses the problems of auto-patch abuse on 2-meter repeaters, and reminds us that a landline patch is one of the most valuable tools a repeater system can have for emergency communications effectiveness. Abuse can result only in withdrawal of the privilege.
- Ben Vester, K3BC, describes the interesting properties of his half-square antenna, including different antennas he tried that didn't work as well in “The Half Square Antenna.”
- Headaches associated with converting membership records to an automatic data processing system are addressed in “Woes of Babysitting a Computer” by John Nelson, W1GNC.
- Speaking at the ARRL Midwest Division Convention, A. Prose Walker, W4BW, Chief of the Amateur & Citizens Radio Division of FCC, discusses the established methods by which any change in our frequency allocation picture might be made. See the details in “Spectrum Allocations for the Amateur Service.”



March 1999

- The cover features Jim Andera, K0NK, and pack dog Tobie getting on the air from the great outdoors. In the related story, Jim presents an introduction to the trials and tribulations of operating “polar bear portable” in “Hamming From an Igloo.”
- David Sumner, K1ZZ, discusses putting forth positive experiences to encourage and welcome newcomers in “It Seems to Us...The Radio Amateur is Friendly.”
- The mystique behind the devotion to a single radio manufacturer is explained in “The Collins Collectors Association” by George Maier, K1GXT.
- A refreshing story of two ham radio families during their three-year “cultural exchange program” is told in “Kurashiki-Pasadena — DX Fun for the Entire Family!” by Mitsu Sakamoto, JA4FVE.
- Steve Hageman shares some ideas on developing PIC-based projects for yourself in “PIC Development on a Shoestring.”
- Why do competitors spend entire weekends in front of their radios? To increase operating skill, chase awards, compete on multiple fronts, and have tons of fun! David Jones, KK7GW, shows how in “Contest Fun for Everyone.”
- Bernie McClenny, W3UR, reports on his UAE visit as a team member to operate the CQ World Wide CW DX Contest in “How's DX?: The United Arab Emirates.”



Silent Keys

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

WB1ATK **Eichacker**, Richard F., Rockport, ME
WJ1M **Meo**, Joseph, Southport, CT
K1PIL **Roberts**, Nelson "Sparky" C., Southwick, MA
K1QPN **Moore**, Donald E., Bloomfield, CT
KD1RM **Foisy**, Gerard F., Cumberland, RI
W1SJL **Iannuccillo**, Emilio D., Bristol, RI
N1SZZ **Purcell**, Larry T., Ledyard, CT
W1VPI **Brazeal**, Earl H., Jr., Woodstock, CT
K2AVS **Sturm**, John G., Buffalo, NY
W2CC **Popkin**, David B., Englewood, NJ
AE2EE **Baumgarte**, Dennis R., Batavia, NY
KC2HCY **Meyer**, Ned G., Ocean, NJ
N2HEP **Crudele**, Alfred D., Jr., New Windsor, NY
WA2HKH **Herrick**, Alfred A., Woodbury, NY
WB2HYX **Herrick**, Sydel, Woodbury, NY
WB2JH **Hackett**, Frederick R., Pavilion, NY
N2IYY **Tarantula**, Robert R., Ronks, PA
N2LND **Barbato**, John L., Spencer, MA
WA2OCN **Sepesi**, Peter G., Bridgewater, NJ
N2UR **Diepeveen**, Neal, Sarasota, FL
N2SCX **Kozma**, Robert P., Rome, NY
K2SLZ **Bean**, Roger D., East Aurora, NY
KA2ZKM **Meyer**, Marion, New Gloucester, ME
K2ZLF **Meyer**, Joseph C., New Gloucester, ME
N3EDD **Mumper**, John Martin, Saint Leonard, MD
KD3GZ **Brook**, Derek J., Elmira, NY
WB3HTK **Newman**, Walter W., Orelan, PA
K3JAW **Hoeflich**, Philip, Seven Valleys, PA
KB3JDW **Batz**, Charles E., Westminster, MD
KD3LE **Long**, George M., Bellwood, PA
KB3RAN **Hardy**, David Brooke, Lusby, MD
K3RON **Rubin**, Ronald L., Rydal, PA
K3RTU **Smith**, James S., Aston, PA
KA3VWH **Finestone**, Stephen C., Wellsboro, PA
K3ZO **Laun**, Alfred A., Temple Hills, MD
KD4BXF **Spanyer**, Carl H., Jr., Harvest, AL
KJ4CFT **O'Brien**, John, Calhoun, GA
WA4CRL **Johnson**, George H., Fredericksburg, VA
KG4HPO **Wentworth**, Michael L., DeBary, FL
W4JPW **Thomas**, William C., Jr., Columbus, GA
KB4KA **Cox**, Terry A., Fairfield Bay, AR
KE4KKI **Stewart**, James W., Greeneville, TN
KM4MEX **Waters**, Haran N., Mount Olive, NC
WB4N **Jackson**, Barry, Maysville, KY
WB4OMN **Naylor**, John T., Clinton, NC
KI4OXX **Krueger**, Michael H., Northport, AL
N4PGS **Faust**, Gregory H., Charlottesville, VA
NQ4Q **Willmuth**, John C., Berlin, MD
KI4QAC **Green**, Carl E., Alabaster, AL
AC4QJ **Van Der Bijl**, Otto R.P., Prosser, WA
K4QLM **Puig**, Wilfred, Cocoa, FL
KE4RGR **Allen**, Phillip S., Columbia, SC
W4RJA **Antolick**, Richard J., The Villages, FL
N4SM **Jones**, Thomas M., Clyde, NC

W4WJH **Jaquish**, Michael P., Athens, TN
N4WMY **Tigges**, Michael B., Radcliff, KY
KD4Y **Connellan**, Herbert D., Jr., Greenville, AL
WA5EII **King**, Donald R., Fort Worth, TX
N5GDO **Oliver**, Gary D., Athens, TX
K5IHK **DeMajo**, John, Chesterfield, VA
W5IR **Green**, Jerry, Magnolia, TX
KI5IRS **Rees**, Joseph Harrison, Metairie, LA
N5LD **Gray**, Mary L., Gun Barrel City, TX
KC5LUA **Fortinberry**, George K., Kentwood, LA
WB5MMS **Cagle**, Don, Bixby, OK
KB5MY **Randall**, Rosalie, Kemp, TX
N5NVP **Hammill**, Daniel L., San Diego, CA
KD5OEV **Bookter**, James J., Leesville, LA
K5POU **Johnson**, Ellen J., Waco, TX
WB5QFM **Plumlee**, David L., Independence, MO
K5RCD **Taylor**, Charles R., Shreveport, LA
KF5SK **Davis**, Randall C., Floresville, TX
KE5UPK **Speed**, William E., Malakoff, TX
KB5VAI **Bookter**, Irma L., Leesville, LA
WB5VDC **Calhoun**, Heath, Clinton, MS
AD5VO **Felder**, Wavelen Wayne, Beaumont, TX
K5YJB **Sellmeyer**, J.S., Allen, TX
KF5ZYG **Kuykendall**, Roger, Flowery Branch, GA
KF6BGR **Harrison**, James W., III, Lago Vista, TX
K6ERU **Arterberry**, Martha K., Waterville, ME
WA6EUT **Laffin**, Ray W., Pleasanton, CA
WH6FTU **Whalan**, Michael R., Ridgecrest, CA
KI6FWO **Braun**, Sylvia J., Laupahoe, HI
N6IID **Hutchinson**, Warren, Woodland Hills, CA
N6IN **Chandler**, Paul L., Highland, CA
KE6LEY **Ichikawa**, Gordon R., Owego, NY
K6LJS **Hess**, Kenneth G., Alameda, CA
N6NQQ **Thompson**, Melvin Clark, Los Alamos, NM
N6PR **Hammond**, Brian, San Diego, CA
K6ZX **Maraffio**, William R., Ammon, ID
N7A **Fulmer**, Patrick D., Yuba City, CA
N7AFM **Loudon**, Roger G., Yakima, WA
KB7AIH **Van Zee**, James C., Phoenix, AZ
WA7EDI **Harris**, Edwin D., Eugene, OR
KB7EBK **Cripps**, Lorraine, Phoenix, AZ
K7GCO **Suber**, Ivy D., Klamath Falls, OR
KA7HHG **Glanzer**, Kenneth W., Bridgewater, SD
WA7LDB **Bigelow**, Arthur, Prineville, OR
W7LFB **Byrd**, Lynda, Weiser, ID
KI7NAE **Grundstrom**, Roger, Hot Springs, SD
WA7PBI **Forstein**, Thomas J., Bow, WA
N7SIP **Kimmel**, Gene G., Yakima, WA
N7TT **Nielson**, Anthony G., Herriman, UT
KB7UOG **Gohndrone**, John, La Center, WA
N7WVQ **Sargent**, Harold W., Sr., American Fork, UT
KD8AMR **Dunlap**, Samuel J., Medford, OR
WA8DTU **McElroy**, David, Dearborn Heights, MI
WB8DXC **Urschel**, Donald R., Franklin, OH
WB8GWK **Filby**, James W., Mentor, OH

