Build a Coupled-Resonator Dipole for HF | 34

QST

DIGITAL EDITION

ARRL The National Association for Amateur Radio®
April 2023 www.arrl.org
DEVOTED ENTIRELY TO AMATEUR RADIO

What to Know About Mics

QST Reviews

Icom IC-V3500 FM VHF Transceiver

Comet CAT-300 1.8 – 50 MHz Manual Antenna Tuner

QRO.cz RX Audite SDR Splitter/Switch

tinySA Ultra — A 100 kHz to 6 GHz Spectrum Analyzer

Birth of the New Flagship Mobile

AESS Front Speaker, Touch & Go, Search & Go, Introducing the Entirely New Mobile

FTM-500DR
BIGHEAD

Delivers Clear & Powerful High-fidelity Audio Front Speaker, with AESS* Dual Speaker System

*(AESS: Acoustic Enhanced Speaker System)

Uncomplicated and Effortless Dual Band Mobile Operation Innovative Smart Operating System with TOUCH & GO / SEARCH & GO Functions

(E2O: Easy to Operate -IV)

- TOUCH & GO enables initiating communications quickly by touching the target frequency
- SEARCH & GO enables Dual-Receive of a desired frequency during Main channel operation

As of January 2023, this device has not been approved by the FCC. It may not be offered for sale or lease until FCC approval has been obtained. The information shown is preliminary and may be subject to change without notice or obligation.

YAESU
Radio for Professionals

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

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

Smart New Operating Features

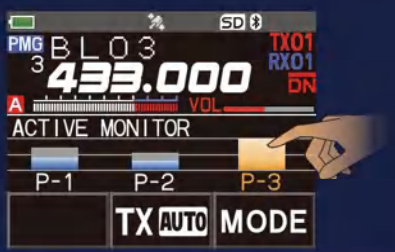
Touch & Go

Simply Touch the displayed Channel Bar to Quickly Start Communications

High-resolution Full-color LCD touch panel, and Ultra-High-Speed PLL Real-time Scope

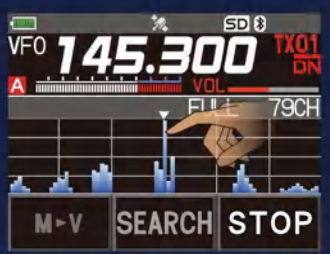
PMG (Primary Memory Group) Activity Monitor

- Register the current display frequency into PMG with one press of the "PMG" key.
- Simply press the "PMG" key to instantly display the receive status of the registered frequencies in a Bar Graph (Activity Monitor).
- Touch & Go Operation allows quickly starting communication by touching the displayed target channel bar.



79 channel Band Scope

- Displays a bar graph of up to 79 channels, in high-speed real time, centered on the current VFO frequency.
- Select the number of channels from 79ch/39ch/19ch by touching the displayed channel number.
- Touch & Go Operation allows immediately moving to the frequency and starting communication by touching a displayed channel bar.



C4FM/FM 144/430MHz DUAL BAND
5W DIGITAL TRANSCEIVER

FT5DR

C4FM Digital Clear Voice
Clear and Crisp Voice Technology

AMS Automatic Mode Select

66 ch GPS

WIRES-X

Touch & Go Operation

micro SD Card

Bluetooth®

Comfortable Grip with Full Flat-Back and Quick Release Holster (Supplied)

- Comfortable size and form with no protrusions provides excellent grasp, even when wearing gloves for outdoor activities.
- Quick Release Holster that easily attaches and releases the FT5DR and allows operation with an excellent hold and feel.

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MA-6B 6-Band Beam

Small Footprint -- Big Signal

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

Cushcraft's latest MA-6B gives you *2-elements on six bands!* You get solid *signal-boosting directivity* in a bantam-size and weight.

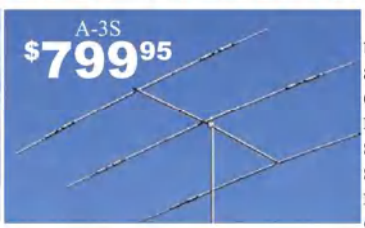
It mounts on your roof or mast using standard TV hardware. It's perfect for exploring exciting DX without the high cost and heavy lifting of installing a large tower and a full-sized array. Its 7 foot 3-inch boom has less than 9 feet of turning radius. Contest tough -- handles 1500 Watts.

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.You get 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 five bands: 20/17/15/12/10 Meters. 12 and 17 Meters is a single element trapped dipole. ***See cushcraftamateur.com*** *for gain figures.*

Cushcraft 10, 15 & 20 Meter 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 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!

It goes without saying that the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these antennas sold years ago are still in service today! 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 powerhouse gain and super performance. A-3WS, $649.95, 12/17 M. **30/40 Meter** *add-on kits* available.

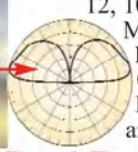
Cushcraft R9 . . . 80-6 Meters

80 Meters . . . No Radials . . . 1500W

Cushcraft's world famous R8 now has a big brother!

Big Brother R9 now includes 75/80 Meters for local ragchewing and worldwide low band DX *without radials*!

It's omni-directional low angle radiation gives you exciting and easy 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 when the going gets tough to break through pileups/poor band conditions.

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.

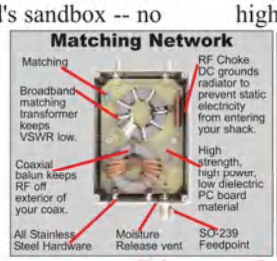
Rugged Construction: Thick fiberglass insulators, all-stainless steel hardware and 6063 aircraft-aluminum tubing is double or triple walled at key stress points to handle anything Mother Nature can dish out.

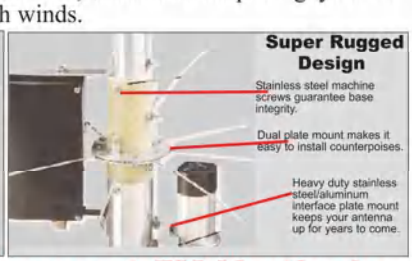
31.5 feet tall, 25 lbs. Mounting mast 1.25 to 2 in. Wind surface is 4 square feet.

R8, $699.95. Like R9, less 75/80 M.

R-8TB, $119.95. Lets you tilt your antenna up/down easily by yourself to work.

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





Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios

Dual-bander VHF rigs are the norm these days, so why not compliment your FM base 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 three elements per band and the A270-10S provides five for solid point-to-point performance. They're both pre-tuned and assembly is a snap using the fully illustrated manual.

Cushcraft Famous *Ringo* 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!

***Free* Cushcraft Catalog**
and Nearest Dealer . . . 662-323-5803
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http://www.cushcraftamateur.com

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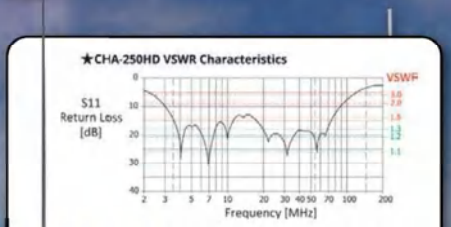
COMET®

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

❶ 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

❷ 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

❸ 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

❹ 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

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

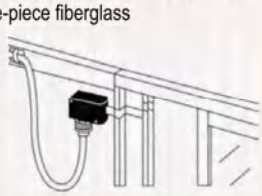
Wavelength: 146MHz 5/8 wave x 2 • 220MHz 5/8 wave x 3• 446MHz 5/8 wave x 5 • Max Pwr: 120W • Length: 10'2" • Weight: 3lbs. 1oz.• Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

❻ 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

❼ 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!

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COMET®

QST

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April 2023 ♦ Volume 107 ♦ Number 4

Columns

Departments

Digital and Mobile Editions

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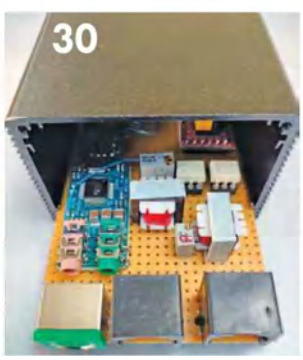
Write for *QST*

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

Our Cover
Hams do a lot of talking and research about transceivers and antennas — how the different types work, and the best use cases for them — but in this issue, we turn our attention to microphones and audio quality. Lindy Williams, K6EB, a retired broadcast and recording engineer and author of "Microphones and Ham Radio," reports that now more than ever, hams in a QSO usually mention what kind of mic they're using, and sometimes those mics are not only costly, but also designed for bandwidths far in excess of the limited ham spectrum. Lindy's article, which is the first in a three-part series on the quality of transmitted audio, will give you an understanding of ham radio's limited bandwidth, as well as the areas within that bandwidth that will transfer maximum intelligibility and optimum signal coverage. [Chris Zajac, photo]



QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, Inc., 225 Main St., Newington, CT 06111-1400, USA. Periodicals postage paid at Hartford, CT, USA and at additional mailing offices.

POSTMASTER: Send address changes to: *QST*, 225 Main St., Newington, CT **06111-1400, USA. Canada Post: Publications Mail Agreement #90-0901437. Canada returns to be sent to IMEX Global Solutions, 1501 Morse Ave., Elk Grove Village, IL 60007.**

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Membership without _QST_ is available to the immediate family of a member living at the same address, and to anyone who is legally blind, for $10 per year.

Foreign remittances should be by international postal or express money order or bank draft negotiable in the US and for an equivalent amount in US funds.

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Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421.

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WANTED

For Low SWR, Excellent Antenna Matching and Ease of Use

LDG Electronics

The Innovators of Hiqh Quality Automatic Antenna Tuners

AT-200PRO II

250 Watts SSB or CW on 1.8-30 MHz, and 100 Watts on 54 MHz.State-of-the-art, processor-controlled switched-L tuner. It will match virtually any kind of coax-fed antenna, including Yagis, dipoles, inverted Vs, slopers, loops, just about anything.

Z-100PLUS

A small, low-cost automatic tuner suitable for any amateur purpose, whether base, mobile or portable. It handles up to 125 watts SSB or 30 watts Digital, but requires only 0.1 watts to tune, making it ideal for QRP operation.

Z-100A

Featuring LDG's famous 10:1 SWR tuning range that matches Dipoles, Verticals, End fed wires, G5RVs or even an off-center fed Windham. Easy integration means plug and play operation; installation could not be simpler. The Z-100A tuner goes anywhere with an HF radio… desktop, portable, parks, islands, or tall summits.

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The SteppIR Advantage

PROBLEM SOLVED!

Yagi antennas are basically single frequency devices that work well only over a very narrow range, typically 0.5% change in frequency. Fixed length yagis compensate by using a variety of techniques, all of which result in serious degradation of performance, especially in Front to Rear rejection, and added complexity, size, and weight. Dipoles have a much broader bandwidth but still cannot cover the entire 80m and 40m bands and maintain a low SWR (<1.5:1). Our patented solution is to simply adjust all of the antenna elements to the optimal length for the desired frequency with none of the compromises in performance that all fixed antennas require. This is accomplished remotely using an electronic controller that can automatically follow the radios' frequency. SteppIR antennas enjoy optimal performance on all frequencies within their specified frequency range (varies by model), and that includes non-ham radio frequencies as well!

THE INHERENT ADVANTAGES OF A STEPPIR:

Create/Modify Mode

The create modify mode allows the user to change the length of each individual antenna element on all bands of operation -and frequencies outside the ham bands as well – and then save the new antennas to memory. This can be incredibly useful to "tune" out potential objects that may be causing interaction with the SteppIR antenna, or to create your own custom antenna designs.

180 Degree Mode

The 180 degree mode feature is one of the most popular among SteppIR owners. For our Yagi antennas, this feature allows a user to electrically "rotate" the antenna from the forward beam heading, to the reverse (180 degrees) beam heading, with a click of a button – the entire process takes approximately 2 seconds.

Bi-Directional Mode

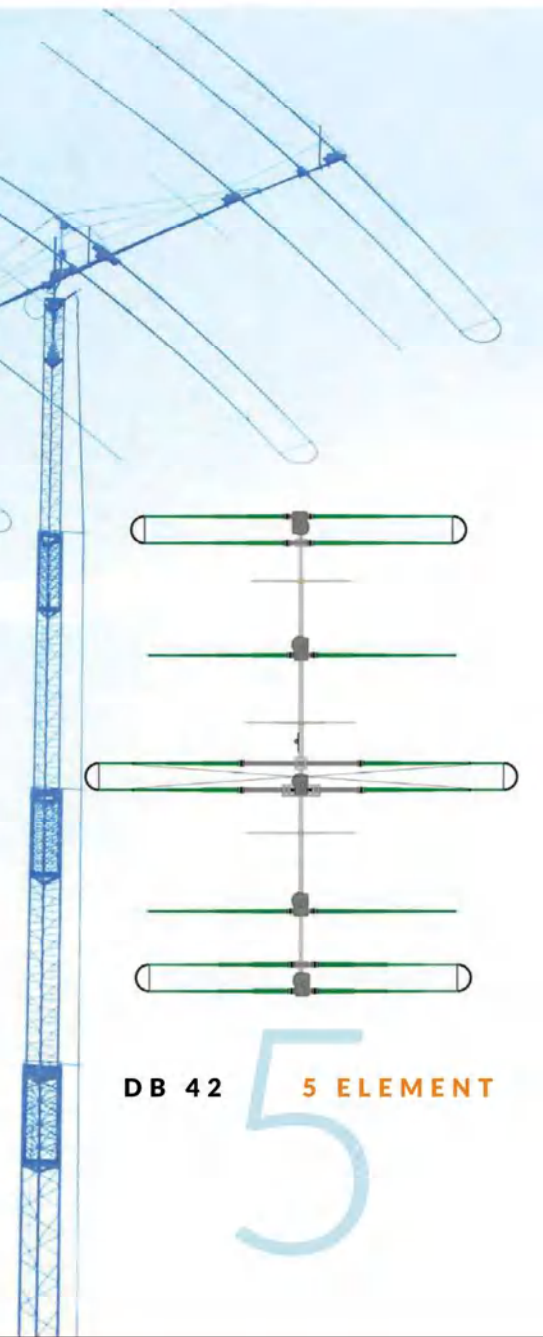
The bi-directional mode works similarly to the 180 function, except when enabled, the Yagi antenna will now be operating with gain in both directions – forward and backwards, simultaneously!

Retract Elements

With a touch of a button, SteppIR antennas can be fully retracted into their housing, which helps to protect the most valuable part of the antenna during extreme weather events.

Emergency Communications

Many times, emergency communications occur outside the standard amateur radio allocated bands of operation. All SteppIR antennas are optimal within the entire scope of their specified frequency range.



DB 42 5 ELEMENT

steppIR COMMUNICATION SYSTEMS

SEE ALL OF STEPPIR'S ANTENNAS: www.steppir.com 425-453-1910

DIAMOND ANTENNA

diamondantenna.net

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

Diamond Antenna is a division of RF Parts Company

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

YEAR of the VOLUNTEERS

Making a Big Decision — Together

I once heard someone say that the membership is at the "top of the pyramid" at ARRL. That struck me, because we do not function that way. ARRL is a membership organization that is structured and run as a company for the benefit of its members. As a member, you choose to support ARRL by paying to be a member; you may choose to provide additional financial support to one or more areas of advocacy that are of interest to you; you vote for your Section Manager, Vice Director, and Director. Yet these are individual actions, taken as a portion of the overall membership. When is your voice, as a membership, heard all at once? I can't find any evidence that, during modern times, the membership ever did anything with a single voice!

Well, here I am asking for you — our membership — to consider an important question and give me your point of view. We need to make a big decision, and if we are cavalier about it, we know that there are those who will head for the door, unhappy that their opinion was never considered! As CEO, I am asking for *your* input. So, here's the big question:

How does ARRL handle an increase in dues?

When I came to ARRL as CEO in 2020, it took me about 2 weeks of going through financials and budgets to see two things: significant work has been done over the years to cut costs, and we have a revenue problem. No organization can operate year after year running a deficit. As each year goes by, and costs for everything increase, maintaining the same annual dues doesn't work. Sooner or later, the financials fall into the red.

Fortunately, in the past 20 years, some very talented people have been committed to raising money and managing the investments that give ARRL the ability to fill that deficit with the earnings on our endowments. Even with market dips, careful management of our investments keeps ARRL strong and running for our members — for the moment. With each successive year, the deficit continues to grow until it overtakes the earnings and the investments begin to erode. There are those who would have us dive into and spend our investments until they are gone, with the hope that some wealthy benefactors will take over paying ARRL's operating costs. If you've spent any time running a business, you'll be familiar with this well-known phrase: Hope is not a strategy.

One area that has been a challenge for us to manage is the cost of printing and mailing our periodicals — in particular, *QST*. You'll remember last May, due to paper shortages, we had to go to paper brokers to find something close to *QST*'s usual paper, just to get the magazine printed and mailed to you on time. Given the performance of other magazines in the amateur radio industry over the years, we were not going to miss mailing even one issue of *QST*. The costs of paper, ink, printing, and distribution have all gone up. These are not costs we can ignore or (again) *hope* get better with time — especially in light of current trends in inflation.

I have spent the past year discussing these financial issues with members, and some themes have consistently emerged: Members agree that $49 is a bargain for all that ARRL does to promote and protect amateur radio (especially when compared to a fast food meal for four, or a tank of gas!). There are many members who enjoy the benefit of reading all ARRL publications, current and past, digitally through the website or app, and if the printed versions of ARRL magazines became an added cost (as *QEX* and *NCJ* are today — imagine adding *On the Air* and *QST* to that model), members would gladly pay for ARRL to continue printing these magazines for those interested in receiving them.

There are other questions that need to be answered regarding Life Members and generous Maxim Society and Diamond Club donors, and frankly we haven't gotten that deep into the analysis or discussion yet. There is still much work that our Administration & Finance Committee needs to do.

And then there's you. Here's your chance to educate me on your thoughts. We will have an online survey available on **www.arrl.org** for the entire month of May. If you haven't done so lately, please go to the website and make sure your account is up to date, including your password (the new website login requires stronger passwords than the old one did).

Take a moment to click on the survey link and answer the few questions there that will ask for your thoughts on how membership is bundled, how you would respond to options such as digital-only or digital-with-printed-magazines, and your honest feelings about costs. Here's where we, as a membership, hold hands and answer big questions together to help guide the future of ARRL. Keep radio active, get on the air and work VOTA, and see you at some of the conventions this year.

David A. Minster, NA2AA
Chief Executive Officer

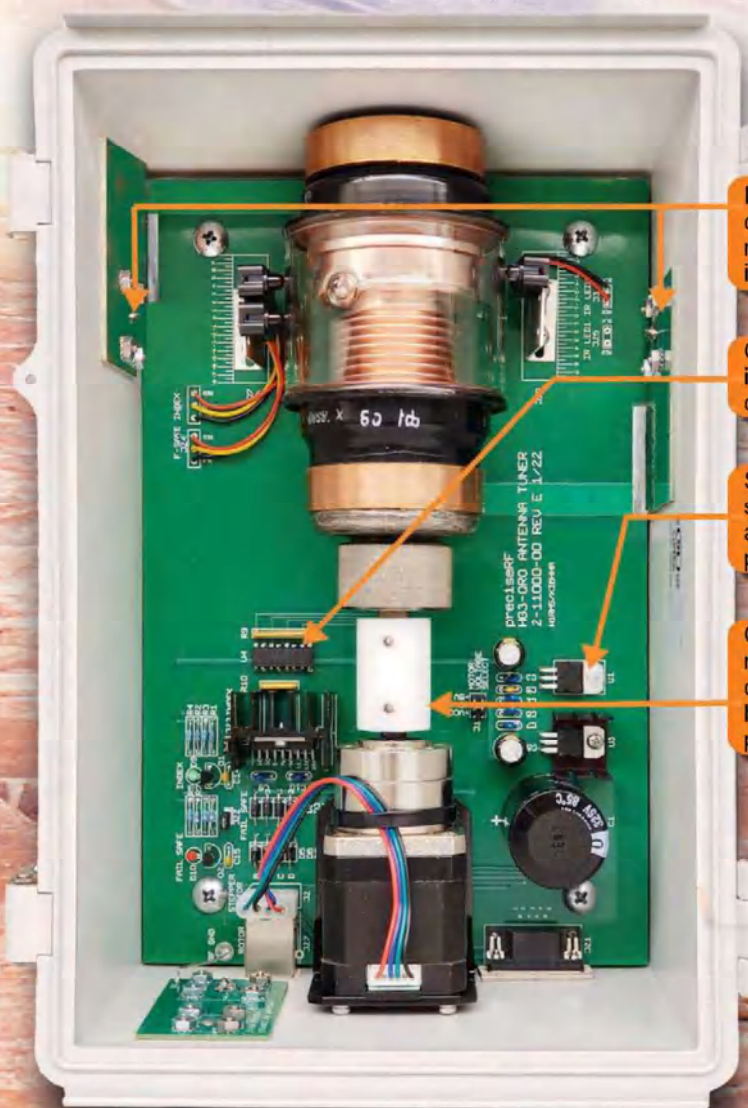
COMPROMISE WAS NOT AN OPTION FOR THE NEW HG3 QRO-A!

No Compromises Mag Loop

The new HG3 QRO-A raised the bar again for Magnetic Loop Antennas (MLA). MLAs are well known for their superior performance. The remotely tuned HG3 QRO-A MLA covers 80*-10 meters with stepper motor precision and resolution. The high Q vacuum capacitor allows for 1.5 KW PEP*. The 45,000-step resolution delivers an unprecedented 511 Hz resolution bandwidth allowing you to set your band preferences spot on. Rapid-Tune automatically scans each band for the lowest SWR and works with most HF radios.

It Pays to Pay Attention

How do you make a great product even better? You listen to your customers.The heart of an MLA is the tuner. We made so many improvements to it that we now call it the HG3 QRO-A. The HG3 Plus Controller also received new firmware and an improved SWR function. *Some limitations may apply or are optional.



HG3 QRO-A Improvements:

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AS-300 Series arrestors are known for their reliability and performance. They feature easy mounting to plates, ground rods with our stacking bracket and also a convenient screw lug. The stacking bracket can be used on plates as well to save precious room in arrestor enclosures.

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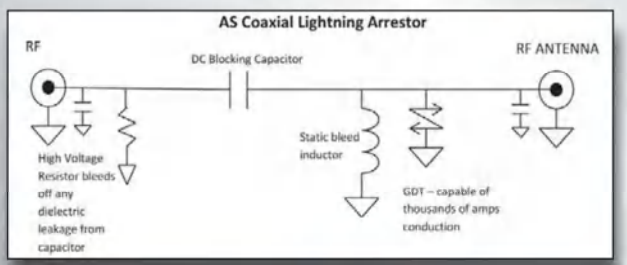
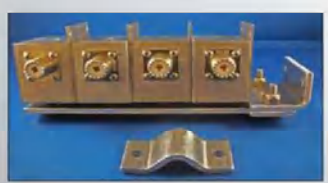
AS-303U

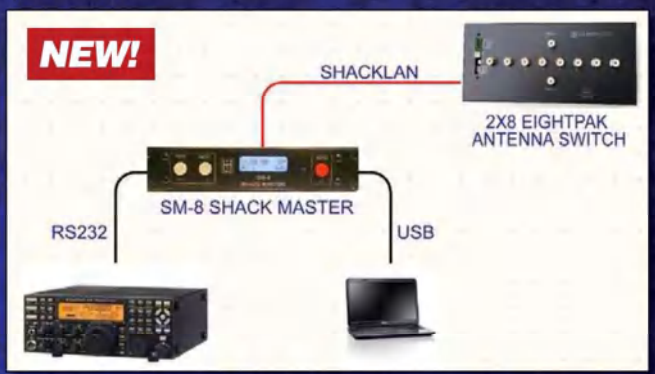




Hamation Station Automation

Hamation remote and Local Station Control products allow you to automatically or manually select antennas, bandpass filters, and control accessories. Accessories can be StackMatches, Antenna switches, antenna phasing systems, SteppIR controller, turning radios on and off, etc. All of this can be done directly from the Ethernet as well!

Wiring are simple phone cables that daisy chain to all the devices. Wireless control is also available to your tower-located switches. Call us to learn how to set up simple or complex systems. Below is a simple basic system that can switch antennas as you change bands. We can interface to any radio CAT port, not just RS232.



A more complex system could be a SO2R contest station as shown.

The Shared Apex Loop Array™!

Capture the whole band or the whole HF spectrum at once with the Shared Apex Loop Array 2nd Generation. Can be remote controlled over the internet or in your station. 8 directions of directivity.

The Shared Apex Loop Array™ is a revolutionary receiving antenna that will change the way that you listen to the radio! The patented design provides performance in a size and over a wide range of frequencies that will please both the rag-chewer and DXer alike.

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RF Power and SWR meter. Couplers for 3 kW, 10 kW or higher available for HF/6 m. VHF and UHF couplers for 1.5 kW. You can connect up to 5 couplers to the display to monitor RF power on different TX lines.

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Dana Kasowitz, KC1SEB, dkasowitz@arrl.org

Member Spotlight

In 2023, this page will highlight amateurs who have achieved recognition in areas outside of, or related to, amateur radio.

YEAR of the VOLUNTEERS

Larnelle Harris, WD4LZC

Most people recognize Larnelle Harris from his award-winning gospel music, but hams may recognize Larnelle Harris, WD4LZC, as "Stu." Quickly realizing that his given name was a chore to communicate in Morse code, Larnelle chose the much shorter "Stu" after his middle name, Steward.

Discovering a Passion

As a youth, Larnelle was enthralled with citizens band (CB) radio. In the early 1970s, he had a single-sideband CB radio in his car. A pastor friend recognized Larnelle's interest and invited him to see his operating setup. To a youngster, "presentation is everything," Larnelle recalls. He walked into the dark room, and when the pastor flipped the switch, an array of radios lit up. "I've always loved twisting knobs and fiddling with computers, and I was totally taken aback." Having just learned about amateur radio, he became eager to read as much as possible on the topic in order to pass the test and obtain his license.

At that time, understanding Morse code was an essential part of the license test, and fortunately, Larnelle found it relatively easy to learn, saying, "It was like drumming" — something Larnelle had already mastered as a musician.

Once Larnelle passed the Novice exam, he was eager to upgrade his amateur status. He was so eager, in fact, that he rushed to the FCC office in downtown Chicago and arrived at 4:00 AM, hours before the office opened. After passing the time, he finally took, and passed, the General test, eventually upgrading to an Advanced and ultimately Extra-class license.

All in the Family

In 1986, on the way to the Grammy Awards ceremony in California, Larnelle and his wife, Mitzy, stopped in Chicago yet again so that Mitzy could take her amateur license test. It proved to be a successful weekend, as Mitzy passed the test and earned her call sign (KA4TEW), and Larnelle took home two Grammy Awards — one for Best Solo Performance for "How Excellent Is Thy Name," and one for Best Gospel Performance by a *Duo or* Group for "I've Just Seen Jesus" with Sandi Patty. Before cell phones were in widespread use, Larnelle and Mitzy would communicate via 2 meters while they were out and about.

Awards and Honors

With numerous accolades to his name, including various Dove Awards, Grammy Awards, and number-one hit singles, Larnelle is also the proud inductee into three Halls of Fame. He was twice inducted into the Gospel Music Hall of Fame (in 2007 as a solo artist, and in 2014 as a member of Gaither Vocal Band), and he has been inducted into both the Amateur Radio Hall of Fame (in 2008) and the Kentucky Music Hall of Fame (in 2011). Additionally, Larnelle is a proud member of ARRL's A-1 Operator Club.

Using His Platform for Good

As an acclaimed gospel singer, Larnelle has had many opportunities to travel to distant and prominent places, such as the Berlin Wall, the Kremlin, the White House, and the Green Line in Israel. He credits his career with opening doors and giving him a platform to do good work. For example, his song "Mighty Spirit" became the national theme song for President George H.W. Bush's 1993 Points of Light Foundation, which drew attention to everyday people who were involved in some of the most pressing issues (hunger, homelessness, illiteracy, etc.). The song also became part of the president's campaign to promote volunteerism.

In his memoir *Shaped Notes*, Larnelle describes amateur radio as "a way to get away, settle down, and relax. We are just operators — no Grammy winners or artists, no company presidents or elite athletes — just amateur radio ops getting in shape to handle emergencies, should they arise, by experimentation and having fun." Larnelle enjoys "making friends on the radio. It's fun for me." Indeed, Larnelle has made friends all over the world and locally, all because of ham radio.

Looking Ahead

Whether he's on stage, at the church, or on the air, Larnelle continues to enjoy communicating. "My business is communicating," he emphasizes. While Larnelle primarily enjoys operating CW, he's looking forward to trying his hand at contesting. "It's a new facet of the hobby for me, and that's exciting."

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Create an online ARRL Member account, and get access to members-only benefits. Register at **www.arrl.org/myARRL**. Already registered? Log in at the top of the ARRL website.

- **Magazines | www.arrl.org/qst and www.arrl.org/ota**
  Members in the US receive a choice of print magazine: *QST*, ARRL's membership journal (12 monthly issues), or *On the Air*, our new magazine for new and beginner-to-intermediate-level radio amateurs (6 bimonthly issues). All members can access the digital editions of *QST*, *On the Air*, *QEX*, and *NCJ* from a web browser and apps available for iOS, Android, and Kindle Fire devices. Members need a valid ARRL account to access ARRL's digital magazines, the Archives and Periodicals Search, and the Product Review Archive.
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ARRL supports legislation and regulatory measures that preserve and protect meaningful access to the radio spectrum. Our **ARRL Regulatory Information Branch** answers member questions concerning FCC rules and operating practices. **ARRL's Volunteer Counsel** and **Volunteer Consulting Engineer** programs open the door to assistance with antenna regulation and zoning issues.

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ARRL is an incorporated, noncommercial association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1986. Its affairs are governed by a Board of Directors, whose voting members are elected every 3 years by the general membership. The officers are elected or appointed by the Directors.

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

"Of, by, and for the radio amateur," ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A *bona fide* interest in Amateur Radio is the only essential qualification of membership; an amateur radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US.

Membership inquiries and general correspondence should be addressed to the administrative headquarters: ARRL, 225 Main St., Newington, Connecticut 06111-1400 USA.

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Up Front

A Sign of Good Luck to Come

Steve Hancock, N3FWE, has two hobbies — ham radio and photography. After walking at the local park, he got back to his car, camera in hand, and saw this dragonfly on the tip of his Comet dual-band antenna and snapped a quick photo. He would have liked to have gotten a better picture showing his mobile setup — a Kenwood TS-480 with hamsticks, and a Kenwood TM-D700 — but the dragonfly flew off.

Raser Antenna Revisited

April is the 51st anniversary of Wes Lamboley's, W3WL, *QST* cover article, "Fundamental Raser Principles."

Wes wrote to let us know that the Tesla coil used to make the ruby rods for the raser antenna is still alive and well, and is often used to demonstrate the principles of high-frequency RF energy. The photo below is from a middle school STEM-type class where Wes (left) often puts on a show (and talks about ham radio) for the students.

One of the newest communications techniques makes use of the principles embodied by the RASER (Radio Amplification by Stimulated Emission of Radiation). This device exhibits characteristics similar to that of a LASER, but the energy radiated lies within the obf spectrum rather than the light spectrum. Amateur radio can both benefit from and advance the technology associated with the Raser. This article is intended to acquaint the reader with the physical principles, and present a method of Raser construction with the results of a test.

Synthetic ruby-growing apparatus built by the author. The retractor has been removed in order to show internal detail (see footnote 2 for additional information).

Fundamental Raser Principles

An Introduction to Laser Technology as Applied to Amateur Antennas

BY W. R. LAMBOLEY, W8FMG

THE RASER is a means by which rf energy is radiated; its physical makeup in this case includes a Yagi antenna. The Raser constructed by the author used standard Yagi dimensions at 432 MHz. Two modifications were made to the basic Yagi: a synthetic ruby rod of proper length (0.473) was "grown" and fitted inside the driven element, and a 750-ohm balanced feed was used instead of the usual 50-ohm gamma match.

How It Works

A signal is applied to the driven element through the 750-ohm balanced feed system. Approximately 20 percent of the signal is radiated normally; the remaining 80 percent is absorbed by the ruby rod. The signal absorbed by the rod is bounced from end to end until the hyper-excited atomic structure of the ruby can absorb no more

* 1841 Riverdale Road, Columbus, OH 43227.

power. At this time the ruby rod, functioning something like the laser, radiates all its stored energy in one coherent burst (see October 1971 *Journal of Transcendental Physics* for a more rigorous treatment of the principle). The peak power radiated during the "burst" is about 28 times that of the average power input to the driven element. The number 28 is called the "Time-

Two rods grown by the author. The rod on the left is ruby (TCN-28); the rod on the right is silicon (TCN-12).

56 *QST* for

1930s Replica Station

During the Great Depression when money was scarce, ARRL published a 15-cent booklet titled "How to Become a Radio Amateur." It contained instructions on building a complete, modest CW radio station that included a transmitter, receiver, power supply, and operating table. Jerry Fuller, W6JRY, obtained a republished version of the booklet and built a replica of the station, including the operating table, using period parts. The station operates on 160 and 80 meters, and Jerry confirms he's made several contacts. On the shelf are other *QST* projects Jerry has built.

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-Michael K7FLA

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-Tony KJ7RNV

Correspondence

Letters from Our Members

A QSO Unintentionally Forges A Friendship

In 1977, I was stationed at Kaneohe Marine Corps Air Station (now the Marine Corps Air Station at Kaneohe Bay), on the island of Oahu, Hawaii as a Navy hospital corpsman. Because I was a licensed ham, the captain of the communications department decided that I could operate the Military Auxiliary Radio System (MARS) station, which was KH6BGS then, during non-military working hours. I was thrilled to be able to operate from the Hawaiian Islands with an unbelievable Collins radio station.

One of the contacts I made was with Tom, WB9DRH, from the Milwaukee, Wisconsin area. I told him where I was stationed, and that my home was in Watertown, Wisconsin.

In 1982, I was honorably discharged and began college. I helped found the Watertown Amateur Radio Club. Tom, who was N9HR by that time, became a member of the club. During one of our meetings we discussed contacts that we had made over the years. During this discussion, we realized that we had talked to each other on the air when I was in Hawaii.

Tom and I are still friends today, and it's all because of amateur radio. Little did we know back in 1977 that we would not only meet each other someday, but we would belong to the same radio club. We now live only about 10 miles apart.

Dennis W. Berg, WB9MSM
Watertown, Wisconsin

Suggesting A New Form of Public Service

Morse code requires the long-term memory association of sounds, and any Morse code operator who has tried to develop their ability to copy CW beyond rudimentary levels has experienced a subtle form of short-term memory. This is the brain's memory function that enables the operator to use a kind of "memory buffer," which allows the operator to hold a short string of Morse characters in memory before they are written down or saved. It is my personal experience (at 73 years old) that this "memory buffer" deteriorates with age. This seems to be a general experience among many of my older CW friends.

I would like to suggest a novel form of public service. Because copying Morse code is so deeply and uniquely involved in a complex successful or unsuccessful use of both short- and long-term memory, I believe it offers a unique opportunity to assist the scientific community in studying memory and memory loss.

The advantage of using CW skills as a test variable is that it's immediately quantifiable. An even more interesting scientific study of memory using CW skills as a test variable would be longitudinal studies over long-time intervals.

Acquainting the scientific community with amateur radio and exploring its usefulness in memory studies would be a lot of work! For now, I hope these brief suggestions will stimulate interest in such an endeavor.

William Schrempp, K7RY
Newberg, Oregon
Life Member

Historical Significance of "A Stealth Rooftop Antenna"

I found the article "A Stealth Rooftop Antenna" in the November 2022 issue of *QST* quite interesting. The conductor orientation and small size are unlike any antennas I've seen before. I decided to look further into the subject and Googled "slot antennas." In addition to learning about them, I learned about their inventor, Alan Blumlein. He made many contributions to electronics, and the story of his short life is compelling. I encourage readers to look up slot antennas and Alan Blumlein for a fascinating history.

Stephen Holland, KD4TTC
Naperville, Illinois

Humidifiers To Help with Static

The letter "Liquid Solution for Static" in the "Correspondence" column of the *February 2023 issue of QST* made me want to share my solution for dealing with static electricity.

I used to work in the explosives industry, and static electricity was a serious problem. We controlled the static by injecting steam into rooms. We always maintained a minimum of 60% relative humidity (RH). Research has shown that at 60% RH, it is virtually impossible for static electricity to form because the water vapor drains it off as soon as it develops.

To help with the humidity in my home, I purchased humidifiers. I also recommend using an indoor humidity monitor. I use two humidifiers and try to keep our indoor humidity at 40 to 50%. At 60%, it starts to feel muggy, and you may get condensation on the windows.

John Majka, K9AAN
Louisville, Kentucky

Send your letters to "Correspondence," ARRL, 225 Main St., Newington, CT 06111. You can also submit letters by fax to 860-594-0259, or via email to **letters@arrl.org**. We read every letter received, but we can only publish a few each month. We reserve the right to edit your letter for clarity, and to fit the available page space. Letters published in "Correspondence" may also appear in other ARRL media. The publishers of *QST* assume no responsibility for statements made by correspondents.

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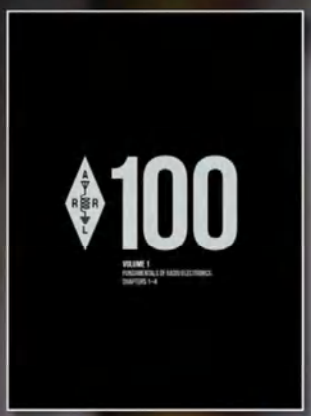

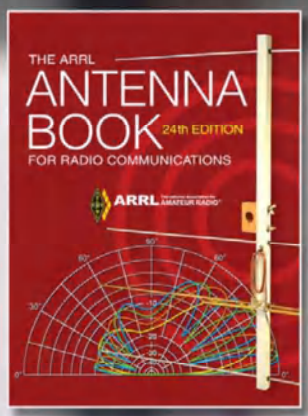

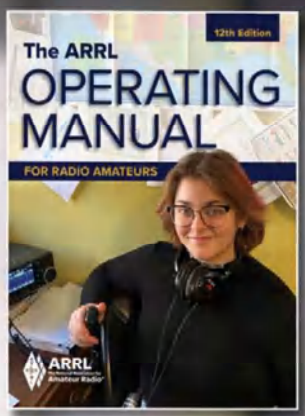

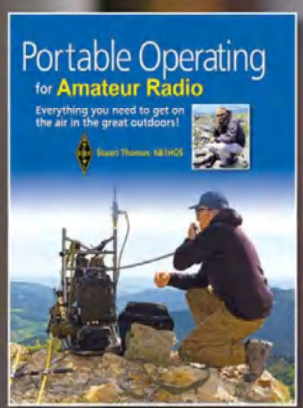

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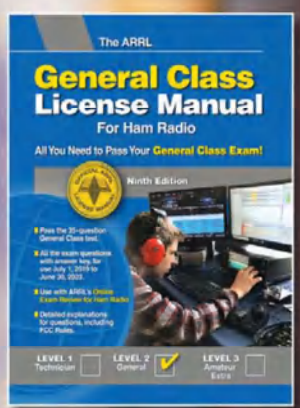

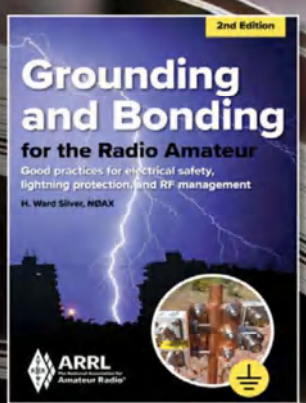

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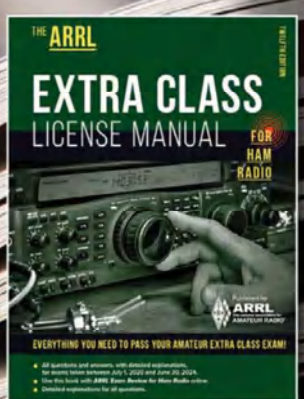

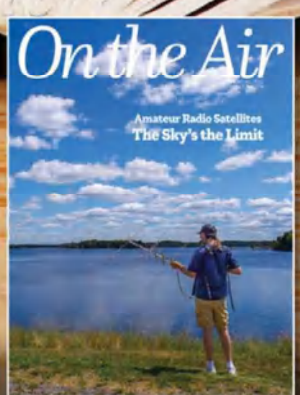

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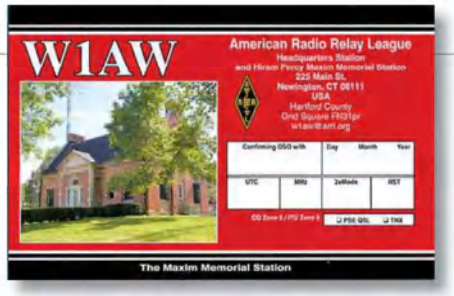

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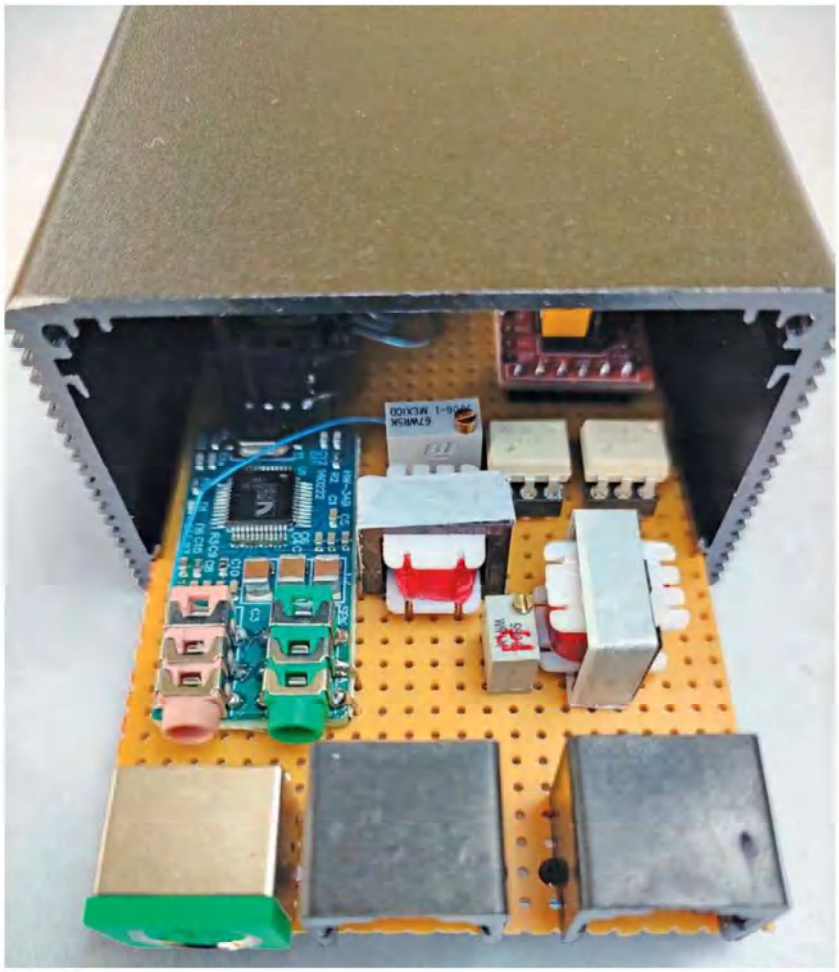

Anthony Le Cren, F4GOH/KF4GOH

I decided to make a USB interface to drive a Yaesu FT-897D for the Touchard-Washington High School radio club, F4KMN, in Le Mans, France. The design includes an FE11SX4 USB hub module with a CM108 sound card and an FT232RL serial TTL adapter. The circuit board slides into a standard aluminum box (see the lead photo), resulting in a product that looks commercially made. There is no need for two separate interfaces (CAT and audio), as everything is in the same box, which saves you a USB port on the computer.

Schematic

The module's interconnection and galvanic isolation are shown in Figure 1. I chose a USB type-B connector as the input to the USB hub. It can accommodate four USB devices, but I used only two: one for the sound card and one for the serial adapter. Find the four pins of a USB connector (+5 V, D+, D–, and GND), then wire them with wrapping wire as depicted in Figure 1.

Use H11L1 fast optocouplers for galvanic isolation of the CAT part. Also, take care to separate the 5 V power supplies from the USB connector and the 5 V supplied by the transceiver.

In the proposed configuration, a low logic level on the TX output of the FT232RL supplies 2 mA of current to the optocoupler LED, resulting in a low-level output. The input and output signals of the optocoupler are perfect for driving the Yaesu FT-897D. The transfer function of the optocoupler is shown at **www.arrl.org/qst-in-depth**.

