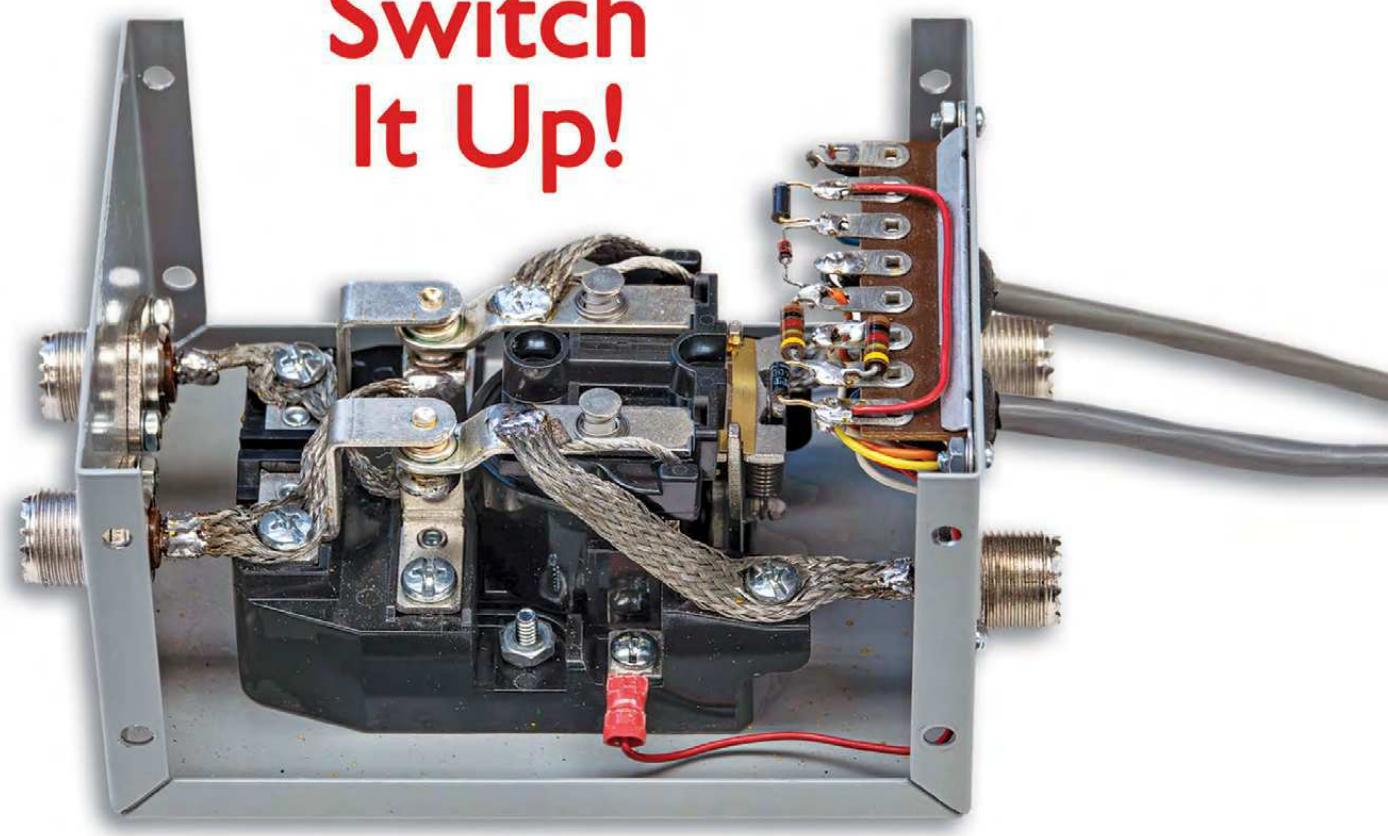
QST
DIGITAL EDITION

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

Switch It Up!



QST Reviews

PreppComm MMX Multiband Morse Code Transceiver

Icom AH-730 Automatic Antenna Tuner

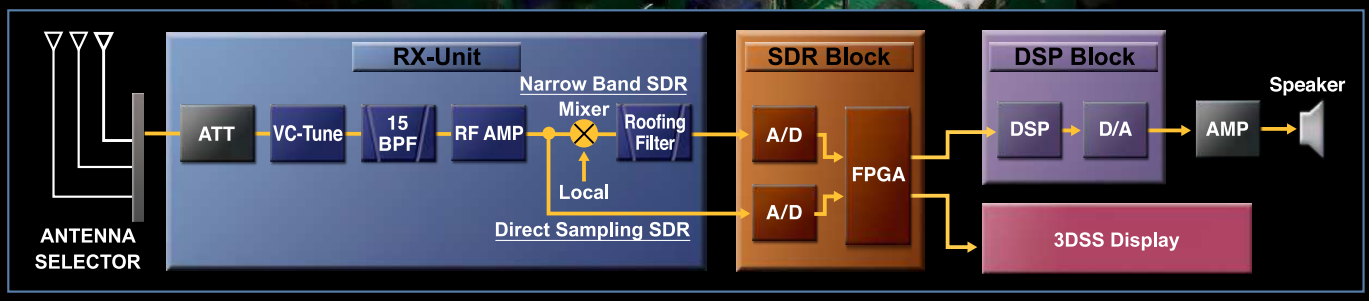
Chelegance JNCRadio M-104 Four-Band HF Portable Antenna Kit

The radio... YAESU

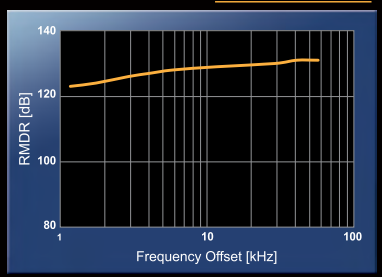
FTDX101 TECHNICAL HIGHLIGHT

True Performance
Hybrid SDR Configuration

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

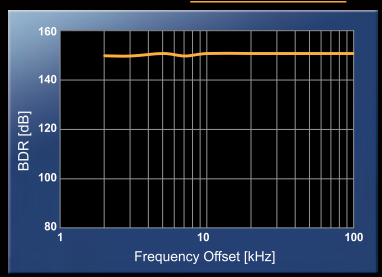


2kHz RMDR 123dB+



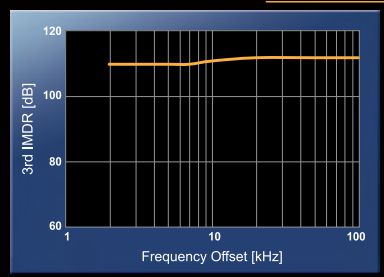
14MHz Band Reciprocal Mixing Dynamic Range (RMDR)