WB8GWK **Green**, Dalbert E., Adrian, MI
KC8HEF **Newsome**, Gary A., Homer, MI
W8IJ **Barrows**, David O., Camp Hill, PA
WD8KOU **Ferguson**, Forester W., Sr., Lebanon, OH
N8LXQ **Dooley**, James P., Stevensville, MI
KA8MEG **Wysong**, Jerry F., Richmond, IN
WV8RC **Cummings**, James R., Charleston, WV
KD8TAF **Anderson**, David G., New Paris, OH
KA8YIW **Ebert**, Donald, Saline, MI
W8ZRZ **Heringhaus**, Donald R., Ottawa, OH
K9AQX **Ferris**, Joseph R., Marco Island, FL
KC9ET **Ovrid**, Virginia K., Iron River, MI
W9EXP **Day**, Theodore A., Richmond Hill, GA
K9FTJ **Stallsworth**, Robert L., Tuscola, IL
N9HHL **Korner**, Gregory C., Brookville, IN
N9JRJ **Szymanowski**, James E., Richmond, IN
KD9KB **Gross**, George L., Quincy, IL
WA9MTY **Mills**, Patricia A., Martinsville, IN
N9ND **Eccles**, Dale, Clearwater, FL
N9RH **Hoops**, Robert, Greensburg, IN
K9TUD **Loomer-Oliver**, Mary A., Cameron, WI
W9YEA **Howell**, Roy L., Bedford, IN
K0ARY **Quayle**, Bruce B., Jr., Imperial, MO
WW0B **Biggs**, Rex H., Joplin, MO
WD0D **De Wolf**, Danny E., North Platte, NE
W0DED **Dedmon**, Timothy M., Alamo, TX
KC0FIC **Hoepner**, Edward K., Colorado Springs, CO
K0HE **Atwood**, Rick, Bellevue, NE
N0JRM **Ford**, Susan J., Springfield, MO
N0NOQ **Simpson**, William F., Scott City, KS
K0STZ **Medina**, Ruben L., San Luis, CO
AB0XE **Howard**, Stephen F., South Saint Paul, MN
VE3CM **Cowan**, Jim, Woodslee, ON, Canada
VA3GEG **Geduld**, Geoffrey E., Ottawa, ON, Canada
VE3RSI **Sacerty**, J. Robert, Sarnia, ON, Canada
VE6GY **Green**, Ernest W., Foothills, AB, Canada
VA7DLJ **Johnson**, David L., Metchoshin, BC, Canada
LZ1PZ **Mihaylov**, Hristofor "Fori" A., Veliko Tarnovo, Bulgaria

- ◆ Life Member, ARRL
- ▼ Veteran
- Former call sign

For information on how to list a Silent Key in QST, please visit www.arrrl.org/silent-key-submission-guidelines.

Note: Silent Key reports must confirm the death by one of the following means: a copy of a newspaper obituary notice, 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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IC-9700 | All Mode Tri-Band Transceiver

- VHF/UHF/1.2GHz • Direct Sampling Now Enters the VHF/UHF Arena • 4.3" Touch Screen Color TFT LCD • Real-Time, High-Speed Spectrum Scope & Waterfall Display • Smooth Satellite Operation



IC-905 | VHF/UHF/SHF All Mode Portable

- GPS-Controlled Oscillator for Ultimate Frequency Stability • Separate Controller & RF Unit Configuration • Industry First 144 MHz to Microwave Transceiver • Wideband 50 MHz Span Real-time Spectrum Scope • Full D-STAR Functions



IC-V3500 | 144MHz FM Mobile

- 65W of Power for Long Range Communications • 4.5 Watts Loud & Clear Audio • Modern White Display & Simple Operation • Weather Channel Receive & Alert Function



IC-7851 | HF/50MHz Transceiver

- 1.2kHz "Optimum" roofing filter • New local oscillator design • Improved phase noise • Improved spectrum scope • Dual scope function • Enhanced mouse operation for spectrum scope



IC-705 | HF/50/144/430 MHz All Mode Transceiver

- RF Direct Sampling • Real-Time Spectrum Scope and Waterfall Display • Large Color Touch Screen • Supports QRP/QRPP • Bluetooth® and Wireless LAN Built-in



ID-50A | VHF/UHF D-STAR Portable

- High Visible LCD with Backlight Function • Find Nearby Repeaters with the Built-In GPS • Easy D-STAR Settings for Beginners • Voice Recorder Function • Share Pictures in DV Mode



IC-7300 | HF/50MHz Transceiver

- RF Direct Sampling System • New "IP+" Function • Class Leading RMDR and Phase Noise Characteristics • 15 Discrete Band-Pass Filters • Built-In Automatic Antenna Tuner



IC-7100 | All Mode Transceiver

- HF/50/144/430/440 MHz Multi-band, Multi-mode, IF DSP • D-STAR DV Mode (Digital Voice + Data) • Intuitive Touch Screen Interface • Built-in RTTY Functions



IC-7610 | HF/50 MHz All Mode Transceiver

- Large 7-inch color display with high resolution real-time spectrum scope and waterfall • Independent direct sampling receivers capable of receiving two bands/two modes simultaneously

IC-V86 | VHF 7W HT

- 7W Output Power Plus New Antenna Provides 1.5 Times More Coverage • More Audio, 1500 mW Audio Output • IP54 & MIL-STD 810G-Rugged Design Against Dust & Water • 19 Hours of Long Lasting Battery Life • 200 Memory Channels, 1 Call Channel & 6 Scan Eges



IC-2730A | VHF/UHF Dual Band Transceiver

- VHF/VHF, UHF/UHF simultaneous receive • 50 watts of output on VHF and UHF • Optional VS-3 Bluetooth® headset • Easy-to-See large white backlight LCD • Controller attachment to the main Unit



IC-T10 | Rugged 144/430 MHz Dual Band

- Disaster Ready - Excellent Fit for Your Emergency Bag • Loud Audio - New Speaker Design • Long Battery Life - Up to 11 Hours • FM Broadcast & Weather Channels



IC-R8600 | Wideband SDR Receiver

- 10 kHz to 3 GHz Super Wideband Coverage • Real-time Spectrum Scope w/Waterfall Function • Remote Control Function through IP Network or USB Cable • Decodes Digital Incl P25, NXDN™, D-STAR • SD Card Slot for Receiver Recorder



ID-5100 AD

VHF/UHF Dual Band Digital Transceiver

- Analog FM/D-Star DV Mode • SD Card Slot for Voice & Data Storage • 50W Output on VHF/UHF Bands • Integrated GPS Receiver • AM Airband Dualwatch

ID-52A | VHF/UHF D-STAR Portable

- Bluetooth® Communication • Simultaneous Reception in V/V, U/U, V/U and DV/DV • Enriched D-STAR® Features Including the Terminal Mode/Access Point Mode • UHF (225~374.995MHz) Air Band Reception



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March is Yaesu Month at HRO!