You can achieve galvanic isolation of the sound part with two conventional 600 Ω transformers. Two multiturn potentiometers allow you to adjust the ALC of the TRX and the LF level of the sound card's microphone

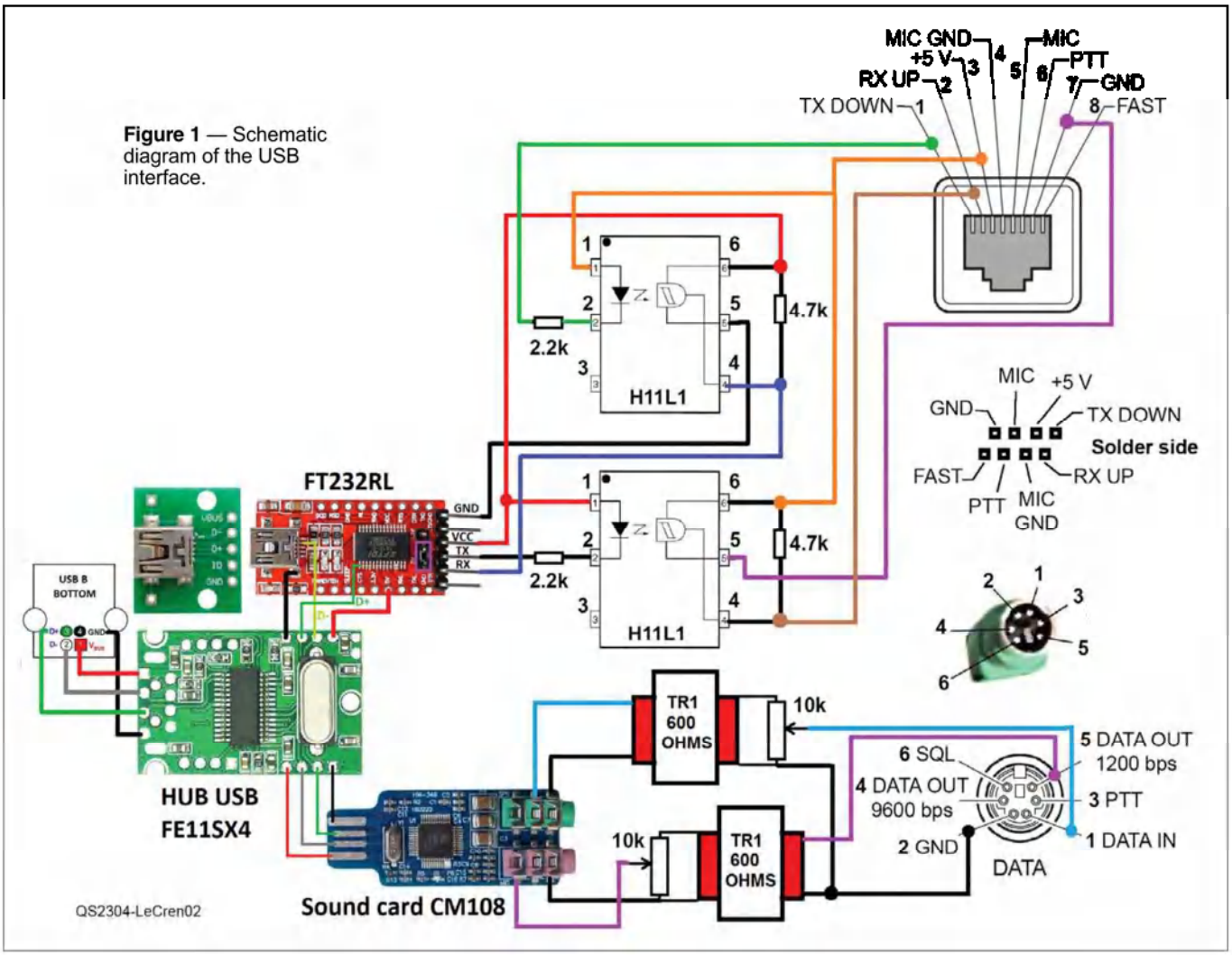

Figure 1 — Schematic diagram of the USB interface.

input. See the interface breadboard on the *QST* in Depth web page. Assembly and driver installation are also featured at **www.arrl.org/qst-in-depth**.

See *QST* in Depth for More!

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

- ✓ Additional technical details
- ✓ Additional images showing the circuit board and optocoupler transfer function
- ✓ Assembly and driver installation

Anthony Le Cren, F4GOH/KF4GOH, has been licensed since 2010 and holds a General-class license. Anthony loves to apply Arduino and ESP32 to radio, and he teaches computer science at Touchard-Washington High School in Le Mans, France. Anthony has written numerous articles and maintains a web page of amateur radio projects at **https://hamprojects.wordpress.com**. Anthony can be reached at **kf4goh@sfr.fr**.

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

Networking Basics for Amateur Radio

Understand your home network and how you can interface it to your amateur equipment, then visit www.arrl.org/qst-in-depth for instructions on how to connect remotely to an Icom IC-7610.

Al Rovner, K7AR

Many modern transceivers, amplifiers, and accessories contain an Ethernet port and allow the user to have full control from a remote location. This article covers networking basics, which I expand upon in materials at **www.arrl.org/qst-in-depth** that show how to connect an Icom IC-7610 to your network for remote access.

Ethernet

Ethernet is the technology used to provide reliable, secure, and high-speed communication between connected devices in a local area network (LAN). Devices communicate with each other using a well-defined set of rules and protocols. Ethernet consists of hardware and software components; the hardware components use inexpensive Ethernet cables to connect devices to a switch or router. In general, Ethernet cables are unshielded, relying on four twisted pairs to reduce noise and crosstalk. Though earlier Ethernet protocols provided speeds of 10 Mbps, current protocols allow for 100 and 1000 Mbps (or 1 Gbps). Your home network speed is likely 100 Mbps or more.

Definition of a Typical Home Network

Broadband networks bring a coaxial or fiber connection into your home and connect to an interface device known as a modem, which typically has one Ethernet connection (see Figure 1). The modem may include a Wi-Fi interface for your home network. A wireless router can provide Wi-Fi as well as additional Ethernet hardwired connections (see Figure 2).

Ethernet connections tend to be color coded. The wireless router pictured in Figure 2 has a blue connector that can connect to the modem Ethernet connector, while the four yellow connectors can connect to other networked devices. The wireless router provides a firewall to keep unsolicited traffic from reaching your network, as well as a detailed administrative web page allowing control of the network. It also allows authorized Wi-Fi devices to use your internet connection and multiple wired Ethernet connections to be established.

IP Addresses

Every device in a LAN must have a unique Internet Protocol (IP) address. An IP address is formatted as aaa.bbb.ccc.ddd, and the router addresses traffic between devices by using device-specific addresses. Most routers provide a set of addresses within the range of 192.168.0.xxx or 192.168.1.xxx, in which xxx ranges from 0 to 255. The 10.10.1.xxx range is another block of addresses that may be used for a consumer's internal network. The router reserves a few addresses for itself, while setting aside some to be automatically assigned (dynamic addresses), and others to be manually assigned (static addresses). Dynamic addresses are leased from the router for a specific period of time. If not periodically renewed by the networked device, the router will recover that IP address and potentially assign it to a different device. For a device like a tablet, this doesn't matter. However, this could be an issue for a connected radio. Imagine attempting to remotely access a radio, only to find that the router has changed the radio's IP address — this exemplifies the need for a static address when connecting a radio.

Figure 1 — Typical cable modem interfaces.

Ports

Network ports allow one IP address to serve many applications by defining application-specific end points. Each IP address has more than 65,000 ports associated with it. Many ports have become industry-standard values, such as port 80 for web browsing. Although a home external IP address typically has one fixed value, you can use many ports to perform various tasks, such as web browsing, email, and allowing other users to connect to devices on the network.

Conclusion

You can apply the basic concepts of home networking to connect your ham shack equipment, which will enable you to remotely control your station. This is detailed at **www.arrl.org/qst-in-depth**, where I've provided materials that demonstrate how to remotely control an Icom IC-7610. You may use similar techniques to control an amplifier, remote ac power switch, shack PC, and other devices.

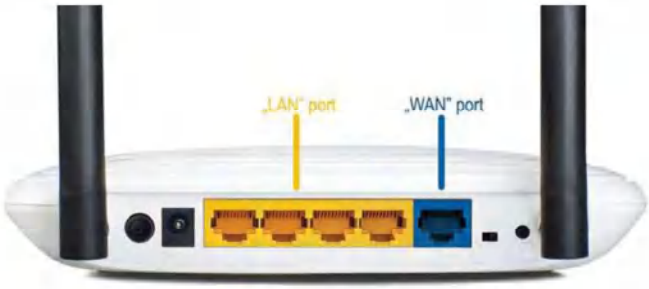

Figure 2 — Typical wireless router interfaces.

See *QST* in Depth for More!

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

- ✓ Instructions on how to remotely control an Icom IC-7610
- ✓ IC-7610 network settings
- ✓ Additional IC-7610 parameters
- ✓ Port forwarding for the IC-7610
- ✓ **RS-BA1** network properties setup

All figures provided by the author.

Al Rovner, K7AR, has been a licensed ham radio operator for 51 years, and he is an active DXer and contester. He is a retired engineer with a BS degree in electrical engineering from Drexel University, and an MS degree in computer science from Oregon Health & Science University. You can reach Al at **k7ar@comcast.net**.

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

All ARRL members can now enjoy the online edition of *QEX* as a member benefit. Coming up in the March/April 2023 and future *QEX* issues are articles and technical notes on a range of amateur radio topics. These are at the top of the queue.

- H. Lawrence Serra, N6NC, correlates take-off angles and received angles of arrival with a make-do interferometer.
- Dr. Ulrich L. Rohde, N1UL, analyzes and measures AM and FM noise of oscillators.
- Wesley Cardone, N8QM, characterizes the generic diode with precision for simulation using SPICE.
- Jeff Anderson, K6JCA, corrects a common L-network misconception.
- In a technical note, Glenn Schulz, W9IQ, discusses the Smith chart SWR circle.
- Ron Block, NR2B, discusses the single-point ground panel location.
- In his essay series, Eric P. Nichols, KL7AJ, discusses phase.
- Wojciech Kaczmarski, SP5WWP, and James T. Francis, Jr., KA1PQK, design a square-root Nyquist filter.

QEX, a forum for the free exchange of ideas among communications experimenters, is edited by Kazimierz "Kai" Siwiak, KE4PT (**ksiwiak@arrl.org**), and is published bimonthly. The printed edition annual subscription rate (six issues per year) for members and non-members in the US is $29. First-class delivery in the US is available at an annual rate of $40. For international subscribers, including those in Canada and Mexico, *QEX* can be delivered by airmail for $35 annually; see **www.arrl.org/qex**.

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A Coupled-Resonator HF Antenna

Use this multiband dipole for operation on 80, 60, 40, 20, 15, and 10 meters.

Jay Taft, K1EHZ

A few years ago, I built a 2-meter/70-centimeter Yagi antenna using a coupled-resonator design by Martin Steyer, DK7ZB, that works well. Recently, I wondered how this approach could be applied to a multiband HF antenna. The coupled-resonator antenna configuration was developed from a coaxial-sleeve antenna design. Both are described in chapter seven ("Multiband Antennas") of the 21st edition of *The ARRL Antenna Book*.

Design

A coupled-resonator configuration with three wires spaced 2 inches apart looked just right for operating during ARRL Field Day and for Amateur Radio Emergency Service® (ARES®) operations. After looking at the graph of spacing versus frequency ratio (Fig A) by Gary Breed, K9AY, on page 7-24 of the *Antenna Book*, I decided 2-inch spacing would be practical for #14 AWG wire. The antenna could be deployed as an inverted V at about 30 feet high in the center and 10 feet high at the ends.

I cut the driven wire for 40 meters (see Figure 1) and added loading coils to cover a narrow segment of 80 meters. The basic 40-/80-meter design can be found at **www.qsl.net/ik1zoy/image/dipcar.jpg**. Sixty meters is covered by connecting jumpers across the loading coils and adding short wire extensions. One resonator wire covers 20 meters, and the other covers 10 meters. The third harmonic of the 40-meter segment is close to 15 meters, and the seventh harmonic is within the 6-meter band.

Modeling

Modeling with *EZNEC* (**www.eznec.com**) shows that the antenna should exhibit typical dipole SWR (see Figure 2) on 80, 60, 40, 20, 15, and 10 meters. *EZNEC* also calculated radiation patterns for planned antenna height above ground on 80, 60, 40, and 20 meters. Radiation patterns on 80, 60, and 40 meters would provide near vertical incidence skywave (NVIS) propagation. Low-angle radiation was calculated for 15 and 10 meters. Patterns on 6 meters were multi-lobed, using the seventh harmonic on the 40-meter wire.

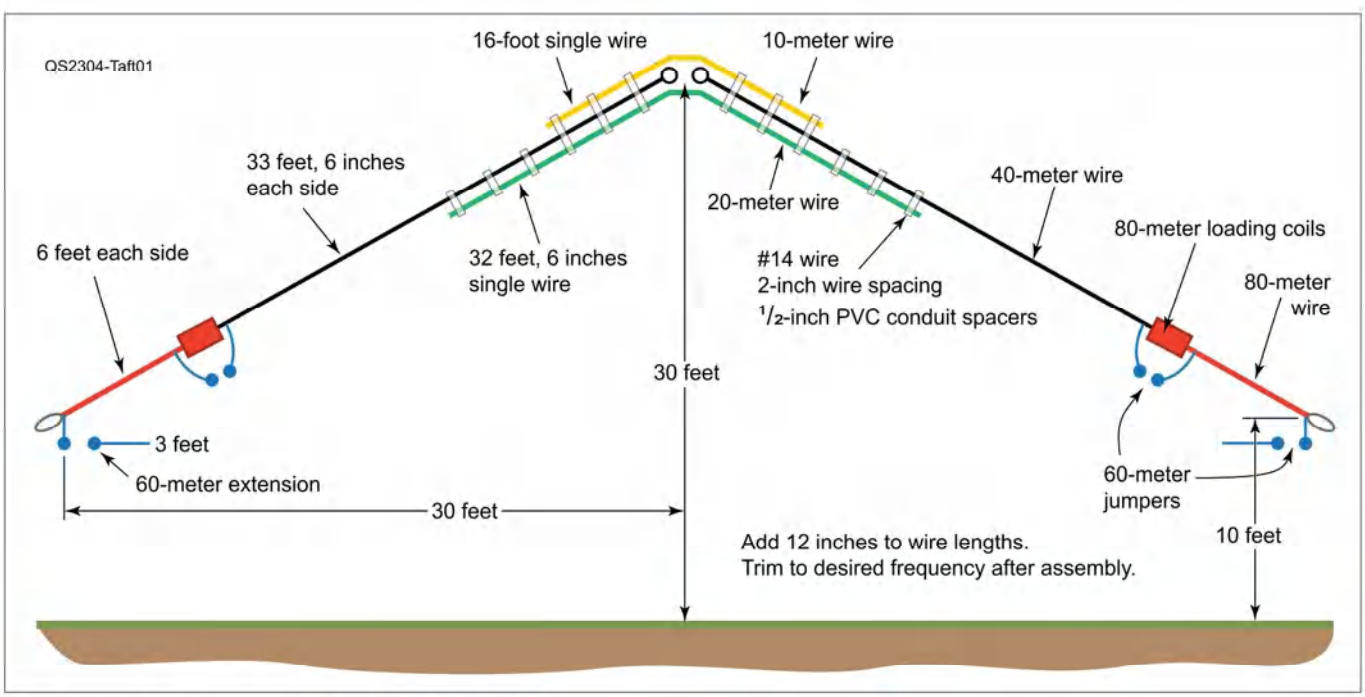


Figure 1 — The coupled-resonator HF antenna design.

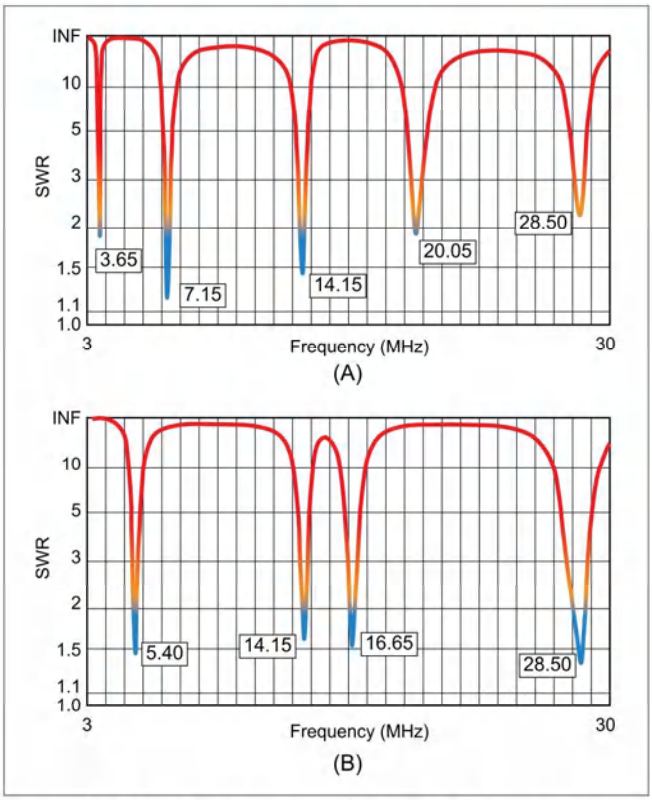


Figure 2 — *EZNEC* model calculations for SWR based on the design in Figure 1. Panel A is the 80-, 40-, 20-, 15-, 10-, and 6-meter configuration. Panel B is the 60-meter configuration, which also works for 20 and 10 meters.

Using half-wave wires resonating on each band produces the single-lobed radiation patterns. This avoids the multi-lobed patterns with intervening nulls when a dipole or long wire covers multiple bands.

Materials

Although PVC has a higher loss tangent, indicating a higher potential for power dissipation than nonpolar polymers (such as high-density polyethylene), it has performed well in other antennas of mine over several years (see *QST* in Depth, **www.arrl.org/qst-in-depth**, for more information). I found PVC pipe, PVC electrical conduit, wire, and stainless-steel hardware for the antenna at various hardware stores and major home centers. I used about 150 feet of #14 AWG thermoplastic high-heat-resistant, nylon-coated (THHN) wire. I chose flexible stranded wire that would be easy to roll up for portable operating. The feed point is a 4-inch plastic electrical box with a lid gasket and four mounting tabs. The wire spacers are cut from ½-inch gray PVC electrical conduit. I made a 1:1 balun from an FT240-31 toroid and #14 AWG THHN wire that I had on hand. A similar balun is available already assembled, or as a kit, from Palomar Engineers (**https://palomar-engineers.com**) and Balun Designs (**www.balundesigns.com**). I wound the 80-meter loading coils with #18 magnet wire (**https://powerwerx.com**) on 1½-inch PVC schedule 40 pipe that's 5½ inches long, and used automotive wire lugs to connect the wires to the stainless-steel hardware.

Figure 3 — The feed-point box with the balun installed and PVC spacers attached to the box-mounting tabs.

Construction

The antenna can be constructed using the instructions below, as well as by viewing Figures 1 – 6, as noted.

Assemble the Feed Point and Balun

Wrap the FT240-31 toroid with electrical tape to protect it from abrasion. Tape together two 4-foot lengths of #14 AWG insulated wire, and wind it 10 – 12 turns around the toroid (see Figure 3). Crossing the toroid at the sixth turn helps align the wire ends opposite each other. Secure the wires with cable ties.

Drill holes in the plastic box (see Figure 3) to install the SO-239 coax connector and stainless-steel eyebolt. On the side with the coax connector, drill two weep holes in opposite corners. Drill a hole in the center of each vertical side for 6-32 screws. Install the toroid in the box with 6-32 × 1-inch stainless-steel hardware as terminals for the 40-meter wire.

Trim the toroid wires to fit connections inside the plastic box, and install lugs on the wires. Crimp and solder the lugs to be sure the connections are durable. Install the toroid in the box.

Make two ½-inch PVC spacers 7 inches long to support the wires at the feed-point box. Drill wire support holes in the center, as well as 2 inches from each side of the center. Drill additional holes to match the box-mounting tabs (see Figure 4).

Figure 4 — The back of the feed-point box shows the center-driven wire and coupled-resonator wires above (for 10 meters) and below (for 20 meters). The orange tape on the 10-meter wire is for restricting movement through the spacer.

Figure 6 — The long PVC spacer with holes drilled 2 inches apart at slight angles to each other to minimize slipping on the wires.

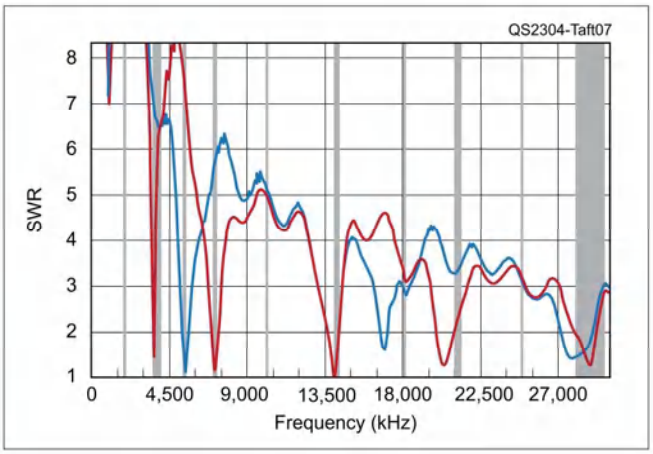


Figure 7 — The measured SWR of the antenna as an inverted **V** about 20 feet above ground. The red curve is the 80-, 40-, 20-, 15-, 10-, and 6-meter configuration. The blue curve is the 60-, 20-, and 10-meter configuration with four jumpers connected. The gray vertical bands show the limits of each amateur band.

Figure 5 — The 80-meter loading coil with disconnected jumpers. The coil is wrapped with electrical tape to stabilize and weatherproof the magnet wire. It's also painted gray for aesthetics. Note the method for attaching the coil form to the 40-meter (on the left) and 80-meter (on the right) wires.

Assemble the Loading Coils

Refer to Figure 5 of this article, as well as the instructions by Paul Tadlock, KGØZZ, at www.amateurradio.bz/40_80_meter_antenna.html, to assemble the loading coils. The loading coils are assembled using #18 magnet wire wound on 1½-inch PVC pipe that's 5½ inches long. I used 81 turns for digital frequencies on the low end of 80 meters (reduce this by a few turns for higher frequencies on 80 meters).

Thread the ends of the 40-meter wires through the mounting holes in the coil form, and connect them to the coil wire at the 6-32 screw. Wrap the coils with electrical tape to stabilize the windings and provide weather protection.

Prepare the Spacers

Using ½-inch PVC electrical conduit (see Figure 6), prepare the spacers. To support the area with three wires, I installed six spacers that were 5 inches long and had holes drilled in the center, as well as holes drilled 2 inches from the center at slight angles to the center hole to stabilize the position along the wires. Beyond each end of the 10-meter resonator, I installed three spacers that were 3 inches long with holes drilled ½ inch from each end at slight angles to each other.

Cut the Antenna Wires

Following the dimensions in Figure 1, cut the antenna wires, adding 12 extra inches for adjustments. Begin assembly at the feed-point box. Thread each 40-meter wire through the center holes of the box spacers and of the three long spacers, as well as either hole in the three short spacers. Attach the wire lugs at the feed-point end, and connect them to the feed-point terminals **(refer to Figures 3 and 4). Install the loading coil at its end and the extensions for 80 meters.**

Install the Resonator

The 20-meter resonator is installed by being threaded straight through the bottom feed-point spacer holes. Wrap electrical tape around the wire outside of each spacer to keep it centered on the feed-point box. In-

stall the 10-meter resonator wire similarly, using the upper holes in the long PVC spacers.

60-Meter Operation

For 60 meters, I attached short jumpers to each loading coil terminal with Anderson Powerpoles on the other end to make the connection. After 80 meters was tuned, I also attached 3-foot-long wires to the end of the 80-meter wire with Powerpoles or automotive spade connectors. The 60-meter extensions could be secured to support lines for safety and storage. As an inverted-V antenna with sloping ends, it's easy to make connections for 60 meters and to disconnect jumpers and extensions when operating on the other bands. Keep all hot wires out of reach to avoid RF burns.

Final wire lengths for my antenna include: 33½ feet per leg for 40 meters, 6 feet per leg for 80 meters, 32½ feet total for 20 meters, 16 feet total for 10 meters, and 24 inches for 60-meter extensions. Because the *EZNEC* model shows that all wires interact on all bands, assemble the entire antenna before tuning.

Frequency Adjustment

I adjusted wire lengths for SWR minimums on 7.2, 14.2, and 28.4 MHz. The antenna also shows an SWR dip at 20 MHz near the third harmonic of 7 MHz. Keep wire lengths the same on both sides. Leave the wire wrapped back on itself for future adjustments. If the 40-meter wire is too short, add extensions on the 40-meter side of each loading coil for SWR adjustments. Bandwidth is narrow on 80 meters, so tune it to the band segment used most frequently.

The final SWR measured with a RigExpert AA-54 antenna analyzer is shown in Figure 7. SWR dips are less than 2 on most bands. SWR oscillates around 2 MHz on 6 meters, and is below 3 MHz on 15 meters. Actual SWR dips correspond well to the dip frequencies calculated by *EZNEC*, including the dip near 20 MHz, which is below the expected third harmonic of 7.2 MHz at 21.6 MHz.

Operational testing was done with an Icom IC-7200 at 50 W, an SCS PTC-II PACTOR modem, and an LDG Electronics AT-200Pro automatic antenna tuner. The equipment was connected to a Beelink T4 Pro Mini PC to form a Winlink radio mail server gateway on all bands except 60 meters, where automatically controlled data stations are prohibited. To test 60 meters, I made Winlink peer-to-peer contacts out 110 miles. Many contacts proved the antenna was working well on all bands.

Final Comments

The coupled-resonator inverted-V dipole is a competent NVIS propagation antenna on the low bands that I use for weekly ARES digital nets and checking Winlink email. It has some DX possibilities, even at NVIS propagation height above ground. It deploys conveniently on a modest-height mast or in trees, and it takes up about 80 linear feet end to end. Increasing height above ground and deploying it in a flat-top configuration should increase its DX capabilities. This antenna is well-suited to transceivers without tuners, except on 15 meters and to transceivers with internal tuners on all bands.

See *QST* in Depth for More!

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

- ✓ A discussion of power limitations
- ✓ A discussion and a list of contacts made using the antenna

All photos by the author.

Jay Taft, K1EHZ, is an Amateur Extra-class licensee. He earned his first license in 1958 at the age of 14, and his first job was servicing marine HF radios along the Connecticut coast. Jay has a bachelor's degree in biology, as well as a master's degree and doctor of philosophy degree in biological oceanography. His career includes oceanographic research at Johns Hopkins University, military service in the US Army, and academic administration at Harvard University. Jay enjoys building antennas and rehabbing vacuum tube radios. He also operates Winlink global email gateways. Jay is a member of ARRL, New Hampshire ARES, the Merrimack Valley Amateur Radio Association, and the Granite State Amateur Radio Association. He can be reached at **jltaft@comcast.net**.

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

Strays

QST Congratulates...

Steve Warford, WB4ZSC, on the publication of his book, *Welcome to Aiken's Corner...and other STEAM stories*, written under the pen name Murt Gibson. Three of the tales incorporate amateur radio operators who assist with adventures in Aiken's Corner, North Carolina. The book is available from **www.amazon.com**, as well as from the Arizona State University Library.

Warford has volunteered at the Center for Amateur Radio Learning, W7ASC, at the Arizona Science Center for more than a decade and is a retired engineer.

Pascal Villeneuve, VA2PV, va2pv@arrl.org

Product Review

Icom IC-V3500 FM VHF Transceiver

Reviewed by Rick Palm, K1CE
k1ce@arrl.net

The Icom IC-V3500 is a basic but multi-featured, high-power, compact (1.6 × 5.5 × 4.6 inches), simple-to-operate FM VHF transceiver that has a large heatsink on the bottom and back panel that helps ensure stable output during high-power transmissions (see Table 1 and Figure 1). Power settings are switchable: 65, 25, 10, and 5 W. While the IC-V3500 transmits from 144 – 148 MHz, the receiver covers 136 – 174 MHz, home to a variety of other radio services — such as aeronautical, satellite, and space services, as well as the marine channels.

The radio features 207 alphanumeric memory channels, **which include 200 regular channels, one call channel, and three pairs of scan edge memories (1 A/B, 2 A/B, and 3 A/B).**

The Icom IC-V3500 radio is built and tested to US military specifications, MIL-STD 810G. For more information about the method and procedure, you can download the product brochure at **www.icomamerica.com/en/downloads/DownloadDocument.aspx?Document=1132**.

Out of the box, the front panel features a white, easy-to-read, uncluttered LCD screen, with large characters. Radio function labels along the bottom of the screen **create identifiers for the front panel function pushbuttons in low light and during nighttime operation.**

AF output is about 4.5 W to a top-firing loudspeaker. The manufacturer's literature states that both the frequency response and opening slits have been improved from similar models. It also states that setup presets exist to raise, lower, or mute the radio for those who like precise audio levels.

A safety alert is an emergency call function to send beeps and hot microphone audio to others. While the emergency call function is active, the speaker will amplify messages to notify others within range.

Other features include built-in CTCSS and DTCS encoders/decoders for repeaters and simplex access; a bank link scan function to scan all memory channels **in a series of selected banks; up to 16 DTMF autodial memory channels; a priority watch function; wide/narrow channel settings, and a power supply voltage display.**

Most critical functions can be conveniently changed with the keypad on the handheld microphone.

Basic Operation

The primary function buttons for programming the various features of the radio are found along the bottom of the radio's front panel, with corresponding labels just above, on the display screen. There are six rectangular buttons and labels, plus a small round **button at the seven o'clock position under the large round dial knob. The small round button is for BANK OPT, which is pushed to select a specific bank of memory** channels and other functions, such as the emergency alert system (more on this function later). The

Bottom Line

The Icom IC-V3500 is a basic but multi-featured, high-power (65 W), compact, simple-to-operate FM VHF transceiver. It's built to support high-power transmission, and with its high-output speaker, it's an ideal radio for public event and emergency communications.

six main buttons are positioned left to right — the first is the **SET LOCK** button, which is pushed to enter the **SET** mode, with various selectable operating parameters such as the repeater tone frequency (most repeaters seem to use the easy-to-remember subaudible 123 Hz tone frequency to open the repeater to the user's transmission).

There are 19 selectable parameters on the **SET** mode list, including ones for tone squelch operation and frequency offset (which sometimes can be a nonstandard offset between the transmit and receive frequencies, such as 1 MHz; usual offset is 600 kHz). Other adjustable parameters include the memory channel skip function, which is helpful during a memory scan to eliminate a usually busy, but not desired channel, for efficient monitoring. A transmit permission parameter inhibits transmission (for example, an operator with young children who may accidentally gain access to the radio cannot transmit). The weather alert parameter can be switched off or on.

Table 1
Icom IC-V3500, serial number 65001140, FCC ID# AFJ325110

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 136 – 174 MHz; transmit, 144 – 148.	As specified.
Modes: FM, FM-Narrow (FM-N).	As specified.
Power requirements: Transmit, 11 A at 65 W RF output; receive, 0.4 – 1.5 A at 13.8 V dc; power supply, 13.8 V dc ± 15%.	At 13.8 V dc: Receive, no signal, maximum; audio and backlights, 670 mA; lights at minimum, 650 mA. Power off, 0 mA transmit (high/mid/mid low/low): 9.6/5.9/3.8/2.8 A.
Receiver	**Receiver Dynamic Testing***
Sensitivity: FM 12 dB SINAD: 136 – 174 MHz, 0.18 µV.	–125 dBm / 0.13 µV.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 72 dB;† 10 MHz offset: 83 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	84 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset: 72 dB.†
Squelch sensitivity: Not specified.	At threshold: 0.08 µV; at maximum: 4.1 µV.
S-meter sensitivity: Not specified.	S-9: 2.8 µV.
Audio output power: At least 3.5 W, 4.5 W typical into 4 Ω at 10% THD.	4.4 W at 10% THD; THD at 1 V_{RMS}, 0.9%.
Transmitter	**Transmitter Dynamic Testing**
Power output: High/medium/low power, 65/25/10/5 W.	As specified.
Spurious-signal and harmonic suppression: ≥60 dB.	>68 dB. Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S-9 signal: 95 ms.
Receive-transmit turnaround time (TX delay): Not specified.	59 ms.
Size (height, width, depth): 1.6 × 5.5 × 4.6 inches.	
Weight: 2.4 pounds (radio body, control head, and control cable).	

*Test results shown are for standard FM mode. Sensitivity, adjacent channel rejection, and dynamic range increased by 1 dB in FM narrow mode.
†Measurement was noise limited at the value indicated.

There is an initial **SET** mode, which contains the 15 "set and forget" parameters that generally do not get changed as often as the regular **SET** mode functions. I like the voltage display initial **SET** function to be on, which allows me a quick, initial check of my battery's voltage. The **BANK OPT** parameter assigns one of three functions to the **BANK OPT** key, which is usually set to allow selection of the various programmed memory banks.

The IC-V3500 features two basic modes of operation: the VFO mode and the memory mode. Briefly push the **V/MHZ SCAN** button to select the VFO mode, and turn the dial knob to select a frequency. The frequency changes according to the selected tuning step. The 144 – 148 MHz 2-meter band allows for transmission/reception, as it is the amateur band; extended range, where transmission is inhibited, is 136 – 174 MHz, which covers, among other services, some aviation channels, marine channels, etc. Push the **V/MHZ SCAN** button several times to select the frequency step from 10 MHz to 1 MHz.

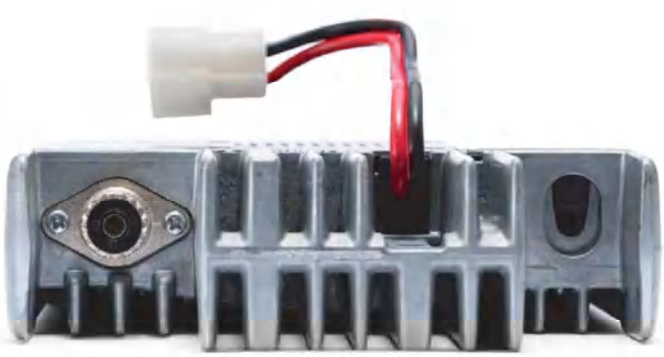


Figure 1 — The Icom IC-V3500 rear panel.

For scanning purposes, select the tuning step to match the repeater channel scheme for your area, which is usually 15 kHz. Push the **SET LOCK** button to enter the set mode, and push it again repeatedly until "TS" is displayed on the screen. Turn the dial knob to select the desired tuning step for scanning purposes; it should match the repeater outputs band plan for the area of operation. To reset the set mode items to their factory default values, a partial reset can be performed that also retains the memory channel contents that were set by the operator.

The call channel is set to the user's preference — for example, the local, most frequently used repeater, or the most used simplex frequency per local custom. Once programmed, simply push the **M/CALL PRIO** button to cycle through the programmed memory channel, and the programmed (loudest) WX channel (in the 162 MHz range), to get to the call channel. While operating on a VFO frequency, the priority watch searches for signals on a selected frequency every 5 seconds. For example, if an operator is monitoring a major local repeater for a possible ARES® activation, enabling the priority watch function will cause the radio to momentarily check for any signals on a frequency of secondary importance, programmed or selected by the operator.

To enable a monitor function to listen to weak signals or to manually open the squelch, push the **MONI ANM PA** button to turn it on or off. For a repeater pair, the function monitors the repeater's input frequency.

A lock function is used to prevent accidental changes in channel, frequency, or functions.

When turned on in the initial parameters set, the squelch attenuator uses the squelch knob to effect up to 20 dB of attenuation when the squelch knob is turned all the way up.

An S-meter squelch function disables the radio's audio output when the received signal is weaker than the specified S-meter squelch level. The operator rotates the squelch knob clockwise past the twelve o'clock position to turn on the function. Please note that you can download an advanced manual from the Icom website (see **www.icomjapan.com/support/manual/3572**).

Scanning Operations

To prepare for scanning, set the scan resume option to the desired level (i.e., the number of seconds of holding on a busy channel prior to resumption of the scan).

To stop the resumption of a scan, simply key the mic briefly. For a full (all frequencies) scan, or a partial scan (programmed into the register by the user by setting the lower and upper edges of the spectrum desired), push the **V/MHZ SCAN** button to select the VFO mode. To scan the memory channels, push the **M/CALL PRIO** button to select the memory mode. For a bank scan, push the small round **BANK OPT** button at the seven o'clock position of the dial knob, and then rotate the dial to select the desired bank of memory channels. Finally, hold down the **V/MHZ SCAN** button for a second to start the scan.

Memory Channel Usage

As mentioned previously, the radio has a total of 207 channels available for saving regularly used frequencies and repeater settings, such as the repeater's CTCSS tone, six scan edges (upper and lower limits) for three programmed scans, etc. To program the memory channel(s), push the **S. MW MW** button directly under the radio on/off button in the upper left corner of the radio's front panel, and then rotate the dial knob on the right side to the desired memory channel. Finally, hold down the **S. MW MW** button for 1 second to write the frequency and select parameters to the channel. To recall a memory channel on which to operate, simply push the **M/CALL PRIO** button and rotate the dial to the desired channel.

Functions Selectable by the Microphone Keypad

If the radio comes with an HM-133V handheld microphone, many functions, including secondary functions, can be turned on or off, or adjusted, by pushing the buttons on the keypad.

An emergency call function can be used to transmit an emergency alert set of tones (the "wee woo" alert sound) in an emergency situation. When the function is turned on — three settings in the initial set of parameters must be set to enable the EMR function — an emergency signal is transmitted to let other stations on the frequency know that you require assistance, and an alarm sounds from the internal speaker. You can also receive the emergency signal from other stations. You can set a specific alert volume level between 0 and 32. Once **BANK OPT** is pushed, the volume level is changed to the set value.

Say you're the sole radio communicator at a remote checkpoint on a mountain rally course, and you suddenly suffer extreme chest pain and feel like you're about to pass out. If your radio is preset for the emer-

gency alert function, you can hold down the **BANK OPT** button for 3 seconds until six short countdown beeps and one long beep sound, and then the channel will change to the one preset as the emergency frequency. The "wee woo" tones will be transmitted at the volume level preset by the operator. After transmitting the signal for 10 seconds, audio from the immediate area is picked up from the microphone and automatically transmitted for 10 seconds. Even if you are lying on the floor, you can talk and explain your emergency issue.

The temporary volume function allows the operator to set a specific volume level between 0 and 32, and when the **BANK OPT** button is pushed, the audio output volume is changed to the selected volume level. Push the button again, and the original volume level is reinstated. For example, if you are working in the radio room of your county EOC, and the emergency manager comes in to give you an emergency message to send, you can simply push the **BANK OPT** key to immediately reduce the volume level of the radio so that you can listen to the manager giving you the message. Push the **BANK OPT** button again to return to the original volume setting.

Using the IC-V3500

The radio is easy to program and use. The set modes, including the initial set mode, are straightforward and easy to program. The initial set mode (entered by turning off the radio, holding down the **SET LOCK** button, and pushing the on/off button) is for parameters of the "set and forget" type, while the regular set mode items are changed more often (for example, the repeater tone frequency for CTCSS-enabled repeater systems).

The front panel buttons (the bottom buttons match their function descriptions above, on the easy-to-read display) are mostly intuitive, and positioned for quick access and usability. On the air, received signal reports were all good.

The supplied HM-133V handheld mic has a keypad on the reverse side with pushbutton keys for most of the major functions of the radio: squelch control, scanning, priority watch, output power selection, audio volume, entry to the set mode, tone scan, and numerous others.

I had no difficulty using the customary functions, such as scanning (I easily programmed in a scan of the repeater output frequencies at 145.200 – 147.400 MHz), memory channel programming with organization by the banks (10 frequency banks are available), a priority channel that I programmed with the marine channel 16 distress frequency (156.800 MHz), and other functions that I had never heard of before (the squelch attenuator and the S-meter squelch).

RF attenuation of up to approximately 20 dB is adjustable by the squelch knob. From the initial set mode, set the **SQL** item to **AT**, and exit the set mode. Then, turn the squelch knob clockwise past the twelve o'clock position to turn on the attenuator; continue rotating the knob for deeper attenuation, with the deepest attenuation at the end (five o'clock position). I experimented with this function and found it helpful when, for example, another nearby transceiver was transmitting on the same frequency at high power.

I also tried the S-meter squelch function, selectable from the initial set mode; it disables the radio's audio output when the received signal is weaker than the user-selected S-meter squelch level. Turn the squelch knob clockwise past the twelve o'clock position to turn it on.

The radio can be programmed with the free software (CS-V3500) available for download on the Icom website (**www.icomjapan.com/support/firmware_driver/3596**). Please note that the optional OPC-478UC programming cable is required.

Conclusion

The primary assets of this radio include high power (65 W) and compactness, two parameters that work against each other thermodynamically. I held the **PTT** button down for more than 3 minutes at high power, and while the large heatsink certainly warmed up, it never felt too hot. It would, however, be a good idea to mount the radio away from heat sources and tight spaces, such as in a vehicle. The goal is to provide appropriate ventilation to the heatsink.

The radio also puts out a high level of audio from the top-firing loudspeaker.

The radio's high audio output, small size, and high RF power output would render it very useful in public event communications tents or trailers, and at disaster areas where operating space is at a premium and ambient noise levels are high. Lastly, and importantly, I enjoyed operating it. I will probably add one to my ever-increasing inventory of 2-meter FM rigs, and I've owned dozens of them over the years.

Manufacturer: Icom America, 12421 Willows Road NE, Kirkland, WA 98034, **www.icomamerica.com**. Price: $240.

Comet CAT-300 1.8 – 50 MHz Manual Antenna Tuner

Reviewed by Phil Salas, AD5X
ad5x@arrl.net

I suspect that one of the most common accessories found in the ham shack is an antenna tuner. And while autotuners have become quite popular, the manual antenna tuner fills the needs of many hams. The Comet CAT-300 antenna tuner is a rugged manual antenna tuner that handles power levels up to 300 W.

Basic Description

Like most manual antenna tuners, the CAT-300 is a T-configuration antenna tuner. This antenna tuner can handle up to 300 W PEP of RF from 160 through 6 meters. It includes a colorful 1.8 × 2.5-inch analog cross-needle meter that simultaneously displays forward power, reflected power, and SWR. There is a pair of high-voltage variable capacitors, and a tapped shunt inductor (actually, two series inductors). Controls include a 30/300 W range selector, PEP and average power reading, a **TUNER** switch that bypasses the CAT-300 while leaving the power and SWR functions intact, an **ANTENNA 1** or **ANTENNA 2** switch, the normal transmit and antenna variable capacitor, and tapped inductor (**BAND**) control. On the rear panel, you will find three SO-239 connectors — one **INPUT** to connect your transceiver, and two outputs to connect your antennas (see Figure 2). Please note that there are two possibilities for the **ANTENNA 2** output, using either the SO-239 or the **WIRE ANT** banana jack for a wire antenna. There is no internal balun. Figure 3 shows the internal view of the CAT-300, and the complete specifications are given in Table 2.

The **BAND** switch selects the shunt inductor tap. This may or may not be associated with the listed band, depending on the mismatch. The CAT-300 two-sheet manual lists starting capacitor and inductor positions for a 50 Ω input and 50 Ω output. This was a good starting point for my adjustments, as I was gradually increasing the resistive mismatch. However, for real on-the-air SWR adjustments, I recommend the technique described by Andrew S. Griffith, W4ULD, in "Getting the Most Out of Your T-Network Antenna

Table 2
Comet CAT-300
Manufacturer's Specifications (not tested by the ARRL Lab)

Frequency range:	1.8 – 54 MHz
Input impedance:	50 Ω
Output impedance:	10 – 600 Ω
Maximum TX power:	300 W PEP
Minimum SWR measurement power:	6 W
Lighting power supply:	11 – 15 V dc at 250 mA maximum*
Dimensions (width, height, depth):	9.8 × 3.9 × 9.5 inches
Weight:	6 pounds

*The actual current was only about 20 mA. I suspect that the original CAT-300 used an incandescent lamp for meter illumination. When this was changed to LEDs, apparently the current spec was not revised.

Figure 2 — The Comet CAT-300 rear panel.

Bottom Line

For those hams interested in a manual antenna tuner, the Comet CAT-300 is certainly worth considering. It should easily satisfy the needs of 100 – 200 W radios for most any antenna system mismatches.

Tuner" in the January 1995 issue of *QST*. This entails the following procedure:

1. Start with both capacitors in their center (half-meshed) positions.

2. Switch the shunt inductor to find maximum receiver noise.

3. Transmit 5 – 10 W and rotate the output capacitor, looking for an SWR dip.

4. If no dip is seen, switch the inductor up or down and try again.

5. Once an SWR dip is found, adjust the input capacitor for best SWR.

6. Rock the output capacitor, and vary the input capacitor, until you find the lowest SWR.

Table 3
Comet CAT-300 Resistive Load and Loss Testing

VSWR/Impedance	160 M	80 M	40 M	20 M	10 M	6 M
10:1/5 Ω Loss (%)	65%	46%	40%	45%	19%	23%
VSWR	1.1:1	1.1:1	1.1:1	1.1:1	1.2:1	1.2:1
8:1/6.25 Ω Loss (%)	58%	41%	30%	26%	10%	15%
VSWR	1:1	1.1:1	1.2:1	1.2:1	2:1	1.3:1
4:1/12.5 Ω Loss (%)	44%	29%	20%	24%	<5%	6%
VSWR	1.1:1	1.1:1	1.2:1	1.1:1	1.2:1	1.1:1
3:1/16.7 Ω Loss (%)	37%	23%	20%	19%	<5%	13%
VSWR	1.1:1	1.1:1	1.1:1	1.1:1	1.1:1	<5%
2:1/25 Ω Loss (%)	26%	20%	16%	18%	6%	14%
VSWR	1.2:1	1.1:1	1:1	1.1:1	1:1	1.1:1
1:1/50 Ω Bypass Loss	0%	0%	0%	1%	2%	3%
Bypass VSWR	1:1	1:1	1:1	1:1	1.1:1	1.3:1
2:1/100 Ω Loss (%)	18%	10%	10%	16%	10%	7%
VSWR	1.1:1	1:1	1:1	1.1:1	1.3:1	1.1:1
3:1/150 Ω Loss (%)	16%	10%	7%	16%	10%	<5%
VSWR	1.1:1	1.1:1	1.1:1	1.1:1	1.1:1	1.1:1
4:1/200 Ω Loss (%)	12%	8%	8%	20%	12%	<5%
VSWR	1:1	1:1	1.1:1	1.2:1	1.1:1	1.1:1
8:1/400 Ω Loss (%)	12%	12%	15%	23%	26%	40%
VSWR	1:1	1.1:1	1.2:1	1.1:1	1.3:1	1.1:1
10:1/500 Ω Loss (%)	15%	12%	<5%	25%	30%	44%
VSWR	1.1:1	1.1:1	1.1:1	1.1:1	1.2:1	1.6:1

My matching tests are shown in Table 3. I found that the adjustments were very touchy on 20 meters and above. However, it was fairly easy to null the SWR using the analog meter on the CAT-300. The input SWR was measured using a NIST-traceable power meter, as I wanted to more precisely measure the matched SWR.

For these resistive SWR tests, all best SWR adjustments coincided with the corresponding band setting, except the high-impedance 10-meter tests. In these cases, I had to use the 6-meter inductor position. And I could not find a tuning solution better than 2:1 SWR for the 6.25 Ω (8:1 SWR) low-impedance test on 10 meters. Also, as you can see in Figure 3, there are insulated shaft extensions on the two variable capacitors. Other manual antenna tuners I've reviewed just used the plastic knobs to isolate the user from the high RF voltages on the capacitors, but I would often get RF burns from the setscrews in the knobs. This is not a problem with the CAT-300.