2kHz BDR 150dB+



14MHz Band Blocking Dynamic Range (BDR)

2kHz 3rd IMDR 110dB+



3rd IM Dynamic Range (IMDR)

HF/50MHz TRANSCEIVER
FTDX101MP 200W

HF/50MHz TRANSCEIVER
FTDX101D 100W

* Microphone M-1: Optional

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**

The radio... YAESU

FTDX101 TECHNICAL HIGHLIGHT

3DSS (3-Dimensional Spectrum Stream)

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

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

3DSS
3D Spectrum Stream

HF/50MHz TRANSCEIVER
FTDX101MP 200W

HF/50MHz TRANSCEIVER
FTDX101D 100W

* Microphone M-1: Optional

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**

Cushcraft 10/15/20M Tribander Beams

Only the best tri-band antennas become DX classics, which is why the Cushcraft World-Ranger A4S, A3S, and A3WS go to the head of the class. For more than 30 years, these pace-setting performers have taken on the world's most demanding operating conditions and proven themselves every time. The key to success comes from attention to basics. For example, element length and spacing has been carefully refined over time, and high-power traps are still hand-made and individually tuned using labratory-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, the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these sold years ago are still in service! Conservative mechanical design, rugged over-sized components, stainless-steel hardware, and aircraft-grade 6063 make all the difference.

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

Cushcraft 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 6 bands!* Solid *signal-boosting directivity* in bantam size/weight.

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

The unique MA-6B is a *two-element Yagi* on 20/17/15/12/10/6 Meters. It delivers solid power-multiplying gain over a dipole on *all* bands. Automatic band switching and a super easy installation in a compact 26 pound package.

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

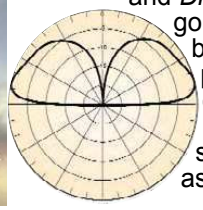
MA-5B, $759.95. Like MA-6B but 5 bands: 20/17/15/12/10 Meters. 12/17M is a single element trapped dipole.

Cushcraft R9 . . . 80-6M Vertical *. . . No Radials…1500W*

Cushraft high performance R9 vertical gives you 9 bands *without radials*!

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

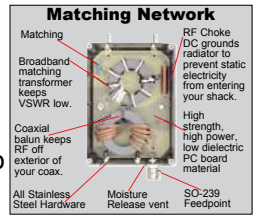
Use full *1500 Watts* SSB/CW and *Digital* when the going gets tough to break through pileups/poor band conditions.

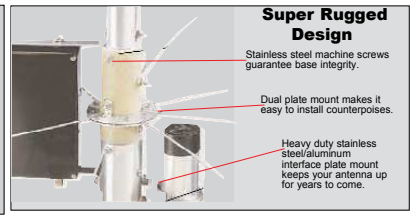


The R9 is super easy to assemble, installs just about anywhere, and its low profile blends inconspicuously into the background in urban and country settings alike.

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

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





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

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

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

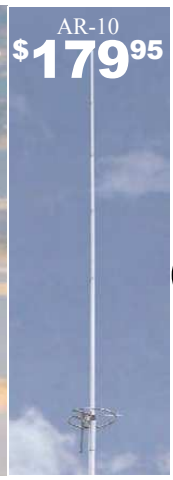
R-8GK, $99.95. Three-point guy kit for high winds.

Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios

Dual-bander VHF rigs are the norm now, so why not compliment your FM station with a dual-band Yagi? Not only will you eliminate a costly feed line, you'll realize extra gain for digital modes like high-speed packet and D-Star! Cushcraft's A270-6S provides 3 elements per band and the A270-10S provides 5 for solid point-to-point performance. Both pre-tuned. Assembly is a snap using fully illustrated manual.

Cushcraft Famous *Ringos* Compact FM Verticals



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

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

Cushcraft
Amateur Radio Antennas
308 Industrial Park Road, Starkville, MS 39759 USA
Open: 8-4:30 CST, Mon.-Fri.
Call: 662-323-5803 • *mfjcustserv@mfjenterprises.com*

Cushcraft . . . Amateur Radio Antennas . . . www.cushcraftamateur.com

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

CAA-500MarkII Antenna Analyzer

1.8-500MHz

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

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

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

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

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

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

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

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

COMET®

QST

Contents

March 2024 ♦ Volume 108 ♦ Number 3

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

Columns

Departments

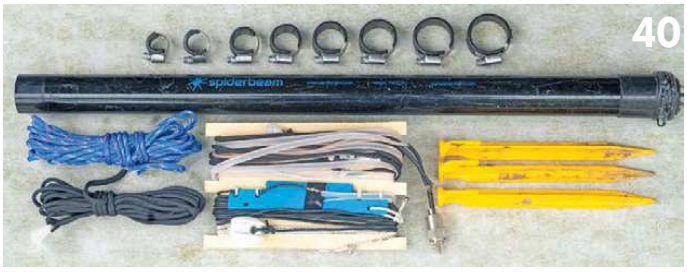
Digital and Mobile Editions

ARRL members can access the digital edition via a link at **www.arrl.org/qst**, download our iOS app from the iTunes Store, and download our Android app from the Google Play Store.

Write for *QST*

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

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



QST (ISSN 0033-4812) is published monthly as the official journal of the American Radio Relay League, Inc., 225 Main St., Newington, CT 06111-1400, USA. Volume 108, Number 1. 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 The Mail Group, 1501 Morse Ave., Elk Grove Village, IL 60007.

ARRL Membership and *QST* cannot be separated. All ARRL members have digital, online access to *QST*. Print subscriptions are available and sold separately. For ARRL members in the US, a subscription to *QST* via mail is $25 per year. For libraries and institutions, a subscription to *QST* is available for $84 per year; single copies $7.

ARRL Membership is available to individuals at $59 per year. A reduced rate is available for licensed radio amateurs under 26 years old, for $30 per year. Membership is available to the immediate family of a member living at the same address, and to anyone who is legally blind, for $12 per year. A complete list of dues rates is available at **www.arrl.org/join**. 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.