FTDX101MP | 200W HF/50MHz Transceiver

- Hybrid SDR Configuration • Unparalleled 70 dB Max. Attenuation VC-Tune • New Generation Scope Display 3DSS • ABI (Active Band Indicator) & MPVD (Multi-Purpose VFO Outer Dial) • PC Remote Control Software to Expand the Operating Range • Includes External Power With Matching Front Speaker



FT-710 Aess | HF/50MHz 100W SDR Transceiver

- Unmatched SDR Receiving Performance • Band Pass Filters Dedicated for the Amateur Bands • High Res 4.3-inch TFT Color Touch Display • AESS: Acoustic Enhanced Speaker System with SP-40 For High-Fidelity Audio • Built-in High Speed Auto Antenna Tuner



FTM-500DR | C4FM/FM 144/430MHz Dual Band Xcvr

- Front Firing Acoustically Enhanced Speaker System • True Dual Band Operation, C4FM/C4FM Digital D-D Dual Receive • 2.4" High-Resolution Full-Color Touch Panel Display • Built-in High Precision GPS Receiver • Wireless Operation Capability with Optional Bluetooth® Headset



FTDX10 | HF/50MHz 100 W SDR Transceiver

- Narrow Band and Direct Sampling SDR • Down Conversion, 9MHz IF Roofing Filters Produce Excellent Shape Factor • 5" Full-Color Touch Panel w/3D Spectrum Stream • High Speed Auto Antenna Tuner • Microphone Amplifier w/3-Stage Parametric Equalizer • Remote Operation w/optional LAN Unit (SCU-LAN10)



FT-891 | HF+50 MHz All Mode Mobile Transceiver

- Stable 100 Watt Output • 32-Bit IF DSP • Large Dot Matrix LCD Display with Quick Spectrum Scope • USB Port Allows Connection to a PC with a Single Cable • CAT Control, PTT/RTTY Control

FT-70DR C4FM/FM 144/430MHz Xcvr

- System Fusion Compatible • Large Front Speaker delivers 700 mW of Loud Audio Output • Automatic Mode Select detects C4FM or Fm Analog and Switches Accordingly • Huge 1,105 Channel Memory Capacity • External DC Jack for DC Supply and Battery Charging



FT-991A | HF/VHF/UHF All Mode Transceiver

- Real-time Spectrum Scope with Automatic Scope Control • Multi-color waterfall display • State of the art 32-bit Digital Signal Processing System • 3kHz Roofing Filter for enhanced performance • 3.5 Inch Full Color TFT USB Capable • Internal Automatic Antenna Tuner • High Accuracy TCXO



FTM-300DR | C4FM/FM 144/430MHz Dual Band

- 50W Output Power • Real Dual Band Operation • Full Color TFT Display • Band Scope • Built-in Bluetooth • WIRES-X Portable Digital Node/Fixed Node with HRI-200

FT-5DR C4FM/FM 144/430 MHz Dual Band

- High-Res Full-Color Touch Screen TFT LCD Display • Easy Hands-Free Operation w/Built-In Bluetooth® Unit • Built-In High Precision GPS Antenna • 1200/9600bps APRS Data Communications • Supports Simultaneous C4FM Digital • Micro SD Card Slot



FT-2980R | Heavy-Duty 80W 2M FM Transceiver

- 80 watts of RF power • Large 6 digit backlit LCD display for excellent visibility • 200 memory channels for serious users

FT-65R | 144/430 MHz Transceiver

- 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



FTDX101D | HF + 6M Transceiver

- 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



FTM-200DR | C4FM/FM 144/430MHz Dual Band

- 1200/9600bps APRS® Data Communications • 2" High-Res Full-Color TFT Display • High-Speed Band Scope • Advanced C4FM Digital Mode • Voice Recording Function for TX/RX

FTM-6000R | 50W VHF/UHF Mobile Transceiver

- All New User Operating Interface-E20-III (Easy to Operate-III) • Robust Speaker Delivers 3W of Clear, Crisp Receive Audio • Detachable Front Panel Can Be Mounted in Multiple Positions • Supports Optional Bluetooth® Wireless Operation Using the SSM-BT10 or a Commercially Available Bluetooth® Headset



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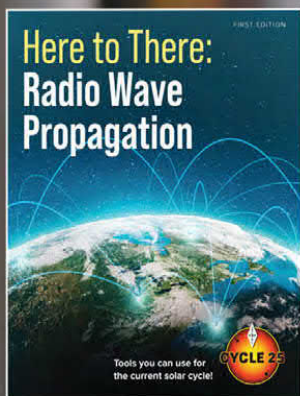
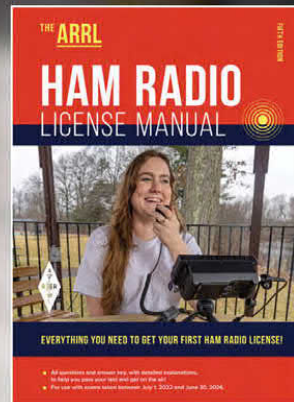
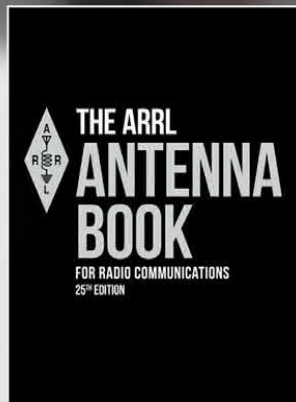
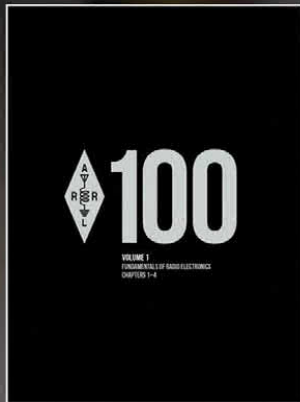
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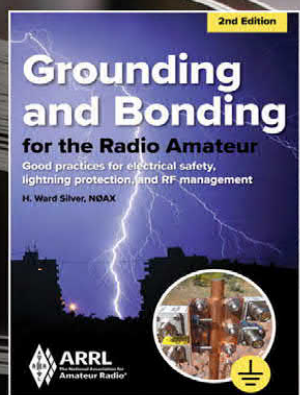
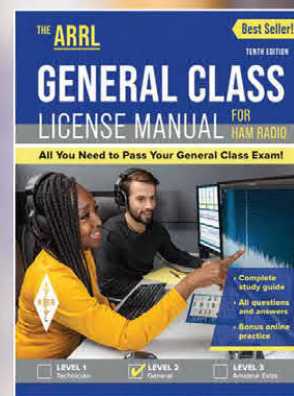
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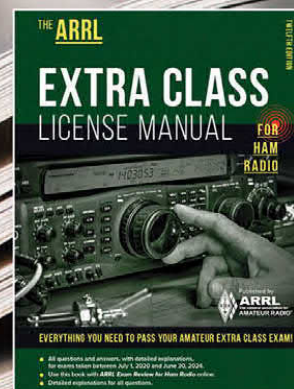


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MFJ Reach for the Sky Mister!