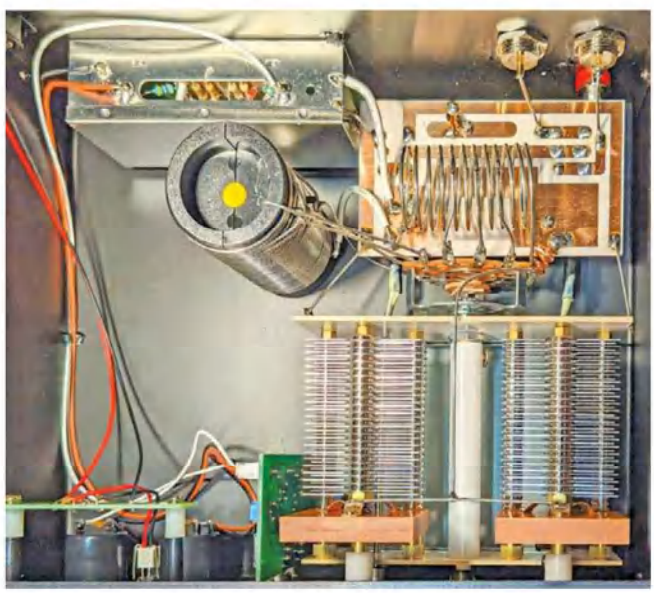


Figure 3 — The Comet CAT-300 internal view.

Table 4
Comet CAT-300 SWR and Power Reading Accuracy

	Low Impedance		High Impedance		30 W Scale		300 W Scale	
Band	2:1 SWR	3:1 SWR	2:1 SWR	3:1 SWR	10 W	20 W	50 W	80 W
160 M	1.4:1	1.9:1	1.7:1	2.7:1	9.5 W	20 W	50 W	80 W
20 M	1.4:1	2.2:1	1.5:1	2.4:1	8.7 W	16 W	50 W	70 W
10 M	1.4:1	2.0:1	1.6:1	2.5:1	8.2 W	15 W	50 W	70 W
6 M	1.3:1	1.8:1	1.7:1	2.5:1	9 W	17 W	50 W	75 W

Next, I measured the SWR and power readings versus my NIST-traceable equipment with the CAT-300 placed in the bypass mode. The CAT-300 readings are my best attempts to interpolate the readings on the analog CAT-300 meter. The results are shown in Table 4.

The SWR readings are reasonably accurate when the impedance is high. The low-impedance SWR measurements are much less accurate. However, the SWR meter is quite adequate for dipping the SWR during tuning.

Finally, I looked at the peak meter-reading position. The peak reading meter circuitry is not powered. Apparently, a larger capacitor is used to hold the sampled energy a little longer than normal. However, this also means it takes longer to charge this capacitor and, thus, display the peak power. On CW, I found that it took four dits before a true peak reading could be observed. This was more difficult on SSB. I found that I needed to talk fast and continuously for several seconds in order to see a peak reading. However, the CAT-300 meter only ever showed about 80% of the peak reading displayed on my Array Solutions PowerMaster.

Conclusion

The Comet CAT-300 manual antenna tuner is a well-made and rugged product. I was particularly impressed with the bypass SWR, especially on 10 and 6 meters. This shows that Comet was careful to ensure that stray wiring inductances were kept to a minimum. I was also pleased with the insulated variable capacitor shafts.

Manufacturer: Comet Co., LTD (Japan). Distributed in North America by the NatCommGroup, NCG Companies Inc., 15036 Sierra Bonita Lane, Chino, CA 91710, www.cometantenna.com. Price: $280.

QRO.cz RX Audite SDR Splitter/Switch

Reviewed by Pete Smith, N4ZR
pete.n4zr@gmail.com

Over the last decade, one trend in amateur radio has been the use of small software-defined radios (SDRs) to augment station capabilities in a number of ways — from actively monitoring bands other than those currently being heard on the station transceiver, to powering spectrum display of the existing band, to contributing spots to the Reverse Beacon Network.

Many users have encountered one technical issue: how to monitor the bands with an SDR while at the same time actively operating on one or more of them. This is the need that the RX Audite SDR Switch meets. The RX Audite is the brainchild of Jan Sustr, OK2ZAW. For more information, see **www.QRO.cz**. Jan is one of the technical gurus behind the OL7M contest station. You will find the online manual via **https://hamparts.shop/blog/rx-audite-sdr-switch-manual.html**. The RX Audite is also sold from this website.

The Audite supports all the HF bands and 6 meters (the frequency range is 0.1 – 60 MHz), with a maximum input power of 250 W (200 W maximum recommended). The PTT is not designed for QSK, but you can use it with the right PTT lead/tail/transmit delay time (minimum 20/20 ms). According to the manufacturer, the isolation between the transceiver and the SDR is 100 dB at 14 MHz, and 80 dB at 50 MHz. The RF limiter for RF signals is up to +13 dBm (20 mW) and could be +17 dBm at 50 Ω.

Bottom Line

This RX Audite splitter/switch combines TRX switch, RX splitter, and RF limiter protection for both RX outputs. It's reliable, and the insertion loss can be compensated with the addition of the optional RX preamplifier. With this unit you can share your main transmit antenna with two receivers with RF power limiter protection.

Figure 4 — The RX Audite rear panel.

Description

On the front panel you will find three switches. The leftmost switch is the SDR output second RX antenna switch. The second switch turns on or off the optional preamplifier, and the third one turns on and off the unit. On the front panel there is also a PTT LED indicator.

On the rear panel you will find a ground connection (**GND**), a 12 – 14 V dc power input (requiring a maximum of 0.7 A if the preamplifier is installed), **PTT IN** and **OUT**, an SO-239 for connecting to the transceiver (**TRX**), another SO-239 for the transmitting antenna (**TX/RX ANT**), and two SMA female connectors, one for a separate receiving antenna (**RX [INBAND]**) and one to connect the SDR receiver (**RX [SDR]**; see Figure 4).

How It Works

The Audite is inserted in the feed line between a transceiver and an amplifier or antenna. What it does, quite simply, is divert the transmitting antenna to an SDR whenever PTT is not asserted. When you are transmitting, the Audite bypasses the SDR and allows the station to operate normally. What is special about the Audite is the extent of protective circuitry offered to ensure that neither the transceiver nor the SDR is damaged by their coexisting, either on the transmit antenna or through the use of a close-by in-band receiving antenna by the SDR, while it is being subjected to high RF voltages from nearby transmitting antennas.

Figure 5 is a block diagram of the Audite in receiving mode/standby (turned on but PTT not asserted). The signal coming from the transmit antenna is split between the SDR and the transceiver. The optional preamplifier, which the test unit included, more than makes up for the loss in the signal caused by the splitter.

The PTT (denoted by the dotted lines in the diagram) is via two double pole double throw (DPDT) relays. When PTT is asserted by the transceiver, the Audite and the SDR connected to it are isolated from the transmitted RF path.

Whether you select the transmit antenna (**TX = INB RX ANT**) or the in-band receiving antenna (**INB RX ANT**) on the front panel of the Audite, there are extensive provisions made to protect your SDR from damage, either from your own transmitter or from other nearby transmitters (in the case of a multi-op station). Neon tubes, gas discharge tubes, and resettable positive temperature coefficient (PTC) fuses protect attached receivers and the internal preamplifier from damage. When transmitting, with PTT asserted, the transmitted signal is isolated from the SDR, as is any separate receiving antenna that is in use. Hedging against a possible operator error or equipment failure, if the PTT circuit to the unit is not activated, a resettable fuse protects the Audite from damage, and it reverts to presenting an open circuit to the transceiver, causing its SWR protection to cut power to a minimum, even as the built-in protection shields the SDR.

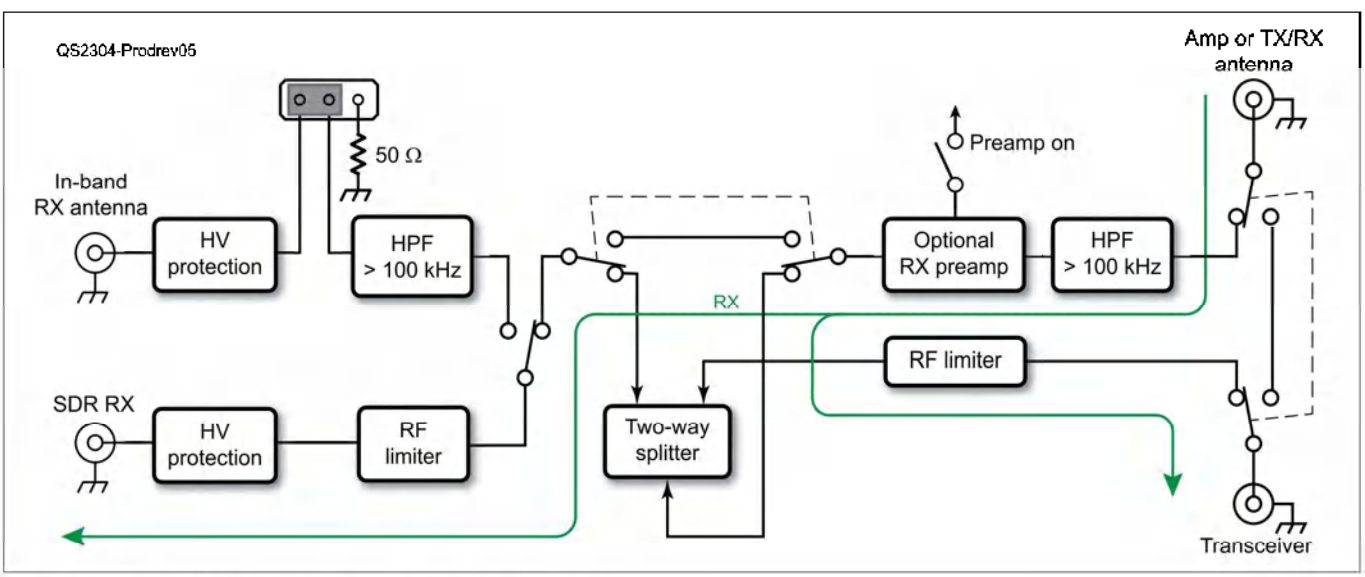


Figure 5 —The RX Audite block diagram. [Courtesy of QRO.cz]

Measurements by the manufacturer (not verified) show the effects of these measures. If PTT is not asserted but the transceiver delivers 100 W to the input, the SDR sees only –16 dBm, through fuse, neon tube, and gas discharge tube protection. With PTT asserted, in normal operations, the SDR sees a maximum of 4 dBm, or 10 dBm (10 mW) with the preamplifier on. In practical use, this is plenty to protect the receiver while still allowing full receiving capability when keyed up.

As this review was being finalized, OK2ZAW let us know about further improvements to the design that usefully improved receiver protection when transmitting.

Conclusion

I have been using the RX Audite in my station running a 100 W transceiver driving a 1500 W amplifier. I have made over 1,000 CW contacts with the Audite in place, watching my SDR continue to decode and spot stations whenever my PTT is not asserted.

Manufacturer: QRO.cz, www.qro.cz (also see www.hamparts.shop). Price: $248 without preamplifier, $262 with preamplifier.

tinySA Ultra — A 100 kHz to 6 GHz Spectrum Analyzer

Reviewed by Phil Salas, AD5X
ad5x@arrl.net

It is amazing how much affordable, sophisticated test equipment is now available for the amateur and electronic hobbyist. I recently had the opportunity to review the tinySA spectrum analyzer (see the March 2021 issue of *QST*). This is a very capable spectrum analyzer. However, besides the small screen, it was lacking in resolution bandwidth, making it unable to analyze standard IMD performance of amateur transceivers. Enter the tinySA Ultra — a much more capable spectrum analyzer. Table 5 compares the tinySA with the new tinySA Ultra.

Description

The tinySA Ultra has a bright 4-inch color LCD screen. It comes with a small telescoping antenna, two 12-inch SMA/SMA test cables, an SMA-female/SMA-female adapter, a USB-C/USB-A cable for charging and computer interfacing, a 32 GB microSD card, and a carrying strap with an attached guitar pick stylus (see the lead photo). ARRL also purchased an optional kit that included SMA/BNC, SMA/N, and SMA/UHF adapters and an additional telescoping antenna.

The tinySA Ultra has a built-in calibration signal generator for automatic self-test, amplitude calibration, and receiver alignment. The signal generator output can be internally AM or FM modulated. Manual and automatic selectable resolution band-pass filters from 200 Hz to 850 kHz are available. And there is an accurate 0 – 31 dB input step attenuator; however, this is disabled

when the internal low-noise amplifier is enabled. You can even turn on a waterfall display to monitor a selected frequency range.

Bottom Line

The tinySA Ultra is a capable and easy-to-use spectrum analyzer. At its price point, it is certainly a piece of test equipment that should be considered by any electronic experimenter.

Table 5
tinySA and tinySA Ultra Specification Comparisons

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

	tinySA	tinySA Ultra
Display size	2.8 inches	4 inches
Max input frequency	960 MHz	800 MHz, 6 GHz in Ultra mode
Resolution filters in 1, 3, 10 steps	3 – 600 kHz	200 Hz to 850 kHz
RF output frequency	Up to 350 MHz	Sine wave to 800 MHz, square wave to 4.4 GHz
RF output level	–76 dBm to +16 dBm	–104 dBm to –16 dBm; level calibrated up to 6 GHz
Internal LNA gain	**N/A**	**20 dB up to 4 GHz**
Internal step attenuator	**0 – 31 dB**	**0 – 31 dB**
Displayed points per scan	**Max 290**	**Max 450**
0 – 350 MHz scan time	**405 ms**	**165 ms**
Min zero span scan time	**1.6 ms for 290 points**	**14 ms for 450 points**
DANL at 100 MHz	**–148 dBm/Hz**	**–153 dBm/Hz (LNA off)** **–169 dBm/Hz (LNA on)**
DANL at 880MHz	**–163dBm/Hz**	**N/A**
DANL degradation in Ultra mode	**N/A**	**10 dB > 2.5 GHz, 25 dB > 5.3 GHz**
Phase noise at 10 kHz offset	–83 dBc/Hz	–92 dBc/Hz
Phase noise at 100 kHz offset	–98 dBc/Hz	–108 dBc/Hz
1 dB compression level	–0.5 dBm	+0.5 dBm (LNA off) –26.5 dBm (LNA on)
IIP3 without LNA	+24 dBm	+18 dBm (at least 2 MHz apart); 0 dBm (500 Hz apart)
IIP3 with LNA	N/A	–8 dBm (at least 2 MHz apart)
Audio out	N/A	3.5-millimeter headphone plug
Firmware update mode activation	Via DFU menu	Push jog button before switch on
AM modulation depth	Fixed 30%	10 – 100%
FM deviation	4 – 75 kHz	1 – 300 kHz
Modulation frequency	50 Hz to 5 kHz	50 Hz to 5 kHz (AM) or 1 kHz (FM)
SD card slot	N/A	32 GB microSD card

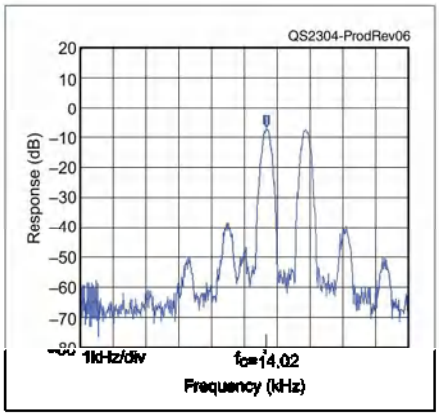


Figure 6 — Two-tone IMD output of a KX3 transceiver.

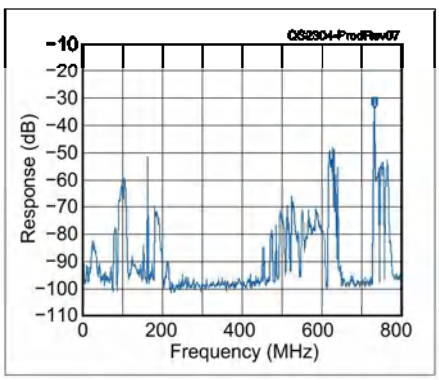


Figure 7 — Spectrum at TV antenna output.

Along the top side of the tinySA Ultra is an on/off switch, a red charging LED, and a comfortably large momentary rocker switch. On the left are two SMA connectors. The upper connector is used strictly for calibration. The lower SMA connector provides the full-frequency spectrum analyzer input, or the signal generator output. Along the bottom of the tinySA Ultra you will find a USB-C port (for charging, computer interfacing, and software updates), a microSD card slot (with the supplied 32 GB microSD card installed), and a 3.5-millimeter headphone jack for listening to demodulated AM and FM signals.

I recommend joining the tinySA user group at **https://groups.io/g/tinySA**. Additionally, on **https://tinysa.org** you can find quite a bit of information, including firmware updates. The Windows software interface program, *tinySA-App*, can be found at **https://tinysa.org/wiki/pmwiki.php?n=Main.PCSW**. Missing, however, is a downloadable user manual (at the time of this review). Keep in mind that the tinySA Ultra's operation is very similar to that of the tinySA. And with just a little bit of playing around time, you will find the tinySA Ultra operation to be easy and straightforward.

Using the tinySA Ultra

Begin by charging the tinySA Ultra with the supplied USB cable. The red charging LED turns off when the battery is fully charged. You may want to consider attaching SMA-male/SMA-female adapters to the tinySA Ultra ports to protect the original SMA connectors, each of which has only a 500-mate/unmate specification. Also, do not attach any large adapters directly to the tinySA Ultra's SMA connectors. Always use the supplied 12-inch SMA/SMA cables.

When using the tinySA for the first time, connect an SMA cable from the upper CAL SMA output to the lower SMA input port. Tap the screen with the supplied guitar pick stylus, a smartphone stylus, or even a toothpick. The 4-inch touchscreen makes for easy navigation. Select **CONFIG**, and then tap **SELF TEST**. When the self-test is complete, tap **LEVEL CAL**. You will be asked to calibrate from 100 kHz to 5.34 GHz, or above 5.34 GHz. Select the **100 KHZ-5.34 GHZ** range, as an external frequency source is needed for calibration above 5.34 GHz.

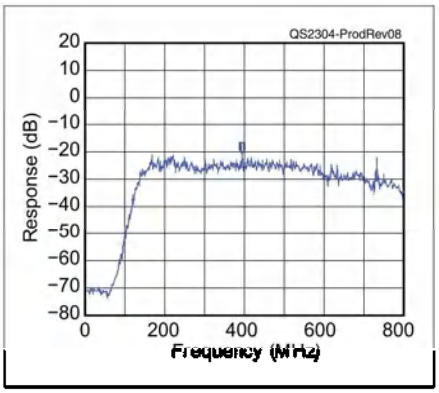


Figure 8 — LTE filter shape using noise source and tinySA Ultra.

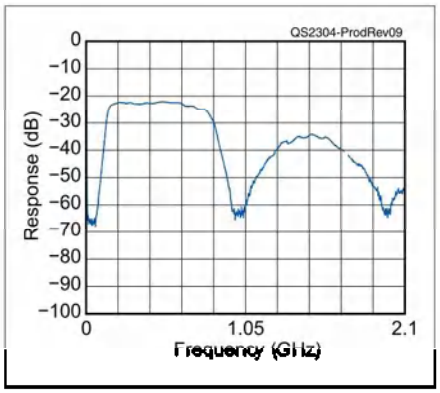


Figure 9 — 2.1 GHz sweep of the LTE filter using the Siglent SSA3021X spectrum analyzer/tracking generator.

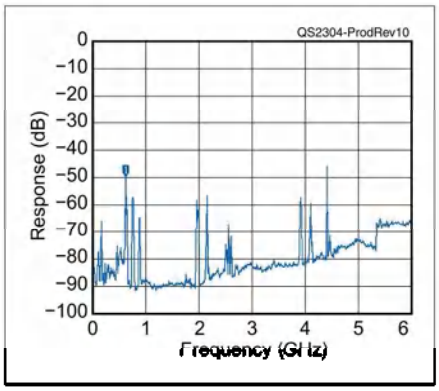


Figure 10 — Full 6 GHz spectrum sweep in Ultra mode.

It is now appropriate to discuss the microSD card. When the card is inserted, you will see a small green "SD" indication on the lower left of the display. Touching this symbol will copy the current screen to the microSD card as a JPG file. Then you can simply remove the card from the tinySA Ultra, insert it into a microSD-to-USB adapter, and copy the file from the microSD card to your computer. Rather than taking photos of the tinySA Ultra's screen, I used the microSD's capability for transferring screen information into this review. Incidentally, you can also select **TRACE** and then **WRITE TO SD**, and all the screen information will be written in a comma-separated data format that can be easily imported into an Excel file.

From the standpoint of typical amateur radio-related measurements, signal harmonics and spurious tones are readily and accurately displayed just as described in the March 2021 issue of *QST*. However, as the tinySA Ultra has a 200 Hz resolution bandwidth, you can observe the standard two-tone IMD test output normally performed during transceiver linearity testing — something that couldn't be done with the tinySA. Figure 6 shows the spectral display of the two-tone output from my Elecraft KX3.

Rather than repeat the same tests I performed in the tinySA review, I decided to investigate a non-amateur use of the tinySA Ultra. I've been wanting to eliminate cable TV at home. After all, the less I spend on cable TV, the more I can spend on ham equipment! So, I installed a passive TV antenna in my attic and an eight-way amplified splitter (I have five TVs). A TV channel scan found dozens of over-the-air TV channels. However, I had intermittent pixelization and occasional loss-of-sync problems with many stations. Because the tinySA Ultra is so portable, I went up to my attic and connected it directly to the TV antenna. Figure 7 shows the resultant spectrum.

A quick look at **www.fcc.gov** showed that my local TV channels fell within the range of about 180 – 600 MHz. In the Figure 7 scan, you can see FM broadcast stations in the 88 – 108 MHz range, and a strong signal around 160 MHz. One TV channel at 180 MHz is apparent, as are the remainder of the TV channels at about 450 – 600 MHz. Above 600 MHz the signals are probably from local 4G LTE cell sites. So, my guess was that some of the strongest non-TV signals might be mixing with other frequencies, thus causing mixing products to interfere with some of the channels. Not surprisingly, Amazon sells LTE filters for TV. Some of these filters even roll off FM broadcast signals. Figure 8 is the LTE filter's response obtained with a broadband noise source and the tinySA Ultra (see the tinySA review in the March 2021 issue of *QST* for more details on making insertion loss and return loss measurements using this method).

As you can see, the filter does a nice job of rolling off FM broadcast signals, but does very little to help with signals above 600 MHz. Because my noise source runs out of gas around 1 GHz, I used my Siglent SSA3021X spectrum analyzer/tracking generator to look at a broader sweep range (see Figure 9).

The filter doesn't roll off much until you get above about 800 MHz. So why is it called an LTE filter? It turns out that the 600 – 800 MHz spectrum has been primarily used for 3G cellular. 4G LTE has generally been above 2 GHz. However, as of the end of 2022, 3G is no longer supported, and many cellular providers have moved their 4G LTE service into the 600 – 800 MHz band. Frequencies above 2 GHz (2.5, 3.7, and 5 GHz bands) are becoming primarily 5G bands. So, these filters are only effective for signals above about 800 MHz, as that is where the LTE bands were. Luckily, however, when I installed the LTE filter, most of my TV channel issues disappeared. Apparently, removing

the FM broadcast channels helped. I still have a problem with my 530 – 536 MHz NBC channel, so I am still looking for a better LTE filter.

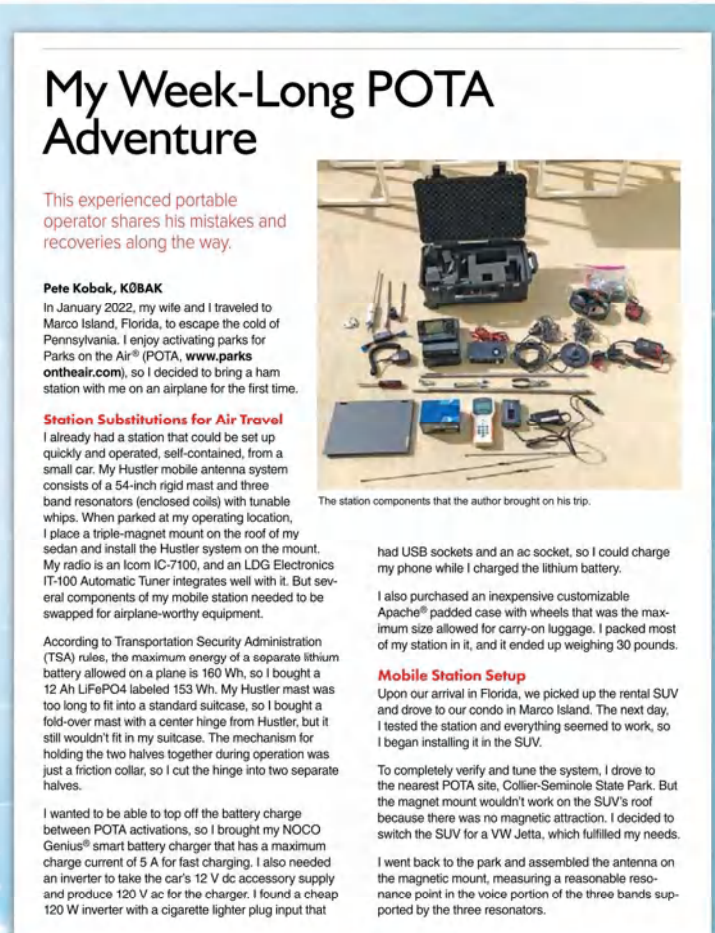
The Ultra Mode

For measurements above 800 MHz, you must enable the tinySA Ultra's Ultra mode. To do this, select **CONFIG, MORE, and then ENABLE ULTRA. It is interesting that when you do this for the first time, you will be directed to a website for an enabling code. Once** the Ultra mode is enabled, you can now scan up to 6 GHz. Figure 10 is a full 6 GHz scan using the telescoping whip antenna. You can see FM, TV, and LTE signals at the lower end. The 2 GHz signals are either **cellular 5G signals or my local Wi-Fi. The signals around 4 GHz are probably 5G (3.7 – 4 GHz). As you can see, the noise floor degrades at higher frequencies.** However, performance is still very good for such an inexpensive instrument.

In Summary

I had a lot of fun playing with the tinySA Ultra. It provides tremendous capability at a surprisingly low price. The 32 GB microSD card is a great addition, making it easy to store many screenshots for future analysis. And besides the normal spectrum analyzer and signal generator tasks, the tinySA Ultra can make insertion loss and return loss measurements with the addition of a few inexpensive components. Finally, you can use the *tinySA-App* for computer interfacing via the USB port.

Manufacturer: tinySA, **www.tinysa.org.** Distributed in North America by R&L Electronics **(www.randl.com).** Price: $130.



My Week-Long POTA Adventure

This experienced portable operator shares his mistakes and recoveries along the way.

The station components that the author brought on his trip.

Pete Kobak, KØBAK

In January 2022, my wife and I traveled to Marco Island, Florida, to escape the cold of Pennsylvania. I enjoy activating parks for Parks on the Air® (POTA, **www.parksontheair.com**), so I decided to bring a ham station with me on an airplane for the first time.

Station Substitutions for Air Travel

I already had a station that could be set up quickly and operated, self-contained, from a small car. My Hustler mobile antenna system consists of a 54-inch rigid mast and three band resonators (enclosed coils) with tunable whips. When parked at my operating location, I place a triple-magnet mount on the roof of my sedan and install the Hustler system on the mount. My radio is an Icom IC-7100, and an LDG Electronics IT-100 Automatic Tuner integrates well with it. But several components of my mobile station needed to be swapped for airplane-worthy equipment.

According to Transportation Security Administration (TSA) rules, the maximum energy of a separate lithium battery allowed on a plane is 160 Wh, so I bought a 12 Ah LiFePO4 labeled 153 Wh. My Hustler mast was too long to fit into a standard suitcase, so I bought a fold-over mast with a center hinge from Hustler, but it still wouldn't fit in my suitcase. The mechanism for holding the two halves together during operation was just a friction collar, so I cut the hinge into two separate halves.

I wanted to be able to top off the battery charge between POTA activations, so I brought my NOCO Genius® smart battery charger that has a maximum charge current of 5 A for fast charging. I also needed an inverter to take the car's 12 V dc accessory supply and produce 120 V ac for the charger. I found a cheap 120 W inverter with a cigarette lighter plug input that had USB sockets and an ac socket, so I could charge my phone while I charged the lithium battery.

I also purchased an inexpensive customizable Apache® padded case with wheels that was the maximum size allowed for carry-on luggage. I packed most of my station in it, and it ended up weighing 30 pounds.

Mobile Station Setup

Upon our arrival in Florida, we picked up the rental SUV and drove to our condo in Marco Island. The next day, I tested the station and everything seemed to work, so I began installing it in the SUV.

To completely verify and tune the system, I drove to the nearest POTA site, Collier-Seminole State Park. But the magnet mount wouldn't work on the SUV's roof because there was no magnetic attraction. I decided to switch the SUV for a VW Jetta, which fulfilled my needs.

I went back to the park and assembled the antenna on the magnetic mount, measuring a reasonable resonance point in the voice portion of the three bands supported by the three resonators.

Dave Casler, KEØOG, askdave@arrl.org

Ask Dave

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

Coax Cables, Band Noise, and A 6-Meter J-Pole Antenna

A Stealthy 6-Meter Vertical

Q Bob Silverman, WA6MRK, asks: How do I keep the base of a J-pole antenna for 6 meters as low as possible to avoid upsetting my HOA?

A First, let's discuss polarization on 6 meters. On 6 meters and above, it is conventional that FM is vertically polarized, and all other modes, collectively called "weak-signal" modes, are horizontally polarized. If you intend to work somebody locally, you will want to follow this convention. However, if your signal bounces off the ionosphere for long-distance work, the initial polarization does not matter.

The J-pole antenna consists of two parts. One is a half-wave dipole. The other is the quarter-wave transmission-line matching network. The quarter-wave transmission line has two parallel wires or copper pipe. This is a quarter-wave stub that is shorted at one end. At the shorted end there is zero impedance, while the top end has a very high impedance. This high-impedance point is used to feed the end-fed half-wave dipole.

There is nothing to indicate that the end-fed dipole needs to be in the same direction as the matching stub. You can bend the antenna to 90 degrees. You can lay out the matching stub horizontally, a couple of feet off the ground where it will be completely hidden, and then put the half-wave dipole above it. The length of the matching stub in feet is determined by the usual formula of ¼ λ = 234/f, where f is the frequency in megahertz (assuming a velocity factor of 0.95 in wire). The length of the half-wave dipole is determined by ½ λ = 468/f. Note that because the 6-meter band is very wide, a single dipole may not cover the entire band. If you are going to put the half-wave dipole riser in a tree, for example, use insulated wire. The dimensions for this can also be determined by using the dimensions for a 2-meter J pole and scaling up. The 50 Ω feed point may need to be determined by trial and error. Figure 1 shows how such an antenna can be installed. Note that this antenna does not require radials and can be mounted at any height, although I recommend that it be a few feet above the ground at least.

This technique of folding the matching stub to the side will allow you to make J poles on any frequency, including HF bands.

RG-8X for Short Jumpers

Q Mike McBride, KJ6MGV, asks: What do you recommend for short patch cables in the shack? I am using low-loss LMR-400 coax for my antenna feeds. Should I use LMR-400 flex types, or something smaller?

A Assuming we are talking about HF, using the LMR-400 from your shack to your antennas provides low loss on both transmit and receive. Any short patch cable will have low insertion loss. The difference in loss between an RG-8X jumper and an LMR-400 jumper of the same length is negligible, only a fraction of a decibel. This is not enough

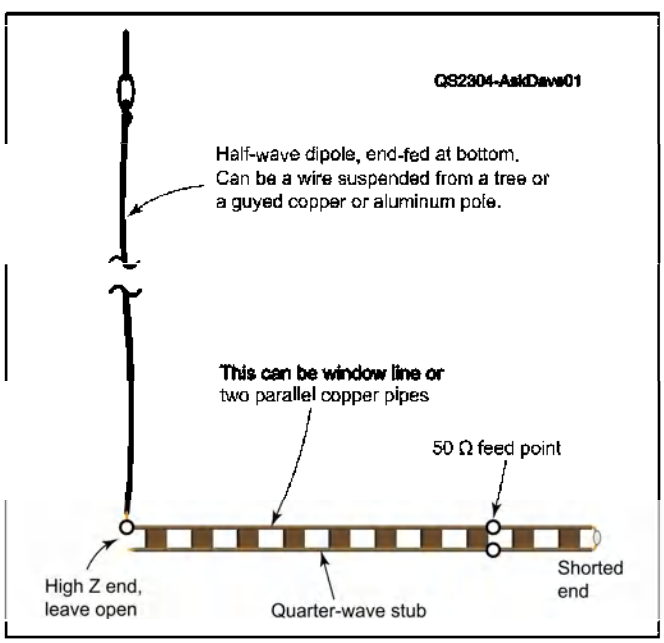


Figure 1 — A 6-meter J pole on its side. A vertical dipole is end-fed with the open end of the quarter-wave transmission line stub. Shorting the other end of the stub causes the open end to have high impedance. You will need to experiment with the right 50 Ω feed point. You can scale up from a 2-meter J pole as a starting point.

to make a difference even if your amplifier is several hundred watts. If you are running the full legal limit, I'd stick with the LMR-400 patch cables to avoid the inevitable heating in the smaller coax.

For example, at 50 MHz (6 meters), RG-6X cable loses 2.5 dB per 100 feet. A 3-foot patch cable is 0.08 dB of this — completely negligible overall.

Ready-made patch cables are available from many sources but are expensive. You can save money by making your own.

Daisy-Chaining DSP Filters Does Not Help with Noise

Q Jim McKenzie, KCØML, asks: Would adding an audio digital signal processor (DSP) filter at the external speaker output reduce S7 to S9 noise without distorting the audio? I have a transceiver with an adjustable DSP filter in the IF stage that I use to listen to SSB signals. Even with it set to the maximum, I still get noise and it runs at these levels constantly.

A The short answer is no. Without going into a deep explanation, noise is an uncorrelated, random signal. Human speech, on the other hand, is highly correlated, meaning there is some ability to predict upcoming signals based on previous signals. The DSP filter in your radio eliminates the uncorrelated noise. The degree to which it does this depends on how you set your noise filter. Some noise has correlation just by chance, so it will go through the filter. Similarly, some human speech is uncorrelated because it is not perfectly predictable, so it will be cut out by the noise filter. If you run the output through an additional DSP filter, the sorting of correlated versus uncorrelated noise has already been done, so this extra filter will not add much value.

Given how much noise you have, my first suggestion is to check your grounding. You should have an 8-foot ground rod driven mostly into the ground right outside your station. All the antennas coming into your station should pass through a lightning protection device that is attached to the ground rod. This alone can reduce your noise level enormously. You should have a single-point ground inside your station, and this should be connected to the ground rod too. Do not defeat the third wire ground on anything plugged into the wall.

Vertical antennas tend to pick up a bit more noise relative to the signal than horizontal antennas do. This is not pronounced, but it might be worth trying a dipole. Dipoles are slightly directional, so you can experiment with different orientations. Or you can try a magnetic loop (small HF loop) antenna, which has strong nulls that can cut back on some interference, though they can be expensive.

There are some standard techniques that can help find interference. Run your radio with a battery. Turn off all electricity to your house at the breaker panel. If this results in a reduction of noise, turn on the breakers one by one. If turning one of them on causes the interference to return, figure out what is on that circuit in your home. You may be able to apply some ferrite beads on the power cord to that device. If this technique does not work, find an old AM transistor radio, and walk around your neighborhood to see where the noise is the strongest. It could be a transformer, an electrical pole, or pretty much anything.

Removing the Center Insulation of Coaxial Cable

Q Ron Russell, KG7OR, asks: What's a good way to get the center insulation removed from RG-213 and other coaxial cables with a molded center insulation? The *QST* Product Review for the Quicksilver Radio Deluxe Coax Crimp Kit in the January 2023 issue speaks of using the included stripper on RG-213 coax. That type of stripper does well with the outer shield, but removing the insulation around the center conductor wires is difficult because it's molded onto the stranded wire.

A I've done this several different ways. One is to grab the end of the insulation with a pair of long-nose pliers. This can sometimes pull it off. Another is to use a sturdy knife, like a box cutter, to create a longitudinal slit. Then the insulation can be peeled off easily. The center conductor of RG-213 is stranded wire. You will need to make sure that all of this goes into the coax center pin. If one strand comes loose when inserting this into the coax connector, it can fold back on itself and short the coax connector. If you are careful, you can very lightly tin this wire, but too much solder will make it too thick to go through the connector.

Each type of coax needs a different stripper. Each stripper comes with a hex key tool that can align the various cutters in the stripper so that you get a very neat cut every time. This alignment is delicate, so you will need to adjust a little and then test each adjustment on a piece of scrap coax.

You can prepare cable ends by hand with a simple knife. It takes some practice, but the measurements that you must attain are widely available. After constructing a cable, use a multimeter to check for continuity at each end of the cable for the shield and the center conductor, and make sure the shield and center conductor have not shorted.

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

Paul Wade, W1GHZ, w1ghz@arrl.org

Microwavelengths

Affordable Microwave Power Measurement

Without any test equipment, it is hard to tell if microwave equipment is working, and even harder to tune it up. When several of us microwavers were getting started on 10 GHz, we would listen for each other across the basement or driveway with great signals. Moving apart by 1 or 2 miles was too far — our gear didn't really work.

Being able to detect RF power is crucial. It shows something is working and enables tune-up. Because there is no plug-and-play microwave equipment above 1296 MHz, we must assemble transverters of various modules, either purchased or homebrew. The power in the equipment is usually at milliwatt levels (for instance, the local oscillator of a transverter or even the lower-level radiated power of an antenna at a safe location). Tuning up homebrew equipment might start at lower levels until the tuning is adjusted. Higher power can be reduced for measurement by attenuators or directional couplers.

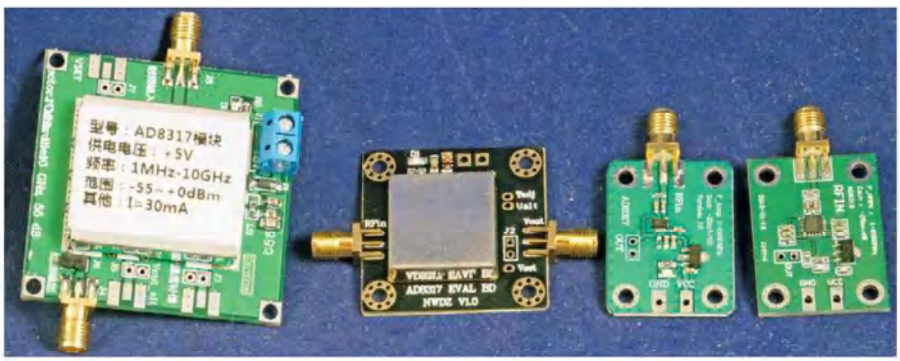


Figure 1 — Some RF power detector modules that are good to 10 GHz, found on eBay. Three versions containing an Analog Devices AD8317 are shown to the left, and one containing an Analog Devices AD8318 appears on the right.

Figure 2 — Performance curves of the Analog Devices AD8317 power detector module show similar performance from 144 to 5760 MHz but are somewhat reduced on 10 GHz. Note that the output voltage decreases with increasing power.

Microwave Power Detectors

Accurate microwave power measurements are made with microwave power meters, like the HP 432, 435, 436, or 438, or newer models from Agilent, Keysight, and Rohde & Schwarz. For the HP 432, waveguide sensors can be found for microwave bands beyond 100 GHz. I find analog meters more useful for tuning up projects, but even their older models are quite expensive. A complete system with a sensor and interconnecting cable can cost several hundred dollars, or as much as a transverter module. For most ham purposes, accurate power measurement isn't crucial. An approximation is good enough to get you on the air.

Diode detectors have traditionally been used for low-cost amateur radio power detection, dating back to galena crystals in the spark era. Diode detectors are temperature-sensitive, non-linear, and not very sensitive if used as RF detectors, making accurate power measurements unreliable, especially in the field. They still play an important role by showing that RF power is present.

In recent years, more sensitive logarithmic power detector integrated circuits (ICs) have become available, like the Analog Devices AD8307. It's good for up to 500 MHz and provides linear-in-dB output voltage. Wes Hayward, W7ZOI, and Bob Larkin, W7PUA, describe an RF power meter using this chip in "Simple RF-Power Measurement" in the June 2001 issue of *QST*, with a measurement range of –70 dBm to >0 dBm, nanowatts to milliwatts. Phil Sittner, KD6RM, describes a digital QRP wattmeter using the same IC and an Arduino Nano microcontroller in

Figure 3 — An inexpensive power meter capable of operation on frequencies from 1 MHz to 10 GHz. The AD8317 module used is the second from the right in Figure 1. The LED indicator is displaying –30 dBm (1 µW) at 3.4 GHz.

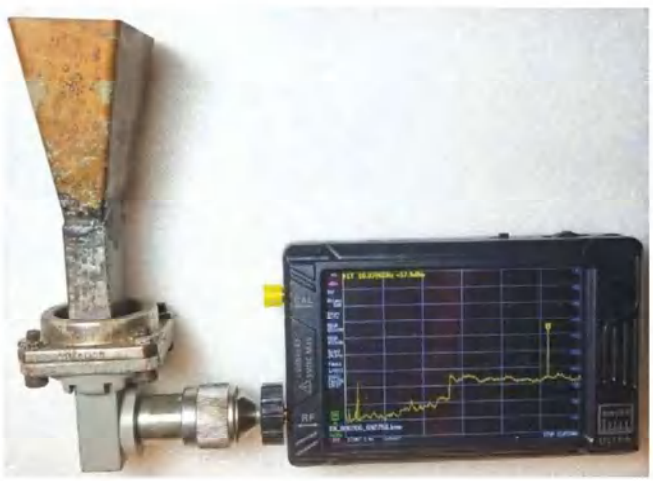


Figure 4 — An inexpensive tinySA Ultra spectrum analyzer displays a clean output from my 10 GHz dish. The horn antenna was held off to the side — never stand in front of the antenna while transmitting.

"Constructing an Accurate Digital QRP Wattmeter" in the October 2022 issue of *QST*.

Similar ICs are available for lower microwave frequencies, up to around 3 GHz. Until recently, the only one available that worked on 10 GHz **was the LTC5508 temperature-compensated Schottky diode detector. Even though it is only rated to 7 GHz, it still detects RF at 10 GHz.**

Newer logarithmic IC power detectors rated for higher frequencies (up to 10 GHz) come in tiny surface-mount **packages with even tinier contacts. Fortunately, some of them are available on eBay as small, assembled modules, at prices not much higher than the IC alone from a distributor. For 10 GHz, the Analog Devices AD8317 is offered in several different** modules. I have tried the three versions shown in Figure 1, and all have similar performance. They are very sensitive, with a large dynamic range, and with output linear-in-dB (about –22 mV per dB), from approximately –50 dBm to –5 dBm. Once it's calibrated at one power level, the difference in the output voltage can be converted to decibel difference, and **the measured power can be calculated within a couple of decibels, which is adequate for most ham projects.**

The curves in Figure 2 show only a small variation in performance at frequencies from <144 MHz and up to at **least 5760 MHz. The curves for different frequencies are nearly on top of each other. However, at 10368 GHz, the detector is about 20 dB less sensitive than at lower frequencies, and the dynamic range is reduced, but it is still usable. The Analog Devices AD8317 data sheet says that it is accurate up** to 8 GHz with "useful operation to 10 GHz," but no data is shown above 8 GHz. A similar IC, the Analog Devices AD8318, in a module also shown in Figure 1, is rated only to 8 GHz, but shows the same 20 dB reduction in sensitivity at 10 GHz.

Figure 3 shows an Analog Devices AD8317 module paired with an LED bar-graph display packaged in an Altoids tin with a 9 V battery to make a compact portable microwave power detector. The LED display shows –30 dBm (1 µW) at 3.4 GHz. This is sensitive enough to monitor output from an antenna without being directly in front of it.

Spectrum Analyzer

A spectrum analyzer displays signal levels over a range of frequencies, so it can also be used for approximate RF power measurement as well as finding wanted and unwanted signals. These large and expensive instruments were **vital when microwave homebrewing involved chains of frequency multipliers. Today, IC frequency synthesizers** have greatly simplified frequency generation.

However, a small and inexpensive **microwave spectrum analyzer changes the story. The new tinySA Ultra (www.tinysa.org) operates up to 12 GHz (20 GHz in a higher mode) at $129. In Figure 4, I held the small horn antenna near the dish antenna of my 10368 MHz rig to capture and display the clean output. The nearest commercial** spectrum analyzer covering 10 GHz would cost roughly 100 times more.

Microphones and Ham Radio

In the first installment of a three-part series on the quality of transmitted audio, K6EB discusses common types of microphones and the characteristics that contribute to their sound and audio quality.

Lindy Williams, K6EB

Most hams attribute their sound quality over the air to the microphone they use. But in most cases, this isn't necessarily true. Using a $6,000 Neumann condenser microphone won't make your audio sound bad, but you most likely will not receive your money's worth in the improved audio quality that you were hoping for.

Understanding Audio Bandwidth

Almost all modern HF SSB transceivers have an audio bandwidth starting at 150 to 200 Hz and ending at 3 kHz. This is essentially the same bandwidth standard telephones have had for more than 100 years — Ma Bell chose this response characteristic as the necessary response bandwidth to convey speech intelligibility. It's far less than the response of most modern microphones. The human ear responds to sounds from approximately 30 Hz to as much as 20 kHz. The Neumann microphone mentioned earlier will give you a flat response over that entire bandwidth. Conversely, with a transceiver, the response from 3 to 20 kHz won't be transmitted.