QST®, DXCC®, VUCC®, DX Century Club®, ARES®, Amateur Radio Emergency Service®, Logbook of The World®, LoTW®, and ARRL The National Association for Amateur Radio® are registered trademarks of the American Radio Relay League, Inc.

ARRL and *QST* in no way warrant the products described or reviewed herein.

QST is available to blind and physically handicapped individuals from the Library of Congress, National Library Service for the Blind and Physically Handicapped. Call 1-800-424-8567 or go to **www.loc.gov/nls/**.

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

To ensure prompt delivery, we ask that you periodically check the address information on your mailing label. If you find any inaccuracies, please contact Member Services at **circulation@arrl.org** or **860-594-0200**.

Reprints and permissions: **permission@arrl.org**

Online Privacy Policy: **www.arrl.org/online-privacy-policy**

Telephone: **860-594-0200**

Fax: **860-594-0259**

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

NEW!

Covering repeater systems throughout the US and Canada

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

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

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

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

ARRL Item No. 1854 | Retail Price $19.95

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

Order online at www.arrl.org/shop | Call toll-free 1-888-277-5289

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

PERCEPTION

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

REALITY

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

PROOF

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

SteppIR Antennas offer superior performance AND reliability!

Station QTH of LZ2BE

¡Bienvenidos a SteppIR!

steppIR COMMUNICATION SYSTEMS

Apoyo en Español

Presiona aquí para más información o llama a Alex 305.713.8575

FOR DETAILS ON PRODUCTS AND TO ORDER: 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

Second Century

Beware the Ides of March

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

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

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

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

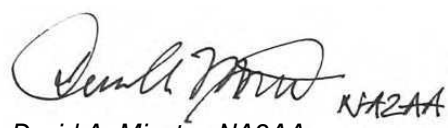
Moving beyond your property becomes a more serious challenge. Neighbors using any of the above may be easy to track down, but the problems they create may be impossible to solve. Elements of commercial power lines may cause interference and be difficult to track down precisely and solve. If you're stumped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

Looking at the bigger picture, we see threats to our spectrum from interference. At the 2024 ARRL Annual Meeting of the Board of Directors, the strongest position yet was taken in opposition to the Shortwave Modernization Coalition — a group advancing the interests of stock traders. The stations being constructed and operated use high power and propose to transmit adjacent to our bands. We will be exploring ways our Volunteer Monitors can observe their signals and record interference.

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

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

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



David A. Minster, NA2AA
Chief Executive Officer

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

HAM-IV . . . $799.95

The most popular rotator in the world! For medium communications arrays up to 15 sq. feet wind load area. 5-second brake delay! Test/Calibrate function. Low temperature grease permits normal operation down to -30° F. Alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. Indicator potentiometer. Ferrite beads reduce RF susceptibility. Cinch plug plus 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength and electric locking steel wedge brake prevents wind induced ant-enna movement. North or South center of rotation scale on meter, low voltage control, max mast size of 2 1/16".

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

HAM-VII, $1099.95. Like HAM-VI but with ***DCU-3*** with *6* memories.

Tailtwister T-2X . . . $1099.95

For large medium antenna arrays up to 20 sq. ft. wind load. Choose ***DCU-2*** *digital* controller (T-2XD2) or *analog* control box (T-2X) with *new* 5-second brake delay and *new* Test/Calibrate function. Low temperature grease, alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, *new* weather-proof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing strength, electric locking *steel* wedge brake, N or S center of rotation scale on meter, low voltage control, 2 1/16" max. mast.

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

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

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

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

AR-500, $199.95. VHF/UHF, small HF beam Rotator.Remote control, precision ***steel*** gears, ***steel*** thrust bearings, cast aluminum housing, includes clamps, hardware, 110/220 VAC selectable.

DCU-3
$639.95

Digital Rotator Controller with 6 programmable Beam Headings

DCU-3, $639.95. Digital Controller lets you program 6 beam headings! Gives fully automatic or manual control of hy-gain HAM or Tailtwister Rotators.

Push a memory button or dial in your beam heading or let *Ham Radio Deluxe* (or other program) control your DCU-3. Antenna automatically rotates precisely, safely to desired direction.
DCU-2, $519.95. Like DCU-3 but less beam headings.

Replace Your Yaesu Rotator Controller

YRC-1, $459.95
Replace your Yaesu rotator controller. More features and a much more robust controller that is far less prone to lighning damage. YRC-1 costs less than repairing your original Yaesu controller!

hy-gain HF Vertical Antennas

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

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

AV-640, $659.95. Like AV-680 less 80M. 25 1/2', 17 1/2 lbs.
AV-620, $599.95. Like AV-640 less 40M. 22 1/2'/10 1/2 lbs.

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

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

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

hy-gain HF Beam Antennas

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

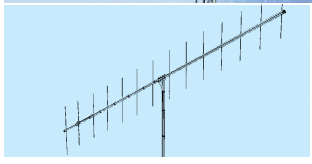
TH-11DX, $1799.95.
11-element, 4.0 kW PEP, 10,12,15,17,20 Meters. *The choice of top DXers.* With 11-elements, excellent gain and 5-bands, the super rugged TH-11DX is the *"Big Daddy"* of all HF beams! Features low loss log-periodic driven array on all bands with mono- band reflectors, BN-4000 high power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

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

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

TH-3JRS, $539.95. Compact 3-Element, 600 W PEP, 10, 15, 20 Meters. *Hy-gain's most popular, lowest-priced tri-bander fits smallest lot*, 14.75' turn radius, 21 lbs. Excellent gain/front-to-back. 80 MPH.