Get that antenna up where it belongs, high in the sky with MFJ's heavy-duty Telescopic Masts and accessories. We have all you need for temporary, portable or permanent antenna installations.

18' Telescopic Mast/Tripod

MFJ-1919EX, \$199.95.

Put your antennas up high anywhere with this super-strong 18 foot telescoping fiberglass mast and MFJ-1919 heavy duty steel tripod. **QuickClamps™** lower mast to 5 feet. Mast has thick 1/8 in. wall, .75" top, 1.5" bottom dia. 15 lbs. Steel tripod has braced triangle base, non-skid feet, mast lock.

9.5' Telescopic Mast/Tripod

MFJ-1918EX, \$129.95.

MFJ-1918 tripod with 9.5 ft. telescoping fiberglass mast. 3.8 feet collapsed. 6.5 lbs.



Tripods Only

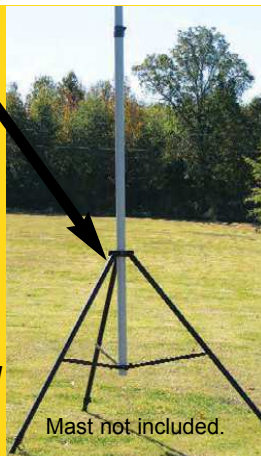
MFJ-1921, \$219.95.

Giant tripod base spreads to 8'! Supports massive masts/antennas. Adjustable length non-skid legs accommodates uneven ground surfaces. Optional foot anchors. 14 lbs.

MFJ-1919, \$129.95.

Large tripod spreads to 4.8 ft. Support 100 lbs. 7.8', 9.75 lbs.

MFJ-1918, \$84.95. Small tripod base spreads to 2.75 ft. Support 66 lbs. 6.75 lbs.



Mast not included.

Light Duty Lightweight Fiberglass Masts

Portable. telescoping high-strength fiberglass masts extend way up into the sky! Just pull out sections and lock.

Choose Lightweight-Light-Duty or Super-Strong Thick-Wall models -- 10 to 50 feet long. Each collapses to an easy-to-carry size for true portability.

For quick put-up and take-down, light-duty models have Twist & Lock sections and heavy-duty thick wall models use military style **QuickClamps™** or stainless steel hose clamps.

Use them for traveling, camping, at hotels, hamfests, field day, DX-peditions. Put up full size full performance inverted Vee, dipole or vertical antenna in minutes at heights that will snag you real DX.

Use multiple telescoping masts to make loops, quads, rotatable dipoles even beams.

Light Duty Lightweight Fiberglass Masts

So lightweight you can take them anywhere!

MFJ's most popular MFJ-1910 is 33 feet long, 3.3 lbs.

MFJ-1910, \$119.95. 33 ft., light duty w/top tie ring.

MFJ-1911, \$129.95. 20 ft., light duty w/top tie ring.

MFJ-1913, \$129.95. 28 ft., lightweight w/top tie ring.

MFJ-1915, \$159.95. 25 ft., for heavier duty use.

MFJ-1916, \$199.95. 34 ft., for heavier duty use.

MFJ-1917, \$209.95. 43 ft., heavier duty w/top tie ring.

80-6 Meter Telescopic Antenna

3.8 foot fiberglass mast telescopes to a 31' self-supporting *high performance* 80-6 Meter antenna in minutes! 1/4 wave performance on 40M, 1/2 wave on 20M. High-Q air wound loading coil. Use antenna tuner for 30/20/15/12/10/6. 600 Watts SSB/CW. Temporary, portable or permanent antenna for home, RV, field day, DXpedition. Includes four 12 foot radials. Current balun reduces feedline radiation and pattern distortion. **MFJ-2982, \$179.95.** 80-6M. **MFJ-2980, \$139.95.** 40-6M.



Super-strong .125" Thick-Wall Fiberglass Masts

Use for temporary or permanent wire antennas, small beams or verticals. **Best seller** is 48 ft. long, just 24 lbs.

Heavy Duty Models: All have QuickClamps™

MFJ-1908HD, \$319.95 is 48' ext., 7.75-ft. collapsed, has 2 1/2" OD bottom, 1" OD top, seven 7.75-ft. sections, 24 lbs.

MFJ-1906HD, \$269.95 is 38' extended, 6 feet collapsed, has 2 1/2" OD bottom, 1" OD top, seven 6-foot sections, 24 lbs.

MFJ-1904HD, \$199.95 is 25' extended, 4 feet collapsed, has 2 1/2" OD bottom, 1" OD top, seven 4-foot sections, 14 lbs.

MFJ-1904H, \$179.95. 22' ext., 5' collapsed, 9 lbs. 2 1/2" OD.

MFJ-1902H, \$159.95. 10' ext., 38" collapsed, 5 lbs. 2 1/2" OD

Standard Models: H models have QuickClamps™

MFJ-1906, \$179.95/MFJ-1906H, \$239.95. 33 feet, ext. 6 ft. collapsed, six 6-ft. sections, 13 lbs. 2" bottom, 3/4" top OD.

MFJ-1908, \$239.95/MFJ-1908H, \$289.95. 41' ext., 7.75-ft. collapsed, six 7.75-ft. sect., 16 lbs. 2" bottom, 3/4" top OD.

Mast Accessories

MFJ-1900, \$99.95. Mount clamps mast to mounting pipe.

MFJ-13, \$84.95. 5 Military **QuickClamps™**. Fit 3/4" to 2" OD.

MFJ-13HD, \$84.95. Extra set clamps, 1- 2 1/2" masts.

Mast Guy Ring Sets

Fits masts 3/4" to 1 1/4"



dia. OD. **MFJ-2830X, \$13.95, fiber-glass; MFJ-2840X, \$19.95, aluminum.**



Left: Stainless Steel Hose Clamps recommended for permanent installations. Fiberglass is slotted. **Right:** UV protected Military grade **QuickClamps** Guy 2 levels when fully extended.



MFJ "HamStick" Isolated Dipole

MFJ-347, \$29.95. Build your own 80-6 Meter *mini*-dipole using two HF mobile whips!

MFJ-347 *isolates* dipole elements. Lets you use a balun to give a *true balanced dipole*. Prevents pattern distortion, noise pickup and RFI radiation from RF on coax shield. Solid aluminum. Use masts up to 1 1/4" OD.



3/8-24 Hamstick Mount. MFJ-342T, \$19.95.

Mount 3/8-24 HF/VHF hamsticks vertically or horizontally on masts to 1 inch. Built-in SO239.



MFJ Balcony Mount Tripod Anchors

Mount *multiple* HF/VHF hamsticks, verticals, dipoles vertically or horizontally on your balcony. High-strength aircraft aluminum extends out 14 inches. Two U-bolts mount to 1 1/2 inches diameter railing/fence post.



MFJ-1907
\$69.95



MFJ-1905, \$44.95. Securely anchor your tripods to the ground with

these 3 *stainless steel* foot braces and your stakes. For high winds, unlevel ground. Fits legs to 1 1/2 inches OD.