There are good reasons for the limited bandwidth of ham transceivers, as well as telephones. The simple explanation is that the signal-to-noise ratio (SNR) is inversely proportional to bandwidth. Using only the most important portion of your speech response to convey information optimally will give you the most efficient transmission. The wider the audio bandwidth, the lower the SNR. There are many other concerns as well, such as spectrum availability. If everyone was transmitting a full 20 kHz wide signal, the band would only accommodate less than 20% of the number of signals. You can imagine the problem that this would present in a contest.

Important Microphone Characteristics

Proximity Effect: One of the factors to consider when choosing a microphone is that they all have a proximity effect. This means that when you speak relatively close to the microphone, it'll accentuate the lower frequencies of your voice (this can be as much as 10 dB). This is much more pronounced with cardioid-pattern microphones, as opposed to omnidirectional microphones. Because there's little intelligibility transferred in this portion of the speech bandwidth, it's less useful for ham radio. For some, this rich, full sound may be what you're striving to achieve. If you're looking to make contacts with a full, natural sound, then accentuating the low frequencies will give you what you want. But it won't improve the intelligibility of your transmission. If the ham listening to you hears your signal at 20 dB over S9, this won't be an issue. But if you're trying to be heard through a pileup, it's a big disadvantage. In SSB transmissions, the energy utilized in these low frequencies will concentrate much of the transmitted energy in a portion of the audio spectrum that conveys little, if any, intelligibility. Virtually all of my audio engineering textbooks point out that the portion of the human voice that conveys maximum intelligibility is between 1.5 and 5 kHz. Because you only have 3 kHz to begin with, it becomes even more important to concentrate on that 1.5 to 3 kHz.

Handling Plosives: Another microphone characteristic to pay attention to is how well it handles speech plosives, or the sounds made when you pronounce "p" and "t," and a few other consonants. Pronouncing words that utilize plosive sounds will cause an excessive compression of the air projected toward the microphone diaphragm, which causes it to move excessively, creating a popping sound. This is dealt with in most microphones by the use of pop filtering, which is typically a foam covering that keeps the excess popping to a minimum. Most modern microphones handle this reasonably well. If you're using compression, which many modern radios do, plosives can also cause the compressor's gain reduction to overreact and poke holes in your audio.

Frequency Response: Some microphones have been designed for specific purposes, like the Shure SM58, which was developed for very close miking and has been effectively utilized in live vocal performances. The Shure 562 was designed for paging and industrial communications. These microphones often have frequency responses focused where the maximum

intelligibility is transferred. Interestingly enough, this is also the same portion of the audio bandwidth that's most important to hams. Some microphone companies, such as Heil Sound, have capitalized on this by designing microphones with a healthy bump in the response from about 1.5 to over 5 kHz. This response extends beyond the 3 kHz bandwidth of most ham transceivers. It doesn't present a problem because the transceiver rolls off the information above 3 kHz.

Sensitivity: Another characteristic that affects microphone performance is its sensitivity. Condenser microphones are very sensitive to sounds and will pick up extraneous noises within your shack, whereas some other microphones, like those designed for live performance usage, were constructed in a way that limits background noise and accentuates sounds that are closest to the microphone. The diaphragms of these microphones are stiffer and only respond to close-proximity sound. This is important to consider if your shack has extraneous noise levels.

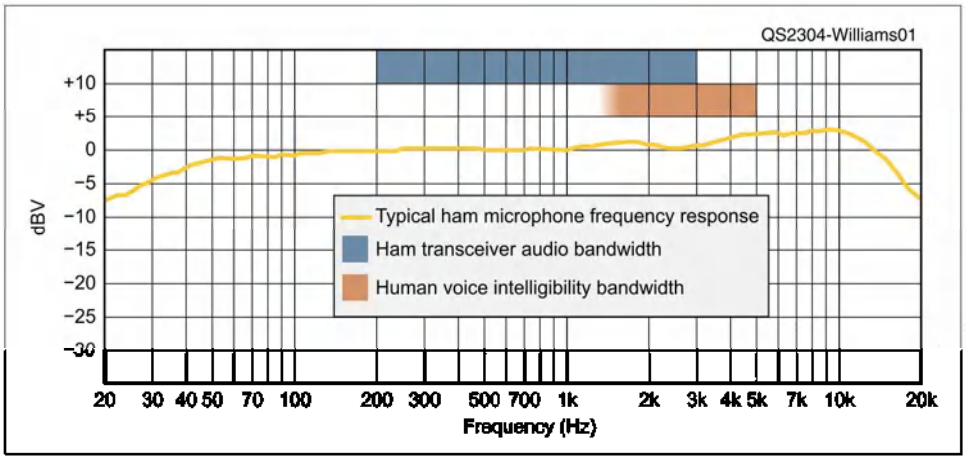
Balanced/Unbalanced Output: There's one other microphone characteristic that should be mentioned, and that's whether the microphone provides a balanced or unbalanced output. This is only a concern when using a lengthy cable between the microphone and the transceiver. If the cable is more than a few feet long and unbalanced, the capacity of the cable, caused by the center conductor and the outer shield, acts like a capacitor. The longer the cable, the larger the capacity, which causes high-frequency roll-off. It acts in the same way as putting a capacitor across the microphone output. This can be eliminated by keeping the cable length short or by having a balanced microphone. Almost no ham transceivers have balanced inputs, but this shouldn't be an issue because most cables are short, and the input impedance of the transceiver is relatively low, minimizing this capacitive effect. Additionally, this capacitive high-frequency roll-off primarily affects frequencies above 3 kHz. A cable would have to be well over 10 feet long for any noticeable effect to take place within the ham bandwidth.

Common Types of Microphones

Carbon: Early microphones utilized a loosely packed carbon element that changed resistance when compressed. With a voltage applied across this element and a capacitive coupled output, the voltage change when the diaphragm compressed and expanded the carbon element would create an electrical response that replicated the sound of the voice or instrument that was then amplified and modulated a transmitter. Carbon microphones have poor frequency response and require a voltage across the element, so they were replaced in most ham radio operations by dynamic or electret-condenser microphones.

Dynamic: The dynamic microphone (see interior view above) is likely the most common microphone in existence today. It is the most rugged design, doesn't require a voltage to be applied across it to function, is extensively used in ham circles, and its mechanism is relatively simple. Much like a generator, it consists of a coil that moves within a permanent magnet. This creates a voltage that's then amplified and utilized in virtually every place you would use a microphone. The frequency response is considerably wider than the bandwidth of a ham transceiver, and it can be fashioned in a number of configurations with either a low- or high-impedance output, balanced or unbalanced output, as well as omnidirectional or cardioid-directional pickup patterns.

Condenser: The condenser microphone (see interior view below) has been around since the 1920s, but it has remained almost exclusively (until recently) found in recording and broadcasting studios. This is partly due to its cost and complexity. It requires a power supply, and up until the 1970s, it required two supplies: a higher voltage applied across the diaphragm and anode, and another supply to power the amplifier that brought the very low signal up to a level that made it usable, as well as matched its impedance to the preamplifier. The audio signal was derived by the variation in capacitive reactance between the very thin diaphragm and the fixed anode. In the



This graph shows the typical ham microphone frequency response.

1970s, manufacturers permanently polarized the diaphragm so that the high-voltage supply was no longer required. Most of the professional versions of this microphone still use a polarizing supply, which is **almost always applied through the microphone connection from the preamplifier's phantom supply, which provides the bias voltage across the element and powers the amplifier.**

The permanently polarized condenser microphones are called electret condenser microphones, and they're commonly used in ham radio today. Many of the microphones sold by Icom and Yaesu utilize this technology. The condenser microphone has a very wide frequency response from below 50 Hz to well over 20 kHz. This is, as stated earlier, a far wider response than can be utilized by the modern transceiver. They are relatively inexpensive, and with the required preamplifier they have an adjustable low-impedance output that's well-matched to the preamplifier built into almost all modern ham transceivers. Most of these same transceivers have a low voltage **available on the microphone input to power the microphone. The condenser microphone also has extremely good transient response. This is the instantaneous** response of the microphone's diaphragm to the audio wave that's moving it. It is the most faithful of all the microphones because the movement of the diaphragm is extremely small, and the diaphragm itself is extremely thin, which affords a very fast and faithful response to the audio waveform that excites it. This is good in a quiet environment (such as a recording or broadcast studio or quiet ham shack), but it can be problematic in a ham shack with noisy fans because it'll pick up every sound within its environment.

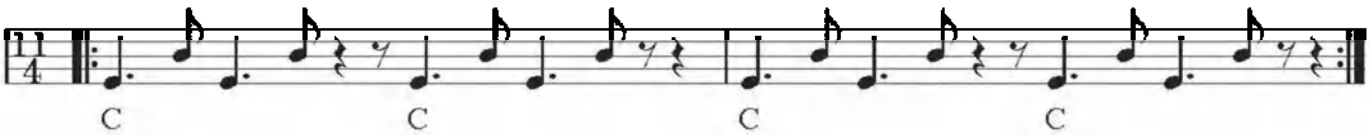
Ribbon and Ceramic: Ribbon microphones, such as the Altec 639, were popular in the golden age of radio and have good frequency response but a relatively low output, and are heavy and expensive. Ceramic or **crystal microphones, such as the Astatic D-104, are still found in many ham shacks, but mostly as part of an antique collection. These microphones created an electrical output caused when the diaphragm flexed the crystalline substrate, which exhibited an electrical voltage that replicated the sound wave that excited it. These microphones have a very high output level, as well as high impedances and an accentuated frequency response from 2 kHz up to well above the ham bandwidth. In order to work with modern ham** transceivers, they usually require an impedance-matching transformer.

Conclusion

I think it's important for hams to understand microphones, what they can and can't do, what they were designed to do, and how they're meant to be utilized **in ham radio. The more you understand what you're purchasing, the better you'll be able to optimize your system for your intended usage, be it a long conversation or a DX pileup.**

Lindy Williams, K6EB, worked as a radio engineer and corporate engineer for more than 55 years in the broadcast industry. He was the Corporate Chief Engineer for Lotus Communications Corporation. Lindy earned his ham radio license in 1957 and quickly earned his General. After being active for several years, he became busy with work and being in the US Army. Lindy became a relicensed ham in 2019 and is now an Amateur Extra-class operator. He can be reached at **lindy@lyndenlwilliamsconsulting.com**.

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



Morse Code Rhythm Patterns from A to Z

Learn Morse code with a musical approach, then practice your skills with the sheet music provided at www.arrl.org/qst-in-depth.

William "Bill" Cody, K3CDY

I decided to tackle Morse code as a brain exercise during my retirement years. After enrolling in the excellent CWops CW Academy Beginner class, my first challenge was learning the letters. I used several teaching aids, such as Nilex Morse Tutor, Morse-It, and Morse Code World, among others. Though they were helpful, they didn't tap into the musical part of my brain.

For some reason, many technical types (e.g., hams) are also musicians. I happen to be an active musician, and after realizing that my paddle is just another instrument, I wanted to take a musical approach to Morse code. I thought that a new angle might help me and my fellow operators.

Concept

Assuming standard Morse code conventions, dits and dahs can be assigned the following musical note durations:

Elements	Percent Duration	Equivalent Note	Symbols	Comment
dit	100%	eighth note		
dah	300%	dotted quarter note		same as three dits or three eighth notes
letter space	300%	eighth rest and quarter rest		same as dah

Elements

For the purposes of this article, the elements presented are only three of the four used in Morse code. The fourth element is the *word space*, which is equivalent to seven dits. I didn't include word spaces because this is an aid for learning single characters, as opposed to successive words.

Percent Duration

Per accepted Morse conventions, a dit is 100% duration, a dah is 300% duration, and the space between each letter is 300% duration. The duration in seconds (or milliseconds) is based on the speed (wpm) you choose, or in this case, the speed at which you set your metronome. If you don't have a metronome to help you maintain a consistent rhythm, an internet search will yield several online metronomes.

Equivalent Note

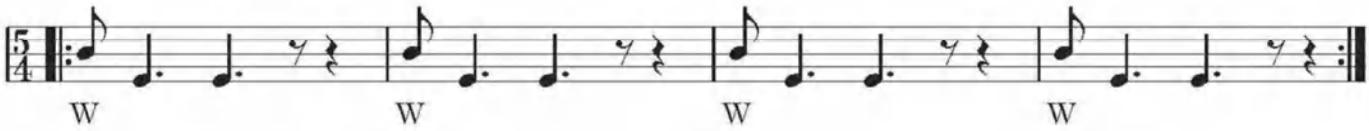
Equivalent note is the name of the equivalent musical symbol. For the *letter space*, which is equivalent to three dits, you'll see an eighth rest and a quarter rest next to each other in no particular order.

Symbols

This is what you'll see on the sheet music.

Presentation

Using the described conventions, I created a series of notes and rests representing Morse code letters A through Z. I excluded numbers because they appear to be the only logical elements in Morse code. I used a drum clef, with the eighth note sounding a snare drum, and the dotted quarter note



sounding a kick drum. You can choose whatever sounds you like.

Several letters required unusual time signatures (7/4, 9/4, 11/4, etc.) to simplify presentation and maximize readability. If I left everything in 4/4 time, the music would look confusing due to the required syncopation.

Each line of the musical score is assigned to each letter of the alphabet. The metronome marking (♩ = 225) means that each quarter note (two dits) is worth one click of the metronome at 225 BPM — this equals approximately 18 wpm. A rate of 225 BPM is considered fast in typical music, but it is just right for this purpose. Remember that a dah is three dits, not two. The dah is a dotted quarter note, which is 1½ clicks; that's why syncopation occurs with many letters when playing along with a metronome.

Practicing

Visit **www.arrl.org/qst-in-depth** for the score, then set your metronome to 225 BPM, and get accustomed to the speed and beats per measure. For example, "A" is presented in 7/4, so repeatedly count 1, 2, 3, 4, 5, 6, 7 along with the metronome until you get the feel for it. Try to find the "1" of each measure. Play the score as written — first in your head, then using your key. Move on to the next line when you're ready. If you have trouble, reduce the speed until you understand the pattern, then gradually increase your speed.

The hardest obstacle is getting used to the odd time signatures and natural syncopation of most characters, but it becomes second nature with practice.

See *QST* in Depth for More!

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

✓ Morse code rhythm pattern score

William "Bill" Cody, K3CDY, earned his Technician-class license in July 2020 and General-class license in November 2020. His ham shack has a SunSDR2 DX SDR transceiver and a 66-foot end-fed half-wave antenna, for operating primarily on 20 and 40 meters. He is a CWops CW Academy student and looks forward to improving his Morse code skills. Bill is a retired IT professional with 4 decades of experience working with real-time computers for military and commercial flight simulators. He has been a musician since the 1970s, performing keyboards, bass guitar, and vocals. Additionally, Bill has a home studio where he provides recording and music production services.

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

Feedback

■ In the December 2022 issue's "Happenings" column, the story "Brian Daly, WB7OML, Received AT&T Fellows Honor" incorrectly states that FirstNet® is an AT&T network. FirstNet is overseen by the FirstNet Authority, an agency of the US Department of Commerce's National Telecommunications and Information Administration. AT&T was contracted to build the network and deploy the Band 14 spectrum.

■ In the November 2022 issue, the feature article "Return Loss Explained, and Why We Should Care" by John Stanley, K4ERO, contains incorrect readings in the final paragraph of the "Why We Use SWR" section. The 3.09 dB RL should be 999 kHz, not 746 kHz. The SWR of 5.68 should also be 999 kHz, rather than 746 kHz. The RL of 13.5 dB is 764 kHz, not 999 kHz. And finally, the SWR of 1.54 should be 764 kHz instead of 999 kHz.

If You Can't Work It, Don't Hear It

A brief explanation of how to increase the ratio of stations worked to stations heard.

Decrease the number of stations you hear to near zero in order to improve the ratio of stations worked to stations heard.

Darryl Y. Sue, KJ6UD

Most hams have heard the expression "I can work everything I can hear" in a product review for a new radio or antenna, or as a claim to operator skill. Well, I certainly can't work everything I can hear, and that's likely the case for many hams on HF.

Developing the Strategy

Improving my station and operating acumen would help me work every station I can hear. However, it's not feasible for me to put up a bigger, better antenna or obtain an amplifier. Upgrading my antenna might also result in hearing more stations that I can't work.

Within ham radio, developing a formula often presents a unique way to analyze the issue in question. I created a simple ratio, without negative logarithms or imaginary numbers, that expresses the relationship between stations worked and stations heard:

W/H ratio = #stations worked/#stations heard

When creating this formula, I realized that the denominator (#stations heard) was just as important as **the numerator (#stations worked), so decreasing the number of stations heard might markedly improve the ratio! In fact, if I could get that number to near** zero, the ratio would increase tremendously. But how would I do this?

Modern HF receivers are designed to have high sensitivity and selectivity. In this case, the key concept is sensitivity — that is, *too much* sensitivity. There are many ways for me to decrease sensitivity on my radio, which might allow me to increase the number of stations I can't hear. I could turn on the RF attenuator (18 dB), set the squelch at a higher level (which would only affect the audio signal), use the notch filter, or decrease the RF gain. I could also narrow the bandpass to avoid hearing stations.

Findings

I discovered that reducing RF gain was the most consistent and effective method of not hearing any **stations, and it worked for digital modes, CW, and SSB. To accomplish this, simply decrease RF gain until you no longer hear anyone. Narrowing the passband was also effective and worked best for SSB and digital modes.**

Some hams might have other suggestions, such as turning off the radio or unplugging the antenna. Both methods would drastically decrease the number of stations heard to zero, thus resulting in a high ratio of stations worked to stations heard. You could **experiment with them, but that would be ridiculous. Try my method instead.**

Darryl Y. Sue, KJ6UD, is a pulmonary and critical care medicine physician. He has been licensed since 1988, currently holds an Amateur Extra-class license, and operates mostly on FT8. His wife, two daughters, parents (SK), two brothers, two sisters-in-law, and five nephews and nieces are licensed amateur radio operators. Darryl can be contacted at **dsue@ucla.edu**.

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

ARRL Board Holds 2023 Annual Meeting

Read the full minutes at
www.arrl.org/board-meetings.

At its January in-person Annual Meeting, the ARRL Board of Directors approved new initiatives and gave out awards and recognitions.

The ARRL Board of Directors convened for the Annual Meeting in Windsor, Connecticut, on January 20 – 21, 2023. In addition to the attending Officers, Directors, and Vice Directors, also present at the meeting were International Amateur Radio Union (IARU) Secretary Joel Harrison, W5ZN; President of **the Radio Amateurs of Canada (RAC) Phil McBride, VA3QR, and ARRL Communications Counsel David Siddall, Esq., K3ZJ.**

ARRL President Rick Roderick, K5UR, led the meeting with a moment of silence for the radio amateurs and colleagues who had passed away since the previ**ous Board meeting. Among those remembered were ARRL President Emeritus Harry Dannals, W2HD (1927 – 2022); Ellen White, W1YL (1926 – 2022), and** Caroline Kenney (1994 – 2022).

Report Highlights

The Board approved a plan to improve Logbook of The World (LoTW) to meet the demands of modern radiosport and ARRL's ongoing commitment to digital transformation. LoTW's architecture is more than 2 decades old, created at the time of Windows 98. **Through a unanimous vote, they authorized the creation of an ad hoc working group, named the Radiosport Platform Committee. The committee will be** comprised of Board members, the CEO, the Director of IT, and members of the user community, all of **whom have demonstrated extensive experience with LoTW and radiosport, gaming, and high-performance** distributed databases. The committee is charged with developing functional specifications, an application architecture, and an infrastructure design, preferably in a resilient cloud environment that meets the needs **of the current LoTW in terms of function and security, as well as extensibility, scalability, and ease of change to meet needs for at least 10 calendar years after** going live. The action authorizes the CEO to recruit and hire an IT Project Manager to oversee the project.

Northwestern Division Director Mike Ritz, W7VO, as **Chairman of the Program and Services Committee, discussed ARRL Field Day plans that include reintroducing a high-power category for portable stations** only at 500 W, and a new rule making phone contacts the same number of points as other modes to even out the scoring.

Treasurer John Sager, WJ7S, reviewed 2022 investment results. The fourth quarter was a bright spot with a positive return of $1.8 million, or 5.7%, partially offsetting the market declines of the previous quarters. **Both the fourth quarter and annual investment returns were better than comparable benchmark indexes. The fourth quarter of 2022 is the first full quarter for which** CAPTRUST has managed all of ARRL's investment assets. The balance of ARRL's investment assets was

$32.9 million as of December 31, 2022, and had increased to approximately $34 million as of January 19, 2023, due to favorable market price action so far in 2023.

Chief Financial Officer Diane Middleton, W2DLM, reviewed the preliminary and unaudited financial statement, noting ARRL had deficit spending of approximately $760,000 from operations in 2022. While revenues remained relatively flat, she explained that most expenses had increased, particularly in the production and mailing of the paper magazines. The balance sheet remains healthy, although total assets ended the year lower primarily due to investment market fluctuations.

Delta Division Director David Norris, K5UZ, in his capacity as President of the ARRL Foundation, reported that 2022 was the most successful year in the Foundation's history. Achievements included awarding $921,250 in scholarships to an impressive list of 139 students, awarding small grants in support of amateur radio, along with the major undertaking of creating and implementing the Club Grants Program made possible by Amateur Radio Digital Communications (ARDC). The Foundation celebrates its 50th year in 2023.

Board Actions

The Board took the following actions:

- Agreed to increase active radio amateur and skill development through the introduction of live, interactive online video programs for licensing and training. The recorded programs will be made available through the ARRL Learning Center, which was introduced as a new membership benefit in 2021.
- Decided to develop a program to promote the use of the 10- and 6-meter bands, with a particular focus on encouraging newly licensed hams to utilize these bands as Solar Cycle 25 continues to improve.
- Directed a sum of $150,000 to be allocated to the 2023 – 2024 plan for the purpose of supporting ARRL Division conventions.
- Awarded the 2022 Doug DeMaw, W1FB, Technical Excellence Award to John Stanley, K4ERO.
- Directed that ARRL develop a Statement of Board Member Responsibility, Authority, and Expectation. The document will supersede and include the current Conflict of Interest Certification. Included will be descriptions of Board member responsibility and authority under Connecticut Corporate Law, and best Board practices. It will, for example, include limitations on directing of staff, the definition of fiduciary responsibility, and implications of a conflict of interest.
- Resolved that the 2023 Ethics and Elections Committee (E&E) develop an E&E Guidebook. The intent of the Guidebook is to effectively document standard operating procedures for E&E and contain an annual calendar including E&E activities with respect to elections.
- Directed that ARRL create a semiannual Awards Recognition Day to honor those individuals, groups, and Affiliated Clubs that have a long-term relationship with ARRL, and those who are making substantive achievements.
- Authorized Headquarters staff to enter negotiations with the Dayton Amateur Radio Association and Dayton Hamvention® to host the ARRL National Convention in conjunction with Dayton Hamvention in Ohio in May 2024, and with the Huntsville Hamfest Association to host the ARRL National Convention in conjunction with the Huntsville Hamfest in Alabama in August 2026.
- Authorized the President and CEO to form a working group to provide input for a 2023 ARRL survey that will help ARRL better support and grow amateur radio and its membership.

Recognitions

It is the Board's practice to recognize individuals, groups, and organizations for their contributions to ARRL and the greater amateur radio community at each Board meeting.

The Board issued a commendation to Thomas J. Abernethy, W3TOM, the immediate past Director of the Atlantic Division, for his many years of service to ARRL and the Board. He retired from the Board in early January.

The Board also recognized the following ARRL Affiliated Clubs for their lengthy tenure and service to the amateur radio community:

- The Cascade Amateur Radio Club of Washington, an ARRL Affiliated Club since February 1948.
- The St. Petersburg Amateur Radio Club of Florida, an ARRL Affiliated Club since August 1921.
- The Orange Amateur Radio Club of Texas, an ARRL Affiliated Club since 1948.

John Ross, KD8IDJ, kd8idj@arrl.net

Happenings

Leadership Changes in ARRL Atlantic Division

ARRL's Atlantic Division has new leadership. Tom Abernethy, W3TOM, who had served as the Atlantic Division Director since 2015, stepped down on January 6, 2023.

Former Atlantic Division Vice Director Robert "Bob" Famiglio, K3RF, of Media, Pennsylvania, is the new Division Director. Former Maryland/DC Section Manager Marty Pittinger, KB3MXM, of Owings Mills, Maryland, has been appointed Atlantic Division Vice Director by ARRL President Rick Roderick, K5UR.

Famiglio was the Vice Director from 2015 to 2017, then he was appointed in 2019 to fill a vacancy. He was subsequently elected unopposed for a term beginning in 2021. As a practicing lawyer, he has served on the ARRL Volunteer Council for decades. Famiglio is also an electrical engineer, a former broadcast station owner, an FAA-certificated pilot, and a Life Member of the Institute of Electrical and Electronics Engineers. He earned his amateur radio license in 1967.

In an email to the Atlantic Division members in early January, Abernethy said he still plans to be involved. "After having served for [more than] 20 years in ARRL-elected offices, it is my intention to remain active in support of ARRL, and I wish everyone all the best as we head into the future of amateur radio and ARRL," he stated.

Pittinger was the Section Manager for Maryland/DC, one of seven ARRL Sections that make up the Atlantic Division. He has an extensive background in radio, served in the US Navy, and currently works for a federal agency in his professional life.

ARRL President Rick Roderick, K5UR (left), recognized Robert "Bob" Famiglio, K3RF (center), and Marty Pittinger, KB3MXM (right), as the new ARRL Atlantic Division Director and Vice Director, respectively, during the ARRL Board of Directors meeting on January 20, 2023. [Alex Norstrom, KC1RMO, photo]

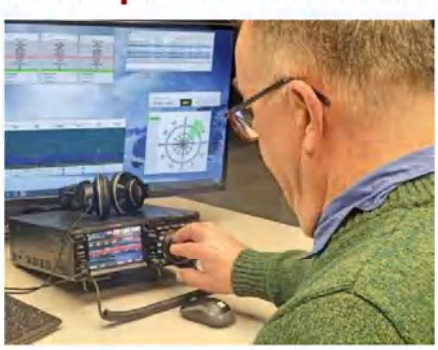
Maryland Assistant Section Manager and Affiliated Club Coordinator Christopher D. Van Winkle, AB3WG, has been appointed Section Manager by ARRL Field Services Manager Mike Walters, W8ZY.

Famiglio and Pittinger will each serve the remainder of the 3-year terms ending on December 31, 2023.

Yaesu Radios Donated to ARRL to Inspire Visitors and Young Hams

There are two new Yaesu transceivers in use at ARRL Headquarters in Newington, Connecticut. They arrived thanks to a generous donation from Yaesu USA.

The company has donated a Yaesu FTDX101MP and FTDX10, both HF 50 MHz transceivers. In arranging the donation, Yaesu Vice President of Sales and Credit Gary Doshay, KN6APR, urged that the radios be used by ARRL "to educate and assist your visitors, and especially young enthusiasts for ham radio."



ARRL Director of Operations Bob Naumann, W5OV, explores the features of the Yaesu FTDX10. The radio is the new addition to the ARRL Radio Lab, W1HQ.

"We appreciate the value that having this equipment available for members and visitors to see and explore will provide," said ARRL Director of Operations Bob Naumann, W5OV. "These are two of the top-three performing transceivers on the Sherwood list," he added.

The FTDX101MP was named for Yaesu Founder Sako Hasegawa,

JA1MP (SK). The model holds a place of honor in the first operating studio of the Hiram Percy Maxim Memorial Station, W1AW. ARRL members and visitors come year-round to tour the station and operate the equipment, most of which has been donated by generous manufacturers over the years. "The radio is already receiving a lot of attention from visitors," said W1AW Station Manager Joe Carcia, NJ1Q. "Some of our recent guests have included students and scouting groups who have enjoyed trying the new radio — adding to the overall 'wow' factor of the station. We're grateful to Yaesu for this new addition to W1AW."

The FTDX10 has been installed in the new ARRL Radio Lab, W1HQ, where it will contribute to the station's ongoing role in the development of innovative amateur radio station design and function. "The Radio Lab is an extension of ARRL's equipment testing program, which supports ['Product Review' in] *QST* magazine," said Naumann. "Putting the latest in modern radio technology through its paces is the intent of the Lab. It represents what is possible if the modern ham were to go with cutting-edge technology and integration. The Yaesu FTDX10 fits perfectly in that environment."

Naumann says the ARRL stations will benefit significantly from the donations of Yaesu's highly capable rigs. "It demonstrates the important partnership ARRL has with amateur radio manufacturers to educate and inspire our community."

ARDC Welcomes New Committee Members

Amateur Radio Digital Communications (ARDC) has announced new 2023 volunteers serving on the Grants Advisory Committee (GAC) and Technical Advisory Committee (TAC).

The GAC reviews and advises the ARDC Board of Directors on eligible proposals, aiding in the identification of possible grant-making opportunities. The TAC advises the Board and staff on 44Net technology, architecture, and policy. Volunteers commit to serving for at least 1 year, and they may serve for a maximum of 3 years. Each term starts in January and is effective through December.

The volunteers joining the GAC are Katie Allen, WY7YL; Judi Clark, KK6ZCU; Dennis Derickson, AC0P; Jim Idelson, K1IR; Kristin Paget, KJ6GCG; William Thomas, WT0DX, and Randy Wilkinson, W4LKS.

The volunteers joining the TAC are Dave Gingrich, K9DC; Rich Gopstein, KD2CQ; Randy Neals, VE3RWN/W3RWN; Alvaro Prieto, KC2VVE, and Ian Redden, VA3IAN.

"It's always exciting to bring on new members to these committees," said ARDC Executive Director Rosy Schechter, KJ7RYV. "This year, I'm delighted to see more women and a variety of technical skills brought to the table. I'm [looking forward] to seeing what these committees do in 2023."

ARDC provides support for ARRL programs and initiatives, including the ARRL Foundation Club Grant Program and Scholarship Program. Read more about the new volunteers, their backgrounds, and their committees at **www.ardc.net/ardc-welcomes-new-gac-and-tac-members**.

Louis E. Frenzel, Jr., W5LEF, Silent Key

Frenzel was an active amateur radio operator and freelance writer. He retired in 2022 after 18 years as a Contributing Technology Editor for *Electronic Design* magazine. He received his bachelor's degree from the University of Houston and a master's degree from the University of Maryland. He taught college-level communications and electronics classes in the Austin, Texas, area.

His friend and colleague, *Electronic Design* and *Microwaves & RF* Senior Content Director William G. Wong, said Frenzel loved technology, learning, and teaching. "He was outgoing [and] always wanted to educate and make complicated technology simple," said Wong. The fifth edition of Frenzel's book, *Principles of Electronic Communication Systems*, is considered a mainstay of college curricula.

Throughout his career, Frenzel served as vice president for several companies, including Heathkit and McGraw-Hill. He held an Amateur Extra-class license.

Raymond "Ray" Paul Richard, W4RPR, Silent Key

Richard was 65 years old and is survived by his wife, Cynthia. He was the Orlando HamCation Advance Tickets Chairman and a member of the Orlando Amateur Radio Club (OARC).

Raymond "Ray" Paul Richard, W4RPR (SK), at the 2022 ARRL Donor Recognition Reception held in Dayton, Ohio.

"Serving his community through amateur radio was a passion of Ray," said OARC President John Knott, N4JTK. "In 2019, Ray was awarded the KB4UT Wayne Nelson Amateur of the Year award for his service and dedication to the Orlando Amateur Radio Club." Richard was also a member of the ARRL Maxim Society, a group of individuals recognized for their extraordinary generosity to the association.

Missouri S&T Amateur Radio Club to Celebrate 100 Years

The Missouri S&T Amateur Radio Club, **WØEEE, at the Missouri University of Science and Technology (Missouri S&T), is gearing up for an early celebration of their centenary.** Club President Morgan Lyons, KI5SXY, said the station first went on the air in 1923 as the MSM Radio Club, broadcasting basketball games from the Jackling Gym on the grounds of the Missouri School of Mines and Metallurgy (MSM).

"The FCC was not around in 1923, but we **believe the original MSM Radio Club used the call sign W9DUM," said Lyons. Then, between September 1937 and March 1938, W9EEE had been assigned to the MSM** Radio Club, and in September 1947, the MSM Radio Club was assigned the call sign WØEEE and changed its name to the Missouri S&T Amateur Radio Club.

The club now has 20 active members and more than 300 alumni who regularly visit to help support club activities.

As of press time, the official date for the celebration in April has not been selected, but there will be an open house and tour of the club's radio shack as well as a special event station.

The Missouri S&T Amateur Radio Club is an ARRL Affiliated Club. Students from the club regularly participate in the ARRL Collegiate Amateur Radio Program, which provides networking opportunities for students and their college radio clubs.

Missouri S&T Amateur Radio Club members operate from their shack. [Missouri S&T Amateur Radio Club, WØEEE, photo]

Section Manager Nomination Notice

To all ARRL members in Colorado, Georgia, Los Angeles, Sacramento Valley, San Francisco, South Texas, Eastern Washington, West Virginia, and Western Washington. You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). **Incumbents are listed on page 16 of this issue.**

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

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

We suggest the following format:

(Place and Date)

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

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

(Signature _____ Call Sign _____ City _____ ZIP _____)

Any candidate for the office of Section Manager must be a resident of the Section, an amateur radio licensee of Technician class or higher, and a full member of ARRL for a continuous term of at least 2 years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on June 9, 2023. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters no later than July 3, 2023, to full members of record as of June 9, 2023, which is the closing date for nominations. Returns will be counted August 22, 2023. Section Managers elected as a result of the above procedure will take office October 1, 2023.

If only one valid petition is received from a Section, that nominee shall be declared elected without opposition for a 2-year term beginning October 1, 2023. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the October issue of *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. A Section Manager vacancy occurring between elections is filled through appointment by the Field Services Manager. — *Mike Walters, W8ZY, Field Services Manager*

SM Nomination Resolicitation:

Because no nomination petitions were received for the Montana Section Manager election by the nomination deadline of December 9, 2022, nominations are hereby resolicited. See the above for details.

John Ross, KD8IDJ, kd8idj@arrl.net

Amateur Radio World

Amateur Radio Responses in Turkey and Syria Following Earthquakes

In the days following the 7.8-magnitude earthquake and aftershocks that hit Turkey and Syria on February 6, 2023, emergency communications have been active with rescue and response efforts.

The Türkiye Radyo Amatörleri Cemiyeti (TRAC) is coordinating primary communications. The designated **primary disaster communication frequency is 28.540 MHz (USB), and 3.777 and 7.092 MHz will also be used as needed. Amateur radio operators** have been asked to avoid these frequencies to allow any emergency traffic.

In a statement issued to ARRL on February 9, 2023, IARU Region 1 Emergency Communications Co-Ordinator Greg Mossop, GØDUB, said the full effects of this disaster are still developing along with the search for survivors. His full statement is as follows:

> [TRAC President] Aziz [Sasa], TA1E, is now at the disaster area **and coordinating frequencies for teams carrying out search operations. Many countries have sent Search and Rescue [(SAR)] resources,** but the only ones known to have radio amateurs embedded in them are Georgia and Bosnia [and] Herzegovina. The Romanian SAR team **has no operators, but [it] does have communications equipment supplied by RVSU, one of the amateur radio emergency groups in Romania.**
>
> **Aziz reported yesterday that "due to the overwhelming dimension of the incident, some problems in coordination occur[ed]. These naturally** have an impact [o]n the coordination of the incoming foreign SAR **[g]roups. As the assignment of their duty area is sometimes [a] last-minute decision, and this decision is made by government officials, I kindly ask the groups to report to me [for] that assignment. I will then [be] able to inform the groups about the** usable frequencies in the area."
>
> With the large number of rescue teams deployed to the country, the challenges in coordinating teams, **locations, and frequencies are to be expected.**
>
> **With the death toll now [more than] 17,000 in Turkey and Syria, the** focus remains [on] getting the right help to the right place. A clear message from Aziz, when asked whether any radio operators or equipment **were required, was, "Assistance of individual radio amateurs is only possible if they are embedded to SAR teams with [International Search and Rescue Advisory Group] Certification, which [is] accredited by the Turkish government."**
>
> **At the time of the earthquake, a** [European Conference of Postal and Telecommunications Administrations] meeting was taking place, and it has been reported that the Turkish **delegation to that meeting confirmed that radio amateurs were being deployed in the emergency response.**
>
> Traffic is being heard on 10 and 80 meters in the Turkish language, so the request to keep frequencies in the area clear remains. The majority **of emergency communications traffic remains on VHF.**
>
> **The earthquake obviously affected Syria as well. I have tried reaching the Syrian [Scientific Technical Amateur Radio Society], but with no response, as they seem to have gone [off the air].**
>
> The full effects of this disaster continue to unfold and [are] now **encompassing the needs of survivors as well as the search for any** *remaining trapped people.*

As of press time, there have been more than 36,000 casualties in Turkey and Syria combined. Aftershocks continue and relief organizations are on site, with more aid arriving in the areas daily. Additional information is **available at www.iaru-r1.org/2023/turkiye-earthquake-6-february-2023.**

Winston "Woody" A. Richardson, 8P6CC, Silent Key

Winston "Woody" A. Richardson, **8P6CC (SK), a Barbados amateur radio operator, died on February 1, 2023. Thought to be among the world's oldest hams, he was 108 years old. Richardson was born on the island of St. Lucia and was first licensed as VP6WR, before Barbados** achieved its independence from the United Kingdom. "I first met him in September 1967, and we were lifelong **friends," said Jim Neiger, N6TJ. "He had a modest station at Upton Terrace, in the suburbs of Bridgetown, [Barbados], and was formerly the** superintendent of the Barbados Water Authority." Richardson hosted Neiger's 8P6J contest operations, which included a number-two spot in the **1980 ARRL DX CW Test, and several top-five spots in the CQ World Wide DX CW contests, from 1980 to 1982. The Woody Richardson Communications Room at the Amateur Radio Society of Barbados (ARSB) is named after him. Richardson visited** the ARSB headquarters in 2020.

Rick Palm, K1CE, k1ce@arrl.org

EYEWARN: An Innovative Program for Situational Awareness

Clark County, Washington, doesn't experience many disasters, but radio amateurs in that area are preparing for something big, which may be a repeat of the 1980 ash fallout from Mount St. Helens, or another mega-thrust rupture of the fault in the Cascadia Subduction Zone (the 1700 Cascadia earthquake) off the coast.

To help meet the situation report (SITREP) needs of the Clark Regional Emergency Services Agency (CRESA), the Clark County Amateur Radio Club (CCARC) created the EYEWARN visual situation reporting program. EYEWARN is fully integrated with the CRESA emergency management program, and its operators observe and collect damage and injury information from any ham radio operator in the county. EYEWARN members use multiple modes (data and voice) for reporting at the onset of disaster conditions and transmit reports to the county Emergency Management Agency office.

The Clark County Amateur Radio Emergency Service® (ARES®) and Radio Amateur Civil Emergency Service (RACES) consist of 80 registrants who provide supplemental and backup communications to hospitals, the American Red Cross, Emergency Operations Centers (EOCs), other public agencies, and various field locations. There are more than 2,500 radio amateurs in Clark County, leaving potentially 97% of licensees to serve as eyes on the ground providing visual reports of damage and injuries in a disaster situation via EYEWARN. EYEWARN and ARES work cooperatively, communicating damage and injury assessments from EYEWARN to CRESA. The agency wants vital SITREPs that can be conducted quickly and efficiently whenever a disaster occurs. Emergency managers value early SITREPs, as they help develop situational awareness about the incident.

ARES has a select team of trained operators, known as Team 9, who staff and operate the ham radio room in the EOC. EYEWARN operators contact the ARES Net Control Station (NCS) and request communications with Team 9. The EYEWARN NCS summarizes the radio reports into a single SITREP, then contacts the ARES NCS, who directs the EYEWARN NCS and the Team 9 radio operator to a different frequency (off of the ARES net) for passing the traffic to CRESA and the EOC duty officer.

EYEWARN Net Logistics

When the EYEWARN Net is activated for an incident, EYEWARN operators can perform an assessment and submit a visual SITREP via the primary net repeater, which is CCARC's 147.24 MHz repeater. The EYEWARN Net primary simplex frequency, 146.43 MHz, is used as a backup. Once a month, the group conducts the EYEWARN Net on simplex to practice operating with the loss of the repeater's capabilities. If the net is not found on the repeater, operators are trained to check the primary VHF simplex frequency, the secondary simplex frequency (146.56 MHz), and the UHF simplex frequency (445.975 MHz).

The CCARC 443.125 MHz machine is normally linked to the 147.24 MHz repeater. During an actual emergency or disaster, it may be unlinked at any time by the Clark County ARES or RACES groups, who have priority for actual or exercise emergency traffic needs. The EYEWARN Net meets weekly on Thursday evenings at 7:00 PM for net familiarization and EYEWARN training, and to answer questions about simulated event reports and personal preparedness.

Special nets also coincide with other exercises held by Clark County ARES and RACES. They follow the EYEWARN Net that's conducted on the third Thursday of each month and allow licensees of all levels to test new equipment, such as radios, microphones, and antennas.

Training and CERT

Although it's not required, EYEWARN Net participants are encouraged to take Community Emergency

Response Team (CERT) training when available to increase their knowledge, as well as their skills and abilities, to be able to operate in emergency situations. The CERT program is a Federal Emergency Management Agency initiative that educates volunteers about disaster preparedness for the hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. These are all skills that would serve an EYEWARN operator well in their own household, as well as allow them to help immediate neighbors. Visit **https://community.fema.gov/PreparednessCommunity/s/welcome-to-cert** for more information.

Using EYEWARN During an Emergency

In an actual event, EYEWARN operators turn on their radios and check into the net as requested. They report from their current location and are not mobilized, nor should they self-mobilize or self-deploy to look for damage.

Once the net is opened, there's a call for available, previously identified and trained EYEWARN NCSs. Following this call, and the assignment of an alternate or backup, the NCS calls Clark County zip codes for any ham who can provide visual SITREPS. There's usually specific information that's requested, and check-ins should use the mandated procedure to check into the net when their zip code is called. Stations check in and report from the zip code they're in, which may be different from their home locations. The zip code list may be shortened if CRESA wants a more focused picture of an event to a specific area.

After checking in, stations give their zip code and call sign (phonetically), and then answer the questions posed by the NCS. Stations who've checked in answer the questions in the order they're asked. After all the desired information is gathered, the net closes.

In October 2022, EYEWARN was used successfully for smoke visibility reporting of the Nakia Creek Fire, just 9 miles northeast of Camas, Washington.

For more information, visit **www.eyewarn.net** or watch "EYEWARN - Amateur Radio Visual Situation Reporting" on YouTube at **www.youtube.com/watch?v=GsIzjRIahQA**.

CCARC Is Willing to Mentor Clubs

In 2020, the ARRL Board of Directors recognized CCARC, a 2017 Dayton Hamvention® Club of the Year, for its exemplary service and dedication. The Board noted that CCARC operates eight repeaters in Washington that directly support public service events, ARES, and EYEWARN.

CCARC would be happy to mentor other clubs and emergency communications groups in setting up their own EYEWARN programs. Thanks to EYEWARN Net Manager James Newsome, KE7ZAC, and Steve Aberle, WA7PTM, for their review and development of this article. Newsome can be reached at **1jamsanx@gmail.com**.

Field Organization Reports

January 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.

495
WA3EZN

490
N9VC

459
WA7PTM

414
W7PAT

363
AD8CM

293
KE8BYC

275
KK8GXG
W3QWM

264
W9EEU

260
WM5N

259
W7EES
KE8DON

250
KT2D

240
ND9W

235
WO2H

219
W9RY

200
KT5SR

194
NW3X

186
AC8NP

186
N5MKY

182
K0RCJ

180
K3JL

179
KC8T

168
N2LC
KV8Z

165
W4DNA

162
KO4KUS

159
KD2LPM

155
N8SY

150
N4CNX

145
KC9FXE

144
WB8YYS

140
AC8KQ
WA3QLW
K4IWW
KK3F
WB9QPM

138
WM2C

135
W2PAX

130
AG9G
WK4WC
K5OB
KE4RS
K4MDA
AI9F
N2JBA
W7VQ
N1UMJ
KW1U
N1LL

125
WB9WKO
KE5YTA
WD8USA
KB8RCR
W2OOD

124
KC9MAL
W3YVQ

121
W5WMC

120
WA4VGZ
K9LGU
WC4FSU
KA8AZK
KF5IOU
KY2D
WA1URS
W2AH
KD8ZCM
WV5Q
NA7G
N7IE
KA9QWC

119
N2DW
NI2W
KY2MMM

118
KD8UUB
KB2YRU

116
K8AMH

115
KB1TCE
N1LZ

114
K1XFC

110
KFØBPN
AD4DO
KDØHHN
KC8PBU
KC8WH
KF5OMH
KB2QO
K8HTN
WB8TQZ
K1UAF
KA9MZJ
N1IQI
W1RVY

109
KR4PI
K1CFI

108
K8RDN
N1PZP

107
K1HEJ

103
K3FAZ

100
NX9K
KZ8Q
WB4RJW
WB8SIQ
AC8RV
KB8GUN
W8MAL
W1KX
K3YAK
KA2GQQ
KA2HZP
KB8PGW
K8ED
WZØC
N1LAH

98
KB1NMO

97
W8DJG

96
W4CMH

94
KT4WX

92
WB8R

91
W8IM

90
KB9GO
KC9UC
KM4WHO
AA3N
W4EDN
W4KX
KL7RF
K8KRA
N8MRS
KB8HJJ
W8QSR
KA1G
WX2DX
WA3DS
KC1KVY

89
W4TTO
W1INC
KC1HHO

88
WB8RGE
WA3QPX
KB1NAL
N2TSO

87
AB8ZA

85
WB3FTQ
WB3VUF
N6IET

84
K6JT

83
N7UWX

82
K2MTG

81
W5XX

80
AD2EY
KR4ST
KN4AAG
K3EAM

79
N3KRX

78
KD2VZA

77
KBØDTI

76
KG5AOP

75
KB4OLY
KE8ANW

74
AJ7B
W3ZR
WA3FIR
N3RB

72
KB3MXK

71
K6RAU

70
NØET

The following stations qualified for PSHR in previous months, but were not acknowledged in this column last month: (Dec. 2022) KY2D 552, W9EEU 212, N1LL 130, KA9QWC, WA4VGZ 120, AB9ZA 82. (Nov. 2022) WA4VGZ 120. (Oct. 2022) WA4VGZ 120.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AR, 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, SFL, SJV, STX, TN, UT, WCF, WI, WMA, WPA, WV, WWA, WY.