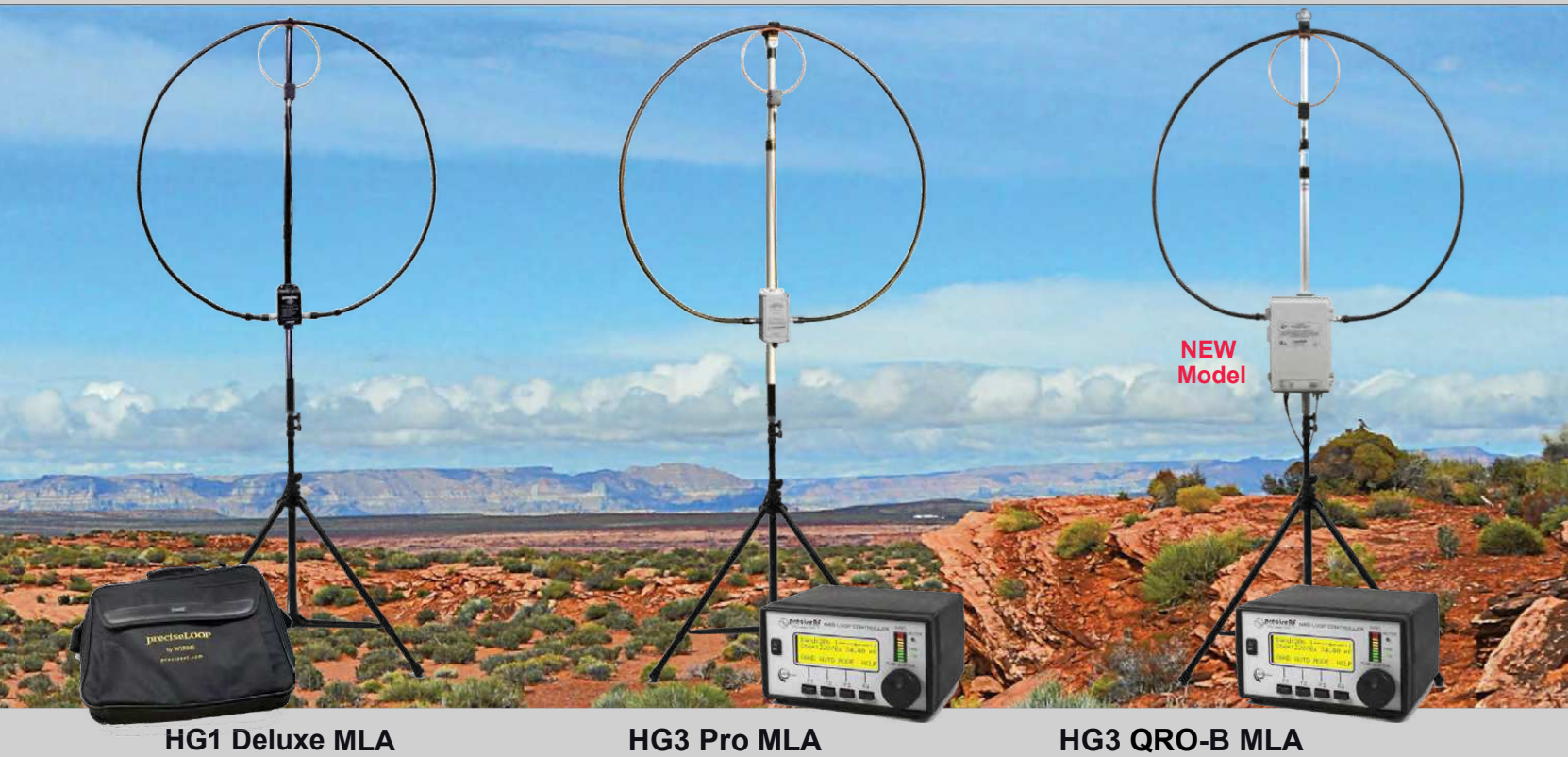
hy-gain VHF/UHF Antennas



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

hy-gain **Antennas & Rotators** 308 Industrial Park Rd, Starkville, MS 39759 USA
Sales/Tech: (662) 323-9538 Open 8-4:30 CST, Mon.-Fri. Prices and specifiecations subject to change. (C) 2023 hy-gain
www.mfjenterprises.com

Upgrade Your Antenna, Get The Best Mag Loop Today!



HG1 Deluxe MLA
Portable & Quick Setup
- 80m to 10m *
- 45W PEP
- LMR600 Radiation Loop
- Calibrated 6:1 Manual Tuning Dial

$535

HG3 Pro MLA
Remote Control & Auto Tuning
- 80m to 10m *
- 45W PEP
- LMR600 Radiation Loop
- Integrated SWR Bridge

$1,335

HG3 QRO-B MLA
Precision Remote Control & Auto Tuning
- 80m to 10m *
- 1000W PEP
- LMR600 Radiation Loop
- Integrated SWR Bridge

$3,025

See what our users say on their Facebook Group "***PreciseRF HG3 QRO***"

CONSIDER THESE BENEFITS IN YOUR NEXT MLA PURCHASE DECISION:

1. **Stepper Motor Tuning**
Precision in Every Tune: Achieve repeatable and precise tuning with higher resolution. Optimized Signal Quality. Enjoy the lowest SWR for clear communication.

2. **Microprocessor Control**
Control at Your Fingertips: Experience remote tuning for unparalleled convenience. Set the precise capacitor resonance value. Select bands quickly and seamlessly for spot-on tuning and minimal noise.

3. **Integrated SWR Bridge**
Optimal Signal Strength: The integrated SWR bridge automatically scans for the lowest SWR, ensuring peak transmitter performance, minimal noise, and greater convenience.

4. **Ideal for HOA Restrictions**
Setup Anywhere, Anytime: Easily deploy your mag loop in diverse locations. Freedom from elevation constraints, such as wire antennas. Great for HOA restrictions. Sets up easily in the attic.

5. **QRO High Q Vacuum Capacitor and Loop**
High-Power with Minimal losses for the Best Performance: Vacuum capacitor and higher loop surface area deliver greater efficiency. Wide tuning range provides coverage of all popular HF bands.

6. **Supported by Knowledgeable Hams**
Trusted Expertise: Choose a brand with a proven track record in the hands of knowledgeable hams. Dedicated Support: We are committed to providing comprehensive assistance and guidance for your mag loop setup.

SOTA-1 MLA $435
- High-Q Capacitor
- 3:1 Reduction Dial
- 15W PEP
- LMR400 Radiation Loop
- Lightweight Nylon Bag


Precision QRP tuner


Bag holds everything including the tripod

Tested and proven on Mt. Kilimanjaro
Gear up for your next adventure with the SOTA-1 MLA – your perfect companion for SOTA expeditions. Crafted from durable and lightweight materials, making it easy to carry on your hiking adventures.