Portable Mast Supports

MFJ-1912, \$129.95. Just

drive your car or truck tire over the stainless steel base of the mount. You're ready for virtually any antenna. Fits up to 2.25" masts.



MFJ-1914, \$139.95.

Stainless steel antenna mast mount includes four heavy duty galvanized ground stakes to hold your antenna up safely in the field. Use up to 2.25" masts.



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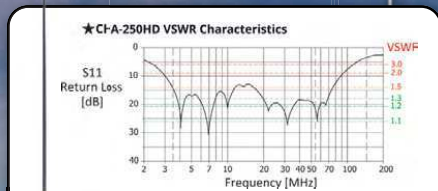
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• 1 Year No Matter What™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ



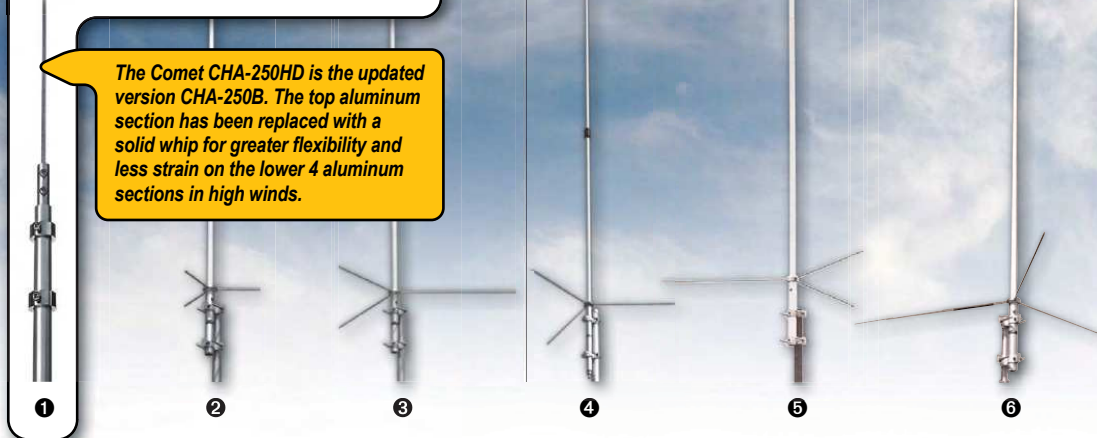


**Life is a JOURNEY.
Enjoy the ride!**



CHA-250HD - No Antenna Tuner Needed!

The Comet CHA-250HD is the updated version CHA-250B. The top aluminum section has been replaced with a solid whip for greater flexibility and less strain on the lower 4 aluminum sections in high winds.



CTC-50M Window Gap Jumper
No more drilling or open windows!



Base Antennas

1 **COMET, CHA-250HD BROADBAND 80M THROUGH 6M VERTICAL ANTENNA**

A newly designed broadband vertical with NO GROUND RADIALS. EXTREMELY easy to assemble, requires no tuning or adjustments and VSWR is under 1.5:1 from 3.5-57MHz! • TX: 3.5MHz – 57MHz • RX: 2.0– 90MHz • VSWR is 1.5:1 or less, continuous • Max Power: 250W SSB/125W FM • Impedance: 50 Ohm • Length: 23' 5" • Weight: 7 lbs. 1 oz. • Conn: SO-239 • Mast Req'd: 1" – 2" dia. • Max wind speed: 67MPH

2 **COMET, GP-3 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA**

Wavelength: 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Max Pwr: 200W • Length: 5'11" • Weight: 2lbs. 9ozs. • Conn: Gold-plated SO-239 • Construction: Single-piece fiberglass

3 **COMET, GP-6 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA**

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

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

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

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

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

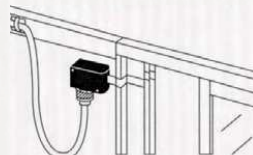
6 **COMET, GP-15 TRI-BAND 52/146/446MHZ BASE REPEATER ANTENNA**

Wavelength: 52MHz 5/8 wave • 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 4 • Max Pwr: 150W • Length: 7'11" • Weight: 3lbs. 1oz. • Conn: Gold-plated SO-239 • 2MHz band-width after tuning (6M) • Construction: Single-piece fiberglass

7 **COMET, CTC-50M WINDOW GAP JUMPER**

Avoid drilling holes or leaving windows open/unlocked. Flat coax easily forms to window frame. Low loss SO-239 on each end, 15 inch length.

• Max Pwr: HF 100W PEP / VHF 60W FM / UHF 40W FM / 900-1300 MHz 10W FM



CAA-500MarkII

1.8-500MHz Antenna analyzer

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.

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

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!

CAA-5SC

Protect your CAA-500MarkII from moisture, shock, dents and dings!

Shoulder strap included.



Call or visit your local dealer today!

www.natcommgroup.com | 800-962-2611



MFJ POTA helpers

80-10 Meters with single EFHW antenna, no tuner needed!

MFJ-1982MP, \$99.95



- **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.
- **End-Fed Half-Waves** (EFHW) res-

onate on halfwave fundamental frequency and even harmonics. 80-10 Meters -- no traps, stubs, resonators. Broad-band matching transformer gives you low SWR! No tuner usually needed.

- **No long counterpoise**, radials or feedline required
 - **Nearly invisible**, no-tangle black Teflon insulated radiator wire.
 - **Weather** and U/V resistant. Easy storage and transport.
- MFJ-1982MP, \$99.95. 300 Watts**
Restricted space, 80-10M. 132 ft.
MFJ-1984MP, \$89.95. 300 Watts

Restricted space, 40-10M. 66 feet.
MFJ-1982HP, \$129.95. 800 Watts, high power, 80-10 Meters. 132 feet.
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.
MFJ-1984LP, \$79.95. 30 Watts QRP, 40-10 Meters. 66 feet.

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.



Premium stainless steel telescopic whips

-- Build collapsible dipoles, mobiles, portable and base antennas. Great for traveling. Rigidly collared at the base, stronger than plated brass, resists rust/corrosion. 16.9/12/10/8/4.5' models available.

MFJ-1979, \$69.95. Most popular! 16.9' ext., 27" collapsed. 10 sect. 20-6M.

MFJ-1936T, \$49.95. Ground rod, 3/8-24 mount, 17' whip, counterpoise.

Continuously tuneable Portable 60-6M Antenna

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.



HF Hamstick Portable Antennas

MFJ-16XXT, \$22.95-\$29.95. Monoband portable hamsticks make POTA fun & easy! Small, lightweight, efficient, and easy-to-use. Dual center and distributed loading lets you radiate efficiently -- get more power out for working DX and ragchewing. Ruggedly constructed. Heavy duty 4'-3/8" diameter fiberglass rod, .125" diameter PH-17-7 stainless steel whip, chrome plated brass fittings give years of dependability. Adjust whip for lowest SWR. Allen wrench, tuning/matching instructions. 250W. PEP. 7' fully extended, collapses to 4' for easy storage. 6/10/12/15/20/30/40/60/75M. 3/8 x 24 mount.

MFJ-347, \$29.95. Mounts 2 of your favorite hamsticks to make a dipole. Use masts up to 1.25" OD. Isolated dipole elements.



18 foot Telescopic Mast with Tripod

MFJ-1919EX, \$199.95. 18' telescoping fiberglass mast with heavy duty steel tripod. Mast collapses to 5'. Thick 1/8" wall, .75" top, 1.5" bottom. 15 lbs. Braced triangle, non-skid feet.