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported: AL, CT, ENY, EPA, EWA, GA, KS, MDC, ME, MI, MO, MS, ND, NFL, NLI, NM, NNJ, NNY, NV, SCV, SDG, SNJ, STX, TN, VA, WCF, WMA, WPA.

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 1744, WB9WKO 800, KY2D 717, K6HTN 611, KW1U 570, N9VC, KK3F 506.

Contest Corral

April 2023

Check for updates and a downloadable PDF version online at www.arrl.org/contest-calendar.
Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.

Start - Finish				Bands	Contest Name	Mode	Exchange	Sponsor's Website
Date	Time	Date	Time					
1	0800	1	2000	1.8-28	RSGB FT4 International Activity Day	Dig	Signal report, 4-char grid	www.rsgbcc.org/hf/
1	1000	2	0400	14	PODXS 070 Club PSK 31 Flavors Contest	Dig	SPC, mbr or name	www.podxs070.com
1	1200	2	1200	3.5-28	EA RTTY Contest	Dig	RSQ, province or serial	concursos.ure.es/en/eartty/bases
1	1400	2	0200	1.8-28,50, 144	Louisiana QSO Party	CW Ph Dig	RS(T), LA parish or SPC	laqp.louisianacontestclub.org
1	1400	2	0200	1.8-28,50, 144	Mississippi QSO Party	CW Ph Dig	RS(T), MS county or SPC	www.arrlmiss.org
1	1400	2	2000	1.8-28, V/UHF	Missouri QSO Party	CW Ph Dig	RS(T), MO county or SPC	www.w0ma.org
1	1400	2	2200	3.5-28	Florida State Parks on the Air	CW Ph Dig	Park ID or SPC	flspota.org/rules
1	1500	2	1500	1.8-28	SP DX Contest	CW Ph	RS(T), SP province or serial	spdxcontest.pzk.org.pl/2023
3	1900	3	2030	3.5	RSGB 80m Club Champ, CW	CW	RST, serial	www.rsgbcc.org/hf/
4	0100	4	0300	3.5-28	ARS Spartan Sprint	CW	RST, SPC, pwr	arsqrp.blogspot.com
5	2000	5	2100	3.5	UKEICC 80m Contest	Ph	6-char grid	www.ukeicc.com/80m-rules.php
6	0000	7	0300	7	Walk for the Bacon QRP Contest	CW	Max 13 WPM; RST, SPC, name, mbr or pwr	qrpcontest.com/plgwalk40
8	0000	8	0600	1.8-28	QRP ARCI Spring QSO Party	CW	RS, SPC, mbr or pwr	qrparci.org
8	0700	9	1300	1.8-28	JIDX CW Contest	CW	RST, JS prefecture or CQ one	www.jidx.org/jidxrule-e.html
8	1200	9	1100	3.5-28	DIG QSO Party, CW	CW	RST, mbr or RST	diplom-interessen-gruppe.info
8	1200	9	1200	1.8-28	OK/OM DX Contest, SSB	Ph	RS, OK/MO county code or serial	okomdx.crk.cz
8	1200	9	1800	3.5-28	IG-RY World Wide RTTY Contest	Dig	RST, 4-dig yr first licensed	www.ig-ry.da/ig-ry-ww-contest
8	1400	9	0200	1.8-28,50, 144	New Mexico QSO Party	CW Ph Dig	Name, NM county or SPC	www.newmexicoqsoparty.org
8	1800	9	2359	1.8-28,50	Georgia QSO Party	CW Ph	RST, GA county or SPC	gaqsoparty.com
8	2100	9	2100	1.8-28,Sat	Yuri Gagarin Int'l DX Contest	CW	RST, ITU zone	gc.qst.ru/en/section/32
9	1000	9	2100	3.5-14	WAB 3.5/7/14 MHz Data Modes	Dig	RS, serial, WAB square or country	wab.intermip.net/Contests.php
10	0000	10	0200	1.8-28	4 States QRP Group 2nd Sun Sprint	CW Ph	RS(T), SPC, mbr or pwr	www.4sqrp.com
10	1500	10	1730	3.5,7	DARC Easter Contest	CW Ph	RS(T), DOK or serial	www.darc.de/der-club/referate/conteste
10	1900	10	2300	144	144 MHz Spring Sprint	CW Ph Dig	4-char grid	sites.google.com/site/springvhfupsprints
12	0030	12	0230	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or pwr	naqcc.info
14	2100	15	2059	3.5-28	Hollyland DX Contest	CW Ph	RS(T), 4X area or serial	www.larc.org
15	0600	16	0559	3.5-28	Worked All Provinces of China	Ph	RS(T), BY province or serial	www.mulandxc.com
15	0700	16	0659	3.5-28	YU DX Contest	CW Ph	RS(T), YU/YT county or serial	www.yudx.yu1srs.org.rs
15	0700	15	1900	1.8-28	Dutch PACCdigi Contest	FT8 Dig	RST, 4-char grid	www.veron.nl
15	0900	16	2359	3.5-28	CQMM DX Contest	CW	RST, continent abbrev	www.cqmmdx.com/rules
15	1300	16	2200	1.8-28, V/UHF	Nebraska QSO Party	CW Ph Dig	NE county or SPC (FT8: grid)	nebraskaqsoparty.com
15	1400	16	2000	No WARC	Texas State Parks on the Air	CW Ph Dig	RST, park ID or SPC	www.tspota.org
15	1600	16	0400	3.5-28	Michigan QSO Party	CW Ph	RST, MI county or SPC	miqp.org/index.php/rules
15	1700	16	1200	3.5-28	EA-QRP CW Contest	CW	RST, category, "M" if mbr	www.eaqrp.com
15	1800	16	1800	1.8-28,50, 144	Ontario QSO Party	CW Ph	RS(T), ON county or SPC	www.va3cco.com/oqp/rules.htm
15	1800	16	1800	1.8-28,50, 144	North Dakota QSO Party	CW Ph Dig	RS(T), ND county or SPC	www.ndarrlsection.com
16	1200	16	2000	1.8-28,50, 144	Quebec QSO Party	CW Ph	RS(T), QC zone or SPC	wp1.quebecqsoparty.org
16	1800	16	2359	3.5-28	ARRL Rookie Roundup, SSB	Ph	Name, 2-dig yr first licensed, state/province/XE area/DX	www.arrl.org/rookie-roundup
18	1900	18	2300	222	222 MHz Spring Sprint	CW Ph Dig	4-char grid	sites.google.com/site/springvhfupsprints
19	1900	19	2030	3.5	RSGB 80m Club Champ, SSB	Ph	RS, serial	www.rsgbcc.org/hf/
22	0800	22	1800	3.5-28	QRP to the Field	CW Ph	RST, SPC, name/SOTA	www.zianet.com/qrp/qrpttf/pg.html
22	1200	23	1200	3.5-28	SP DX RTTY Contest	Dig	RST, SP 2-letter province or serial	www.pkrvg.org
23	0000	23	0400	3.5-14	North American SSB Sprint Contest	Ph	Other's call, your call, serial, name, SPC	ssbsprint.com/rules
23	1700	23	2059	3.5-28	BARTG Sprint 75	Dig	Serial	bartg.org.uk
24	1900	24	2030	3.5-14	RSGB FT4 Contest	FT4	4-char grid, signal report	www.rsgbcc.org/hf/
26	1900	26	2300	432	432 MHz Spring Sprint	CW Ph Dig	4-char grid	sites.google.com/site/springvhfupsprints
27	1900	27	2030	3.5	RSGB 80m Club Champ, Data	Dig	RST, serial	www.rsgbcc.org/hf/
29	0001	30	2359	28	10-10 Int'l Spring Contest, Digital	Dig	Name, mbr or "0," SPC	www.ten-ten.org
29	1200	30	1200	3.5-28	UKEI DX Contest, CW	CW	RST, serial, UKEI district code, serial	www.ukeicc.com/dx-contest-rules.php
29	1300	30	1259	1.8-28	Helvetia Contest	CW Ph Dig	RS(T), HB canton or serial	www.uska.ch/contest
29	1600	30	2159	7,14,21,28	Florida QSO Party	CW Ph	RS(T), FL county or SPC	floridaqsoparty.org/rules

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.*

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

2022 September VHF Contest Results

Check out the results of the event, held September 10 – 12, 2022.

Regional Leaders

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

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

N7DSX/R	5,096	R
K7LSX/R	4,825	R
N6ZE/R	3,454	R
W7HXC/R	960	R
KD6EFQ/R	897	R
N6GP/R	7,925	RL
KA7RRA/R	2,116	RL
K6LMN/R	854	RL
N6JSO/R	261	RL
N6LB/R	243	RL
N1AV	39,102	SOHP
K6KLY	10,560	SOHP
KE7SW	**8,036**	**SOHP**
W7OJT	**2,052**	**SOHP**
W7MEM	**1,856**	**SOHP**
KW2E	**16,575**	**SOLP**
N7IR	**8,077**	**SOLP**
N7EPD	**5,973**	**SOLP**
NA6MG	**2,915**	**SOLP**
KM6RNJ	**2,793**	**SOLP**
N6KN	**7,627**	**SO-ALG-HP**
K7ND	**2,616**	**SO-ALG-HP**
VA7MM	**304**	**SO-ALG-HP**
K6MI	**4,602**	**SO-ALG-LP**
K2GMY	**3,625**	**SO-ALG-LP**
N7HK	**3,013**	**SO-ALG-LP**
VA7SC	**2,020**	**SO-ALG-LP**
KC6ZWT	**2,000**	**SO-ALG-LP**
WQ6D	**484**	**SOP**
VE7VIE	**30**	**SOP**
AA6XA	**1,425**	**SOP-ALG**
K7ATN	**488**	**SOP-ALG**
KM6SJO	48	SOP-ALG
VE7LOE	45	SOP-ALG
W6HHS (KM6SJO, op)	1	SOP-ALG
WA7PVE	720	SO3B
W8AEF	320	SO3B
KI6X	275	SO3B
WA8ZID	203	SO3B
K6JGV	152	SO3B
N7QOZ	2,033	SO-ALG-3B
WB7FJG	216	SO-ALG-3B
K6OAK	6	SO-ALG-3B
VE7BGP	2	SO-ALG-3B
W7IMC	2,230	SOFM
AA6QI	1,424	SOFM
N6UTC	1,404	SOFM
KG7KMV	750	SOFM
AF6GM	273	SOFM
AL1VE	2,484	LM
WO1S	1,008	LM
K7CPU	310	LM

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

WØAUS/R	36,417	R
KA9VVQ/R	18,144	R
W9FZ/R	18,144	R
KCØP/R	12,150	R
NØHZO/R	7,697	R
K5SRT/R	2,370	RL
ABØYM/R	280	RL
AEØEE/R	184	RL
W3DHJ/R	160	RL
AA5PR/R	143	RL
KOØZ/R	682	RU
KØAWU	12,540	SOHP
WE7L	**819**	**SOHP**
K7ULS	**323**	**SOHP**
N5JS	**216**	**SOHP**
K5PI	**176**	**SOHP**
WTØDX	**176**	**SOHP**
ABØRX	**2,262**	**SOLP**
NØLL	**2,200**	**SOLP**
K5ND	**1,333**	**SOLP**
KM5RG	**1,166**	**SOLP**
N5EKO	**1,120**	**SOLP**
WØGHZ	**43,320**	**SO-ALG-HP**
NØHJZ	**17,536**	**SO-ALG-HP**
K5LLL	**2,847**	**SO-ALG-HP**
WA5LFD	**157**	**SO-ALG-HP**
WØRT	**130**	**SO-ALG-HP**
KAØPQW	**15,540**	**SO-ALG-LP**
KAØCRO	**441**	**SO-ALG-LP**
KBØMRK	**441**	**SO-ALG-LP**
KFØM	**162**	**SO-ALG-LP**
KBØKQI	**144**	**SO-ALG-LP**
NØSUW	272	SOP
KG5HFO	3,634	SO3B
W5TRL	2,479	SO3B
KØVG	513	SO3B
KEØIZE	495	SO3B
WØGN	176	SO3B
WBØULX	12	SO-ALG-3B
KF5DDV	9	SO-ALG-3B
KAØOUV	6	SO-ALG-3B
KEØOR	6	SO-ALG-3B
KG5UNK	130	SOFM
K5QE	69,344	LM
NØLD	136	LM
KC5MVZ	270	UM

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

VE3OIL/R	72,688	R
KG9OV/R	21,488	RL
K9JK/R	1,700	RL
KB9RUG/R	520	RL
VE3WY	16,830	SOHP
N4SV	11,096	SOHP
VA3IKE	7,906	SOHP
NØAKC	7,560	SOHP
W9EWZ	4,576	SOHP
K2DRH	86,112	SOLP
K9MU	33,705	SOLP
K9KLD	**14,696**	**SOLP**
VE3SMA	**4,862**	**SOLP**
VA3TIC	**4,042**	**SOLP**
WØUC	**50,794**	**SO-ALG-HP**
K8ZR	**1,344**	**SO-ALG-HP**
K2YAZ	**858**	**SO-ALG-HP**
W9DZ	**289**	**SO-ALG-HP**
VE3DS	**16,992**	**SO-ALG-LP**
KE9QEP	**294**	**SO-ALG-LP**
WA8TWM	**30**	**SO-ALG-LP**
NN9K	**28**	**SO-ALG-LP**
WØELT	**1**	**SO-ALG-LP**
VA3EON	**91**	**SOP**
NØXA	200	SOP-ALG
VE3FU	40	SOP-ALG
KQ9A	21,182	SO3B
K8RO	6,161	SO3B
WA8MCD	**5,472**	**SO3B**
VE3BW	**3,403**	**SO3B**
VE3RJ	**1,860**	**SO3B**
AK4U	341	SO-ALG-3B
VA3OGG	168	SO-ALG-3B
VE3EG	96	SO-ALG-3B
VE3KG	24	SO-ALG-3B
N9TTK	12	SO-ALG-3B
VE3RWJ	462	SOFM
VE3AYR	36	SOFM
VE3MIS	36,435	LM
N8GA	63,544	UM
WD9EXD	33,117	UM

Southeast Region
(Delta, Roanoke, and Southeastern Divisions)

NV4B/R	**32,271**	**RL**
KM4OZH/R	5,808	RL
K2JB/R	3,210	RL
WD5HJF/R	1,053	RL
KE4WMF/R	882	RL
K4CNY/R	704	RU
N4QWZ	48,813	SOHP
K3SK	21,804	SOHP
N3MK	21,675	SOHP
K1HTV	18,648	SOHP
AJ6T	14,508	SOHP
K4EA	4,557	SOLP
KY4G	3,913	SOLP
AA4DD	3,569	SOLP
W4TM	**3,444**	**SOLP**
K4FJW	**3,432**	**SOLP**
W3IP	**46,425**	**SO-ALG-HP**
WB4WXE	**2,556**	**SO-ALG-HP**
N1GC	**2,090**	**SO-ALG-HP**
K4YRK	**176**	**SO-ALG-HP**
N4CF	**1**	**SO-ALG-HP**
W4RAA	**2,288**	**SO-ALG-LP**
W4YN	**234**	**SO-ALG-LP**
NT4RT	**140**	**SO-ALG-LP**
WA4WZQ	**42**	**SO-ALG-LP**
K4BAI	**10**	**SO-ALG-LP**
AB4DX	**414**	**SOP**
KC4UUS	**12**	**SOP-ALG**
KC8KSK	**2**	**SOP-ALG**
KK4MA	**15,219**	**SO3B**
KO4ECD	**7,300**	**SO3B**
KK4BZ	**4,270**	**SO3B**
KV4ZY	**3,570**	**SO3B**
N8HK	**1,755**	**SO3B**
N7QLK	90	SO-ALG-3B
N5QYC	42	SO-ALG-3B
KK4AND	9	SO-ALG-3B
W5WGF	348	SOFM
K4NRT	15	SOFM
NN4RB	4	SOFM
KO4UOF	1	SOFM
AA4ZZ	142,492	LM
W4IY	43,456	LM
NE5BO	4,080	LM
N4NRV	117	LM
W8ZN	235,641	UM
N4SVC	49,856	UM
W4NH	41,736	UM
AG4V	14,195	UM

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

K2QO/R	73,188	R
W3ICC/R	22,936	R
KF2MR/R	17,353	R
KV2X/R	8,613	R
WB2WGH/R	5,780	R
WB2SIH/R	8,370	RL
KØBAK/R	6,396	RL
AF1R/R	6,372	RL
N5BNO/R	3,540	RL
N4ZN/R	588	RL
KG6CIH/R	58,256	RU
N2SLN/R	23,166	RU
WB2VVQ/R	4,750	RU
K1TEO	**385,200**	**SOHP**
N2JMH	**131,528**	**SOHP**
K1KG	**70,950**	**SOHP**
K2TER	**39,700**	**SOHP**
VA2WA	**22,705**	**SOHP**
WB1GQR (W1SJ, op)	**99,710**	**SOLP**
N2WK	**71,004**	**SOLP**
KA2ENE	**35,904**	**SOLP**
WA2VNV	**25,174**	**SOLP**
NR2C	**12,780**	**SOLP**
WZ1V	**59,777**	**SO-ALG-HP**
K1TR	**26,010**	**SO-ALG-HP**
W2FU	**20,808**	**SO-ALG-HP**
N1JEZ	**19,422**	**SO-ALG-HP**
W2KV	**17,612**	**SO-ALG-HP**
AF1T	**86,229**	**SO-ALG-LP**
WB2JAY	**23,250**	**SO-ALG-LP**
AC1J	**11,650**	**SO-ALG-LP**
K3TUF	**3,838**	**SO-ALG-LP**
N2BEG	3,648	SO-ALG-LP
WX3P	576	SOP
W1IG	300	SOP
WB2AMU	1,416	SOP-ALG
KQ2RP	40	SOP-ALG
N3YY	26,677	SO3B
K1HC	11,752	SO3B
W3FAY	8,800	SO3B
KA2BPP	5,311	SO3B
W2FDJ	2,210	SO3B
N1JD	2,112	SO-ALG-3B
W1DYJ	1,275	SO-ALG-3B
K2AXX	1,081	SO-ALG-3B
N1ZN	465	SO-ALG-3B
KC0NAH	418	SO-ALG-3B
KB1YNT	370	SOFM
VA2DG	272	SOFM
N2NT	119,955	LM
W2EA	65,274	LM
W2LV	56,745	LM
W3SO	21,730	LM
K1WHS	18,200	LM
W2SZ	390,176	UM
KD2LGX	57,000	UM
WE1P	36,900	UM
KV1J	30,358	UM
N3NGE	28,800	UM

The next September VHF Contest will be held September 9 – 11, 2023.

Top Ten

Classic Rover

K2QO/R	73,188
VE3OIL/R	72,688
W0AUS/R	36,417
W3ICC/R	22,936
KA9VVQ/R	18,144
W9FZ/R	18,144
KF2MR/R	17,353
KC0P/R	12,150
KV2X/R	8,613
N0HZO/R	7,697

Limited Rover

NV4B/R	32,271
KG9OV/R	21,488
WB2SIH/R	8,370
N6GP/R	7,925
K0BAK/R	6,396
AF1R/R	6,372
KM4OZH/R	5,808
N5BNO/R	3,540
K2JB/R	3,210
K5SRT/R	2,370

Unlimited Rover

KG6CIH/R	58,256
N2SLN/R	23,166
WB2VVQ/R	4,750
K4CNY/R	704
KO0Z/R	682

Single Operator, High Power

K1TEO	365,200
N2JMH	131,528
K1KG	70,950
N4QWZ	48,813
K2TER	39,700
N1AV	39,102
VA2WA	22,705
K3SK	21,804
N3MK	21,675
K1HTV	18,648

Single Operator, Low Power

WB1GQR (W1SJ, op)	99,710
K2DRH	86,112
N2WK	71,004
KA2ENE	35,904
K9MU	33,705
WA2VNV	25,174
KW2E	16,575
K9KLD	14,696
NR2C	12,780
KB4BKV	12,261

Single Operator, Analog Only, High Power

WZ1V	59,777
W0UC	50,794
W3IP	45,425
W0GHZ	43,320
K1TR	26,010
W2FU	20,868
N1JEZ	19,422
W2KV	17,612
N0HJZ	17,536
N6KN	7,627

Single Operator, Analog Only, Low Power

AF1T	86,223
WB2JAY	23,250
VE3DS	16,992
KA0PQW	15,540
AC1J	11,650
K6MI	4,602
K3TUF	3,838
N2BEG	3,648
K2GMY	3,625
WB2VVV	3,564

Single Operator, Portable

WX3P	576
WQ6D	484
AB4DX	414
W1IG	300
N0SUW	272
VA3EON	91
VE7VIE	30

Single Operator, Portable, Analog Only

AA6XA	1,425
WB2AMU	1,416
K7ATN	488
N8XA	200
KM6SJO	48
VE7LOE	45
KQ2RP	40
VE3FU	40
KO4UJS	12
KC8KSK	2

Single Operator, Three-Band

N3YY	26,677
KO9A	21,182
KK4MA	15,219
K1HC	11,752
W3FAY	8,800
KO4ECD	7,300
K8RO	6,161
WA8MCD	5,472
KA2BPP	5,311
KK4BZ	4,270

Single Operator, Analog Only, Three-Band

N1JD	2,112
N7QOZ	2,033
W1DYJ	1,275
K2AXX	1,081
N1ZN	465
KC0NAH	418
AK4U	341
N2FMS	279
WB7FJG	216
VA3OGG	168

Single Operator, FM Only

W7IMC	2,230
AA6QI	1,424
N6UTC	1,404
KG7KMV	750
VE3RWJ	462
KB1YNT	370
W5WGF	348
AF6GM	273
VA2DG	272
K7LAN	216

Limited Multioperator

AA4ZZ	142,492
N2NT	119,955
K5QE	69,344
W2EA	65,274
W2LV	56,745
W4IY	43,456
VE3MIS	36,435
W3SO	21,730
K1WHS	18,200
WA3EKL	17,009

Unlimited Multioperator

W2SZ	390,176
W8ZN	235,641
N8GA	63,544
KD2LGX	57,000
N4SVC	49,856
W4NH	41,736
WE1P	36,900
WD9EXD	33,117
KV1J	30,358
N3NGE	28,800

Division Winners

Classic Rover

Atlantic	K2QO/R	73,188
Dakota	W0AUS/R	36,417
Hudson	KD2TAI/R	2,640
Midwest	WA0CNS/R	1,824
Northwestern	W7HXC/R	960
Southwestern	N7DSX/R	5,096
Canada	VE3OIL/R	72,688

Limited Rover

Atlantic	K0BAK/R	6,396
Central	KG9OV/R	21,488
Dakota	AE0EE/R	184
Delta	NV4B/R	32,271
Hudson	WB2SIH/R	8,370
Midwest	KD8RTT/R	42
New England	AF1R/R	6,372
Northwestern	KA7RRA/R	2,116
Pacific	N6JSO/R	261
Roanoke	KM4OZH/R	5,808
Rocky Mountain	AB0YM/R	280
Southwestern	N6GP/R	7,925
West Gulf	K5SRT/R	2,370

Unlimited Rover

Atlantic	N2SLN/R	23,166
Delta	K4CNY/R	704
Midwest	KO0Z/R	682
New England	KG6CIH/R	58,256

Single Operator, High Power

Atlantic	N2JMH	131,528
Central	N4SV	11,096
Dakota	K0AWU	12,540
Delta	N4QWZ	48,813
Great Lakes	N4QS	450
Hudson	WA2FZW	12,480
Midwest	WB0M	21
New England	K1TEO	365,200
Northwestern	KE7SW	8,036
Pacific	K6KLY	10,560
Roanoke	K3SK	21,804
Rocky Mountain	WE7L	819
Southeastern	WA4GPM	13,446
Southwestern	N1AV	39,102
West Gulf	N5JS	216
Canada	VA2WA	22,705

Single Operator, Low Power

Atlantic	N2WK	71,004
Central	K2DRH	86,112
Dakota	WB0HHM	525
Delta	AA4DD	3,569
Great Lakes	K8WU	378
Hudson	WA2VNV	25,174
Midwest	AB0RX	2,262
New England	WB1GQR (W1SJ, op)	99,710
Northwestern	KW2E	16,575
Pacific	K6VVP	1,925
Roanoke	K4FJW	3,432
Rocky Mountain	KB0NAV	744
Southeastern	K4EA	4,557
Southwestern	N7IR	8,077
West Gulf	K5ND	1,333
Canada	VE3SMA	4,862

Single Operator, Analog Only, High Power

Atlantic	W2FU	20,868
Central	W0UC	50,794
Dakota	W0GHZ	43,320
Delta	K4YRK	176
Great Lakes	K8ZR	1,344
Hudson	W2KV	17,612
Midwest	W0RT	130
New England	WZ1V	59,777
Northwestern	K7ND	2,616
Roanoke	W3IP	45,425
Southeastern	WB4WXE	2,556
Southwestern	N6KN	7,627
West Gulf	K5LLL	2,847
Canada	VA7MM	304

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.

Single Operator, Analog Only, Low Power

Atlantic	K3TUF	3,838
Central	NN9K	28
Dakota	KA0PQW	15,540
Great Lakes	KE8QEP	294
Hudson	WB2JAY	23,250
Midwest	KF0M	162
New England	AF1T	86,223
Northwestern	WA6OEM	790
Pacific	K6MI	4,602
Roanoke	W4YN	234
Rocky Mountain	KB0KQI	144
Southeastern	W4RAA	2,268
Southwestern	N7RK	3,013
Canada	VE3DS	16,992

Single Operator, Portable

Dakota	N0SUW	272
Hudson	WX3P	576
New England	W1IG	300
Southeastern	AB4DX	414
Southwestern	WQ6D	484
Canada	VA3EON	91

Single Operator, Portable, Analog Only

Great Lakes	N8XA	200
Hudson	WB2AMU	1,416
Northwestern	K7ATN	488
Pacific	AA6XA	1,425
Roanoke	KO4UJS	12
Canada	VE7LOE	45

Single Operator, Three-Band

Atlantic	N3YY	26,677
Central	KO9A	21,182
Dakota	K0VG	513
Delta	K5OLV	187
Great Lakes	K8RO	6,161
Hudson	KA2BPP	5,311
Midwest	KE0IZE	495
New England	K1HC	11,752
Northwestern	WA7PVE	720
Pacific	K6JGV	152
Roanoke	KK4MA	15,219
Rocky Mountain	KC7QY	154
Southeastern	N8HK	1,755
Southwestern	W8AEF	320
West Gulf	KG5HFO	3,634
Canada	VE3BW	3,403

Single Operator, Analog Only, Three-Band

Atlantic	K2AXX	1,081
Central	N9TTK	12
Dakota	WB0ULX	12
Delta	N5QYC	42
Great Lakes	AK4U	341
Hudson	KC2JRQ	147
Midwest	KA0OUV	6
New England	N1JD	2,112
Northwestern	N7QOZ	2,033
Pacific	K6OAK	6
Roanoke	N7QLK	90
Southeastern	KK4AND	9
West Gulf	KF5DDV	9
Canada	VA3OGG	168

Single Operator, FM Only

Delta	W5WGF	348
New England	KB1YNT	370
Northwestern	W7IMC	2,230
Roanoke	NN4RB	4
Southeastern	KO4UOF	1
Southwestern	AA6QI	1,424
West Gulf	KG5UNK	130
Canada	VE3RWJ	462

Limited Multioperator

Atlantic	W2EA	65,274
Delta	NE5BO	4,080
Hudson	N2NT	119,955
New England	K1WHS	18,200
Northwestern	AL1VE	2,484
Roanoke	AA4ZZ	142,492
Southwestern	WO1S	1,008
West Gulf	K5QE	69,344
Canada	VE3MIS	36,435

Unlimited Multioperator

Atlantic	KD2LGX	57,000
Central	WD9EXD	33,117
Delta	AG4V	14,195
Great Lakes	N8GA	63,544
Hudson	WE1P	36,900
New England	W2SZ	390,176
Roanoke	W8ZN	235,641
Southeastern	N4SVC	49,856
West Gulf	KC5MVZ	270

2023 Straight Key Night Results

181 amateurs worldwide started off the new year by participating in ARRL's classic operating event.

Paul Bourque, N1SFE,
ARRL Contest Program Manager

Every year, hams from around the world look forward to Straight Key Night (SKN) as one of their favorite on-air events. Friends old and new ring in the new year by operating hand-sent Morse code. This year, more than 1,250 contacts were reported during the 24-hour event.

While many operators used vintage equipment and keys for the event, others operated using less traditional methods. Some operators even utilized Earth-Moon-Earth (EME) to make their contacts. Courtney Duncan, N5BF, contacted Alan Sias, NØOY, via 23-centimeter EME.

Operators new to CW as well as seasoned regulars participate in SKN. **Tom Dandrea, N3EQF, reported that his single SKN contact was with Teri Beard, KO4WFP. She was first licensed in January 2022 and recently upgraded to General class. Tom stated that his 45-minute contact with Teri was "very enjoyable."** Daniel Dresser, KO6YG, contacted Martin Kirk, WA7JMA. It was Martin's very first CW contact. Glenn Kurzenknabe, K3SWZ, reported a contact with Ken **Grant, VE3FIT, during SKN this year. Glenn and Ken were both licensed in 1962 at the age of 15. They first worked each other 60 years ago in** 1963.

Some participants feel very passionate about the event. Richard Hayer, **AA7IR, said, "The spirit of ham radio lives on in those patient [and] kind amateurs pursuing their love of CW." Many operators are already anticipating the next SKN. Brian Roberts, K9VKY, noted, "SKN 2024 can't get here fast enough!"**

Glenn Kurzenknabe, K3SWZ, displays the QSL cards he received from Ken Grant, VE3FIT. Glenn first worked Ken as a Novice operator back in 1963. Almost 60 years later they enjoyed a QSO on Straight Key Night. [Glenn Kurzenknabe, K3SWZ, photo]

Best Fist and Most Interesting QSO

SKN participants are asked to cast their votes for "Best Fist" and "Most Interesting QSO." **This year's vote for "Best Fist" is a three-way tie between Thomas Billings, AA4TB; Albert Bianchi, K4UX, and John McKee, WN4OFT. For "Most Interesting QSO," there's a four-way tie between Larry Anderson, K5LDA; Bryan Braunschweig, W0ESE; Randall Jackson,** WB6ZFG, and Bob Inderbitzen, NQ1R, who operated from ARRL Headquarters' Hiram Percy Maxim **Memorial Station, W1AW.**

The next ARRL Straight Key Night will be held on January 1, 2024.

Participating Stations

AA1ZX, AA4TB, AA7IR, AA8UU, AA9WJ, AAØQZ, AB8FJ, AB9BZ, **AB9NZ, AC8JU, AD8Y, ADØKH, ADØYM, AE3A, AE7CG, AG4T, K1APJ, K1EEE, K2AL, K2NPN, K2NV, K3BVQ, K3KKA, K3LO, K3MD, K3SWZ, K3TW, K3WU, K4ETW, K4RCW, K5AEB, K5LDA, K5MBA, K5NZ, K5RIX, K5SOH, K5WSN, K6GPB, K6KQV, K6PBQ, K6SQL, K6TY, K7SU, K7ZX, K7ZYV,** K9LA, K9SB, K9VKY, K9YA, KØPK, KØVIR, KØWOI, KA5HRF, KA7T, KA8NNY, KAØLDG, KB2MN, KB6NTW, KB8PGW, KB8TL, KB8TXZ, KB9W, KBØLMB, KC2KWA, KC2LM, KC3AM, KCØGXX, KCØINP, KD2BD, KD5QHV, KD8RV, KE1R, KE3V, KEØTT, KF4IZE, **KF8KS, KG4KGY, KG5IEE, KG7BF, KI5PED, KIØG, KN4SA, KN7NNN, KO4UHE, KO4WFP, KO6YG, KO8S, KQ9J, KW6G, N2BE, N2KZ, N3EQF, N3HCN, N4HAI, N4QR, N4UJ, N5BF, N5DTF, N6KZ, N6VOH, N6ZO, N7ZZ, N8PEM, N9BOR, N9EP, NØQLT, NJ3K,** NO6V, **NWØM, NYØO, W1AW, W1DGL,** W1PD, W1PID, W1RO, W1TPB, W1TS, W2NTN, W4CMG, W4GSP, W4NNF, W4RK, W5ZA, W6KN, W6SGJ, W6TDX, **W7IY, W7UUU, W7VHW, W8DPK, W8FDV, W8JNO, W8WTS, W8WZ, WØEJO, WØESE, WØFUN, WØKIZ, WØNB, WØOJW, WØVLZ, WA1CFX,** WA1PMA, WA2CHV, WA6BXV, WA6LE, WA7LNC, WA7YAZ, WA9PWP, WA9ZBW, WAØJLY , WAØVQY, WB2AWQ, WB4ABY, WB4YDL, **WB5NOE, WB6OVV, WB7AEA, WB7EHX, WB7WHG, WB8CFO, WB8SJE, WB9HFK, WBØB, WBØCJB, WBØIXV, WD4OQH, WD5ABC, WD8RIF, WN7Y, WU6P, and WY2U.**

DX and VE stations included EA8NQ, HP1DCP, HP1IBF, KP4CR, SN3V, VE3DN, VE3GFN, VE7NI, VO1NA, and YS1MS.

April 2023 Frequency Measuring Test

There will be two transmitting stations for the April Frequency Measuring Test (FMT) — W8RKO in Ohio and K5CM in Oklahoma. Transmissions will be made on 40 and 80 meters (in that order). The FMT will start with a "call up" by K5CM at 0300 UTC April 21 (Thursday evening in North America). If the scheduled frequency is busy, transmissions will be on frequencies close to the published frequency, so be prepared to tune.

Measure the transmitted frequency and report your results at http://fmt.arrl.org. Results must be submitted by 0200 UTC on April 24, at which time they'll be published on the website. Stations submitting measurements within ± 1 Hz for all transmissions from K5CM or W8RKO will be listed in the "Green Box" in the results.

The call-up frequency may not be the same exact frequency as during the key-down measurement period (it may shift as much as ± 10 Hz). Although the call up is scheduled to start at a specific time, both stations will try to start earlier. Every effort will be made to start key down at the published time. The key-down period will be 1 minute.

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

W8RKO
40 meters near 7065 kHz
03:15 Call up
03:18 Key down
03:19 End 40-meter run

K5CM
80 meters near 3598 kHz
03:30 Call up
03:33 Key down
03:34 End 80-meter run

W8RKO
80 meters near 3599 kHz
03:45 Call up
03:48 Key down
03:49 End 80-meter run

New Products

New Antenna Technology

A new antenna technology for VHF/UHF, developed by UpSide Down Antenna Company, promises to be a breakthrough in RF communications. It effectively doubles the capacity of any VHF/UHF repeater.

Termed the UpSide Down Antenna, or USDA (not to be confused with the United States Department of Agriculture), the technology replaces the existing antenna at a repeater site. It utilizes a special network (see Figure 1) that combines the upright and inverted RF signal arriving at the repeater and uses the existing transmission line. The USDA only responds to an upright or inverted signal and rejects the opposite signal. The manufacturer states that the isolation (rejection) between the two signals is in excess of 60 dB.

To use the USDA system, you only need to hold your handheld radio in an upright or inverted position. When calling another station, try the call in the upright position. If there's no response, invert the radio and try again. The manufacturer states that the handheld radio must be held within ± 45 degrees of the upright or inverted position for the antenna to perform as designed.

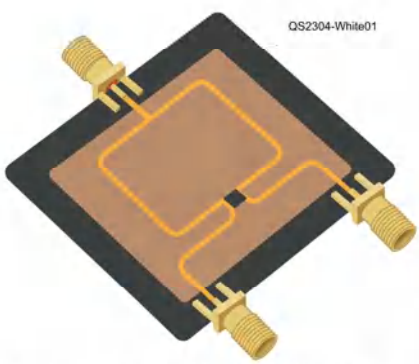


Figure 1 — The interior view of the USDA combining network. The USDA is specially priced for the month of April.

With this new technology, two simultaneous conversations can be carried on without any interference with each other.

At the present time, this technology is only accessible to users of handheld devices, as the radio can be physically rotated. A company spokesman stated that they're in the process of designing a USDA for mobile and base station applications.

— Terry White, VE5TLW, was first licensed in 1998 and holds basic, CW, and advanced qualifications. He enjoys SSB, the various digimodes, and contesting. Terry has 311 DXCC entities confirmed. For more than 45 years, he worked in telecommunications, specializing in microwave, RF, and their respective antenna systems. Terry can be reached at ***twhite@sasktel.net****.*

Strays

Amateur Contact Log Software Offers VOTA Help

Version 7.0.7 of *Amateur Contact Log* by N3FJP Amateur Radio Software is now available. Upload your Volunteers On the Air (VOTA) logs to ARRL's Logbook of The World for points. If you're operating one of the event's W1AW portable stations, there is an FAQ at www.n3fjp.com/news/news2014-03-24.html to help you log effectively as W1AW/X. For help in finding VOTA points, download the VOTA Watch List at www.n3fjp.com/vota.html, so *Amateur Contact Log* can notify you when operators on the list are spotted or contacted.

Mike Walters, W8ZY, mwalters@arrl.org

Club Station

Student Club Members Upgrade Their University Station

The University of Arizona Amateur Radio Club, K7UAZ, recently decided it was time to revamp its station's communication capabilities, which included upgrading their antenna. In this month's column, university club members Sarah Li, K7SLI; Eckhart Spalding, KJ7CQC; Hilly Paige, W7HIL; Hanna Nkulu, KK7EKD, and Zack Schimke, KN6GWL, share what the process was like and what they learned along the way.

K7UAZ recently installed a Mosley TA-63N antenna on the roof of the campus' landmark Old Engineering building. This installation was one of many upgrades to the university's station that were necessary for the club to be able to provide meaningful operating experiences to student members for years to come.

Getting Grant Approval

In February 2020, Station Manager Curt Laumann, K7ZOO, and former K7UAZ President Ken Gourley, KG6T, started the process of obtaining the necessary funding to upgrade the station. Ken and the club's former Treasurer, Eckhart, began the grant application process through the university's student government body, the Associated Students of the University of Arizona (ASUA), to request $4,800 for the station upgrade. They created mock receipts for the requested items, spreadsheets detailing line items, and an in-depth slideshow, and presented their grant proposal at an ASUA Appropriations Board Meeting. Because of complications with the ASUA and the COVID-19 pandemic, the grant didn't gain approval until March 2021. The club received about $2,900, and they promptly ordered the antenna, which arrived that summer.

Installing the Upgrades

Before installing the antenna, K7UAZ members used their downtime during the summer to evaluate the station's equipment on the roof of Old Engineering and found significant opportunities to improve the station. Areas of concern included corroded guy wires, substantial losses in transmission lines, and directional antenna systems with stuck bearings. Using some of the grant money from ASUA, as well as a supplementary $8,000 grant from Amateur Radio Digital Communications, the club purchased new rotor systems, cables, a satellite antenna, and an Icom IC-9700 transceiver for satellite communications.

K7UAZ club members raising the new Mosley TA-63N antenna on the roof of the university's Old Engineering building, using an intricate system of pulleys and a tram line. [University of Arizona Amateur Radio Club, K7UAZ, photo]

Student club members individually inquired about the Mosley antenna and other upgrades through in-person dialogue with Curt, as well as via the club's email list. While not every member was physically involved in the upgrades, almost all could read about them in email updates.

Over the next 10 months, members volunteered their free time in between work and classes to help upgrade the roof's equipment, such as replacing every single radiating element on the roof, taking down the beam antennas with all of the associated rotors and transmission lines, and replacing the guy wires. The only things that remained the same after these upgrades were the towers.

Raising the Antenna

Of all the upgrades done, the biggest challenge was raising the antenna onto the tower. A climbing and rigging team visited the roof to discuss potential rigging methods and design a list of necessary materials. Community member D. Evans, AG7RE, and Curt collaborated for several hours on the process. An intricate system of pulleys and a tram line were created to hoist the 15 × 30-foot, 60-pound HF antenna onto the tower.

In March 2022, Hanna, Hilly, Sarah, D., David, and Curt met to finish the antenna's installation. Before going on the roof, safety protocols and any related concerns for the installation were discussed, and the team equipped themselves with hard hats, handheld radios, and appropriate climbing gear. Curt climbed the tower, a couple of members maneuvered the ropes, and others acted as spotters — the whole process took about 4 hours.

After the installation, the team discussed the successes and areas for improvement. Overall, having contingency plans, direct communication, a steady installation process, and expertise from the community gave everyone the comfort needed to successfully hoist the antenna onto the tower.

Lasting Benefits

One of K7UAZ's main goals is to provide diverse learning experiences to its student members. Whether they're through individual projects like creating a quarter-wave 2-meter ground plane antenna, assisting students with studying for their radio licensing exams, or participating in group projects, the club finds a way to incorporate new and unique learning opportunities.

One of the reasons the club decided to install the new antenna was to expose students to more bands. This meant that instead of only experiencing high-performance DX contacts on monoband 20-meter and 15-meter beams, members could now study propagation on 6, 10, 12, 15, 17, and 20 meters. The new antenna also allows members to experience meteor scatter. Students can now learn about communicating across different bands, as well as have more experimental opportunities to study propagation. Giving students the liberty to study different interests is valuable in amateur radio, because it's an extremely diverse hobby. A college club's shack is often the first available resource for students when engaging in the hobby, and it should offer as many capabilities as possible for developing hams.

In addition to the educational values offered by having the new equipment, student members learned about basic hand assembly methods and amateur radio tower safety. For example, Sarah and Hanna learned where to tape critical areas of the antenna with electrical tape and how to maneuver the ropes for the pulley system. Both students felt these hands-on skills made them more comfortable with working on hardware for future projects. Hilly learned more about amateur radio tower safety and how to rig loads onto a tower. By actively participating in these upgrades, students were able to develop real-life skills.

The club's station upgrade was featured in the University of Arizona College of Engineering's news and the 2023 ARRL Calendar. Through this publicity, more students and members of the community learned about the club and its projects, and the club gained 12 – 15 new members during the fall 2022 semester alone.

Looking to the Future

The university experience is coveted by many due to the plethora of new opportunities and experiences that are available for students. K7UAZ members are encouraged to curate their understanding of amateur radio topics and principles by having the opportunity to engage in activities such as hosting nets, learning basic soldering skills, and building their own 2-meter antenna. Additionally, collaborating with other members in the club through communication events and various build projects fosters a meaningful community.

To date, the club boasts an entirely new satellite antenna system, a vastly improved 2-meter repeater transmission line, an operating position for experimental radio stations, and an HF antenna system. With this updated system, K7UAZ hopes to see a continuous rise in student member involvement, engagement in diverse learning experiences and projects, and a constant drive to educate others about amateur radio. If you ever walk by Old Engineering at the university, take a minute to look up. It's not every day that you see a Mosley antenna on the roof of a university building!

Write for "Club Station"

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

ARRL Special Service Clubs

ARRL offers the Special Service Club (SSC) program for clubs that demonstrate that they're working to improve the amateur radio community by completing special projects, holding license classes, and working with local groups on events, among other activities. Visit **www.arrl.org/ssc-application** for more information about this program. Below is a list of new and renewing SSCs as of January 27, 2023.

Renewing SSCs

Snohomish County Hams Club, WA7LAW	**Everett, WA**
Lake Monroe ARS, N4EH	**Orlando, FL**
Baton Rouge ARC, W5GIX	**Baton Rouge, LA**
Meriden ARC, W1NRG	Wallingford, CT
Olympia ARS, NT7H	Olympia, WA

Steve Goodgame, K5ATA, sgoodgame@arrl.org

Ham Media Playlist

Thomas (K4SWL) — Offering Real-Time Field Activations

Tom Witherspoon, K4SWL, began producing YouTube videos as a direct result of his blog posts on "QRPer" and "SWLing Post." When his readers initially asked him to make videos of his field activations, Tom had no desire (or time) for the task. Then, the COVID-19 pandemic came along.

Capturing Amateur Radio Field Activations

All of a sudden, Tom had extra time on his hands, so he began posting his real-time, real-life, ham radio field activation videos to YouTube. Titled simply "Thomas (K4SWL)," Tom's YouTube channel was born in 2020. His first video, and the catalyst for the creation of his channel, was prompted by a reader who asked him to make a video showing what a Parks on the Air® (POTA) CW activation looked like from the activator's point of view.

A fan of operating at low power, Tom enjoys CW and experimenting with different antennas, radios, and methods to power a station. You might notice the lack of advertising in Tom's videos. Tom's primary purpose for creating content is to motivate others to get out in the field to operate and to improve their CW skills. According to Tom, the greatest compliments he receives are from those who say that his videos encouraged them to try something new or improve at something.

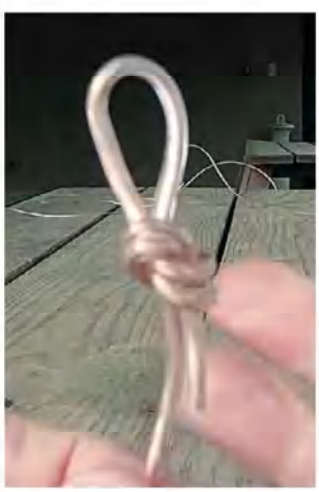
Simple, Straightforward Filming

Many of Tom's subscribers enjoy the feeling of being in the field with him. And virtually taking his viewers along for the ride, especially when they are unable to get out in the field themselves, delights Tom as well. Tom's method of creating content is pretty simple. He turns on his camera and records. He doesn't spend much time planning the best shots; rather, he simply films what he is doing, what he is looking at, etc. He does very little editing, so viewers see raw footage of an activation. They see what goes well, what doesn't go so well, and what mistakes are made. But most of all, they see Tom's love for portable operations. Because of Tom's minimal editing, many of his videos are relatively long. To Tom, it is important that people who want to learn how to operate in the field get a real sense of an activation.