Key Features:
- Lightweight Design: Ideal for easy transport on your outdoor journeys.
- Quick Deployment: Get up and running swiftly for a seamless SOTA experience.
- QRP Power: 15W PEP for maximum radio performance with minimal gear weight.

Order your SOTA-1 MLA today and elevate your summit conquests with the best SOTA performance yet.

Visit preciseRF.com to purchase your next MLA today.

• email: sales@preciserf.com • phone: 503-915-2490 •
• some features are optional • some limitations may apply • prices subject to change •

preciseRf
PRECISERF.COM ™

LDG ELECTRONICS

TRUSTED QUALITY
That Makes Amateur Radio EASY!

For novice & advanced users.

- √ Huge Selection
- √ Premium Quality
- √ Affordable Prices
- √ Unparalleled Customer Service

Desktop Tuners

Zero Power Tuners

Remote Tuners

Hobby Accessories

www.LDGElectronics.com

Phone: 410-586-2177

Serving HAMS Everywhere!

Sierra Harrop, W5DX, sharrop@arrl.org

Member Spotlight

Steve Herman, W7VOA

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

A Life Inspired by Working DXCC

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

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

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

Merging Radio and Journalism

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

VOA is chartered to explain the American worldview to audiences outside the US, many of which may hold significant differences. Steve relies on his experience in ham radio to approach that task. "Ham radio — despite the cultural, linguistic, societal, and political differences — is something that brings us all together," said Steve.

Further Ham Pursuits

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

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

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

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

Guide to Member Benefits

Join or Renew
www.arrl.org/join

Donate
www.arrl.org/donate

Benefits
www.arrl.org/benefits

Shop
www.arrl.org/shop

ARRL Online | www.arrl.org/myarrl

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.

ARRL Magazines | www.arrl.org/magazines

Members can access the digital editions of four ARRL magazines from a web browser and the free ARRL Magazines app available from Apple's App Store, Google Play, and Amazon Kindle. Members need a valid ARRL account to access the digital magazines, Periodicals Archive and Search, and the Product Review Archive. Print subscriptions are available and sold separately.

QST – ARRL's monthly membership journal
On the Air – for new and beginner-to-intermediate-level radio amateurs
QEX – A Forum for Communications Experimenters
NCJ – the National Contest Journal

E-Newsletters | www.arrl.org/opt-in-out

Subscribe to the weekly ARRL Letter, the monthly ARRL Current, and a variety of other e-newsletters and announcements for members. Keep up with ARRL News, publications, podcasts, and calendars.

Email Forwarding Service

Email sent to your **arrl.net** address will be forwarded to any email account you specify.

ARRL Learning Center | learn.arrl.org

This online learning environment is designed to help members get the most out of amateur radio. Courses, tutorials, and resources cover getting on the air, emergency communications, and electronics and technology.

Technical Information Service | www.arrl.org/tis

Call or email our expert ARRL Lab specialists for answers to all of your technical and operating questions.

Advocacy | www.arrl.org/regulatory-advocacy

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.

Logbook of The World – LoTW | www.arrl.org/lotw

Record your contacts and qualify for awards using ARRL's premier logging service.

Group Benefits* | www.arrl.org/benefits

ARRL Ham Radio Equipment Insurance Plan *US only

Find...

…a License Exam Session | **www.arrl.org/exam**
…a Licensing Class | **www.arrl.org/class**
…a Radio Club (ARRL-affiliated) | **www.arrl.org/clubs**
…a Hamfest or Convention | **www.arrl.org/hamfests**

Interested in Becoming a Ham?

www.arrl.org/newham
newham@arrl.org | Tel. 1-800-326-3942 (US)

Connect with ARRL

ARRL The National Association for Amateur Radio®
225 Main Street, Newington, CT 06111-1400 USA
1-860-594-0200, or 1-888-277-5289 (toll-free US only)
Mon. – Thurs. 8 AM to 7 PM EST, and Fri. 8 AM to 5 PM EST, except holidays

FAX 1-860-594-0259, email **hq@arrl.org**
Contact ARRL: **www.arrl.org/contact-arrl**

Website: **www.arrl.org**
Facebook: **@ARRL.org**
X: **@arrl, @w1aw, @arrl_ares**
Threads: **@arrlhq**
Instagram and Instagram TV: **@arrlhq**
YouTube: **ARRLHQ**
LinkedIn: **www.linkedin.com/company/american-radio-relay-league**

The American Radio Relay League, Inc.

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

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.

Officers, Division Directors, and Staff

As an ARRL member, you elect the Director and Vice Director who represent your Division on ARRL policy matters. If you have a question or comment about ARRL policies, contact your representatives listed below.

Officers

Founding President 1914-1936
Hiram Percy Maxim, W1AW

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

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

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

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

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

Treasurer
John Sager, WJ7S

Chief Financial Officer
Diane Middleton, W2DLM

Staff

Director of Operations
Bob Naumann, W5OV

VEC Manager
Maria Somma, AB1FM

Field Services Manager
Mike Walters, W8ZY

Radiosport & Regulatory Information Manager
Bart Jahnke, W9JJ

Laboratory Manager
George Spatta, W1GKS

Director of Emergency Management
Josh Johnston, KE5MHV

Membership Manager
Marc Spardello, W1NJ

Director of Marketing & Innovation
Bob Inderbitzen, NQ1R

Marketing Operations Manager
Jason Leonard

Retail Sales & Marketing Manager
Jackie Ferreira, KB1PWB

Advertising Sales Manager
Janet Rocco, W1JLR

Public Relations & Outreach Manager
Sierra Harrop, W5DX

Director of Publications & Editorial
Becky R. Schoenfeld, W1BXY

Education & Learning Manager
Steve Goodgame, K5ATA

Director of Development
Kevin Beal, K8EAL

Development Operations Manager
Christina Lessard, KC1TDM

Controller
Thomas Bell, KC1MHQ

Human Resources Manager
Luci Goodwin

*Executive Committee Member

Atlantic Division

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

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

Central Division

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

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

Dakota Division

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

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

Delta Division

www.arrldelta.org
David A. Norris, K5UZ
907 Evening Sunset Cir., Redfield, AR 72132
870-613-1606; **k5uz@arrl.org**

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

Great Lakes Division

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

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

Hudson Division

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

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

Midwest Division

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

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

How to Contact ARRL Staff

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

New England Division

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

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

Northwestern Division

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

Vice Director: Vacant

Pacific Division

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

Vice Director: Vacant

Roanoke Division

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

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

Rocky Mountain Division

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

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

Southeastern Division

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

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

Southwestern Division

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

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

West Gulf Division

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

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

ARRL Section Managers

The 15 Divisions of ARRL are arranged into 71 administrative *Sections*, each headed by an elected *Section Manager* (SM). Your SM is the person to contact when you have news about your activities, or those of your radio club. If you need assistance with a local problem, your SM is your first point of contact. He or she can put you in touch with various ARRL volunteers who can help (such as Technical Specialists). Your SM is also the person to see if you'd like to become a Section volunteer. Whatever your license class, your SM has an appointment available. Visit your Section page at **www.arrl.org/sections**.