MFJ-1918EX, \$129.95. Tripod, 9.5' telescoping fiberglass mast. 3.8' collapsed. 6 1/2 lbs.

Tripods Only

MFJ-1921, \$219.95. Giant tripod base spreads to 8'! Supports massive antennas. Adjustable non-skid legs. 14 lbs.

MFJ-1905, \$44.95. Optional foot anchors.

MFJ-1919, \$129.95. Base spreads 4.8'. Supports 100 lbs. 7.8 ft, 9.75 lbs.

MFJ-1918, \$84.95. Base spreads 2.75'. Support 66 lbs. 6.75 lbs.



Telescopic Fiberglass Masts

Pull out sections and lock to extend your antenna way to the sky. Lightweight, Light-Duty or Super-Strong Thick-Wall models, 25-43'. Each collapses for easy-to-carry size for true portability.

MFJ-1910, \$119.95. 33', light duty, has top tie ring for wires.

MFJ-1915, \$159.95. 25 feet, for heavier duty use.

MFJ-1917, \$209.95. 43 feet, heavier duty use, has top tie ring for wires.



MFJ RFI Isolator

MFJ-915, \$49.95. Prevents unwanted RFI from traveling on your coax shield into your expensive transceiver and other electronic equipment. Prevents painful RF "bites" and erratic operation. 1.5 kW. 1.8-30 MHz.

MFJ 4:1 Balun

MFJ-918, \$49.95. True 1:1 current balun/center insulator. High-permeability ferrite beads on RG-303 Teflon[®] coax. 2" dia.x6" long. 14 gauge 7-strand copper wire. 1.5 kW 1.8-30 MHz.



MFJ POTA Antenna Tuners

MFJ-939, \$199.95. Automatic Tuner, 200W Digital/SSB/CW. 20,000 memories, super fast automatic tuning. Includes interface cable, 2-year warranty. Compact 6 1/2 Wx2 7/8 Hx8 3/4 D".

MFJ-945E, \$189.95. 160-6M Manual antenna tuner. Lighted Cross-Needle SWR/Wattmeter, Lamp/ Bypass switches. 300 Watts. Compact 8 Wx2 Hx6 D inches.



MFJ 30 Amp Power Supply

MFJ-4230MVP, \$159.95.

Ham radio's best seller is just 5 Wx2 1/2 Hx6 D inches, and just 3 pounds. Perfect for home, POTA or for power for your "Go-Box". 25A continuous, 30A surge at 13.8 VDC. Adjusts 4-16 VDC. 120/240 VAC at 47-63 Hz -- worldwide! V/A Meter switch. 75% efficiency, low ripple/noise, <100 mV. Over-voltage/current protections.



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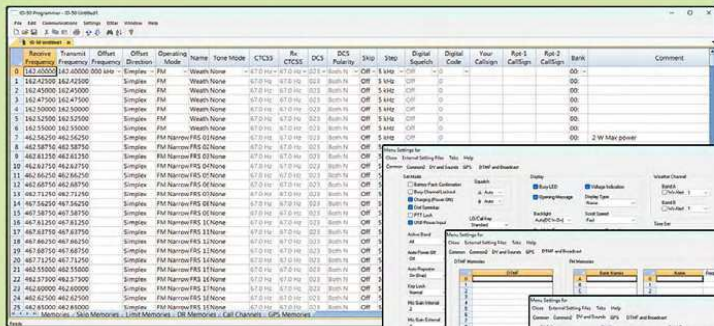
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End Fed Half Waves

Operate 80-10 or 40-10M with one support/no tuner.

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Lightweight, virtually invisible. Gives you directivity and gain (see MFJ website).

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MFJ-2014, \$139.95. 75/40 Meters, 1500 Watts. 122 ft.

MFJ-2016, \$169.95. 160/75/40 Meters, 1500 Watts. 240 ft.

MFJ-2013, \$109.95. 60/30 Meters, 300 Watts. 86 ft.



Dual Band 80/40 or 40/20 Dipoles, 1.5 kW

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Super-strong center insulator, built-in SO239, hanghole.

MFJ-17754, \$89.95. 40/20M, 42 ft.



MFJ All Band Doublet

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MFJ 1.5 kW Dipoles

7-strand, 14-ga. copper wire. Ceramic insulators. Center insulator with SO-239

MFJ-1779C, \$59.95. 20-6M, 35 feet.

MFJ-1779B, \$79.95. 80-40M, 135 feet.

MFJ-1779A, \$99.95. 160M, 265 feet.



20M Extended Double Zepp

MFJ-1742, \$124.95. See web for gain. 90 ft. long, 100 ft. ladder line. 7-strand, 14-ga. wire. 80-10M with tuner/balun. 1500 Watts SSB/CW/Digital.



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MFJ-1748, \$124.95. 125 feet long, 100 foot ladder line included. 7-strand, 14-ga. wire. Use tuner/balun. 1500 Watts SSB/CW/Digital.



MFJ-915, \$49.95

RFI Isolator

Prevents unwanted RF from traveling on your coax shield into your expensive transceiver. Prevents painful RF "bites" and erratic operation. 1.5 kW. 1.8-30 MHz.



MFJ-918, \$49.95

4:1 Balun

True 1:1 current balun/center insulator. High-permeability ferrite beads on RG-303 Teflon[®] coax. 2" dia.x6" long. 14 gauge 7-strand copper wire. 1.5 kW 1.8-30 MHz.



MFJ-913, \$49.95, 300W

MFJ-919, \$84.95, 1.5 kW

True 4:1 current baluns/antenna center insulators transform 200 ohms to 50 ohms, 1.8-30 MHz. Transmission line transformer, low permeability ferrite cores, SO-239, stainless steel hardware with direct 14 gauge stranded copper wire to antenna.



MFJ Vertical Mounted Antennas

MFJ 6-Band Cobweb Antenna

MFJ-1836H, \$319.95. Six-bands: 20/17/15/12/10/6 Meters, 1.5 kW. Perfect for restricted space. Nearly invisible. 9x9x1/2 feet, 8 lbs. Outstanding performance! Horizontally polarized gives less noise, more gain over verticals. Omni-directional. No radials needed! Works great at low heights. Low SWR.

MFJ-1836, \$299.95. Like MFJ-1836H, but 300 Watts.

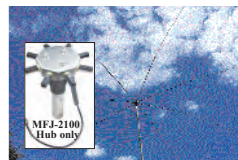


MFJ 4-Band Dipole Octopus Antenna

Octopus antenna hub turns hamsticks into four balanced HF/VHF/UHF dipoles! Rotate for maximum signal, minimum QRM/noise. Mount low for local NVIS, high for DX. Perfect for portable, limited space, HOAs, camping, ARES. Balun. No tuner needed.

MFJ-2104, \$299.95. Includes 8 hamsticks for 75/40/20/15 M.

MFJ-2100, \$129.95. Hub only. Use eight hamsticks.



MFJ Multi-Band Verticals, no radials needed!

Low angle radiation lets you easily work far-away, rare DX!

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5 models: Choose your bands 80-2 Meters

MFJ-1796, \$369.95. 6 bands: 40/20/15/10/6/2M, 12 feet.

MFJ-1797, \$399.95. 7 bands: 40/30/20/17/15/12/10M. 23 ft.

MFJ-1797LP, \$369.95. Like MFJ-1797, but only 9 feet tall. Narrower bandwidth on 40 Meters.

MFJ-1799, \$599.95. 10 bands: 80/40/30/20/17/15/12/10/6/2M. 20 ft.

MFJ-1799X, \$549.95. Like MFJ-1799, but less 80M.