In one such video, titled "How I evaluate a new POTA site plus serious QRP fun with my new-to-me Elecraft KX1" (**https://tinyurl.com/k4swl-qrpfun**), Tom steps viewers through the process of surveying a potential site for operation. He stresses the importance of assessing a location before setting up equipment, and discusses safety and antenna options, among other important details. Tom also explains why he creates videos in the manner he does — that is, he wants newcomers to field operations to understand that while sometimes contacts roll in fast, other times they take a while. Tom feels that editing videos to make it appear like contacts are being made nonstop can be misleading and discouraging to new operators, so he chooses to show the experience in real time.

Showcasing Successes and Mistakes

In "I left my antenna at home, so had to improvise! Let's build another simple speaker wire antenna…" (**https://tinyurl.com/k4swl-antenna**), Tom reaches his site without an antenna. Rather than scrapping the day or going back for an antenna, he chooses to rummage through his vehicle and comes up with a way to make an antenna. His mistake makes for a useful video, as he builds an antenna and shows how to do so with few tools at one's disposal. Tom gets his station on the air by using speaker wire, a banana clip, and a pocketknife to make his antenna. He doesn't have measuring tape



Tom, K4SWL, created an antenna out of speaker wire after arriving at an activation site only to discover he'd forgotten to bring an antenna.

to measure the length of the speaker wire, so he improvises by using the length of the picnic table to approximate the length of the wire.

Tom often uses CW for his portable operations, and he excels at discussing what he is doing and what he is sending. For example, in the same video, when Tom is looking for an open frequency to call CQ, he sends "QRL." He then explains that he is sending QRL and indicates that he is asking if the frequency is in use.

Taking on Challenges

In "POTA with one-tenth of a watt? Can it be done? Let's make an attempt!" (**https://tinyurl.com/k4swl-qrppota**), Tom discusses some of the challenges he expects to face using low power. Additionally, he offers tips on mitigating some of those challenges, such as making sure you bypass the ATU when using a resonant antenna, and ensuring your antenna is resonant so you have as little reflected power as possible. Viewers watch as Tom struggles to make contacts with such a low signal, and they feel the thrill each time he completes a contact.

One of the major differences between Tom and most other HamTubers is his field report. As Tom readily admits, he considers himself a blogger who happens to film his activations. For each activation, Tom completes a blog post that he calls a "field report." Links to these "QRPer" blog posts are found in the description of each video. These posts provide the granular details of the activation, listing exact equipment used, the planning, the setup, images, and other helpful advice.

Whether you are looking for information on operating in the field, you are a seasoned field operator and want to pick up some tips, or you are just looking for a way to practice copying CW, Tom's videos have all that and more to offer. Be sure to check them out at **www.youtube.com/ThomasK4SWL**.

Tom, K4SWL, works W9UUM for his seventh contact at 1/10 W at Fort Dobbs State Historic Site (K-6839).

Volunteer Monitor Program Report

The Volunteer Monitor (VM) Program is a joint initiative between ARRL and the FCC to enhance compliance in the Amateur Radio Service. This is the January 2023 activity report of the VM Program.

♦A warning for unlicensed operation on 146.520 MHz was issued to a trucking company in Keller, Washington.

♦A commendation was issued to an amateur in Rimersburg, Pennsylvania, for exemplary operation on 7.222 MHz, taking extra steps to assist amateurs with settings for ALC, microphone gain, and bandwidth to obtain the most efficient and considerate operation on SSB.

♦A commendation was issued to an amateur in Boise, Idaho, for courteous and valuable assistance to new and less active amateur operators.

♦Advisory notices were issued to Technician-class amateurs in New York, Colorado, and Texas for FT8 operation on 40 and 15 meters. Technicians have no data privileges on those bands.

♦Advisory notices were sent to Technician-class licensees in Florida and New Jersey for FT8 operation on 20 meters. Technicians have no operating privileges on 20 meters.

♦An Extra-class licensee in Mississippi was issued an advisory notice for willful and deliberate interference on 3.927 MHz, and was informed that additional instances would be referred to the FCC for enforcement action, including fine or license revocation.

♦A VM Alert was issued on January 31, 2023, for a constant carrier on 7.195 MHz. The matter was referred to the FCC.

The final totals for VM monitoring during December 2022 were 1,878 hours on HF frequencies, and 2,433 hours on VHF frequencies and above, for a total of 4,311 hours. — *Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH*

Bernie McClenny, W3UR, w3ur@arrl.org

How's DX?

Exciting DX Developments

As of the writing of this column, DXers have just seen the third most-wanted DXCC entity (FT#W — the Crozet Islands) on the air, and we are about to see the second most-wanted entity (3Y/B — Bouvet Island; see Figure 1). On January 15, the solar flux index (SFI) hit a Solar Cycle 25 record at 245. This was the highest SFI since 2014 — the current sunspot cycle is expected to peak between early next year and mid-2025.

The Crozet Islands

The January 2023 issue's "How's DX?" column covered the plan for the first-ever DXpedition to the Crozet Islands. Thierry Mazel, F6CUK, arrived at Port Alfred on Possession Island just a few days before Christmas and began operating as FT8WW on the night of December 25 (see Figure 2). He expected to operate until mid-March before heading home around March 26. In January, the DX community learned that he would have to go off the air after 3 weeks of operating — this was agreed upon at his arrival. During those 3 weeks, Thierry had an almost-daily routine of starting on 30 meters, moving to 20 meters, then finishing on 17 meters. His goal was to give as many people as possible an All Time New One. When he ceased HF activity on January 15, he had a total of 4,920 CW contacts, 15,702 FT8 contacts, and two SSB contacts. After that, he continued on the Qatar-OSCAR 100 (QO-100) narrow-band transponder on board the Es'hail-2 satellite, making 1,173 more contacts for a grand total of 21,797 as of press time. He made 11,241 unique contacts, accounting for 51.6% of all contacts.

By operating consistently, DXers figured out the best times and bands for logging Thierry, as the contacts were somewhat balanced between Europe, North America, and Asia. FT8WW had a mandatory off time of 5 hours per day so that scientists at the research station could take geomagnetic measurements. Despite many obstacles, Thierry did a great job and hopefully will present at the Hamvention DX forum in May. He was able to secure more operating time between February 10 and March 3, then for another week starting on March 10.

A Big Problem

Many DXers noticed an inordinate number of callers trying to work Thierry on the wrong FT8 cycle. FT8WW was transmitting on first or even cycle at 00 and 30 seconds, so those trying to work him should have been calling second or odd at 15 and 45 seconds. Many were calling FT8WW while he was transmitting, and were therefore unable to make the contact.

There was also an excessive number of stations who called the Crozet DXpedition without copying the DX station. This is another mistake that can cost you in the long run and frustrate your fellow DXers, as Thierry tried to answer those who could not copy him. It's less egregious to not copy 50 to 75% of his transmissions, but it's totally inappropriate to call at anything less. The same can be said for CW and SSB, but these problems were overwhelming during the FT8

Figure 1 — A view of Bouvet Island from the 3YØJ team's chosen vessel, the *Marama*. The team operated from the southeast corner of the island at Cape Fie. [3YØJ DXpedition team, photo]

Figure 2 — Thierry Mazel, F6CUK, is the first person to embark on a DXpedition to the Crozet Islands. As of press time, FT8WW has 21,797 contacts from the third most-wanted DXCC entity. [Thierry Mazel, FT8WW, photo]

operations. The same issues also occurred during the 3Y0J DXpedition to Bouvet Island.

Helping Fellow DXers

We were all new to the hobby and DXing at some point. When we come across someone who is calling on the wrong cycle, or calling on top of the DX station, the best way to help them and the DX community at large is to politely correct them off the air. That can be done with a phone call, letter, or email, or at the next club meeting or hamfest.

International DX Convention

The 74th International DX Convention is scheduled to take place in Visalia, California, on April 21 – 23. This year's event is being sponsored by the Northern California DX Club and the Central Arizona DX Association. Ken Opskar, LA7GIA, from the recent 3Y0J DXpedition, will be the Saturday night banquet speaker. Updates and more information can be found at **www.dxconvention.com**.

DX News from Around the Globe

CY0 — Sable Island

Sable Island is located some 300 kilometers (190 miles) southeast of Halifax, Nova Scotia, and was added to the ARRL DXCC list in 1976 under the old Point 1 rule. After DXCC 2000, it remained grandfathered in **despite no longer meeting DXCC criteria. Contacts dating back to the beginning of the DXCC program on November 15, 1945, and after, count** for this DXCC entity. CY0 currently ranks number 49 worldwide on Club Log's DXCC Most Wanted list.

A team of nine Americans are scheduled to head to Sable Island as CY0S for a DXpedition on March 20 – 30. **This will be an all-band (1.8 – 28 MHz) and all-mode operation. For more information, visit www.t-rexsoftware.com/cy0s.**

FO/A — the Austral Islands

Though originally scheduled for November 2022, Haru Uchida, JA1XGI, is now going to Raivavae (OC-114) in the Austral Islands. He'll be using special call sign TX5XG on April 12 – 19 with an Icom IC-7300 and a mini Ninja antenna. Haru will also use CW, RTTY, SSB, and FT8 on Fox and Hound on the 40- through 10-meter bands. QSL cards can be sent directly to the JARL QSL Bureau to JA1XGI, through OQRS on Club Log, or through LoTW. For updates and more details, visit **https://australvacation.amebaownd.com**.

FW — Wallis and Futuna

The only amateur radio operator living on Wallis Island is Jean-Gabriel Guillemonat, FW1JG/F4CIX, who plans to stay on the air until January 2024. He operates on 40 to 6 meters via FT8 and SSB. **Jean-Gabriel also confirms contacts through LoTW and OQRS on Club Log.**

H4 — the Solomon Islands

Michael Buser, DL2GMI, is planning to be back on Malaita Island (OC-047) **in early April for either 1 week or 10 days. He's hoping to reactivate his old H44MI call sign on SSB, RTTY,** and CW, on 80 to 10 meters (he will not be on 60 meters). Michael may also operate EME on 6 meters. Confirm contacts via the bureau to DL2GMI, OQRS on Club Log, or LoTW.

VK9/W — Willis Island

Sandeep "Sands" Purushan, VU2WXW/VK4WXW, has been working at the Willis Island Meteorological Station since late last year (see Figure 3). He will continue to be **active on SSB as VK9WX until April. Sands has been reported on 40, 20, 15, and 10 meters, and he sometimes** appears on 7.163 and 14.207 MHz after 1100Z, along with Stan "Stax" Schwartz, KE5EE.

Figure 3 — Sandeep "Sands" Purushan, VK4WXW, was able to put up a multiband vertical and operate as VK9WX from Willis Island. He began working at the Willis Island Meteorological Station in late November. [Sands Purushan, VK9WX, photo]

Wrap-Up

That's it for this month, with special thanks to Jean-Gabriel Guillemonat, FW1JG/F4CIX, and Sands Purushan, VU2WXW/VK4WXW. Don't forget to send any DX news — even holiday-style operations — to your editor at **bernie@dailydx.com**. Until next month, see you in the pileups! — *Bernie, W3UR*

Jon Jones, NØJK, n0jk@arrl.org

The 40 MHz Band Springs to Life with Solar Cycle 25

Rising interest in the experimental 40 MHz, or 8-meter, band coincides with the rising solar flux and F2 propagation. The 8-meter band shares many characteristics with the 6-meter band. However, as it is lower in frequency, it has better F2 propagation than 6 meters for any given solar flux. It is also the lowest portion of the very high frequency (VHF) spectrum allocated to amateur radio use. **The term refers to the average signal wavelength of 8 meters.**

The considerable interest in 8 meters is reflected by posts in the ON4KST 50 MHz R2 chat — some countries outside of the US and Canada have an allocation at 40 MHz, and their hams are now making contacts. On January 18, Martin, PJ4MM, made the first confirmed two-way voice contact between Europe and Bonaire Island on 40 MHz, with EI2IP in Limerick, Ireland.

In the US, some experimental stations are allowed limited activity, but operation on 8 meters is otherwise not permitted. Operators can only listen for stations on the band, as many radios have coverage of 40 MHz. The FT8 frequency is currently 40.680 MHz. Antennas for 6 or 10 meters will allow hams to listen to the band, but a dedicated 8-meter antenna would work better. PJ4MM uses a "modified four-element, 6-meter Yagi" with the element length increased by about 25%. A simple dipole for 8 meters would also be effective and easy to build.

Another reason to monitor the band is being able to detect early warnings of 6-meter F2 openings. It will open at a lower F-layer ionization level than 6 meters. Operators can see potential 50 MHz F2 paths and estimate the best time of day to monitor them. For much of January, there was transcontinental F2 propagation on 40 MHz, as low-power experimental **stations on the west coast were copied on the east coast. The high solar activity that month helped boost the** F2 maximum usable frequency. Sporadic E also occurs on 40 MHz — being a lower frequency than 50 MHz may allow for more frequent openings.

Random Morning Meteors

Larry Lambert, NØLL (EM09), noted many people making 6-meter random meteor-scatter contacts during January mornings. On January 23, Larry got on the radio at 1112 UTC and made 13 MSK144 contacts on 6 meters. On January 21, Rich Zwirko, K1HTV (FM18), made more than 14 contacts on 6-meter MSK144 around sunrise. MSK144 has been a reliable mode for making meteor-scatter contacts on 6 meters; I found that when I call on 50.260 MHz MSK144 in the morning, NOØT/P almost always posts a PSK flag for me. Random meteors will be more frequent as summer approaches.

On the Bands

50 MHz. The high solar flux during January sparked many F2 openings, and winter sporadic E appeared as **well. On January 4, Ron Todd, K3FR (FM18), worked CO2QU (EL83) on FT8 via sporadic E. F2 appeared on 6 meters the morning of January 6 between the southeast US and Ecuador (see Figure 1), as HC2FG (FI07)** was spotted from Florida to Texas. Some sporadic E was in the mix, too, with W4IMD (EM84) and W7JW (EN82) into Kansas.

On January 13, there was a strong E_s opening to Texas and Mexico from the midwest. I, NØJK (EM28), logged XE2ML (DL74), WM5L (DM91),

Figure 1 — An F2 opening on 6 meters occurred on January 6, 2023, between the southeast US and Ecuador. [**www.dxmaps.com**]

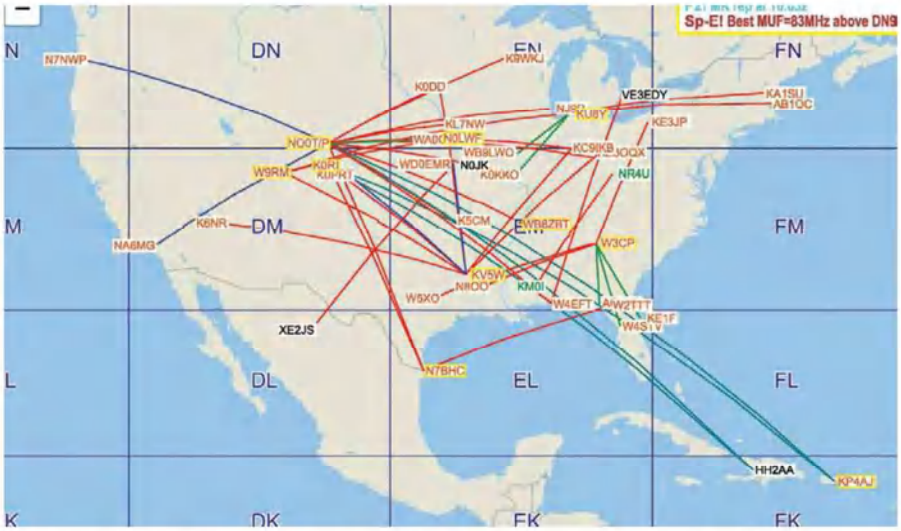


Figure 2 — Another F2 opening on January 16, 2023, when the solar flux was 228. [www.dxmaps.com]

W5TRL (EM10), and others on FT8. From Colorado, Bill, WTØDX (DM79), **worked the same opening to 22 stations in Alabama, Louisiana, Mississippi, and Texas. F2 occurred again** on January 16 (see Figure 2), with KØRI (DM78) and NOØT/P (DN70) spotting KP4AJ (FK68) on FT8 at 1550 UTC — the solar flux was 228. XE2JS (DL78) was in for me on E_s at 1605 UTC. Later that day, the TN8K DXpedition team in the Republic of the Congo worked PJ4MM, V26OC, and FG8OJ on FT8 via F2. On January 20, there was a sporadic-E-to-TEP opening from Colorado and Oklahoma, as W5LDA (EM15) was into Brazil. The E_s link cloud was shown by a contact between WM5L (DM91) and W4IMD (EM84) at that time. VK4WTN and ZL2WHO were also in, and KØKKO (EM48) worked several stations in New Zealand.

A strong sporadic-E opening took place early in the morning on January 21 during the 2023 ARRL January VHF Contest. Starting around 1500 UTC, stations in W1, W2, W3, W8, VE3, and VE4 worked the midwest with strong signals. I used the W1AW/Ø KS call sign for a single-operator portable operation, and I worked many stations on FT8.

PJ4MM (FK52) copied me on F2, but he did not complete the contact. From **Canada, VE3OIL operated via rover and worked into the midwest, including rover K5SRT (EM26). Near the** end of the E_s opening, MMØAMW (IO75) in Scotland was monitoring 6 meters and briefly stepped away from the radio at 1645 UTC. When he returned, he saw that several North American stations had been decoded on FT8, including N2BJ (EN61), NA9RB (EN40), K9CT (EN50), W9YOY/R (EN52), and KW9A (EN40) between 1645 and 1650 UTC. I worked KW9A about 15 minutes earlier. It was a small footprint — was it multihop E_s or F2? On the evening of the contest, there was a strong E_s-to-TEP opening for stations in the northeast states to Argentina, Chile, and Brazil. Overall, the January VHF Contest saw some remarkable propagation.

There was another possible F2 opening on January 23. Jack, NA3F (FN10), decoded HC2FG (FI07) nine times around 1425 UTC. He uses a five-element Yagi that is elevated by 10 feet. KE1F (EL99) was in for me (EM28) on E_s at 1705 UTC. Later that day, Eric, WD6DBM (CM97), logged five ZL3 stations in 15 minutes. On January 24, Bob, K6QXY, worked ZL3RC, ZL4LV, ZL3RJ, ZL3OY, ZL3NW, ZL4SY, and ZL3OZ. He used stacked five-element Yagis elevated by 70 feet and fixed on the South Pacific. Solar activity dropped during the last week of January, and with it, F2 propagation on 6 meters.

144 MHz. John Lock, KFØM (EM17), reported working KBØZOM (EN00) on CW, as well as WE7L (DM79) and K5QE (EM31) on FT8 tropo during the ARRL January VHF Contest. K5SW (EM25) reported working WQØP (EM19) and WB5HIL (EM43) on CW.

1296 MHz. Al Katz, K2UYH, noted that 1296 MHz has become "the band for EME CW operation. IK1FJI made 74 CW contacts in the ARRL EME contest on 1296 [MHz]." N1AV plans to be on 902 and 1296 MHz EME from Hawaii on March 5 – 9. He **completed the ARRL Worked All States Award on 1296 MHz.**

Here and There

John Walker, WZ8D, passed away on January 22, 2023. John was active on the VHF bands, including the 2023 January VHF Contest. This information is courtesy of Terry Price, W8ZN. Robert "Bruce" Clark, KØYW, also became a Silent Key on November 26, 2022. He made the first Africa-to-US EME contact from WA6LET with then-ZE1DX on 2 meters. Bruce went to Hawaii and gave W5LUA a 1296 MHz EME contact for the first 23-centimeter Worked All States Award — this information is courtesy of Al Katz, K2UYH. Ed, N7PHY, said he will activate rare grid DN47 from June 9 to 11, 2023. This will be during the ARRL June VHF Contest. Lance Collister, W7GJ, notes the *WSJT-X* Q65 mode works well in the "NA contest mode" in the latest *WSJT-X* version. In fact, he believes it may be possible to make faster contacts via Q65. Lance is also planning a trip to Rodrigues Island (3B9) from August 27 to September 9, 2023, for 6-meter EME and terrestrial operation.

Special Event Stations

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

Mar. 15 – Mar. 21, 0000Z – 2359Z, W1DGL, Prescott, AZ. Yavapai Amateur Radio Club. **VOTA**. 7.225 14.275 21.250 28.400. Certificate & QSL. Yavapai Amateur Radio Club, P.O. Box 11994, Prescott, AZ 86304-1994. **fix_broke_airplanes@hotmail.com**

Mar. 18, 1300Z – 1900Z, W1M, Russell, MA. Western Massachusetts Council Scouts BSA. **WHOA Weekend**. 7.190. QSL. Tom Barker, 329 Faraway Rd., Whitefield, NH 03598.

Mar. 18 – Mar 19, 1600Z – 2359Z daily, W9WKP, Lincoln, NE. Southeast Nebraska Amateur Radio Club. **Nebraska Sandhill Crane Spring Migration**. 7.225 7.285 14.265 14.325. Certificate. SENARC c/o Charles Bennett, KDØPTK, P.O. Box 67181, Lincoln, NE 68506. **senebrradioclub@gmail.com**

Mar. 25, 1600Z – 2200Z, N4H, Alexander City, AL. Lake Martin Amateur Radio Club K4YWE. **Battle of Horseshoe Bend 209th Anniversary Commemoration**. 14.320 29.000. Certificate & QSL. Michael Courtney, 96 Alabama Dr., Alexander City, AL 35010. **www.facebook.com/k4ywe**

Mar. 29, 1500Z – 2030Z, W5KID, Baton Rouge, LA. Baton Rouge Amateur Radio Club. **Vietnam Veterans Day**. 7.040 7.250 14.040 14.250; CW SSB FT8. QSL. USS *Kidd* Amateur Radio Club, 305 S. River Rd., Baton Rouge, LA 70802. **www.qrz.com/db/w5kid**

Mar. 31 – Apr. 3, 0000Z – 2359Z, KI4HUS, Benton, KY. Marshall County Amateur Radio Association. **165th Annual Tater Day Festival — Yam It Up!** 3.820 7.250 14.325 28.350. QSL. Steve French, KM4JZJ, 3640 Olive Hamlett Rd., Benton, KY 42025. **www.facebook.com/groups/861322314291904**

Apr. 1 – Apr. 2, 1200Z – 1400Z, W4P, Ellijay, GA. Popcorn Net. **3rd Anniversary**. 7.271 7.272. Certificate & QSL. Popcorn Net, 216 Mount Pleasant Dr., Ellijay, GA 30540. **wt2t@popcornnet.net**

Apr. 4, 1700Z – 2200Z, WE7GV, Sahuarita, AZ. Green Valley Amateur Radio Club. **Vintage Radio Special Event**. 14.242 14.245 14.248. Certificate & QSL. Tom Lang, 1085 W. El Toro Rd., Sahuarita, AZ 85629. **we7gv1@gmail.com**

Apr. 8, 1500Z – 1800Z, N4B, New Bern, NC. New Bern Amateur Radio Club. **Battle of New Bern Adventure Day Special Event**. 7.116 14.228. QSL. John Riley, 980 Dry Monia Rd., New Bern, NC 28562.

Apr. 8, 1600Z – 2300Z, NI6IW, San Diego, CA. USS *Midway* Museum Ship. **Commemorating Operation Frequent Wind, the evacuation of Saigon in 1975**. 7.250 14.320; 14.070 PSK31 D-STAR on PAPA System repeaters. QSL. USS *Midway* Museum Ship COMEDTRA, 910 N. Harbor Dr., San Diego, CA 92101. **www.qrz.com/db/ni6iw**

Apr. 11, 1500Z – 2030Z, W5KID, Baton Rouge, LA. Baton Rouge Amateur Radio Club. **Kamikaze Attack Remembrance**. 7.040 7.250 14.040 14.250; CW SSB FT8. QSL. USS *Kidd* Amateur Radio Club, 305 S. River Rd., Baton Rouge, LA 70802. **www.qrz.com/db/w5kid**

Apr. 14 – Apr. 29, 0000Z – 2359Z, W4M, Boones Mill, VA. AA4SS. **Whiskey 4 Moonshine**. 7, 14, and 15 MHz, all HF bands, phone, digital, CW, and satellite. QSL. Timothy Boyd, 2201 Green Level Rd., Boones Mill, VA 24065. **www.qrz.com/db/w4m** and **www.whiskey4moonshine.wordpress.com**

Apr. 15, 1400Z – 2200Z, K5G, Garland, TX. Garland Amateur Radio Club. **100th Anniversary of the Garland, Texas, Power Company, Garland Power and Light**. 14.260. Certificate. Garland Amateur Radio Club, 1027B Austin St., Garland, TX 75040. *PDF certificates will be emailed after the event.* **info@k5qhd.org**

Apr. 15 – Apr. 16, 1400Z – 0200Z and Apr. 16, 1400 – 2000Z, K5LRK, The Colony, TX. Lake Area Amateur Radio Klub. **Texas State Parks on the Air, Commemorating Tom King, WK5DX, the Texas Event's Founder.** 7.040 7.215 14.040 14.265. QSL. Ken Rainey, AC5EZ, 529 Kenilworth Ave., Oak Point, TX 75068. **www.tspota.org/home**

Apr. 15 – Apr. 17, 1400Z – 0200Z, K9CYC, Chicago, IL. Columbia Yacht Club Amateur Radio Society. **40th Anniversary of the Voyage of the *Abegweit***. 14.300 29.000. Certificate & QSL. Columbia Yacht Club Amateur Radio Society K9CYC, 111 N. Lake Shore Dr., Chicago, IL 60601. **www.qrz.com/db/k9cyc**

Apr. 15 – Apr. 22, 1300Z – 2100Z, W3S, Beaver Falls, PA. Beaver Valley Amateur Radio Association. **100th Anniversary**. 7.270 14.270 28.470 145.310 (–600 kHz PL 131.8). Certificate & QSL. BVARA, P.O. Box 424, South Heights, PA 15081. *Stations making contact on two or more bands or modes may request a PDF certificate that will be emailed.* **www.w3sgj.org**

Apr. 22 – Apr. 23, 1400Z – 1900Z, K4S, Venice, FL. Tamiami Amateur Radio Club. **Venice Shark's Tooth Festival**. 14.320 SSB; 18.085 CW; 80 – 10 FT8. QSL. Tamiami ARC, P.O. Box 976, Nokomis, FL 34275. **www.tamiamiarc.org**

Apr. 28 – Apr. 30, 1700Z – 1700Z, K8L, Youngstown, OH. WF8U and KC3GFU. **National Library Week**. 7.074 7.240 14.074 14.240; SSB and FT8. QSL. K8L, 239 Elvira Ct., McDonald, OH 44437. **www.qrz.com/db/wf8u**

Apr. 29, 1200Z – 2359Z, KG4NXO, Bloomington, IN. Marion County Emergency Management. **MERT20 Special Event**. 3.862 7.262 14.262 146.790 REF 37 D-STAR. Certificate & QSL. Emergency Operations Center MERT, 698 NW 30th Ave., Ocala, FL 34475. **www.mert20.org**

Apr. 29, 1400Z – 2300Z, N5BVA, Springdale, AR. Bella Vista Radio Club. **30th Anniversary**. 7.190 14.260. QSL. Don Banta, 3407 Diana St., Springdale, AR 72764. **www.qrz.com/db/n5bva** or **www.bellavistaradioclub.org**

Apr. 29 – Apr. 30, 1400Z – 2359Z, W9GFZ, Virginia and New Mexico. National Radio Astronomy Observatory. **Anniversary of the Birth of Radio Astronomy**. 3.800 – 4.000; 7.175 – 7.300; 14.225 – 14.350; 21.275 – 21.450; 28.300 – 29.700. Certificate & QSL. Kevin Shoemaker, 1180 Boxwood Estate Rd., Charlottesville, VA 22903. **kshoemak@nrao.edu**

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.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for July *QST* would have to be received by May 1. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Event page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us. ARRL reserves the right to exclude events of a commercial or political nature.

W1AW Schedule

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

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US time + 4 hours. For the rest of the year, UTC = Eastern US time + 5 hours.

♦ Morse code transmissions: Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675, 50.350, and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13, and 15 WPM.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13, and 10 WPM.

Code bulletins are sent at 18 WPM.

For more information, visit us at
www.arrl.org/w1aw

♦ W1AW Qualifying Runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted by various West Coast stations on CW frequencies that are normally used by W1AW, in addition to 3590 kHz, at various times. Underline 1 minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any), and complete mailing address. Fees: $10 for a certificate, $7.50 for endorsements.

♦ Digital transmissions: Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095, 50.350, and 147.555 MHz.

Bulletins are sent using 45.45-baud Baudot, PSK31 in BPSK mode, and MFSK16 on a daily revolving schedule.

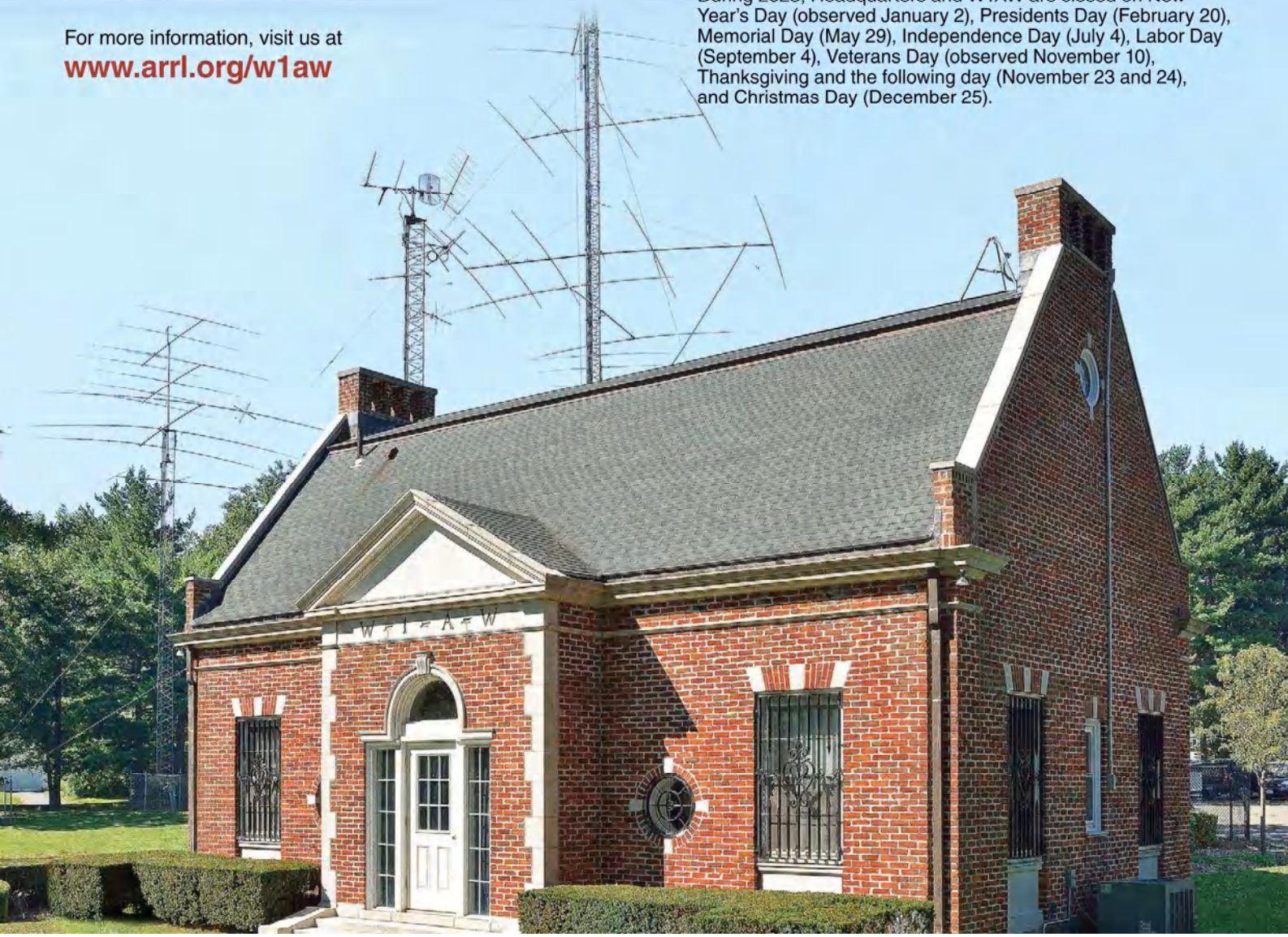
Keplerian elements for many amateur satellites will be sent on the regular digital frequencies on Tuesdays and Fridays at 6:30 PM Eastern time using Baudot and PSK31.

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

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

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

During 2023, Headquarters and W1AW are closed on New Year's Day (observed January 2), Presidents Day (February 20), Memorial Day (May 29), Independence Day (July 4), Labor Day (September 4), Veterans Day (observed November 10), Thanksgiving and the following day (November 23 and 24), and Christmas Day (December 25).



Convention and Hamfest Calendar

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

Abbreviations

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

Alabama (Daleville) — Apr. 15 D F R V
8 AM – 5 PM. *Spr:* Daleville Area ARS. R.A. Culpepper Municipal Park, 290 Daleville Ave. *Tl:* 145.270 (103.5 Hz). *Adm:* Free. **www.daleville.us**

Alabama (Headland) — Apr. 22 F T V
8 AM – noon. *Spr:* Wiregrass ARC. Headland Town Square, Park St. *Tl:* 145.430 (186.2 Hz). *Adm:* Free. **www.w4dhn.org**

Alabama (Mobile) — Apr. 22 D F H Q V
8 AM – 1 PM. *Spr:* Mobile ARC. The Grounds, 1035 Cody Rd. N. *Tl:* none. *Adm:* $5. **www.w4iax.com**

California (Sonoma) — Apr. 22 D F H R T V
8 AM – noon. *Spr:* Valley of the Moon ARC. First Congregational Church of Sonoma, 252 W. Spain St. *Tl:* 145.35 (88 Hz). *Adm:* Free. **www.vomarc.org**

California (Visalia) — Apr. 21 – 23 D H Q R S
8 AM – 5 PM. *Spr:* Northern California DX Club. Visalia Convention Center, 303 E. Acequia Ave. *Tl:* none. *Adm:* $60. **www.dxconvention.com**

Connecticut (Gales Ferry) — May 6 H R
8 AM registration starts, 10 AM auction begins. *Spr:* Southeastern Connecticut ARS. Our Lady of Lourdes Church, 1650 CT-12. *Tl:* 146.730 (156.7 Hz). *Adm:* $5. **secars.org**

Connecticut (Thompson) — Apr. 23 D F H T
8 AM – noon. *Spr:* Eastern Connecticut ARA. Raceway Restaurant, 205 E. Thompson Rd. *Tl:* 147.225 MHz (156.7 Hz). *Adm:* $5. **www.ecara.net**

EASTERN VHF-UHF CONFERENCE AND MICROWAVE UPDATE

April 13 – 16, Windsor, Connecticut
D F H R S T
8 AM – 9 PM each day. *Spr:* North East Weak Signal Group. Hilton Garden Inn, 555 Corporate Dr. *Tl:* 144.200 USB. *Adm:* See website. **www.newsvhf.com**

ARRL DELAWARE STATE CONVENTION

April 15, Georgetown, Delaware
D F H Q R S T V
7 AM – 3 PM. *Spr:* Sussex ARA. Cheer Community Center, 20520 Sand Hill Rd. *Tl:* 146.090 (156.7 Hz). *Adm:* $6. **www.radioelectronicsexpo.com**

Florida (Dade City) — Apr. 8 F H R T V
8 AM – noon. *Spr:* East Pasco ARS. Church Ave parking lot, 37746 Church Ave. *Tl:* 146.880 (146.2 Hz). *Adm:* $5. **www.eparsonline.org**

Florida (New Port Richey) — Apr. 29 D F H R T
8 AM. *Spr:* Gulf Coast ARC. Millennium Academy, 10005 Ridge Rd. *Tl:* 146.670 (146.2 Hz). *Adm:* $5. **www.gulfcoastarc.com**

Florida (Tampa) — Apr. 15 F H Q R T V
7 AM – 1 PM. *Spr:* Tampa ARC. Tampa ARC building, 7801 N. 22nd St. *Tl:* 147.105 (146.2 Hz). *Adm:* $5. **www.hamclub.org**

Georgia (Resaca) — Apr. 22 D F H R T V
8 AM – 2 PM. *Spr:* Cherokee Capital ARS. Hill City Baptist Church, 1411 Hill City Rd. NW. *Tl:* 443.675 (100 Hz) and 146.745 (100 Hz). *Adm:* $5. **www.k4woc.com**

Georgia (Savannah) — Apr. 29 F H T
8 AM – 1 PM. *Spr:* Coastal ARS. Savannah/Hilton Head Regional Airport Recreation Building, Crossroads Pkwy. *Tl:* 442.70 (no tone). *Adm:* Free. **http://coastalamateurradiosociety.net/wpW4LHSblog**

Idaho (Kamiah) — Apr. 29 D F H R S V
8 AM – 3 PM. *Spr:* Clearwater Valley ARC. American Legion Hall, 618 Main St. *Tl:* 146.700 (88.5 Hz) and 146.680 (100 Hz). *Adm:* $5. Email: **c53@att.net**

Idaho (Meridian) — Apr. 1 F H R S T V
8 AM – 1 PM. *Spr:* South West Idaho ARC. Ten Mile Christian Church, 3500 W. Franklin Rd. *Tl:* 146.580 (simplex). *Adm:* Free. **www.k7swi.org**

Illinois (Sandwich) — May 7 D H R T
7 AM – 1 PM. *Spr:* Kishwaukee ARC. Sandwich Fair, 15730 Pratt Rd. *Tl:* 146.73 (100 Hz) and 146.52. *Adm:* $8 Advance, $10 door. **www.karc-club.org**

Illinois (Sullivan) — Apr. 29 D F H R T
8 AM – 1 PM. *Spr:* Moultrie Amateur Radio Klub. Sullivan American Legion Post 68, 8 E. Strain St. *Tl:* 146.655 (162.2 Hz). *Adm:* $5. **www.qsl.net/mark**

Indiana (New Castle) — Apr. 29 F R T
8 AM – noon. *Spr:* Henry County ARC. New Castle Armory, 1537 Grand Ave. *Tl:* 147.390 (127.3 Hz). *Adm:* $5. **www.w9ob.org**

ELLSWORTH HAM RADIO SYMPOSIUM

April 22, Ellsworth, Maine
R S
Noon – 4 PM. *Spr:* Ellsworth Amateur Wireless Association. Meadow View APTs Phase 4 Dining Hall, 25 Tweedie Ln. *Tl:* 146.910 (151.4 Hz). *Adm:* By donation (any amount). **www.eawa.org**

Maryland (Boonsboro) — May 6 D F H Q R S T V
7 AM – 1 PM. *Spr:* Antietam Radio Association. Washington County Agricultural Education Center, 7313 Sharpsburg Pike. *Tl:* 146.94, 147.09 (100.0 Hz). *Adm:* $7. **www.w3cwc.org**

Maryland (Odenton) — Apr. 23 D F H R T
7:30 AM – noon. *Spr:* Maryland Mobileers ARC. Odenton Volunteer Fire Company, 1425 Annapolis Rd. *Tl:* 146.805 (107.2 Hz). *Adm:* $5. **sites.google.com/view/marylandmobileers/hamfest?authuser=0**

Michigan (Cadillac) — May 6 D F H Q R V
8 AM – noon. *Spr:* Wexaukee ARC. Mackinaw Trail Middle School, 8401 S. Mackinaw Trail. *Tl:* 146.980 (no tone). *Adm:* $5. **www.wexaukeearc.org**

Michigan (Centreville) — Apr. 22 D F H R
8 AM – noon. *Spr:* St. Joseph County Michigan ARC. St. Joseph County Grange Fair, Building 52, 316 E. Charlotte St. (enter off of S. Franklin St.). *Tl:* 145.310 (123 Hz). *Adm:* $3. Email: **fuseboxr@hotmail.com**

Minnesota (Brainerd) — Apr. 15 F H Q R
9 AM – 1 PM. *Spr:* Brainerd Area ARC. Brainerd National Guard Armory, 1115 Wright St. *Tl:* 147.225 (no tone). *Adm:* $5. **brainerdham.org**

Mississippi (Corinth) — Apr. 1 – 2 D F H R V
Sat. 9 AM – 5 PM, Sun. 8 AM – noon. *Spr:* Alcorn Co. ARES. Crossroads Arena, 2800 S. Harper Rd. *Tl:* 146.925 (no tone). *Adm:* $8 adults, children free. **http://acares.reiselt.com/wordpress**

Missouri (Kansas City) — Apr. 15 D F H R S V
8 AM – noon. *Spr:* Ararat Shrine ARC. Ararat Shrine Temple, 5100 Ararat Dr. *Tl:* 145.130 (151.4 Hz). *Adm:* Free. **www.hambash.us**

New Hampshire (Moultonborough) — Apr. 15 D F H R T
7 AM – 11 PM. *Spr:* Lakes Region Repeater Association. Moultonborough Function Hall, 139 Old Rte 109. *Tl:* 147.03 (88.5 Hz). *Adm:* $10. **www.w1bst.org**

New Jersey (Landing) — Apr. 22 D F Q T
6 AM – 2 PM. *Spr:* Splitrock ARA. Landing Park Recreation Complex, 165 Landing Rd. *Tl:* 146.985 (131.8 Hz). *Adm:* $7. **www.splitrockara.org**

New Mexico (Roswell) — Apr. 15 D H R
8 AM – 2 PM. *Spr:* Pecos Valley ARC. Beginnings, 3908 S.E. Main St. *Tl:* 147.320 (146.2 Hz). *Adm:* $5. **https://pecosvalleyarc.com/alien-city-hamfest-2023**

New York (Mountainville) — May 7 D F H Q R T V
8 AM – noon. *Spr:* Orange Co. ARC. Black Rock Fish & Game Club, 5 Pleasant Hill Rd. *Tl:* 448.325 (123 Hz). *Adm:* $6. **www.ocarcny.org**

New York (Norwich) — Apr. 15 D F H R S T V
7 AM – 1 PM. *Spr:* Chenango Valley ARA. St. Bartholemew's Parish Hall, 81 E. Main St. *Tl:* 146.685 (110.9 Hz). *Adm:* $7. **www.cvara.net/hamfest**

New York (Palmyra) — Apr. 22 D F H R T
8 AM – 1 PM. *Spr:* Drumlins ARC. Palmyra VFW Post 6778, 4306 Rte. 31. *Tl:* 146.745 (71.9 Hz). *Adm:* $5. **www.drumlinsarc.us/hamfest**

North Carolina (Goldsboro) — May 6 T
8 AM – noon. *Spr:* Wayne Co. ARA. First Pentecostal Holiness Church, 1100 The First Church Rd. *Tl:* 146.85 (88.5 Hz). *Adm:* Free. **www.k4cyp.com**.

North Carolina (Winston-Salem) — Apr. 15 D F H R T
7 AM – 11 PM. *Spr:* Forsyth ARC. Robinhood Road Baptist Church, 5422 Robinhood Rd. *Tl:* 145.47 (100 Hz). *Adm:* $5. **www.w4nc.com**

Ohio (Athens) — Apr. 30 D F H R T V
8 AM – noon. *Spr:* Athens Co. ARA. Athens Community Center, 701 E. State St. *Tl:* 145.15 (no tone). *Adm:* $5. **ac-ara.org**

Ohio (Cuyahoga Falls) — Apr. 15 D F H Q V
8 AM – 1 PM. *Spr:* Cuyahoga Falls ARC. Emidio & Sons Banquet Center, 48 E. Bath Rd. *Tl:* 147.270 and 444.850 (both 110.9 Hz). *Adm:* $6 Advance, $7 door. **www.cfarc.org**

Ohio (Dover) — Apr. 22 D H R V
8 AM – 1 PM. *Spr:* Tusco ARC. Tuscarawas County Fairgrounds, 259 S. Tuscarawas Ave. *Tl:* 146.730 (71.9 Hz). *Adm:* $5. **www.w8zx.net**

Ohio (Toledo) — May 7 F H T
8 AM – 1 PM. *Spr:* Lucas Co. ARES. Toledo Speedway Racetrack, 5639 Benore Rd. *Tl:* 146.61 (103.5 Hz). *Adm:* $5. **swap.lucasares.org**

ARRL EASTERN PENNSYLVANIA SECTION CONVENTION

May 7, Bristol, Pennsylvania

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

Pennsylvania (Elizabeth) — Apr. 16 D F H R V
8 AM – noon. *Spr:* Two Rivers ARC. Elizabeth VFD Bingo Hall, 101 S. 1st Ave. *Tl:* 146.73 (no tone). *Adm:* $5. **www.trarc.net**

Pennsylvania (Spring Grove) — Apr. 29 D F H Q R S T V
8 AM – 1 PM. *Spr:* York Hamfest Foundation. Elicker's Grove Park, 511 Roths Church Rd. *Tl:* 147.330 (123.0 Hz). *Adm:* $5. **www.yorkhamfest.org**

Tennessee (Greeneville) — Apr. 15 D F H R T V
6 AM – noon. *Spr:* Andrew Johnson ARC. Greene County Fair, 123 Fairgrounds Cir. *Tl:* 145.390 (88.5 Hz). *Adm:* $10. **www.greenevillehamfest.com**

Texas (Baytown) — Apr. 1 D F H R S T V
6 AM – 2 PM. *Spr:* Eastside ARS. Baytown Community Center, 2407 Market St. *Tl:* 145.310 (167.9 Hz). *Adm:* $10. **www.earstx.org**

Texas (Belton) — Apr. 15 D F H R T V
7 AM – 1 PM. *Spr:* Temple ARC. Bell County Expo Center, 301 W Loop 121. *Tl:* 146.82 (123 Hz). *Adm:* $5. **www.tarc.org**

Texas (Emory) — Apr. 22 D F H Q R T V
7 AM – 2 PM. *Spr:* Rains ARA. Rains County Fairgrounds, 159 W. Lennon Dr. *Tl:* 146.92 (88.5 Hz). *Adm:* $5. **www.w5ent.org**

Virginia (Stanardsville) — Apr. 22 D F H Q R S T
8 AM – 2 PM. *Spr:* Greene Co. Virginia ARC. American Legion Greene Co. Post 128, 636 Madison Rd. *Tl:* 145.470 (151.4 Hz). *Adm:* $5 (under 14, free). **www.gcvarc.net**

West Virginia (Ripley) — May 7 D F H R S T V
8 AM – 1 PM. *Spr:* Jackson Co. ARC. Ripley Middle School, 1 W. School St. *Tl:* 146.67 (107.2 Hz). *Adm:* $5. **www.jcarc.net**

Wisconsin (Cedarburg) — May 6 D F H R
8 AM – noon. *Spr:* Ozaukee Radio Club. Columbia St. Mary's Center (Milwaukee Curling Club), W67N890 Washington Ave. *Tl:* 146.97 (127.3 Hz). *Adm:* $7. **www.ozaukeeradioclub.org**

Wisconsin (Stoughton) — Apr. 15 D F H V
8 AM – noon. *Spr:* Madison Area Repeater Association. Mandt Community Center, 400 Mandt Pkwy. *Tl:* 147.150 (123.0 Hz). *Adm:* $8 Advance, $10 door. **www.w9hsy.org**

Wisconsin (Superior) — May 6 F H Q R V
9 AM – 1 PM. *Spr:* Arrowhead Radio Amateurs Club. Head of the Lakes Fairgrounds, Multi-Purpose Building, 4700 Tower Ave. *Tl:* 146.940 (103.5 Hz). *Adm:* $10. **www.thearac.org**

To All Event Sponsors

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

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

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **May 1** to be listed in the **July** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's website for possible late changes, driving directions, and other event details. Please note that postal regulations prohibit mention in *QST* of games of chance, such as raffles or bingo.