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

Delaware: Steven Keller, KC3DSO, 803 Meadow Brook Ln., Milford, DE 19963-3000; 240-515-0620; **kc3dso@arrl.org**
Eastern Pennsylvania: Bob Wilson, W3BIG, 2223 West Helms Manor, Upper Chichester, PA 19061-3325; 484-836-9367; **w3big@arrl.org**
Maryland-DC: Chris Van Winkle, AB3WG, 24 Tattersaul Ct., Reisterstown, MD 21136-2431; 240-755-4257; **ab3wg@arrl.org**
Northern New York: Rocco Conte, WU2M, 152 W. Bush Rd., Gloversville, NY 12078-6405; 518-848-9028; **wu2m@arrl.org**
Southern New Jersey: Tom Preiser, N2XW, 177 Bowsprit Rd., Manahawkin, NJ 08050-5001; 609-618-0224; **n2xw@arrl.org**
Western New York: Laura Mueller, N2LJM, 2011 E. Main St., Falconer, NY 14733 716-338-3122; **n2ljm@arrl.org**
Western Pennsylvania: Joe Shupienis, W3BC, P.O. Box 73, Falls Creek, PA 15840-0322; 814-771-3804; **w3bc@arrl.org**

Central Division IL, IN, WI

Illinois: Thomas Beebe, W9RY, 3540 Market Rd., Marion, IL 62959-8940 618-534-6282; **w9ry@arrl.org**
Indiana: Bob Burns, AK9R, P.O. Box 808, Brownsburg, IN 46112 317-520-1188; **ak9r@arrl.org**
Wisconsin: Jason Spetz, KC9FXE, E5910 490th Ave., Menomonie, WI 54751-5644 715-231-7722; **kc9fxe@arrl.org**

Dakota Division MN, ND, SD

Minnesota: Bill Mitchell, AEØEE, 7412 Colfax Ave. S., Richfield, MN 55423 510-529-5658; **ae0ee@arrl.org**
North Dakota: Ralph Fettig, NØRDF, 6650 County Rd. 12 W., Minot, ND 58701-3003 701-822-3467; **n0rdf@arrl.org**
South Dakota: Chris Stallkamp, KIØD, P.O. Box 271, Selby, SD 57472-0271 605-848-3929; **ki0d@arrl.org**

Delta Division AR, LA, MS, TN

Arkansas: James D. Ferguson, Jr., N5LKE, 1500 Lauren Dr., Searcy, AR 72143-8477 501-593-5695; **n5lke@arrl.org**
Louisiana: Matt Anderson, KD5KNZ, 75510 Henderson Rd., Covington, LA 70435-0618; 225-806-2524; **kd5knz@arrl.org**
Mississippi: Malcolm Keown, W5XX, 64 Lake Circle Dr., Vicksburg, MS 39180 601-636-0827; **w5xx@arrl.org**
Tennessee: David Thomas, KM4NYI, 205 Linford Rd., Knoxville, TN 37920 865-654-5489; **km4nyi@arrl.org**

Great Lakes Division KY, MI, OH

Kentucky: Charles O'Neal, KE4AIE, 301 Autumn Ridge Rd., Glasgow, KY 42141-9699 502-680-0539; **ke4aie@arrl.org**
Michigan: Larry Camp, WB8R, 71 Oakdale Ln., Coldwater, MI 49036-1200 517-617-4883; **wb8r@arrl.org**
Ohio: Tom Sly, WB8LCD, 1480 Lake Martin Dr., Kent, OH 44240-6260 330-554-4650; **wb8lcd@arrl.org**

Hudson Division ENY, NLI, NNJ

Eastern New York: John K. Fritze, Jr., K2QY, 4 Normanskill Blvd., Delmar, NY 12054-1335; 401-261-4996; **k2qy@arrl.org**
NYC-Long Island: Jim Mezey, W2KFV, 38 Appletree Ln., Carle Place, NY 11514-1336; 516-315-8608; **w2kfv@arrl.org**
Northern New Jersey: Bob Buus, W2OD, 8 Donner St., Holmdel, NJ 07733-2004 732-946-8615; **w2od@arrl.org**

Midwest Division IA, KS, MO, NE

Iowa: Lelia Garner, WAØUIG, 145 Front St., Robins, IA 52328-9718 319-213-3539; **wa0uig@arrl.org**
Kansas: Ronald D. Cowan, KBØDTI, P.O. Box 36, La Cygne, KS 66040 913-757-4456; **kb0dti@arrl.org**
Missouri: Cecil Higgins, ACØHA, 27995 County Rd. 220, Hermitage, MO 65668-8493 417-493-8208; **ac0ha@arrl.org**
Nebraska: Matthew N. Anderson, KAØBOJ, 14300 NW 98th St., Raymond, NE 68428-4254; 402-480-5515; **ka0boj@arrl.org**

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

Connecticut: Bud Kozloff, W1NSK, 223 Gallows Hill Rd., Redding, CT 06896-1413 203-939-3708; **w1nsk@arrl.org**
Eastern Massachusetts: Jon McCombie, N1ILZ, 75 Northwest St., Eastham, MA 02642 508-246-4982; **n1ilz@arrl.org**
Maine: Philip Duggan, N1EP, 195 Kansas Rd., Milbridge, ME 04658-3120 207-598-5397; **n1ep@arrl.org**
New Hampshire: Peter Stohrer, W1FEA, 9 Gladstone St., Concord, NH 03301-3130 603-345-1470; **w1fea@arrl.org**
Rhode Island: Nancy Austin, KC1NEK, P.O. Box 4941, Middletown, RI 02842-0941 401-935-3070; **kc1nek@arrl.org**
Vermont: Paul N. Gayet, AA1SU, 11 Cherry St., Essex Junction, VT 05452 802-878-2215; **aa1su@arrl.org**
Western Massachusetts: Raymond Lajoie, AA1SE, 245 Leominster Rd., Lunenburg, MA 01462-2031; 978-549-5507; **aa1se@arrl.org**