MFJ 43-foot Vertical, 160-6 Meter

MFJ-2990, \$469.95. High performance 43 foot vertical operates 160-6 Meters, 1500 Watts SSB/CW/Digital. 2 square feet wind load. Self-supporting, no guy wires needed. 6063 aircraft aluminum tubing, bottom section 2" OD, .120" wall thickness. 20 lbs. Requires antenna tuner, ground/counterpoise.



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BigEAR™ Dipole

MFJ-2289, \$249.95. 7-55 MHz. Full-size 20-6 Meter dipole, 40M air loading coil. Two 17 ft. telescopic whips, 28" collapsed.



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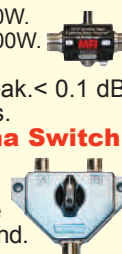
MFJ-270, \$27.95. 400W.

MFJ-272, \$37.95. 1500W. Gas discharge tube shunts 5000 amps peak.< 0.1 dB loss. 1 GHz. SO-239s.

2-Position Antenna Switch

MFJ-1702C, \$69.95.

2-position antenna switch, lightning surge protection, center ground.



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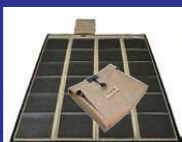
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\$329⁹⁵
Receive Loop with Bias-Tee

Pull weak signals out of static crashes, atmospheric, man-made and power line noise!

Clearly hear signals 50 KHz to 30 MHz you never knew existed. Power line noise and static just disappears.

MFJ-1886 drastically reduces noise and interference by receiving the magnetic field and rejecting the electric field. Rotate MFJ-1886 receiving loop to totally eliminate interfering signals or greatly peak desired signal.

Excellent antenna and preamplifier

balance gives deep null.

State-of-the-art push-pull Gali MMICs preamp gives you high dynamic range, low IMD and 25 dB of low noise gain.

Gives excellent strong and weak signal performance without overload.

Fully protected preamplifier -- magnetically coupled voltages up to 40V and capacitively coupled voltages up to 20V will not damage preamplifier.

Output is protected from transmission line surges induced by distant lightning.

Use anywhere, inside or outside. RF signal and power goes through your 50 Ohm coax.

Ruggedly built to withstand extreme weather. 1-inch OD diameter 6061 aluminum tubing. 36-inch diameter. 2 1/2 lbs. SO-239. Use masts up to 1 3/4 inches.

MFJ-1886, \$329.95. Includes receive loop and MFJ-4116 bias-tee to power MFJ-1886 through coax.

MFJ-1886TR, \$369.95. Includes MFJ-1886 and MFJ-4113TR Bias-Tee/Transmit/Receive switch. MFJ-4113TR powers MFJ-1886 through coax and switches between transmitting antenna and receiving loop. For radios with only one antenna connector.



MFJ-4116, \$44.95. Bias-Tee provides RF signal and power through coax transmission line. Send up to 1A DC up to 50 Volts.

MFJ-4113TR, \$119.95. Bias-Tee with built-in Transmit/Receive switch. Switches between transmitting and receiving antenna. For radios with only one antenna connector. Provides RF signal and power through coax.

Multi-coupler/Bias-Tee

New! MFJ-1888MC, \$249.95. Connect four receivers to one antenna. Receivers are fully isolated. Each receiver port has 1-12 dB adjustable gain. IP3 is +15 dB. 2dB noise figure. Built-in Bias-Tee powers receiving loop through coax. SO-239s. Use 12 VDC or 110 VAC with MFJ-1312D, \$19.95. RF tight, 7 1/4 Wx1 3/4 Hx5D inches.



Super High Dynamic Range High Gain Receiving Loop

New! MFJ-1888, \$499.95. 32 dB gain from 50 KHz to 30 MHz. 20 dB gain at 80 MHz. IP3 is +30 dB, 1 dB compression point is 23 dB, noise figure is 1.7 dB. Built-in BCB input filters to reduce overloading. Includes MFJ-1888MC remote multi-coupler. Can be used with MFJ-4113TR Bias-Tee/T/R switch and/or MFJ-4116 bias tee. 36-inch diameter. 2 1/2 lbs. SO-239. Use masts up to 1 3/4 inches.



Antenna Rotator

Perfect for MFJ-1886/1786/1788 loop, VHF/UHF, small HF beams, TV, FM antennas.



AR-500
\$199⁹⁵

Weather-proof one piece cast aluminum housing with precision all metal gears, steel thrust bearings and automatic braking. Includes rotator, controller, remote control, clamps, hardware. Memories for 12 directions! Digitally displays position. 110/220 VAC.

Wipe out RFI

Wipe out RFI, noise, interference from any direction at any frequency with a 60 dB notch before it gets into your receiver!

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Null out QRM on rare DX and work him! Null out local ham or AM station to prevent receiver overload. Works on SSB, AM, CW, FM, digital BCB to lower VHF. Plugs between antenna and transceiver. 12VDC, 110VAC with MFJ-1312D, \$19.95.



MFJ-1026
\$259⁹⁵

MFJ Super High-Q™ Transmitting Loop Antennas



MFJ-1786
\$659⁹⁵

MFJ 36-inch diameter transmitting loop antenna lets you operate 10-30 MHz continuously including WARC bands!

Ideal for limited space, HOA.

Work DX with low angle radiation and local close-in contacts with high angle radiation when mounted vertically. 150 watts.

Super easy-to-use! MFJ remote control auto tunes to your desired band. Fast/slow tune buttons, Cross-Needle

SWR/Watt-meter lets you quickly tune to your exact frequency. No control cable needed.

World's most efficient small loop antenna has all welded construction, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter aluminum radiator for highest efficiency.

Every capacitor plate is welded for extremely low loss and polished to prevent high voltage arcing. Nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor gives smooth precision tuning. Heavy-duty ABS plastic housing has ultraviolet inhibitor.

Cover 40-15 Meters. MFJ-1788, \$719.95. Like MFJ-1786 but covers 40-15 Meters continuous. Includes remote control.

Portable Loop



MFJ-1780,
\$429.95.

Box fan loop with carrying handle, 24x24x5 1/4". 20-10 Meters continuous, 150 Watts. Fast/slow tune remote control. Highly efficient all-welded construction.

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AC current : 1mA RMS, ±0.2%

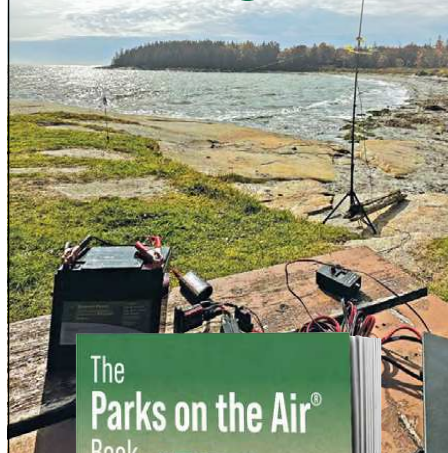
Frequency : 100Hz, ±0.02% signal source (2nd freq. option)

Duty Cycle : 100Hz, 5V RMS, signal source @ 50% ±0.05%

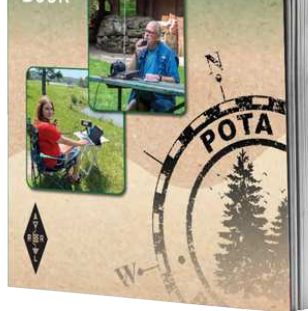
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Yes one of each please.

MFJ-2100, \$129.95.