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

Volunteers On the Air Update

VOTA excitement has been firing up the bands!

Check out **https://vota.arrl.org** for the latest schedule of ongoing and completed W1AW portable activations.

Listed below are some initial QSO tallies from recent W1AW portable activations as of February 9:

- W1AW/Ø Nebraska (January 11 – 17) = 7,002 QSOs
- W1AW/3 Delaware (January 18 – 24) = 2,546 QSOs
- W1AW/2 New York (January 25 – 31) = 8,619 QSOs
- W1AW/5 Texas (February 1 – 7) = 5,078 QSOs

Q&A

Q How do I get a QSL card after working a W1AW portable station?

A VOTA uses Logbook of The World only for QSO confirmations. ARRL Headquarters does not have (and will not be making or sending) any special QSL cards for this event. A few W1AW portable groups have mentioned they are getting QSL cards. They might try to find a way to offer some response by mail, so please stay tuned.

Q Can I work a W1AW portable station more than once on a given band or mode during the VOTA event?

A While you may contact any station you like at any time, please refrain from working the same W1AW portable state operation on the same bands and modes multiple times during their week-long activation. Other stations may want to make a contact, but it could be challenging to pull the new stations out of pileups when stations previously worked are also calling.

Q How can my volunteer points be of value to people if I'm operating using a club or friend's call sign?

A Please send an email to **vota@arrl.org** with an explanation of your operations, your personal call sign, your volunteer position, the call sign being used, and the duration of the event(s). We will tabulate contacts you make at your volunteer point value.

To follow state activation dates, the leaderboard, and related activities of VOTA, visit **https://vota.arrl.org**.

Write for *QST*

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

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

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

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

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

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

Certificate of Code Proficiency

Recipients

Sponsored by
VIBROPLEX
www.vibroplex.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.

November 2022	
Ryan M. Ernest, KFØGVX	10
Donald A. Cutshaw, KO4KYN	15
John S. Hickman, WW3B	15
Thomas J. McGuire	15
David A. Rose, N8GZ	15
Jack W. Bumgarner, WS5D	20
Keith A. Marang, W4AFB	20
Paul W. Peterson, K1HIS	20
Niece Haynes, KA1ULN	35
Dennis A. Mills, NT4U	40

December 2022	
Timothy W. Freeze, KO4ELL	10
Ronald W. Melcher, W3RFX	10
Ron Kinney, KCØZPS	15
John W. Wilson, K5BOI	15
Lawrence Obrowski, WØLRF	20
R. Charles Rippel, K8HU	20
Gary C. Tartanian, K3WK	20
John W. Wilson, K5BOI	20
Jack W. Bumgarner, WS5D	25
Steven H. Saef, AA2BB/4	25
John W. Wilson, K5BOI	25
R. Charles Rippel, K8HU	30
John W. Wilson, K5BOI	30
John W. Wilson, K5BOI	35

January 2023	
Scott F. Avery, AD4SA	10
Moses Bennett, KN6TXF	10
Erich C. Fitschen, KQ4BBC	10
Justin A. McKeever, KQ6BZ	10
Justin A. McKeever, KQ6BZ	15
George A. Stickney, W7BXW	15
Donald A. Cutshaw, KO4KYN	20
John H. Kelly, WA2CHV	20
Justin A. McKeever, KQ6BZ	20
Brian D. Smith, W9IND	25
Jack W. Bumgarner, WS5D	30

Congratulations to all of the recipients.

April 2023 W1AW Qualifying Runs

W1AW, the Hiram Percy Maxim Memorial Station at ARRL Headquarters in Newington, Connecticut, transmits Morse code Qualifying Runs to assist ham radio operators in increasing and perfecting their proficiency in Morse code. Amateur radio operators can earn a Certificate of Code Proficiency or endorsements by listening to W1AW Qualifying Runs.

April Qualifying Runs will be transmitted by W1AW in Newington, Connecticut, at the times shown on 1.802.5, 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 KH6TU on Wednesday, April 26, at 6 PM HST (0400 UTC on April 27) on 7047.5 and 14047.5 kHz. Unless indicated otherwise, sending speeds are from 40 to 10 WPM.

Amateur radio operators who participate in Qualifying Runs may submit proof of 1 minute of the highest speed they have copied in the hope of qualifying for the Certificate of Code Proficiency, or an endorsement to their existing certificate. Legibly copy at least 1 minute of text by hand, and mail the sheet to: W1AW Qualifying Runs, 225 Main St., Newington, CT USA 06111.

Include $10 (check or money order) if this is a submission for your initial Code Proficiency certificate; $7.50 if you are applying for an endorsement (available for speeds up to 40 WPM). Your test will be checked against the actual transmissions to determine if you have qualified.

Members of the North Fulton (Georgia) Amateur Radio League (**https://nfarl.org**) are offering to subsidize the total cost of a Code Proficiency certificate or endorsement submission for any individual age 21 years and younger, and who reside in either the US or Canada. Participants who wish to make use of this offer should indicate on their Qualifying Run submissions they are age 21 or younger, and certify as such via their signature. Eligible participants are not required to send any fee with their Code Proficiency submissions.

For more information about Qualifying Runs, please visit **www.arrl.org/qualifying-run-schedule**.

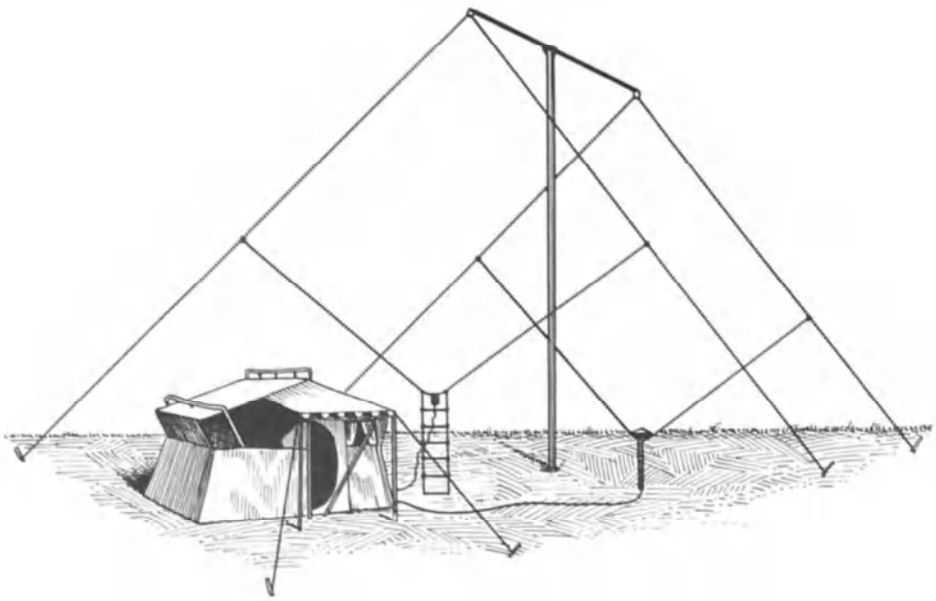
For information about how to qualify for the Certificate of Code Proficiency, please visit **www.arrl.org/code-proficiency-certificate**.

W1AW Qualifying Runs — April 2023
(All times are in Eastern Daylight Time.)

Monday	Tuesday	Wednesday	Thursday	Friday
4/3 4 PM – 2000Z 10 – 35 WPM	**4/4** 7 PM – 2300Z 35 – 10 WPM		**4/6** 10 PM – 0200Z **(4/7 – UTC)** 10 – 40 WPM	
	4/11 10 PM – 0200Z **(4/12 – UTC)** 10 – 35 WPM	**4/12** 7 PM – 2300Z 10 – 40 WPM		**4/14** 9 AM – 1300Z 35 – 10 WPM
	4/18 9 AM – 1300Z 10 – 35 WPM	**4/19** 10 PM – 0200Z **(4/20 – UTC)** 35 – 10 WPM	**4/20** 7 PM – 2300Z 10 – 35 WPM	**4/21** 4 PM – 2000Z 10 – 40 WPM
4/24 10 PM – 0200Z **(4/25 – UTC)** 10 – 40 WPM	**4/25** 9 AM – 1300Z 35 – 10 WPM		**4/27** 7 PM – 2300Z 10 – 35 WPM	**4/28** 4 PM – 2000Z 35 – 10 WPM

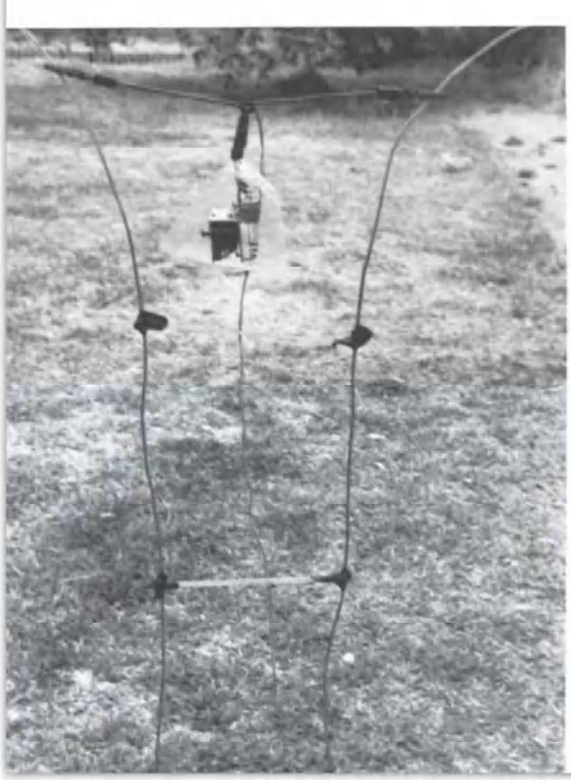
A Look Back


QST
devoted entirely to
amateur radio
May 1973
75 Cents
OFFICIAL JOURNAL OF THE ARRL



A PRACTICAL 40-METER QUAD

BY PETER H. GRILLO,* W9LVT/6



WHAT WAS IT that made Field Day a successful event for your club last year? Was it the publicity generated in your local newspaper? Was it the mere fact that the generator lasted the duration? Did you finally get enough operators to keep all the transmitters going simultaneously? For once, did you finally penetrate the ether and score well on the low bands primarily because the big antennas stayed up? Whatever your reasons may have been for a successful event, good luck certainly played its part since it takes only one small failure to dampen Field Day results. You say that you weren't so lucky? Oh well, there's always next year – or, how about Sweepstakes?

You can start planning right now for the next contest. One of the most perplexing problems continuously plaguing the Field Day committee is

* 2018 South Eighth Ave., Arcadia, CA 91006.

Fig. 1 — A simple relay arrangement is used to short out the stub and change the pattern of the antenna from one direction to another. A small plastic bag provides weatherproofing in the event it rains. (Doesn't it always?)

QST for

how to install a good antenna system. For most clubs, finding a good location is generally the easiest job. The location must be surveyed by the club antenna specialists. The decision of how many transmitters to use depends mostly on how many individual antennas can be set up for simultaneous operation as well as how many operators are available for the 24-hour stretch. Of course, an abundance of equipment is desirable.

Propagation conditions for Field Day and Sweepstakes generally favor the lower bands since they usually remain "open" all night. Success on the higher frequency bands (10 and 15 meters) depends primarily on catching the short-duration openings. As we approach the minimum of the present solar sunspot cycle, 80 and 40 meters will become the most productive bands. A good antenna system becomes critical. The old trick of tying a rock to the end of a long piece of wire, tossing it into the tallest tree and loading it with a coupler just won't "cut the mustard" anymore. Gain and directivity into the dense population areas is the goal. However, the antenna must be simple to construct, easy to tune, and moderately stable against the wrath of Murphy and Mother Nature.

Our club decided to try a two-element full-sized cubical quad for 40 meters. The immediate reaction within the more conservative ranks of our club was, "A 40-meter quad? It'll never work, the first breeze will knock it down!" With these objections in mind, we went ahead with our plans. Our location was approximately rectangular in shape, 60 feet wide, 500 feet long, and above the rest of the terrain. Of course, it just happened to be one of the highest locations in Winnebago County, Illinois!

The sketch illustrates the basic construction of the quad. Dimensions were estimated, using the formula

$$L(\text{feet}) = \frac{248}{F(\text{MHz})}$$

where L is the length of one side of the diamond. The parasitic element was constructed as a reflector using an extra long stub. A small relay shorts out the stub, thus converting the parasitic element from a reflector to a director (see Fig. 1).

The resonant frequency of the driven element is 7150 kHz, the middle of the band. The distance L for the driven element is 34 feet 8 inches. The parasitic element dimension is 5 percent smaller than the driven element. The stub is constructed so that the total circumference of the parasitic element with stub in the line is 5 percent greater than the driven element. L for the director is 33 feet. The stub length is 6 feet 9 inches. Eight-inch plastic spacers are placed between the two wires of the stub.

Supporting the quad is very simple. The mast is 50 feet high guyed with nylon ropes. The boom is constructed from two telescoping sections of electrical conduit and is 18 feet long. The elements are made from No. 14 stranded wire. The driven element is fed directly with RG-58/U coaxial cable.

Fig. 2 — The bottom section of a CDE Ham-M rotor can be adapted to serve as a boom-to-mast bracket.

Location of the stub short is determined by the point of maximum front-to-back ratio. The boom-to-mast construction utilizes the support base from a Ham-M rotator. All it takes is a couple of U-bolts and the boom-to-mast assembly is complete (see Fig. 2). The wire is strung from the end of the boom and is supported by a small piece of nylon rope and an egg insulator.

Results

Orientation for the quad was east and west. Favoring the eastern direction was the driven element/reflector combination whereas the driven element/director combination was broadside to the western direction. A local amateur, approximately 5 miles west of the Field Day site, assisted in tuning the quad for maximum front-to-back ratio. The end result was approximately 25 dB.

Results were a tremendous surprise! The antenna worked just as planned. The class of entry for simultaneous operation of two transmitters was used. One transmitter operated on 20 and 80 meters; the second transmitter was set up for 15 and 40 meters. Our club, W9AXD/9, scored third place in the two-transmitter class. Our biggest totals came from 40 meters – 693 contacts; over one third of our total number. For the first four hours of the contest the antenna was aimed east. A rate of 90 contacts per hour prevailed for five solid hours. From that point on it was a steady decline after a sharp drop to about 45 contacts per hour. It was later surmised that the reason for the drop in contact rate was lack of activity and difficulty in finding stations that hadn't been worked before. The East Coast QRM was drastically reduced by changing the switch from "east" to "west." By midmorning we were surprised to find only a dozen W5-stations listed in the log. The antenna may not have been too effective in the southern direction.

There is no reason why this arrangement couldn't be used for DX operating. The antenna could be positioned just underneath a beam for the higher frequency bands with the peak of the diamond supported from a boom placed through the top section of the tower. QST

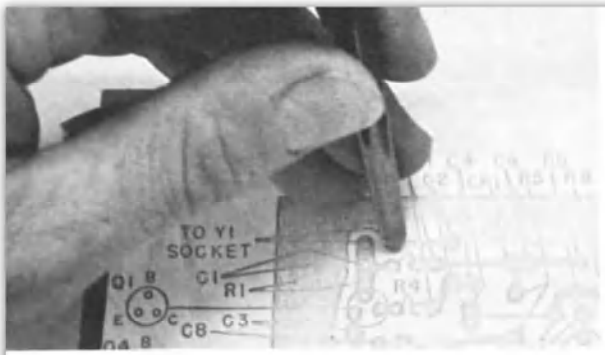


Fig. 1 — Locating holes for components with a center punch.

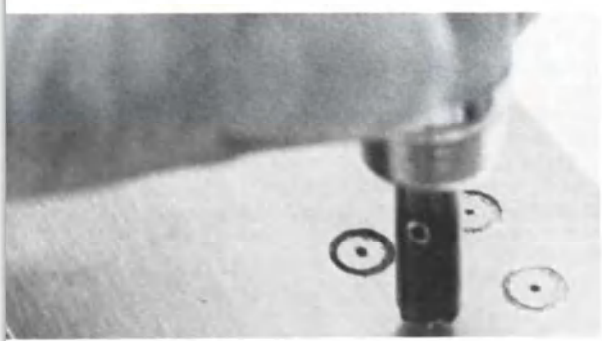


Fig. 2 — The isolated pads and the component holes can be made in one operation.

Gimmicks and Gadgets

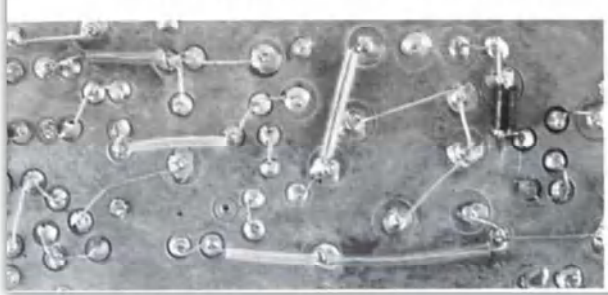
Isolated-Pad Circuit-Board Construction

BY ALFRED F. STAHLER,* W6AGX

A PROBLEM often encountered by the amateur is how to lay out a single circuit board without an inordinate expenditure of labor and time. The isolated-pad method of circuit-board construction is well suited to instances where only a few boards are desired. Another advantage of the isolated-pad technique lies in the ease and simplicity of transferring artwork to the board surface. Fig. 1 shows an electrostatic copy of the artwork taped to a board and the hole centers being directly transferred to the copper by a center punch. Once this is done each of the holes is drilled and an isolated pad formed around the hole (Fig. 2). The components are then inserted, soldered, and excess leads trimmed. Normally, the molten solder will not bridge the gap of the isolated pad because of surface tension. The components are then electrically joined by using tinned wire soldered to the projecting wire stubs. The resulting isolated-pad circuit-board is shown in Fig. 3.

* 5521 Big Oak Dr., San Jose, CA 95129.

Fig. 3 — Bottom view of pc board (copper-clad side) showing method of wiring components.



Use of the isolated-pad technique allows the builder to duplicate circuit templates with identical parts location and wiring layout. The component mounting is just as rugged as with etched pc-board construction.

An article by Ted Swift,[1] W6CMQ, suggested the basis for the construction technique described here. An improved version of the tool used in the Swift article was designed by the author. Improvements included a No. 60 drill as a center drill and adapting the shank to fit a Stanley Tools Co. Yankee screwdriver. Now the hole for the component wire and the isolated pad can be made simultaneously. The improved tool is shown in Fig. 4. These isolated-pad drills can be obtained from the author's son and a similar product is offered by Vector Electronics Co., parts No. P116 or P138. QST

[1] Swift, "Low-Cost Instant Printed-Circuit Boards," *Ham Radio*, August, 1971, p. 44.

Fig. 4 — Tool used in isolated-pad construction. Set screw allows removal of the No. 60 center drill. The shank will fit either an ordinary hand drill or certain push-type screwdrivers.

QST for

Celebrating Our Legacy

Gordon's Positive Influence

In 1955, Gordon was the coolest guy in eighth grade at my school in Stockton, California. He was tall, athletic, and pleasant to everyone. His house was close to mine, so we quickly became friends.

Just about anything Gordon took on, he did very well. Electronics sparked an interest in him, so he ordered a one-tube Knight-Kit from Allied Radio (now Allied Electronics & Automation), a plywood board, plus various parts for building simple circuits like a code practice oscillator kit or a regenerative AM radio. Because Gordon was getting into electronics, naturally, I had to get into electronics too, and that's what launched the rest of my life.

Radio electronics became a consuming fascination, leading to my Novice license in 1959 and my call sign, WV6FUF. When I upgraded to the General class, my call sign became WA6FUF.

As I was headed for dual careers in the military and commercial telecommunications, I met my future wife in one of my electronics engineering classes in college.

My friend Gordon and his Knight-Kit led me to a lifetime of ham radio. I frequently wonder what would have happened if he'd taken up stamp collecting instead.

Ron Russell, KG7OR
Lodi, California

I Owe It All to the Hobby

When I entered high school in 1966, I was fascinated by CB radio, which **was all the rage at the time. My science teacher, Bob Montgomery, K3WMH (SK), ran an amateur radio club. Upon consulting him about the best CB set to buy, he surprisingly said, "Randy, you don't want to do** that. You want to become an amateur radio operator."

As a Novice license holder, I enjoyed my Knight-Kit T-60 and Multi-Elmac PMR-7 receiver. When I earned my General license, I switched to the Multi-Elmac AF-67 transmitter. I built my first Heathkit HW-100 just before college. After graduating, I treated myself to a Heathkit SB-102 and Heathkit SB-200, and installed a Hy-Gain LJ-203BA antenna on my 30-foot tower.

Randy Maurer, WA3HLP (middle), aboard the USS *Nimitz* CVN-68 aircraft carrier in the Navy-Marine Corps Military Affiliate Radio System room. [Photo courtesy of Randy Maurer, WA3HLP]

While tuning on 20 meters I stumbled upon the Maritime Mobile Service Network. Captivated by all the military ships calling in, I became net control **from 1972 to 1997. I logged over 3,000 hours as net control and had around 10,000 phone patches in my logs. At this time in my life, I had a Hy-Gain LJ-204 and an RLP13-30 log periodic dipole array antenna with a Kenwood TL-922A amplifier.**

The highlight of my time in the hobby was following Operation Desert Shield/Desert Storm. I was involved with roughly 1,200 phone patches. **My primary client was the USS *Nimitz* CVN-68. The USNS *Comfort* hospital ship was also a recipient of many of** our phone patches.

Along with meeting my wife in the ham radio club, and our daughter earning her ham license, amateur **radio has many reasons to be the center of my life.**

Randy Maurer, WA3HLP
Ephrata, Pennsylvania

Old 6-meter Station Never Forgotten

Thanks to George Misic, KE8RN, for the great walk down memory lane with "The Clegg 66er and 22er Family" in the March 2021 issue "Classic Radio" column. In 1963, I began my 6-meter career with a Heathkit HW-29A "Sixer" **and eventually secured the Clegg 66er after working with a mix of other transmitters and receivers in between.**

I bought my 66er from Walter Ashe Radio Company in Saint Louis, Missouri. As luck would have it, they also had a National VFO-62, which would give the 66er transmitter frequency agility. Sure enough, they played well together.

My 66er/VFO-62 station was paired to a Mosley Scotch Master five-element 6-meter beam mounted to our chimney. The combination worked well and was a breeze to operate.

I sold the station in the summer of **1969, after I graduated college and as I was getting ready to enter the US Air Force active duty. I do miss that station. It was very basic but highly effective in the halcyon days of 6 meters.**

Thomas Webb, WA9AFM
Midwest City, Oklahoma

Gary S. Ash, AB1GA, gash99@comcast.net

Classic Radio

Recreating a 1950s Meissner Three-Tube Radio

On my tenth birthday in 1954, my parents gave me a Meissner 2BK radio kit. It had two tubes and a set of plug-in antenna coils, and used a 4.5 V A battery and a 90 V B battery. With the help of a local mentor, I got the radio running and enjoyed operating as a shortwave listener.

Unfortunately, I lost this radio in college during a move, but I kept the fond memories of how a simple radio could pick up distant stations. I had earned college degrees in electrical engineering and physics, but after losing my Meissner, I didn't do any radio operating during my career.

Operating my Meissner 2BK radio at 10 years old.

Getting Back into Radio

When I retired, I wanted to teach my grandchildren the mysteries of radio. I had obtained my Novice license in high school, but never mastered Morse code to be able to upgrade. So, I got out my ARRL books and studied to earn my Amateur Extra-class license.

I have a Yaesu FT-450D transceiver with a 235-foot-long, 160-meter off-center-fed dipole. With this set, I can contact a lot of stations around the world. But after earning my new license, I found that I was still thinking about my old Meissner kit. The A and B batteries are now hard to come by (and expensive), but I was able to find the plans for the ac-powered Meissner 3BK kit with an added tube for a rectifier, so I decided to recreate it. It's a super-regenerative design that requires delicate adjustment of the feedback to tune a signal.

Operating my reproduced Meissner 3BK radio today.

Gathering the Parts

The parts list was pretty short, and most of the items are readily available. The parts that were difficult to find were the two-gang tuning capacitor, #9693 socket for the antenna coils, and the coils themselves. Much to my surprise, I was able to purchase four of the six-piece set of antenna coils on eBay. Tuning capacitors with two unequal sections are pretty rare now, but I was able to find a dual-section one that was close enough.

The last thing I needed to find was the special five-prong coil socket. I searched a lot of places online, but couldn't find one. I have a 3D printer and a computer with com-

puter-aided design software, so I decided to draw a socket based on photos and measurements of the original coils. After only a few hours of print time, I had a bare socket made of black polylactic acid plastic. I used thin brass strips for the electrical contacts.

I found the capacitors, resistors, tube sockets, and other components from a variety of different electronics and antique radio suppliers. I even found a set of old Trimm 2000 Ω headphones.

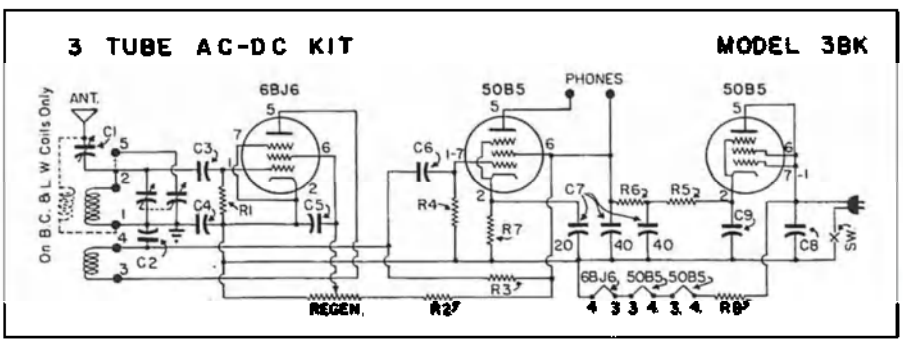
Final Assembly and Operation

I formed the chassis and front panel from an aluminum sheet, used spray paint with a silver hammered finish to mimic the original look, and applied a Meissner logo that I recreated with a waterslide decal. It looks just like my old radio!

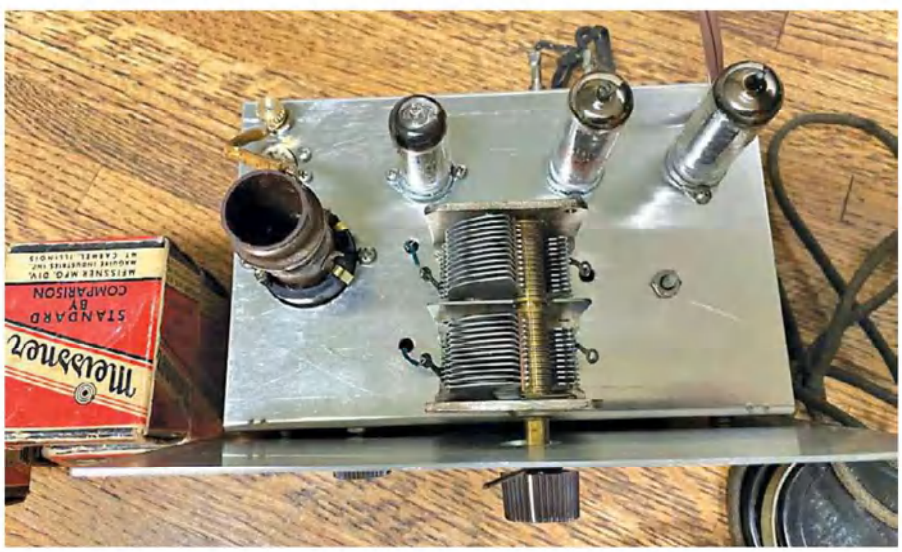
When I finally fired up the set, I could receive the standard AM band on one coil and swap to another coil for shortwave. Of course, it doesn't receive digital modes, FM, or SSB, but it does work and brings back vivid memories.

I'm still looking for the Meissner 18-3503 coil for 3.2 – 8.2 MHz. If you know where I can find one, contact me at **gash99@comcast.net**.

All photos by the author.



The circuit diagram I used to recreate the 1954 Meissner 3BK radio kit.



A top view of my reproduced Meissner 3BK. This radio uses four antenna coils for 550 kHz to 28 MHz.

The Meissner 18-3502 coil (on the right) and #9693 socket copy that I made with polylactic acid plastic using my 3D printer.

Strays

QST Congratulates...

Héctor Morales-Anaya, NP3IR, and Alan Applegate, KØBG, for earning the 2019 ARRL Technical Service Award. This award recognizes the most exemplary nature within the framework of amateur radio technical activities. The award was presented to Hector on December 11, 2022, by the Federación de Radio Aficionados de Puerto Rico Section Manager René Fonseca, NP3O, and Assistant Section Manager Leyda Ríos, WP4RBK, during their Christmas Hamfest in San Juan.

From left to right: Puerto Rico's Section Manager René Fonseca, NP3O; Héctor Morales-Ayala, NP3IR, and Assistant Section Manager Leyda Ríos, WP4RBK. [Angel Santana, WP3GW, photo]

100, 50, and 25 Years Ago

April 1923

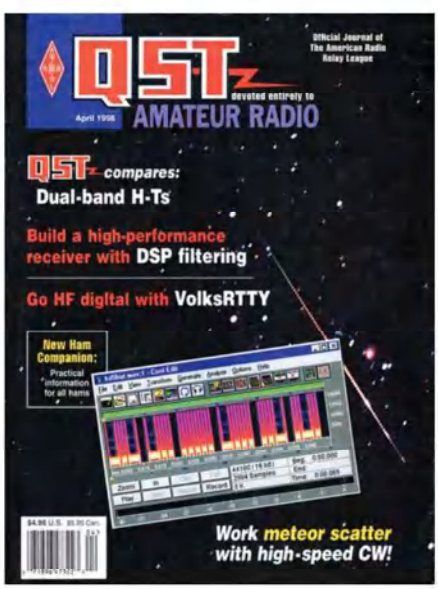
- With the Board of Direction calling for all amateurs to observe quiet hours, the cover shows an operator ready to go at just after 10:00, the "Time for Action."
- Professor L. A. Hazeltine shows how tuned R.F. amplification may be used, with all the benefits of resonant circuits, yet with complete elimination of the tendency to oscillate, in "Tuned Radio-Frequency Amplification with Neutralization of Capacity Coupling."
- In "6ZH Graduates by Radio," Lester Picker, 6ZH, having been injured in a fall, attended his high school graduation over the air, from his bedside 15 miles away.
- "Our A.R.R.L. Board of Direction" shows a photograph of the A.R.R.L. Board of Direction at its annual meeting in Chicago, February 17, 1923.
- "Editorials: Unscrambling the Eggs" explains that the White-Kellogg radio bill, having automatically expired, died with the ending of the 67th Congress.
- Ellsworth J. Hedges relates a story from a budding amateur, and asks, "Are We Fair to the Novice?" in "Radio Communications by the Amateurs."

April 1973

- On the cover, Bob Artigo, W6GFS, is testing his new solid-state 2-meter amplifier. The details are in "Fundamentals of Solid-State Power-Amplifier Design" by J. J. Johnson, ex-K4WYQ, and R. R. Artigo, W6GFS.
- "It Seems to Us…6013041B" asks for patience as we transition to computerized *QST* mailing labels.
- Albert D. Helfrick, K2BLA, constructs "A Solid-State SSB Generator with Digital Readout" using surplus components, and featuring a frequency counter as an "electronic dial."
- The first in a series, this *QST* "Extra" discusses various facets of the operation of rf transmission lines in "Another Look at Reflections" by M. Walter Maxwell, W2DU/W8KHK.
- Margaret S. Koerner, WBØBEM, helps newcomers toward the successful completion of their first FCC exam in "A Primer for Novices."
- Shortly after a devasting earthquake, IARU President/ARRL Vice President Robert W. Denniston, WØDX/YN1IU, rushes to Managua to observe and assist in the massive relief operations in "The Managua Earthquake — A Christmas Tragedy" by David Sumner, K1ZND.
- George Hart, W1NJM, provides a bit of history in "Operating News: W1AW 'Operators'" past and present.

April 1998

- You don't have to wait for a meteor shower to enjoy meteor scatter. The cover shows a Perseid meteor photo with a *CoolEdit* screenshot. The related article is "High-Speed CW and Meteor Scatter — An Exciting VHF DX Medium!" by Jim McMasters, KD5BUR.
- David Sumner, K1ZZ, tackles the Morse requirement in "It Seems to Us…The Joy of Morse."
- Rick Lindquist, N1RL, tells the story of his DXpedition to St Pierre and Miquelon in "The Great Miquelon Kite Caper."
- Connected to your PC and HF transceiver, this easily constructed interface puts you on RTTY and AMTOR for less than $40! View it in "VolksRTTY — An Improved *HamComm* Interface" by Terry Mayhan, K7SZL.
- The League's agreements with six "heavy hitters" of emergency management are outlined in "Public Service: The 'MO' of MOUs" by Rick Palm, K1CE.
- The habits new hams pick up, and what to do about them, are outlined in "FM & Repeaters: Your Technician Accent…And What to Do about It!" by James "Jay" Craswell, WØVNE.



Silent Keys

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

v N1ATI **Smith**, Roger W., Rochester, NH
vK1AXK **Mann**, Robert H., Framingham, MA
vW1BZA **Crossen**, James M., Falmouth, MA
v•W1CS **Dodd**, Spencer S., Jr., Melrose, MA
KB1CYV **Logan**, Roy E., Whitinsville, MA
AD1D **Zlotek**, David A., Nashua, NH
♦WB1GOT **Powell**, William H., Flemington, NJ
vW1GRN **Sowsy**, Paul, Brockton, MA
vW1GTT **Covey**, William H., Chapin, SC
NR1H **Roch**, Norman E., West Warwick, RI
vNW1H **Senghas**, Richard E., Scarborough, ME
♦K1HJC **Morgan**, Myrle H., Jr., Candia, NH
KA1HZD **Jolly**, George A., Sr., Springfield, MA
KB1IRB **Smith**, Philip L., Bridgeport, CT
N1JCW **Wolf**, James C., Hanson, MA
•KA1JGQ **Shadrick**, Warren G., Mansfield, MA
v•N1LFJ **Stocker**, Eugene H., Exeter, ME
•N1MJU **Gomez**, Damaso E., North Weymouth, MA
v•N1QBA **Grabowski**, William E., West Springfield, MA
vW1QM **Marion**, John F., Williamstown, MA
KB1SEQ **Orsborn**, James T., Billerica, MA
vWA1ZRP **Meedzan**, Theodore W., Milford, NH
♦N2BJL **Suhr**, Arthur R., Jr., Coram, NY
•KD2CXD **Killoran**, Patrick J., Nedrow, NY
WA2GEA **Bussell**, Harvey, Schenectady, NY
WA2GRV **Ludington**, Ramsey G., Fulton, NY
vN2IBJ **Gindoff**, Abe, Lakewood, NJ
N2IPH **Derderian**, Robert, Bridgeton, NJ
KA2NCT **Palazzo**, Amelia, Hampstead, NC
vN2PWW **Comiskey**, Joseph N., Bay Shore, NY
WC2R **Westgate**, Charles R., Cranberry Township, PA
vKC2ROJ **Meeker**, Richard B., Brick, NJ
vWB2UIK **White**, Kenneth W., Caroga Lake, NY
WA2USM **Genz**, Wayne P., Winfield Park, NJ
vK2VJG **Doran**, Robert C., Matthews, NC
♦WA2WD **Davis**, Wayne A., Trenton, NJ
W2YXS **Humphrey**, Leonard C., Chester Springs, PA
•KC2ZYD **Merwin**, Jonathan, Brick, NJ
N3AAP **Phillips**, David L., State College, PA
KB3ASA **Albanowski**, Albert G., Gettysburg, PA
KA3FHV **Rowles**, Jeffrey D., McMurray, PA
KB3HKS **Gray**, Robert A., Sr., Pittsville, MD
WA3HUI **Whittaker**, Russell E., Jr., Noblesville, IN
vW3IKL **Tewell**, Donald, Bethlehem, PA
N3IWJ **Gross**, Klaus M., East Bank, WV
vKA3JBY **Johnson**, Barry A., Souderton, PA
vWA3JTC **Manahan**, Richard R., Merritt Island, FL
NM3N **Caiazzo**, Joseph M., Bangor, PA
vAF3P **Menz**, William F., Hermitage, PA
♦NC3T **Bollinger**, Robert S., Great Cacapon, WV
KB3UEM **Fairman**, David J., Apollo, PA
vN3WL **Greiner**, Charles T., Camp Hill, PA
vWA3ZDO **Goode**, Chester J., Sr., Easton, PA
KB4ADF **Kennerty**, John N., Jr., Charleston, SC
vW4AXC **Phipps**, Donald C., Lancaster, SC
vWB4CRV **Lasley**, Jerry, Knoxville, TN
KK4FTO **Eastman**, Daniel F., Quartzsite, AZ
vWB4HDM **Hamrick**, Lynne R., McMinnville, TN
WB4HKC **Gooden**, Delmer F., Cleveland, TN
vK4HTJ **Chandler**, Medrick M., Midland, NC
K4JES **Strader**, John E., Barboursville, VA
♦K4JRB **Thompson**, David L., Peachtree Corners, GA
W4KIK **Michael**, Charles D., Findlay, OH
♦WA4KJA **Inscho**, Frank P., Madisonville, TN
vWD4LGN **Harper**, James L., Charlotte, NC
KF4LJE **Tenney**, John D., Five Points, AL
W4MLO **Jackson**, Miles S., Jr., Rossville, GA
KF4MLT **Aulick**, Charles M., Statesboro, GA
KI4MZN **Frawley**, Edward A., Sebring, FL
W4NZS **Malpass**, Noah C., Mount Olive, NC
WB4ONS **Danello**, David A., Blacksburg, VA
vKF4RJV **Dixon**, Jerry W., Salisbury, NC
•KD4RLH **Galliher**, John E., Norwood, NC
vKO4TDE **Crary**, Charles R., McKenzie, TN
WA4UJA **Paxton**, James M., Henrico, VA
N4UVC **Rowlette**, Robert O., Savannah, GA
KC4VIF **Vaughn**, Richard A., Dixon, KY
v♦WA4WCT **Erdman**, Robert V., Baker, FL
W4WNT **Turner**, William N., Weddington, NC
KA4WYC **Blythe**, Jeff, Clover, SC
•KN4ZC **Hassell**, Earl L., Jr., Trenton, TN
vWB4ZRH **Clark**, William H., Butte, MT
vKF4ZTV **Farrell**, George O., South Daytona, FL
vN5ALB **Harrison**, Donald L., Albuquerque, UT
vKD5CBT **Shaw**, Tom E., Sherwood, NM
vKA5CCS **Dunn**, Bennie E., Huttig, AR
vWA5CHF **Roby**, James W., Austin, TX
vK5DYA **Tipton**, Virgil R., Norman, OK
♦K5HOW **Dempster**, Roy E., Jr., Richardson, TX
W5JAT **Thompson**, John A., Granbury, TX
K5JCC **Roussel**, Peter, Houston, TX
N5JXV **Aubin**, Virgie M., Baton Rouge, LA
vKE5KR **Stokes**, Jack L., Oklahoma City, OK
W5LEF **Frenzel**, Louis E., Jr., Bulverde, TX
ND5OO **Day**, Gary L., Plainfield, IN
KF5PHA **Mustachia**, Michael, Houston, TX
KD5QQH **Benoit**, Randy J., Magnolia, TX
vW5TLJ **Johnson**, Terry L., Bangs, TX
♦W5TXV **Marshall**, Kenton E., Tomball, TX
vW5UMT **Garcia**, Victor, Jr., Round Rock, TX
•KD5XR **Perkins**, Clyde R., Jefferson, AR
KF6A **Kaeo**, Danford P. K., Jr., Alma, MI
AG6BP **Silva**, John, Fresno, CA
KM6CW **Murchison**, Stephen B., Long Beach, CA
vWB6CZG **Keane**, William J., III, Truckee, CA
vW6ER **Sexton**, Donald B., Fairfield, CA
N6FQG **Schmid**, Margrit H., Lompoc, CA
vKC6HLM **Chambers**, Lloyd G., Ripon, CA
K6MRM **Murphy**, Michael R., Carlsbad, CA
vAF6NJ **Geiger**, Charlie W., Simi Valley, CA
KI6OPN **Clark**, Barbara, Coeur d'Alene, ID
NN6R **Zimmerman**, Wayne P., Poway, CA
vK6SEK **Aldrich**, James V., Sonora, CA
vKA6VGA **Farrell**, Clayton F., Highland, CA
vAH6WX **Morris**, Victor F., Jr., Waikoloa, HI
WB6ZCO **Hill**, Woody L., Camarillo, CA
•KJ6ZVS **Cader**, Joyce L., Willits, CA
vWB6ZVU **Nichols**, Clarence D., Torrance, CA
vWU7B **Setter**, Benneth C., Syracuse, UT
♦WA7BSR **Marshall**, John L., Peoria, AZ
KG7BTL **Case**, James T., Vancouver, WA
N7CBM **Franco**, Joseph, Henderson, NV
vWB7CFT **Auger**, David S., Preston, ID
vW7CR **Meier**, Don E., Reno, NV
AG7HQ **French**, Albert L., Sisters, OR
•W7OHK **Reinhart**, Charles A., Sutherlin, OR
vKD7OIW **Petrotta**, Peter R., Carlsbad, CA
vW7SYE **Haller**, Kenneth E., Mukilteo, WA
AE7TC **Criswell**, Troy D., Lewiston, ID
vN7TLF **Ferguson**, Thomas L., Olympia, WA
KC8BSL **Hein**, Diana M., Calumet, MI
♦K8EAG **Cross**, Gilbert J., Ovid, MI
vWB8FFO **Hicks**, William, Jr., Hillsdale, MI
AC8G **Flasher**, Harry T., Dayton, OH
WA8GLE **Farhat**, Steven K., Akron, OH
KD8GVY **Taylor**, Earl T., Oak Harbor, OH
vW8GZF **Alexander**, John A., Saint Simons Island, GA
♦WN8L **Geib**, William E., Sugarcreek, OH
WD8LHS **Besonen**, Bill J., Trout Creek, MI
W8MAU **Cullen**, Robert M., Silver Spring, MD
WA8NGY **Mattix**, Mark C., Englewood, OH
KC8SSK **Drenthe**, James, Galesburg, MI
W8TE **Ackerman**, Richard B., Lawton, TX
vWK8Y **Davis**, Robert D., Spotsylvania, VA
vWB8ZDU **Casagrande**, Michael J., Cincinnati, OH
•WA9AQL **Tollefson**, Philip J., Pewaukee, WI
•KC9ASK **Knowles**, Michael J., Poseyville, IN
KB9ATR **Slough**, Jon E., Arnold, MO
KD9AUU **Kociara**, Robert F., Brookfield, IL
vWD9CVX **Shaffer**, Leonard, Auburn, IN
v♦KA9EKS **Richter**, Ralph C., Godfrey, IL
N9GAR **Moreman**, William L., Tilton, IL
WA9GVG **Tompkins**, Melvin W., New Castle, IN
vKC9IQI **Emerson**, Floyd F., Knightstown, IN
W9JOS **Shepard**, James, Terre Haute, IN
KA9KYB **Hicks**, John W., Madison, WI
vN9LLS **Gossfeld**, Walter A., Hartford, WI
N9MBV **Cantrell**, Micheal, Amboy, IN
K9REH **Harris**, Richard E., Morgantown, IN
KC9RSY **Finley**, William M., Quincy, IL
♦K9SGL **Brentlinger**, Theodore J., Terre Haute, IN
WB9TKB **Meinke**, Raymond O., Northbrook, IL
KA9VMV **Cahill**, Robert, Zion, IL
vW9WM **Belt**, William J., Pittsfield, IL
•KD9ZP **Olig**, Eugene A., Sr., Fond du Lac, WI
vKD9ZR **Cordes**, Frederick H., Mooresville, IN
KØAMD **Martin**, Thomas E., Omaha, NE
NØCFJ **Meyer**, Fred W., Marshalltown, IA
WØDGY **Meacham**, Scott B., Richmond, VA
vKBØDK **Van Slyke**, Marlin, Randolph, NE
v♦AAØF **Schwemle**, Donald K., Forestburg, SD
WDØFSI **Ewens**, Farrell L., Kansas City, MO
WØGMO **Miller**, David G., Longmont, CO
KEØGVL **Martinez**, Janette M., Kansas City, MO
♦KØHW **Wennblom**, R. James, Elk Point, SD
vWØIKE **Eichenlaub**, William, Red Wing, MN
WBØJEN **Husmann**, Michael L., Buffalo, MO
KFØJKB **Detwiler**, Geraldine R., Odessa, MO
KØODF **Bilyeu**, Lynn H., Chadron, NE
♦KØPFV **Lord**, John W., Omaha, NE
KØRWR **Rowlands**, Robert, Ballwin, MO
vNØTSZ **Kruft**, James E., Fargo, ND
•NØØUDP **Fox**, Tommy F., Springfield, MO
•NØUZF **Thiem**, Vera B., Grand Island, NE
♦WØWCH **Gergen**, Marc, Mesa, AZ
WAØYJX **Black**, George E., Adrian, MO
v•KØYNE **Buresh**, Paul E., Nelson, NE
WAØYSO **Treimer**, David R., Bettendorf, IA
CO2KK **Coro**, Arnaldo J., Havana, Cuba

♦ Life Member, ARRL
v Veteran
• Former call sign

For information on how to list a Silent Key in *QST*, please visit **www.arrl.org/silent-key-submission-guidelines**.