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

Alaska: David Stevens, KL7EB, 8521 Golden St., Apt. 4, Anchorage, AK 99502 907-242-6483; **kl7eb@arrl.org**
Eastern Washington: Jo Whitney, KA7LJQ, P.O. Box 2222, Yakima, WA 98907 509-952-5765; **ka7ljq@arrl.org**
Idaho: Dan Marler, K7REX, 6525 W. Fairfield Ave., Boise, ID 83709 208-914-8939; **k7rex@arrl.org**
Montana: Kevin Kerr, W1KGK, P.O. Box 69, Plains, MT 59859-0069 406-242-0109; **w1kgk@arrl.org**
Oregon: Scott Rosenfeld, N7JI, 3662 Vine Maple St., Eugene, OR 97405-4473 541-684-9970; **n7ji@arrl.org**
Western Washington: Monte L. Simpson, W7FF, P.O. Box 3008, Silverdale, WA 98383 360-633-7665; **w7ff@arrl.org**

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

East Bay: Mike Patterson, N6JGA, P.O. Box 30627, Walnut Creek, CA 94598 925-200-8300; **n6jga@arrl.org**
Nevada: John Bigley, N7UR, 2420 Palora Ave., Las Vegas, NV 89121-2157 702-498-5829; **n7ur@arrl.org**
Pacific: Alan Maenchen, AD6E, 2164 Kamaile St., Wailuku, HI 96793-5458 408-382-1008; **ad6e@arrl.org**
Sacramento Valley: Dr. Carol Milazzo, KP4MD, P.O. Box 665, Citrus Heights, CA 95611-0665; 916-259-3221; **kp4md@arrl.org**
San Francisco: Dr. Antonis Papatsaras, AA6PP, 48 Bayo Vista Ave., Larkspur, CA 94939-1006; 415-861-5053; **aa6pp@arrl.org**
San Joaquin Valley: John Litz, NZ6Q, 1434 Douglas Rd., Stockton, CA 95207-3536 209-331-3078; **nz6q@arrl.org**
Santa Clara Valley: James Armstrong, NV6W, 2048 Paseo Del Sol, San Jose, CA 95124-2048; 408-679-1680; **nv6w@arrl.org**

Roanoke Division NC, SC, VA, WV

North Carolina: Marvin K. Hoffman, WA4NC, P.O. Box 2208, Boone, NC 28607 828-964-6626; **wa4nc@arrl.org**
South Carolina: John Gendron, NJ4Z, 3052 Devonshire Dr., Rock Hill, SC 29732-9260 704-649-2210; **nj4z@arrl.org**
Virginia: Jack Smith, KE4LWT, 515 New Life Dr., Ruckersville, VA 22968-3045 662-523-0000; **ke4lwt@arrl.org**
West Virginia: Dan Ringer, K8WV, 18 W. Front St., Morgantown, WV 26501-4507 304-292-1999; **k8wv@arrl.org**

Rocky Mountain Division CO, NM, UT, WY

Colorado: Amanda Alden, K1DDN, 230 Glenmoor Rd., Canon City, CO 81212-7705 719-315-0434; **k1ddn@arrl.org**
New Mexico: Bill Mader, K8TE, 4701 Sombrerete Rd. SE, Rio Rancho, NM 87124 505-250-8570; **k8te@arrl.org**
Utah: Pat Malan, N7PAT, 10102 S. Redwood Rd. #95401, South Jordan, UT 84095 801-413-7438; **n7pat@arrl.org**
Wyoming: Garth Crowe, Sr., WY7GC, 2342 Sagewood Ave., Casper, WY 82601-5018 307-689-1340; **wy7gc@arrl.org**

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

Alabama: Dennis Littleton, K4DL, 2230 Bishop Rdg., West Blocton, AL 35184-4246 205-718-4410; **k4dl@arrl.org**
Georgia: Hank Blackwood, K4HYJ, 406 Dawnville Rd. NE, Dalton, GA 30721 706-529-5647; **k4hyj@arrl.org**
Northern Florida: Scott Roberts, KK4ECR, 2361 Oak Hammock Ln., Orange Park, FL 32065; 904-759-7812; **kk4ecr@arrl.org**
Puerto Rico: Rene Fonseca, NP3O, Urb Santa Isidra 4 G8 Calle 6, Fajardo, PR 00738-4145; 939-579-4134; **np3o@arrl.org**
Southern Florida: Barry M. Porter, KB1PA, 14555 Sims Rd., Apt. 258, Delray Beach, FL 33484; 561-499-8424; **kb1pa@arrl.org**
Virgin Islands: Fred Kleber, K9VV, P.O. Box 24275, Christiansted, VI 00824-0275; **k9vv@arrl.org**
West Central Florida: Michael Douglas, W4MDD, 2527 Apple Blossom Ln., Wauchula, FL 33873; 863-585-1648; **w4mdd@arrl.org**

Southwestern Division AZ, LAX, ORG, SB, SDG

Arizona: Rick Paquette, W7RAP, 1600 W. Sunkist Rd., Tucson, AZ 85755-9561 520-425-6877; **w7rap@arrl.org**
Los Angeles: Diana Feinberg, AI6DF, P.O. Box 4678, Palos Verdes Peninsula, CA 90274-9618; 310-544-2917; **ai6df@arrl.org**
Orange: Bob Turner, W6RHK, P.O. Box 973, Perris, CA 92572 951-236-8975; **w6rhk@arrl.org**
San Diego: Dave Kaltenborn, N8KBC, 630 Alber St., Chula Vista, CA 91911 619-616-8758; **n8kbc@arrl.org**
Santa Barbara: John Kitchens, NS6X, P.O. Box 178, Somis, CA 93066 805-216-2569; **ns6x@arrl.org**