Want a super versatile antenna system? This Octopus hub lets you place four bands, two hamsticks each. Picture 75/40/20/10 Meters or any other combination you wish. One feedline, tough aircraft aluminum construction.

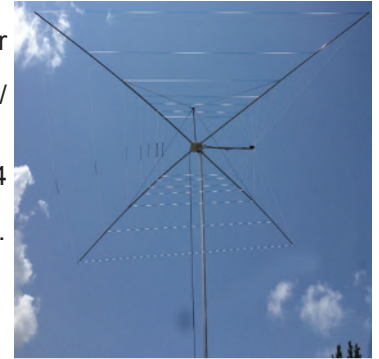
MFJ-2104, \$299.95. 75/40/20/15M hamsticks, hub combination.

MFJ-2104X, \$299.95. Octopus hub and your choice of four pair of MFJ hamsticks.



MFJ-1838, \$489.95.

The Cobweb Antenna for restricted spaces covers 8-bands: 40/30/20/17/15/12/10/6 Meters. Super strong large diameter fiberglass, heavy duty 14 gauge stranded hard copper wire. 1500 Watts. 12 feet 23 lbs.



MFJ-1836H, \$319.95.

20-6 Meters, 1500W.



MFJ-1797, \$399.95.

SkyMaster 40-10 Meter vertical covers all of your favorite bands: 40/30/20/17/15/12/10 Meters. Handles 1000 Watts PEP. Just 7.5 lbs, 23.5 feet tall.

MFJ-1797LP, \$369.95.

Like MFJ-1797 less the 14.5' whip, less efficient, narrow bandwidth on 40M. Weighs 6 lbs., only 9 feet tall for super low profile.

MFJ-2982, \$179.95. The FeatherLite is a self-supporting vertical antenna that sets up in minutes, collapses to 3.8 feet for easy storage. Perfect for RVs, vacations, field day. 80-6M, includes mount, balun, wire and telescopic mast.

MFJ-2980, \$139.95. 40-6 Meters.



MFJ-2389, \$399.95.

Compact Vertical Antenna covers 80/40/20/15/10/6/2 Meters and UHF. Weighs less than 6 lbs. and just 8.5 feet tall. Built-in ground radial system, no fooling with counterpoise wires. SWR is 1.5:1 or less, handles 200 Watts. 1/4 wave on HF, 80-6 Meters, 1/2 wave on 2-Meters and a 5/8 wave on 440 MHz. *All in one antenna!*

MFJ-1886, \$329.95.

Low-Noise Receive Loop lets you work DX and ragchew even through horrendous noise. Pull weak signals out of static crashes, atmospheric, man-made and power line noise. Clearly hear signals 50 KHz to 30 MHz.

MFJ-1888, \$499.95. Like MFJ-1886 but includes MFJ-1888MC remote multi-coupler. Connect 4 receivers.



MFJ-1778, \$89.95.

The famous G5RV antenna is 102 feet wide with 32.5 feet of ladder line terminating in an SO-239 connector. Operate all bands 160-10 Meters. Use **MFJ-915, \$49.95**, RFI isolator for eliminating RF from traveling on long coax lines.

MFJ-1778M, \$79.95.

Half-size G5RV Junior is 52 feet, covers 40-10M with tuner. 1500 Watts.

MFJ-1779 ABC, \$99.95, \$79.95, \$59.95.

Single Band Dipole antennas have a custom injection molded UV-resistant center insulator with heavy duty 14-gauge hard copper wire. Models for 20-6M, 80-40M and 160M. Use horizontal, sloping or inverted vee. **MFJ-1779A**, 265 ft. 160M. **MFJ-1779B**, 135 ft. 80/40. **MFJ-1779C**, 35 ft. 20-6M.



MFJ-2010, \$89.95.

Off Center Fed Dipole delivers ham radios most interesting DX bands, 40/20/10/6M. Long leg is 44.6 ft., short is 22.3 ft. Perfect for low profile, portable, QRP, < 2 lbs. **MFJ-2012, \$109.95.** Like MFJ-2010 but legal limit. **MFJ-2013, \$109.95.** For 60/30 Meters, 300 Watts. **MFJ-2014, \$139.95.** For 75/40 Meters, legal limit.



Build your own!



MFJ-2774K, \$99.95.

Deluxe dipole kit includes three multi-purpose center insulators, 100 feet of nylon rope, copper wire, two PL-259 connectors, two RG68 reducers, stainless steel screws and nuts and six ceramic insulators. Make G5RV, doublet or dipole antennas!

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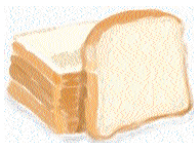
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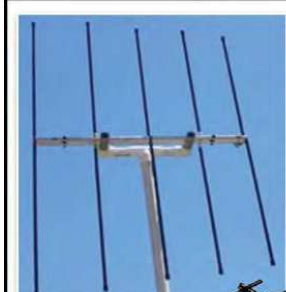
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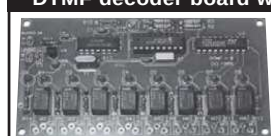
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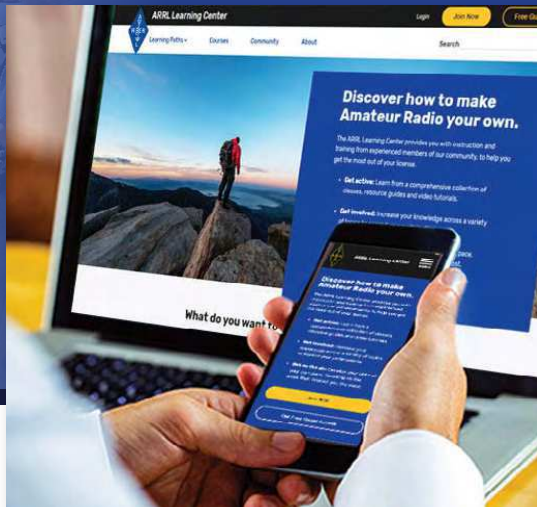
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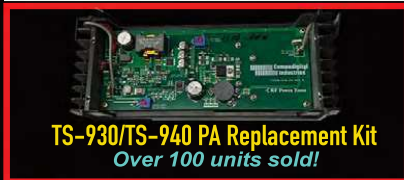
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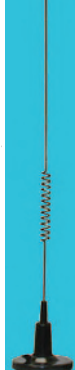
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3/8 - 24
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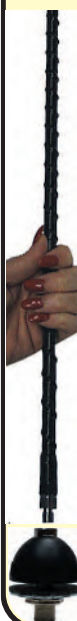
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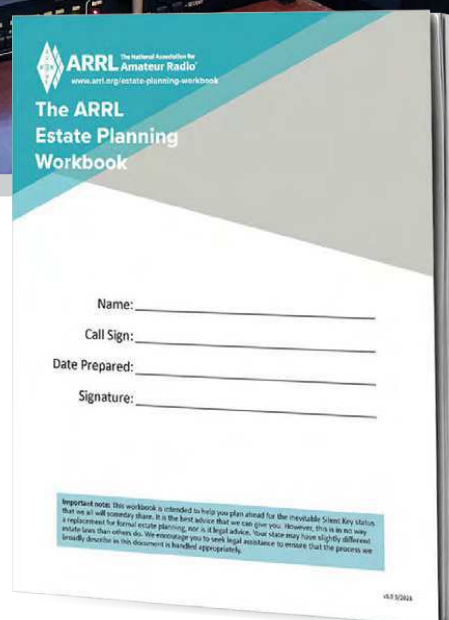
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