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

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• 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

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

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-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

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-3100R | *Rugged 65W 2M FM Transceiver*

• Rugged & Compact • Crystal Clear Front Panel Audio • 220 Memory Channels • Weather Broadcast Reception • Severe Weather Alert Feature

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-5DR *C4FM/FM 144/430 MHz Dual Band*

• High-Res Full-Color Touch Screen TFT LCD Display • Easy Hands-Free Operation w/Built-In Bluetooth© Unit • Built-In High Precision GPS Antenna • 1200/9600bps APRS Data Communications • Supports Simultaneous C4FM Digital • Micro SD Card Slot

FT-65R | *144/430 MHz Transceiver*

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

FTM-6000R | *50W VHF/UHF Mobile Transceiver*

• All New User Operating Interface-E2O-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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*Free Shipping and Fast Delivery!

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-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-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-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-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

IC-718 | *HF Transceiver*

• 160-10M** • 100W • 12V operation • Simple to use • CW Keyer Built-in • One touch band switching • Direct frequency input • VOX Built-in • Band stacking register • IF shift • 101 memories

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

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-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

ID-5100A Deluxe

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

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-2300H | *VHF FM Transceiver*

• 65W RF Output Power • 4.5W Audio Output • MIL-STD 810 G Specifications • 207 alphanumeric Memory Channels • Built-in CTCSS/DTCS Encode/Decode • DMS

IC-V86 | *VHF 7W HT*

• 7W OutputPower 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 Edges

IC-T10 | *Rugged 144/430 MHz Dual Band*

• Disaster Ready - Excellent Fit for Your Emergency Bag • Loud Audio - New Speaker Design • Long Bettery Life - Up to 11 Hours • FM Broadcast & Weather Channels

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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Wold's Best and Largest Selection of Clean, NO RF Hash, no RFI power supplies are designed for ultra-reliable ham radio! High duty cycles on switchers for long Digital mode transmissions!

75-Amps, $349.95

MFJ-4275MV high-current switching power supply gives 75A max/70A continuous. Great for ALS-500M amplifier. Adjustable output 4-16 VDC/ 110/220 VAC. Binding posts, quick connects, *PowerPoles*(R), cigarette lighter socket on front. Battery charger gives charging current of 20A max, 5A continuous. 9¾Wx5½H x9½D". Only 10.5 lbs.

45-Amps, $199.95

MFJ-4245MV Switching power supply gives 45A surge/40A continuous. 9-15 VDC out. 85-260 VAC in. Low ripple, highly regulated. 5-way posts, cigarette lighter, quick connects. 5 lbs., 7½Wx4¾Hx9D".

25-Amps, $164.95

MFJ-4225MV Switching power supply gives 25A surge, 22A continuous. Adjustable 9-15 VDC output, 85-260 AC input. Large 3" dual Amp/Volt meters, binding posts, cigarette lighter socket. 3.7 lbs., 5¼Wx4½Hx6D".

$169.95

30A, 4-16V Adjustable, *PowerPoles*™, and binding posts, Volt/Amp Meter ...

Ham Radio's Best Seller!

MFJ-4230MV, $154.95 *Binding Posts* on back.

MFJ-4230MPF, $149.95 *PowerPoles*(R) on front of unit.

MFJ-4230DMP, $179.95 Like MFJ-4230MVP but has bright orange digital Volt/Amp display.

MFJ-4230MVP is ham radio's best compact switching power supply -- just 5Wx2½Hx6D" and 3 lbs. Takes up little room on your operating position and perfect for home station, field day, DXpeditions, camping, hiking or for your next business trip or vacation. Gives 25A continuously or 30Amps surge at 13.8 VDC. Voltage is front panel adjustable 4-16 VDC. Selectable input voltage of 120 or 240 VAC at 47-63 Hz lets you carry it with you and use it worldwide. Front panel rocker switch lets you choose Amp/Volt meter for continuous monitoring. Cool operation with excellent 75% efficiency. Extra low ripple and noise is less than 100 mV. It's quiet! Continuous air flow gently cools the power supply and a heat sensor increases fan speed if the temperature rises above 70 degrees celsius. Over-voltage and over-current protection fully protects your transceiver and has ALARM LED. DC output is 5-way binding posts on front ***and*** *PowerPoles*™ on back. Power your HF, VHF, UHF rig and accessories with ease.

35-Amps, $169.95

MFJ-4235MV switching power supply. 35A surge, 30A continuous. 4-16 VDC, 1% voltage regulation. <9 mV peak-to-peak ripple. AC in: 90-125 or 200-240V. 7Wx4¼Hx8¾D", 4 lbs.

35-Amps, $189.95

MFJ-4035MV 19.2 lb. transformer, 35A max, 30A continuous. 1-14 VDC out, 110 VAC in. Highly regulated, 1% load, 1 mV ripple. 5-way posts, cig lighter. 9½Wx6Hx9¾D".

15-Amps, $94.95

MFJ-4115. 17A surge, 15A cont. 13.8 VDC. 110/220 VAC. 3¾Wx2¼Hx7¾D", 1.5 lb. 5-way posts. **MFJ-4215MV, $94.95.** Like MFJ-4115 but has backlit volt/amp meters.

25-Amps, $129.95

MFJ-4125 gives 25A surge, 22A continuous. 13.8 VDC switcher has 5-way binding posts on front and quick connects on back. 3.5 lbs.

25-Amps, $144.95

MFJ-4125P. 25A surge, 22A continuous. 13.8 VDC switcher has 2-pair *PowerPoles*(R), 5-way posts, quick connects. 3.5 lbs.

28-Amps, $129.95

MFJ-4128. 28A surge, 25A cont. 13.8 VDC. AC: 85-135/170-260 VAC. 5-ways, cig sock. **MFJ-4218MV, $139.95.** 0-24 VDC,18A@13.8/9A@24VDC.

MFJ *PowerPole*(R) Splitters

MFJ-1104, $69.95 *PowerPole*(R) Splitter, 30 Amp fused input, outputs fused at 25, 10, 5A. Open fuse indicator. 2¾Wx3¼Hx1½D".

MFJ-1107, $84.95 40A fused binding posts input, 4 fused *PowerPole*(R) outputs, two 2.1 mm center positive power jacks.

MFJ-1106, $79.95 One in, six out *PowerPoles*(R). 30A total. 7 sets of mating conectors included.

MFJ High Current DC Multi-Outlet Strips

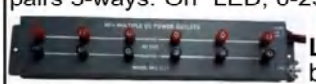
Power multiple transceivers/accessories from a single DC power supply

MFJ-1118, $119.95 **Power** two HF and/or VHF rigs and six accessories from rig's 12 VDC supply. 35A high-current and 15A accessory binding posts, Voltmeter, on/off switch. Master fuse, RF bypass. 12½Wx2¾Hx2½D".

MFJ-1129, $154.95 **10 outlets.** Installed fuses: two 1A, three 5A, three 10A, two 25A, one 40A. Outlets 1, 2, 4-8 are *PowerPoles*(R). Outlet 3 is a 35A high current post, outlet 9, 10 are 15A posts. Switch, voltmeter. 12½Wx1¼Hx2½D".

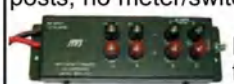
MFJ-1116, $84.95 **Like** MFJ-1118 but 15A total, 8 pairs 5-ways."On" LED, 0-25 VDC voltmeter.

MFJ-1128, $154.95 12 fused *Power Poles*(R), three 1A, four 5A, four 10A, one 25A, one 40A. Switch, Meter.



MFJ-1112, $69.95 **Like** MFJ-1116 but 6 pairs 5-way posts, no meter/switch. 12½Wx2¾Hx2½D".

MFJ-1126, $119.95 8 fused *PowerPoles*(R): a 1A, three 5A, two 10A, one 25A, one 40A. Switch, Voltmeter. 9Wx1½Hx2¾D".



MFJ-1117, $94.95 **High-current.** Powers four HF/VHF radios simultaneously -- 2 at 35A each, 2 at 35A combined. 8Wx2Hx3D".

MFJ-1124, $99.95 4 pairs 35A PowerPoles(R), 2 pairs 35A high current posts.

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Got Noise?!

MFJ has answers

Noise-Cancellers Wipe Out Interference

Null out all types of noise!!! Severe power line noise from arcing transformers and insulators, fluorescent lamps, dimmers, touch controlled lamps, computers, TV birdies, lightning, garage door openers, electric drills, motors, industrial processes. It's much more effective than a noise blanker because interference much stronger than a desired signal can be completely removed without affecting the desired signal. All modes -- SSB, AM, CW, FM, frequences from BCB to lower VHF.

Null out strong QRM on top of weak rare DX ! Null out a strong local ham or AM broadcast station to prevent your expensive receiver from overloading.

Use as an adjustable phasing network. Combine two antennas to give you a powerful receive station and have a variety of directional patterns.

MFJ-1026 **$269.95**

MFJ-1026 simply plugs between your transmitting antenna and your transceiver. To null, you adjust the amplitude and phase potentiometer controls for a minimum S-meter reading or low noise. To peak, push reverse.

Use built-in active or external antenna. *Constant Amplitude Phase Control*™ makes nulling super easy -- snag that rare DX you have missed.

RF-sense T/R switch auto bypasses your rig when you transmit. Adjustable T/R delay time. Use 12 VDC or 110 VAC with **MFJ-1312D, $26.95**. 6½X1½X6¼ inches.

MFJ-1025, $239.95. Like MFJ-1026, less the built-in active antenna. Use external antenna connection.

MFJ *Ultrasonic* Receiver with parabolic reflector *pinpoints* power line noise

HF and VHF operation can be affected by noise, makes it hard to hear weak stations, adds to fatigue. Often, noise comes from power lines. Power companies are willing to help with issues, but don't have equipment or trained personnel to locate it. MFJ aids in finding noise generated by corona discharge and arcing components. Acoustic receiver is tuned to 40 KHz. 18" diameter plastic dish gives a narrow beamwidth to pinpoint noise sources less than 12" at 50 feet. Also listen to nature: bats, birds, and insects!

MFJ-5008 **$249.95**

MFJ Power Line Noise Finder

MFJ-852 **$159.95**

Walk or drive around with these *handheld* power line noise meters to search out leaky insulators, loose hardware and corroded ground lines quickly. Track noise right down to the pole,transformer or insulator, or other source. Operates in 135 MHz region where activity is minimum and radiation from corona/arcing is more localized. 0.3 uV sensitivity and wide-range AGC for noise level meter -- *over 70 dB!*

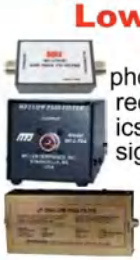
MFJ-1767, $129.95. Adds 3-element beam to MFJ-852.

MFJ-856, $209.95. Combination of MFJ-852 noise finder and MFJ-1767 three-element beam antenna.

MFJ Low-Noise Receiving Mag Loop

Clearly hear signals 50 KHz to 30 MHz you never knew existed. Power line noise and static disappears. Rotating the MFJ-1886 eliminates interfering signals or greatly peaks desired signals. Excellent antenna and preamplifier balance gives deep null. Gives excellent strong and weak signal performance without overload. Fully protected state-of-the-art push-pull Gali MMICs preamplifier gives high dynamic range, low IMD and 25 dB of low noise gain. Use inside or outside.

Reduce Harmonics, Avoid TVI with MFJ Low Pass Filters



Suppress TVI, RFI, telephone, other interference by reducing unwanted harmonics to your antenna. Your HF signal still passes through with low loss so you snag that rare DX! *Keep the wife and neighbors happy!*

MFJ-702B, $59.95. 200W. SWR below 1.5 to 30 MHz.

MFJ-704, $124.95. 1500W. SWR below 1.3 to 30 MHz.

MFJ-705, $179.95. 2500W. SWR below 1.3 to 30 MHz.

MFJ Clamp-on RF Ammeters

MFJ-854 **$159.95**

Clamp-On RF Ammeters quickly snap over wires and cables to measure RF currents flowing in antenna elements, radials, ground wires and on outside of coax. Tune counterpoises, radials, ground systems. Study/optimize antennas for peak performance. Find peaks/nulls. MFJ-854 has five calibrated ranges to 3 Amperes, including sensitive 30 mA range.

MFJ-853, $99.95. Like MFJ-854, Ranges: 0.3, 1, 3 A. Mini size.

MFJ-853H, $99.95. 3/10/30 A ranges.

MFJ-805, $139.95. Check RFI on cables up to 1/4" dia. VLF to VHF.

MFJ AC Line Filter/Protector

MFJ-1164B **$104.95**

Filters and reduces AC power line RFI, hash, noise, transients, surges generated by computers, motors, RF transmitters, static/lightning by 30 db and up to 60-80 dB with ground. Fast, *nano-second* overvoltage protection. Provides inductive isolation, capacitive decoupling, RFI rejection, overvoltage protection of common mode, differential signals. Rejects/shunts undesired signals to ground. 12Wx3½Hx2D".

Ferrite RFI Suppression Chokes

MFJ-700A4, $21.95. .275" diameter 4-Pack
MFJ-700B4, $21.95. .402" diameter. 4-Pack
MFJ-700C4, $34.95. .528" diameter 4-Pack
MFJ-700D4, $39.95. .750" diameter 4-Pack

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MFJ Dummy Loads & SWR/Wattmeters

Dummy Loads

World's most popular Dry 300 Watt HF /VHF Dummy Load

Air-cooled, non-inductive resistor in a perforated metal housing; Has SO-239 connector. Full 300W for 30 seconds. Derating curve to 5 minutes. SWR below 1.1:1 to 30 MHz, 1.5:1 30 to 650 MHz. Compact 2¼x2¼x7 inches. MFJ-260C $59.95
MFJ-260CN, $69.95. With type "N" connector.

Dry 1.5 kW HF/VHF/UHF Dummy Load

Ham radio's most versatile 1.5 kW 50 ohm *dry* dummy load covers DC to 650 MHz. SWR 1.1:1 to 30 MHz, 1.3:1 to 650 MHz. Handles 1500W for ten seconds, 100W for 10 minutes. 3Wx3Hx9D in. SO-239 connector. **MFJ-264N, $119.95.** With type "N" connector. MFJ-264 $109.95

Oil-Cooled 1 kW CW, 2 kW SSB 50-Ohm VersaLoad™

Run 1KW CW or 2 KW PEP for 10 minutes. Run *continuous duty* with 200 Watts CW or 400W PEP. Transformer oil included. SWR 1.2:1 to 30 MHz. Low SWR to 400 MHz. SO-239 connector. Safety vent with cap, carrying handle. 7½Hx6⅝D in. MFJ-250 $109.95
MFJ-250X, $89.95. No transformer oil.

500 MHz, 100 Watt Dummy Load

Connects directly with built-in PL-259. Finned aluminum air-cooled heatsink. 15 Watts continuous, 100W peak. SWR < 1.5:1, DC-500 MHz. 1⅝ inch round by 3 inches long. MFJ-261 $44.95 *With PL-259* DC to 500 MHz
MFJ-262B, $84.95. PL-259. 35 Watts continuous, 200W for 5-seconds. SWR< 1.2;1 DC-1 GHz.

MFJ 2500W fan-cooled Dry Load

MFJ's 2500 Watt *fan cooled* load handles legal limit amps, 2500W average one minute on, ten minutes off, 300W continuous. DC- 6 Meters. SWR <1.25, 30 MHz; <1.4, 30-60 MHz. Detailed power curve. 12 VDC or 110 VAC. 8¼Wx4Hx 9½D in. SO-239s. 5 pounds. MFJ-265 $279.95

Switchable RF Dummy Load

Select 16.6, 25, 50, 100, 150 Ohm dummy loads. Test/calibrate your wattmeters, SWR accuracy. At 50 Ohms it handles 300 Watts for 30 seconds with SWR < 1.1, 60 MHz. SO-239. 4½Wx2¼Hx6½D in. Optional 12 VDC/110 VAC adaptor, MFJ-1312D, $24.95. MFJ-251 $189.95

3 GHz, 300 Watts Dry Dummy Load

New high-tech metal film resistor on large heavy-duty air-cooled heatsink. 300 Watts for ten seconds and 125W *continuously.* SWR < 1.1, 1 GHz; <1.2, 1.5 GHz; <1.5, 3 GHz. N-connector. 10¾Wx2¼Hx5¼D inches. MFJ-263 $159.95

1.5kW Dry DummyLoad/SWR/Wattmeter

Tune up your transceiver, linear amplifier or antenna tuner into a safe 50 Ohm dummy load at *full power.* Then instantly switch to your antenna and monitor SWR, forward and reflected power on lighted cross-needle meter. 300/3000 Watt ranges. DC-60 MHz.Test/tune Xceivers, amps, tuners, baluns, filters, coax, stubs. MFJ-267 $219.95

SWR/Wattmeters

Compact Cross-Needle SWR/Wattmeters

Large 3-inch *lighted* Cross-Needle meter covers 1.8-200 MHz in 30/300W power ranges. Read forward, reflected power, SWR *simultaneously.* 3¼Wx3¼H x3¼D in. SO-239 connectors. MFJ-822 $84.95
MFJ-842, $84.95. 140-525 MHz, 15/150W.

High-accuracy 1.8-60 MHz Digital SWR/Wattmeter

Highly accurate! Auto-ranging select 25W, 250W, 1500W ranges with *full 10-bit* resolution. Frequency compensated data insures highest accuracy. *True* peak/average forward/reflected power, SWR and frequency are *simultaneously* displayed on backlit LCD and large 3-inch lighted cross needle meter. Peak hold. LED, buzzer, amplifier-bypass alerts and protects your amplifier when SWR is high and toggles extra relay. 6½Wx2⅝Hx6D". MFJ-828 $299.95
MFJ-826B, $229.95. No meter, ampr bypass, control relay.

MFJ GrandMaster™ SWR/Wattmeters

GrandMaster™ SWR/Power Meters are *the Cadillacs of ham radio!* Large 3¼x1¼ inch precision illuminated meter gives easy wide-angle viewing of SWR, forward or reflected power. 7½Wx3⅛Hx4¼D in. SO-239s. MFJ-870 $119.95
MFJ-870, $119.95. 1.6-60 MHz. 30/300/3000 Watt ranges.
MFJ-874, $159.95. 1.8-525 MHz. 5/20/200 Watt ranges.

MFJ *giant* 6.5 inch SWR/Wattmeter

World's *largest* HF+6M SWR/Wattmeter has *giant* 6½ inch meter! Extra-long scales gives highly accurate SWR/power 1.8-54 MHz. Huge numbers make reading easy. *True* peak or average forward and reflected power. 20/200/2000 Watt ranges. 9 Volt battery, 12 VDC or 110 VAC with MFJ-1312D, $24.95. 7Wx5½Hx5D in. SO-239s. MFJ-868B $199.95

VHF SWR/Wattmeter plus Field Strength

World's most popular -- and most affordable -- VHF SWR/Wattmeter. Read SWR, forward and reflected power over 144-220 MHz in two ranges, 30/300W. Built-in field strength meter for 1-220 MHz. 4½Wx2¼Hx3D". MFJ-812B $64.95

Compact Digital SWR/Wattmeters

Displays forward, refelected power, SWR (1.6-60 MHz) and battery *all in a single glance!* Large 1/2" forward power digits and 5/8" reflected/SWR digits! 0-200W. Power/backlight on/off. SO-239s. MFJ-845 $139.95
MFJ-847, $129.95. 125-525 MHz, 0-120W.

MFJ-849, $219.95. Large 3.5" bright orange LCD displays SWR, forward/reflected power. 1.5-525 MHz, 200W, HF/VHF-UHF switch.

MFJ HF *QRP* SWR/Wattmeter

Read forward, reflected power 1.8-50 MHz, 0-5W. Also reads SWR, relative power 100 mW to 50W. SO-239s. 4½Wx 2¼H x3D in. MFJ-813 $64.95

VHF/UHF SWR/Wattmeter

Lighted Cross-Needle,SWR/Watts, 144/220/440 MHz, 30/300W Forward power, 6/60W Reflected power. MFJ-862 $99.95

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MFJ Deluxe Code Oscillator

IN STOCK!

Wow! **MFJ-557, $74.95**

MFJ-557 lets you practice sending Morse Code at home, work, in your car, outside on the picnic table, anywhere. Volume adjusts from barely audible to full classroom sound. **Black Morse straight key on a non-skid heavy steel base -- stays put and doesn't move around while sending. Built-in speaker, adjustable contacts. Use 9V battery, not included. Compact 8.5Wx3.75Hx2.25D inches.**

MFJ-550
$34.95 Key only.

MFJ CW Reader and Keyer Combination

Plug MFJ's CW Reader with Keyer into your transceiver's phone jack and key jack.

Now you're ready to compete with the world's best hi-speed CW operators -- and *they won't even know you're still learning the code!* 5-99 WPM.

Automatic speed tracking. Large 2-line LCD shows send/receive messages. Use paddle or computer keyboard.

Easy operation. Front panel speed, volume controls, 4 message memories, type ahead buffer, read again buffer, adjust weight/sidetone, speaker. RFI free.

MFJ-551, $49.95. RFI suppressed keyboard, a must to avoid RFI problems.

MFJ-464
$269.95
(Keyboard, paddle not included.)

MFJ Pocket-Size *CW Reader*™ and *Code Tutor*

MFJ-461, $129.95. Place this tiny pocket size MFJ Morse Code Reader near your receiver's speaker and watch CW turn into solid text messages as they scroll across an easy-to-read LCD. No cables to hook-up, no computer, no interface, nothing else needed! Practice by copying along with the MFJ-461. Learn the code and increase your speed as you instantly see if you're right or wrong. Eavesdrop on interesting Morse QSOs from hams all over the world. MFJ's *AutoTrak*™ automatically locks on, tracks and displays CW to 99 WPM. Serial port lets you display full screen CW text on your computer monitor with your computer and terminal program. Tiny 2¼x3¼x1", 5½ oz. Fits in your shirt pocket, take it anywhere. Use 9 Volt battery.

MFJ-418, $129.95. Morse Code Tutor. Learn Morse code anywhere! Copy letters, numbers, prosigns or any combination or words or QSOs. ARRL/VEC format. Go from zero code speed to a high speed *CW Pro!* High contrast LCD, built-in speaker.

MFJ-407E Deluxe CW Keyer $139.95

MFJ Curtis-Keyer has all modes, dot-dash memories, jam-proof spacing, weight, sidetone, built-in speaker. Speed, weight and tone controls and tune, semi-auto and on/off are on front panel.

MFJ-401E *Econo* CW Keyer $119.95

Front-panel volume/speed controls (8-50 wpm), tune switch. Internally adjust weight/tone. Solid state keying. Tiny 4x2x3½ inches.

MFJ-564 Iambic Paddles $134.95

Deluxe Iambic paddles. Tension/contact spacing adjustments, steel bearings, precision frame, non-skid feet. Crome (MFJ-564) or Black (MFJ-564B).

MFJ-561 Tiny Iambic paddle $44.95

Tiny *Iambic paddle* is just 1¾Wx¾Hx1¾D", just 2½ oz. Precision paddle formed from phosphorous bronze, rugged metal base, non-skid rubber feet, wired.

MFJ-422E *Keyer/Paddle* $249.95

MFJ *CW keyer and Iambic Paddle* combo lets you send smooth, easy CW. Front panel volume/speed (8-50 WPM), built-in dot-dash memories, speaker, sidetone.

New! Ver. 3.0

MFJ-1234C-EBP . . . Remotely operate your transceiver from anywhere in the world!

MFJ-1234C-EBP
$304.95

Use any web browser on your phone, iPad, tablet, laptop, desktop even a Kindle!

Use nearly any rig with CAT control. All modes: SSB, CW, FM, digital. WSJT-X, FIdigi are installed.

Control via the internet-- radio, rotor, CW keying, VoIP, digital, logging, spot monitoring, callbook lookup.

Look-up calls using included FCC database or optional QRZ sub. Monitor DX spots for un-worked or unconfirmed calls.

Design, maintain multiple logs. Upload ADIF logs to ARRL LoTW server. Send CW from mobile device, keyboard or paddle.

Includes email, word processing, spreadsheet programs, 1000's of Linux programs. Modify, program RigPi features using text editor.

MFJ-1234C-EBP *requires a Raspberry Pi-4 or 3B+ provided by you.*

TECH HELP
- *https://rigpi.groups.io*
- *https://rigpi.net*

* RigPi trademarked, Howard Nurse, W6HN. Raspberry Pi is trademark of Raspberry Pi Foundation.

Plug & Play FT-8 and all Digital Modes!

MFJ-1205, $129.95. *Plug&Play* all digital modes! Specify your radio when ordering and just plug USB cable into your computer. Download *free* software from internet and operate: FT-8, JT4, JT-65, JT6M, FSK441, WSPR, PSK-31, EchoLink, APRS, CW, RTTY, packet, Amtor, more. Easy-to-set transmit/receive levels. Transformer isolated audio, PTT sensing eliminates adjustments. Universal, never obsolete.

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Forward Power
Reflected Power
SWR
All At Once!

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Testing, Tuning, Matching, Monitoring - Made Easy!

	CN-501H	CN-501H2	CN-501V/N
Frequency	1.8~150MHz	1.8~150MHz	140~525MHz
Power Range: Forward	15/150/1.5KW	20/200/2KW	20W/200W
Power Rating	1.5KW (1.8~60MHz) 1KW (144MHz)	2KW (1.8~60MHz) 1KW (144MHz)	200W (140~525MHz)
Tolerance	±10% at Full Scale	±10% at Full Scale	±10% at Full Scale
SWR Measurement	1:1~1:∞	1:1~1:∞	1:1~1:∞
SWR Detection Sensitivity	4W MIN	4W MIN	4W MIN
Input/Output Impedance	50 ohms	50 ohms	50 ohms
Input/Output Connectors	SO-239	SO-239	SO-239 or N-Type

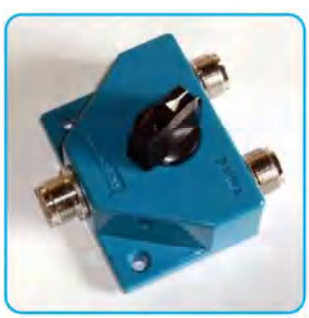
CN-501
Economy Series

Compact HF/VHF AVG reading SWR/Power Meter Cross needle technology displays:
• FORWARD POWER • REFLECTED POWER • SWR - Simultaneously!

	CN-901HP	CN-901HP3	CN-901V/N	CN-901G
Frequency	1.8~200MHz	1.8~200MHz	140~525MHz	900~1300MHz
Power Range: Forward	20/200/2KW	30/300/3KW	20/200W	2/20W
Tolerance	±10% at Full Scale	±10% at Full Scale	±10% at Full Scale	±10% at Full Scale
SWR Measurement	1:1~1:∞	1:1~1:∞	1:1~1:∞	1:1~1:∞
SWR Detection Sensitivity	5W MIN	5W MIN	5W MIN	0.4W
Input/Output Impedance	50 ohms	50 ohms	50 ohms	50 ohms
Input/Output Connectors	SO-239	SO-239	SO-239 or N-Type	N-Type

CN-901
Professional Series

AVG & True PEP power meter .5 second PEP delay to dampen the needle movement with on/off switch:
• FORWARD POWER • REFLECTED POWER • SWR - Simultaneously!



CS-201

Frequency Range (up to): 600MHz
Power Rating: 2.5 kW PEP1 kW CW
VSWR: Below 1.2:1
Insertion Loss: Less than 0.2 dB
Isolation: 60 dB 600 MHz
Connector: SO 239
Output Port: 2

CS-201GII

Frequency Range (up to): 2 GHz
Power Rating:
1.5 kW CW (up to 30 MHz)
250 W CW (up to 1 GHz)
150 W CW (up to 2 GHz)
VSWR: Below 1:1.3 at 1.3 GHz
Insertion Loss: Less than 1.2 dB at 1.2 GHz
Isolation: 50 dB 1 GHz
Connector: Gold Plated N-Type
Output Port: 2

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Reach for the Sky Mister!

MFJ **Get that antenna up where it belongs, high in the sky with MFJ *heavy-duty* Telescopic Masts and accessories. We got all you need for temporary, portable or permanent antenna installations.**

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 portablilty.

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.

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, $309.95 is 48' ext., 7.75-ft. collapsed, has 2½" OD bottom, 1" OD top, seven 7.75-ft. sections, 24 lbs.
MFJ-1906HD, $269.95 is 38' extended, 6 feet collapsed, has 2½" OD bottom, 1" OD top, seven 6-foot sections, 24 lbs.
MFJ-1904HD, $199.95 is 25' extended, 4 feet collapsed, has 2½" OD bottom, 1" OD top, seven 4-foot sections, 14 lbs.
MFJ-1904H, $179.95. 22' ext., 5' collapsed, 9 lbs. 2½" OD.
MFJ-1902H, $159.95, 10' ext., 38" collapsed, 5 lbs. 2½" 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, $219.95/MFJ-1908H, $279.95, 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 Quick*Clamps*™. Fit 3/4" to 2" OD.
MFJ-13HD, $84.95. Extra set clamps, 1- 2½" masts.

Mast Guy Ring Sets

Fits masts 3/4" to 1¼" dia OD. **MFJ-2830X, $13.95,** *fiberglass*; **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.

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.***

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 feet! Supports massive antennas. Adjustable length non-skid legs accommodates uneven ground surfaces. Optional foot anchors, *see bottom right* 14 lbs.

MFJ-1919, $129.95, *Large tripod* base spreads to 4.8 ft. Support 100 pounds. 7.8 ft, 9.75 lbs.

MFJ-1918, $84.95, *Smaller tripod* base spreads to 2.75 ft. Support 66 lbs. 6.75 lbs.

80-6 Meter Antenna

3.8 ft. fiberglass mast telescopes to a 31ft. self-supporting *high performance* 80-6 Meter vertical 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 M. 600W SSB/CW.

Use as temporary, portable or permanent antenna for home, RVs, camping, field day, hamfest, DX-pedition.

Includes four 12 foot radials. Current balun reduces feedline radiation and pattern distortion.

MFJ-2980
$139.95
40-6 Meters

MFJ-2982
$199.95
80-6 Meters

Tripod Anchors

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 1½"OD.

MFJ "HamStick" Isolated Dipole

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 1¼" OD.

MFJ-347
$34.95

3/8-24 Hamstick Mount

MFJ-342T
$24.95
Mount 3/8-24 HF/VHF hamsticks vertically or horizontally on masts to 1 inch. Built-in SO239.

MFJ Balcony Mount

MFJ-1907
$69.95

Mount *multiple* HF/VHF hamsticks, verticals, dipoles vertically or horizontally on your balcony. High-strength aircraft aluminum extends out 14". Two U-bolts mount to 1½"dia.

Portable Mast Supports

New!

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.

New!

MFJ-1914, $119.95. 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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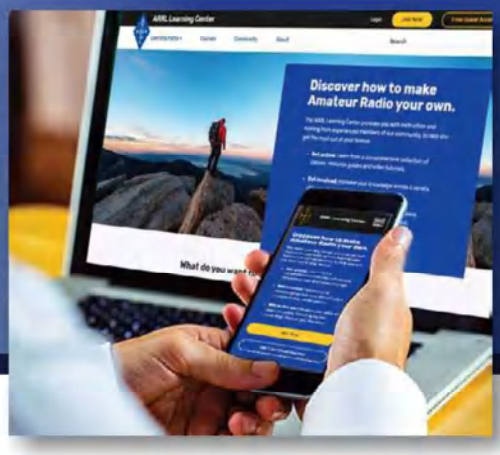

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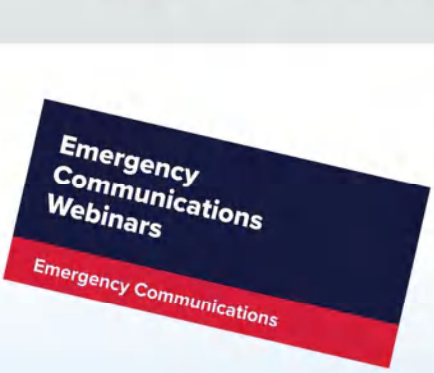

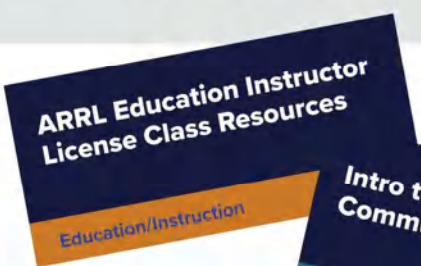

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"Best thing since sliced bread!"

More hams use MFJ analyzers than all others in the world!

MFJ-259D . . . World's Most Popular Antenna Analyzer!

MFJ-259D **$349.95** *New and improved, now covers 280 KHz-230 MHz!*

***World** famous* MFJ-259D gives you a complete picture of your antenna's SWR and Complex Impedance.

MFJ-259D is a complete ham radio test station including frequency counter, RF signal generator, *SWR Analyzer™*, RF Resistance/Reactance Analyzer, Coax Analyzer, Capacitance/Inductance Meter and more!

Read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

Determine velocity factor, coax cable loss in dB, length of coax and distance to short/open.

Read SWR, return loss and reflection coefficient at any frequency simultaneously.

Read inductance (uH) and capacitance (pF) at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

Built-in frequency counter, Ni-MH/Ni-CD charger circuit, battery saver, low battery warning, smooth reduction drive tuning.

Super easy-to-use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR, Complex impedance displayed instantly!

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. Use 10 AA or Ni-Cad or Ni-MH batteries (not included) or 110 VAC with MFJ-1312D, $26.95. Rugged metal cabinet, 4x2x6¾". **MFJ-249D, $329.95.**

MFJ-249D does everything MFJ-259D does with digital display only.

MFJ-269D . . . 280 KHz - 230 MHz plus 415-470 MHz, 12-bit A/D

New and improved. Now covers 280 KHz to 230 MHz and 415 to 470 MHz and 2200 Meter band!

Instantly gives you a complete picture of your antenna.

Read SWR, return loss, reflect-ion coefficient, match efficiency at any frequency simultaneously.

Read Complex Impedance (100 KHz to 230 MHz) as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads parallel equivalent resistance and reactance (Rp+jXp).

Determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

MFJ-269D **$449.95**

Coax Calculator™ calculates coax line length in feet given degrees and vice versa for any frequency, velocity factor.

Measure SWR and loss of coax with *any* characteristic impedance (280 KHz to 230 MHz) from 10 to over 600 Ohms.

Measures inductance in uH and capacitance in pF at RF frequencies, 100 KHz to 230 MHz.

High contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

12-bit A/D converter gives much better accuracy and resolution than common 8-bits -- *MFJ-269D exclusive!*

Built-in frequency counter, battery saver, low battery warning, Ni-Mh/NiCd charge circuit. 4Wx2Dx6¾", 2 lbs. Use ten aA batteries or 110 VAC with MFJ-1312D, $26.95.

MFJ-269DPRO™ SWR Analyzer

MFJ-269DPro, $489.95. Like MFJ-269D, but UHF range covers ***430 to 520 MHz***. For commercial work.

300/150 Watt *Tuner*

300W (6-1600) 150W (6-3200 Ohms)

MFJ-993B **$349.95**

Automatically tunes unbalanced and balanced antennas, ultra-fast automatic tuning and has 20,000 *VirtualAntenna™* memories. Has multiple antenna connections and antenna switch, efficient L-network, select 300 Watts (6-1600 Ohms impedance matching or 150W (6-3200 Ohms). 1.8-30 MHz, 4:1 balun, analog Cross-needle SWR/Wattmeter, backlit LCD, remote control port. Handles 300/150 Watts SSB/CW and digital.

MFJ-225 1.5-180 MHz *continuous* Two-Port Graphic Analyzer

Out in the field, the MFJ-225 is a compact completely *self-contained handheld graphing analyzer*. On the bench it becomes a full-fledged two-port (S21) desktop machine when teamed up with your PC. Using powerful IG-miniVNA freeware, you'll run de-tailed data analysis and print out stunning color-graphic plots to document your work! Built-in back-lighted *3-inch LCD graphic* display. Make fine adjustments using full-screen easy-to-view SWR bargraph, capture vivid swept displays for SWR, impedance, re-turn loss, phase angle, more. DDS generator.

MFJ-225 **$429.95**

SWR Analyzer Accessories

A. MFJ-29D/MFJ-39D, $49.95. Carrying Pouch for MFJ-259D/269D.

B. MFJ-92AA10, $49.95. 10-Pk 2500 mAh Ni-MH Supercells.

C. MFJ-66C, $59.95. Dip coils, set of two covers 1.8-230 MHz.

D. MFJ-731, $134.95. Tunable Analyzer Filter, 1.8-30 MHz, for strong RF fields.

E. MFJ-917, $54.95. 1:1 Current balun for SWR Analyzers to test balanced line antennas, other loads.

F. MFJ-7737, $8.95. PL-259 to BNC Female.

G. MFJ-7727, $9.95. PL-259 to SMA Female.

H. MFJ-5510C, $24.95. 12VDC cigarette lighter adapter.

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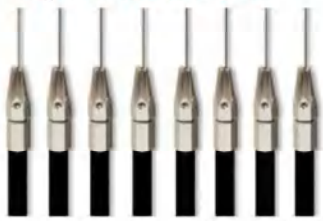

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HybridDX™ HF antenna. Get on 6M to 160M in less than 80 ft.

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Buy American! MFJ automatic tuners are built on American soil by American workers right here in Starkville, Mississippi USA.

MFJ *IntelliTuner*™ Automatic Tuners

MFJ-993B
$349.95

The MFJ-993B *IntelliTuner*™ lets you tune any antenna *automatically -- ultra fast.*

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas, wire connection and 4:1 current balun for balanced lines. *Full Digital Power!*

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *Instant Recall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

You get a highly efficient L-network, 6-1600 ohm matching at 300 Watts SSB/CW and digital or *extra-wide* 6-3200 Ohm matching at 150 Watts SSB/CW and digital, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays. MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!* 10Wx2¾Hx9D inches. Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $31.95**. Radio interface cables, remote control available. See ***www.mfjenterprises.com***

made in USA

600 Watt MFJ Automatic Antenna Tuner

MFJ-994B, $409.95. Like MFJ-993B but handles 600 Watts SSB/CW/Digital, matches 12-800 Ohms. 10,000 memories. Doesn't have LCD, antenna switch, balun, audio SWR meter. 10Wx2¾Hx9D inches.

More hams use MFJ tuners than all other tuners in the world!

World's most advanced Automatic Antenna Tuners feature world renowned MFJ AdaptiveSearch™ and AutomaticRecall™ algorithms -- world's fastest ultra-wide range tuning. Nine World Class models! Choose your features: Digital/Analog/Audio SWR-Wattmeter, Antenna Switch, Balun, Radio Interface, Digital frequency readout, Remoteable, Coax/Balanced Lines/Wire Tuning, Field Upgradeable . . .

1500 Watt *Legal Limit*

for Ameritron AL-1500/1200/82 amps

MFJ-998
$769.95
Full Digital Power!

Roam the entire HF spectrum 1.8- 30 MHz *hands-free* with full *1500 Watt* legal limit on SSB/CW/Digital and near-perfect SWR! Lighted LCD/Cross-Needle Meter.

300 Watt *Extra* Wide Range

SWR/Wattmeter, 10000 VA Memories

MFJ-991B
$289.95
Full Digital Power!

Extra *wide matching range at less cost.* MFJ's *exclusive* dual power level: 300 Watts for 6-1600 Ohms; 150Watts for 6-3200 Ohms. Cross-Needle SWR/Wattmeter.

200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

MFJ-929
$299.95
Full Digital Power!

World's fastest compact auto tuner uses MFJ *Adaptive Search*™ and *InstantRecall*™ algorithms. 132,072 tuning solutions instantly match virtually any antenna with near perfect SWR. Bright LCD Display.

200 Watt *MightyMite*™

Matches IC-706, FT-857D, TS-50S

Full Digital Power!

MFJ-939KIY
$199.95

200W SSB/CW and Digital. Low-profile automatic tuner is great for those tiny new rigs. Just tune and talk! Includes interface cable, 2-year warranty. 6½Wx2⅞Hx8⅜D".

MFJ *Remote* AutoTuners

Get greatly reduced losses and high efficiencies with long coax runs and high SWR antennas. *Full Digital Power!*

MFJ-926B, $379.95. 200W.
MFJ-993BRT, $389.95. 300W.
MFJ-994BRT, $509.95. 600W.
MFJ-998BRT, $919.95. 1.5 kW.

G5RV Antennas

MFJ-1778
$89.95

Cover 160-10 Meters with antenna tuner. 102 ft. long. Use as inverted vee or sloper, 160 Meters as Marconi. 1500 Watts. Super-strong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators.

MFJ-1778M, $79.95. 52'. 40-10M.

No Matter What™ Warranty

Protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace (at our option) for a full year.

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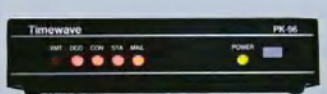

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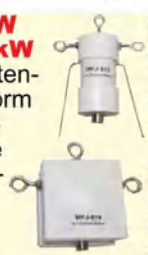

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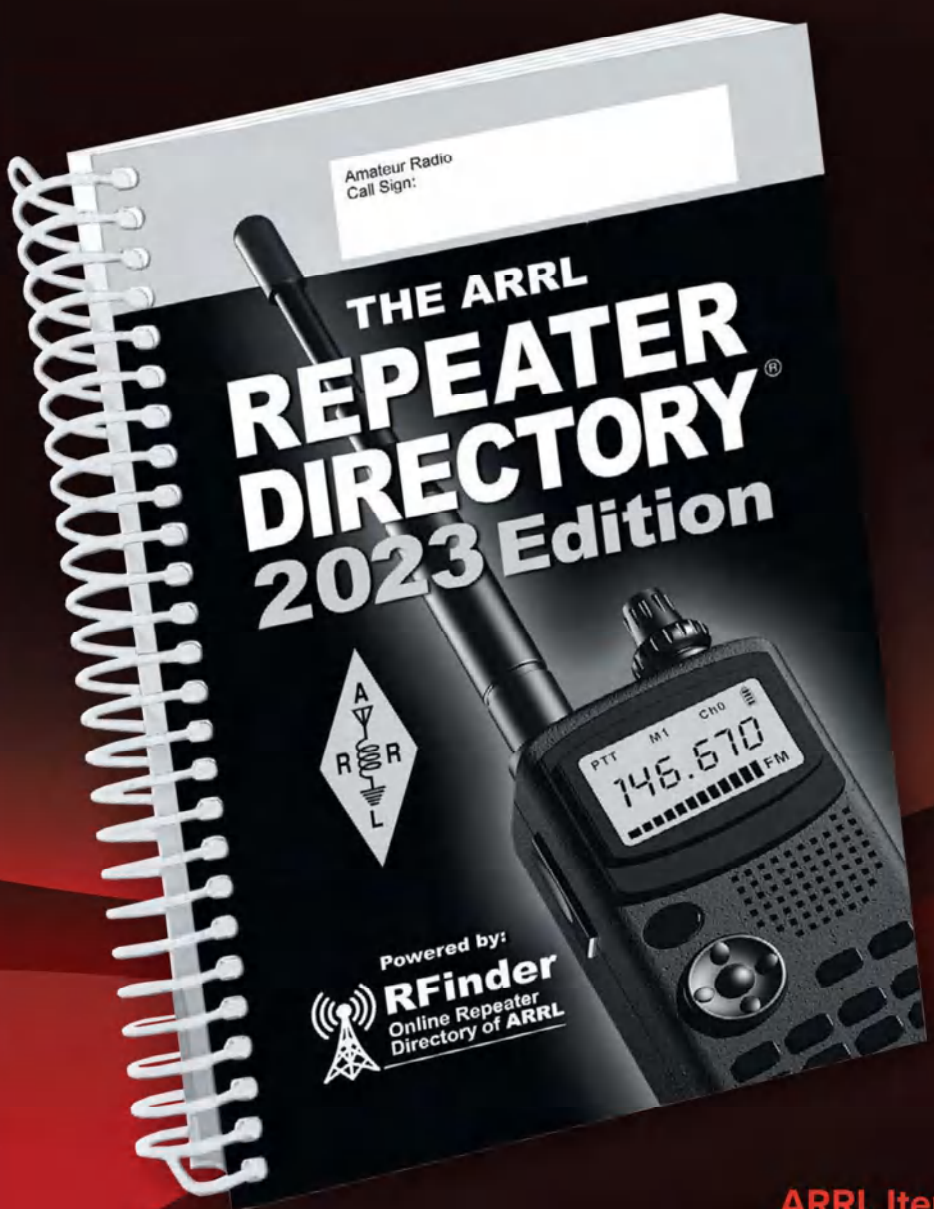

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8. 36-inch Aluminum Circular Loop with Integrated welded capacitor and mast mounting brackets

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A ***New*** larger matching capacitor is 313 pF. Increases matching range. Butterfly capacitor has no rotating contacts.

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• **Nearly invisible,** no-tangle black *Teflon* insulated radiator wire.

• **Weather** and U/V resistant. Easy storage and transport.

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MFJ 10-40 Meters *Portable* Antenna

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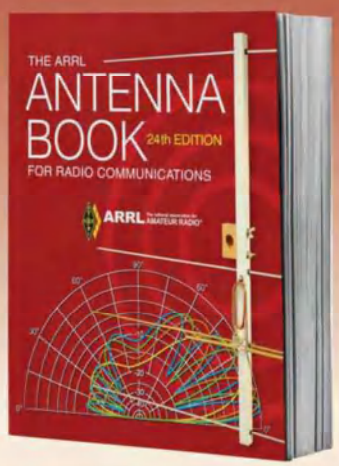

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