West Gulf Division NTX, OK, STX, WTX

North Texas: Steven Lott Smith, KG5VK, 125 Contest Ln., Ben Franklin, TX 75415-3830; 318-470-9806; **kg5vk@arrl.org**
Oklahoma: Mark Kleine, N5HZR, 2651 84th Ave. SE, Norman, OK 73026 405-410-6756; **n5hzr@arrl.org**
South Texas: Stuart Wolfe, KF5NIX, 408 Cedar Grove Rd., Rockdale, TX 76567 512-660-9954; **kf5nix@arrl.org**
West Texas: H. Dale Durham, W5WI, P.O. Box 375, Buffalo Gap, TX 79508 830-719-9000; **w5wi@arrl.org**

Ameritron 160-6M 1.2kW FET Amplifier

1.5-54 MHz…1200 Watts PEP Output…Auto bandswitching, no tuning, no warm-up, SWR protected, Quiet Variable-Speed Cooling…Fwd/Ref PEP, PA Balance, ALC, V, I Metering

AMERITRON new ALS-1306 1.5-54 MHz solid state FET no-tune Amplifier gives you 1200 Watts PEP output on all bands, including 6-M. Automatic bandswitching! No tuning! No warm-up! No tubes! Quiet!

***Eight** rugged MRF-150 power FETs insure reliability*. They are mounted on dual heavy duty heat sinks and properly arranged to spread heat out over a large surface.

Other amplifiers using a single power device *cannot* do this. Some power FETs are a package of several transistors in a single case and concentrate all the heat in one small area -- making them difficult to cool. If one transistor fails, they all fail.

The ALS-1306 RF deck operates at 50 Volts for efficient, low distortion linear RF power service. It's cooled by a whisper quiet fan. Fan speed is regulated by temperature sensors, assuring minimum noise.

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

ALS-1306 runs up to 1200 Watts of clean SSB output power (just 100 Watts drive gives you the full rated 1200 Watts output) for *continuous* coverage between 1.5-54 MHz. 10/12 Meters is included.

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

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

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

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

Front-panel ALC control!

This *exclusive* Ameritron feature lets you adjust output power conveniently from the front panel.

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

Automatic Bandswitching!

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

ALS-1306 automatic bandswitching reads band data from your transceiver and automatically changes bands as you change bands. An optional interface cable is required for your particular radio.

Clean, Modular Construction

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

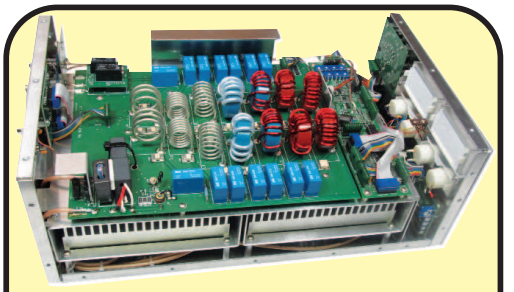
ALS-1306 Power Supply

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

This *hash-free* fully regulated swtiching power supply is only 12 lbs. and measures a compact 10Wx6^{1}/$_{2}$Hx9^{1}/$_{2}$D". It can be placed conveniently out-of-the-way. Output is 50 VDC at 50A to the ALS-1306. Wired for 220 VAC, selectable 110 VAC. Draws less than 25A at 110 VAC; 12 Amps at 220 VAC.

ALS-1306
$3999
Suggested Retail

Call your favorite dealer for your best price today!



Peek Inside and see Ameritron's beautiful craftsmanship!

ALS-606S
600W FET Fixed Station Amp

600 Watts PEP/500W CW output, 160-6M with automatic instant band-switching. Desktop size: 9^{3}/$_{4}$Wx7Hx14^{1}/$_{2}$D inches. Just 14.2 lbs. It's only 4 dB below 1500W -- less than an S-unit -- nobody can hear the difference! SWR/thermal protected, extremely quiet, lighted peak reading Cross-Needle SWR/Wattmeter, front panel ALC control. Includes 110 VAC switching power supply. 220 VAC selectable.

ALS-606S
$2599
Suggested Retail

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

ALS-500M
500 Watt Mobile Amplifier

ALS-500M
$1199
Suggested Retail

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

ALS-500RC, $89.95, Remote Head.

SPS-75MV, $399.95. 110VAC input, 75A at 13.8 VDC output power supply for using ALS-500M at home.

ALS-600S, $2399

Like ALS-606S but automatic bandswitching with external box and no six meters.

ALS-600, $2599. Like ALS-600S but has transformer power supply.

Call your dealer for your best price!

Free Catalog: 800-713-3550

AMERITRON®

. . . the world's high power leader!

116 Willow Road, Starkville, MS 39759
TECH (662) 323-8211 • **FAX** (662) 323-6551
8 a.m. - 4:30 p.m. CST Monday - Friday
For power amplifier components call (662) 323-8211

www.ameritron.com

Epic PWRgate

DC Power Management Has Never Been so Epic

Automatic Backup Switching & Charging

2 Models Available

Works with Lead-Acid or LiFePO4 Batteries!

Features

- 12 volt backup power system rated at 40 amperes continuous
- Eliminates danger of connecting a power supply directly to a battery
- Low loss PWRgate provides forward voltage drop of only 0.05 volts
- USB port access to monitor system or to change charge parameters
- Instantly switch to battery during a outage or power supply failure
- Supports power supply and direct solar panel MPPT battery charging
- Efficient MPPT algorithm optimizes solar charging
- Utilizes industry standard Anderson Powerpoles® (45A rating)

Easy set up for solar

Powerpole® to Solar MC4 Adapter Cable

Price/Sku: $19.95 (58257-1859)

262-522-6503 ext 35
sales@westmountainradio.com
westmountainradio.com/QST324

West Mountain RADIO

Powerpole® is a registered trademark of Anderson Power Products, Inc

ELECRAFT K4

High-Performance Direct-Sampling SDR

A direct-sampling SDR you'll love to use

Our new K4 transceiver harnesses advanced signal processing while retaining the best aspects of the K3S and P3. It features a 7" touch display, plus a rich set of dedicated controls. Per-VFO transmit metering makes split mode foolproof. Band-stacking registers and per-receiver settings are versatile and intuitive. Control usage information is just one tap away thanks to a built-in help system.

Modular, hybrid architecture adapts to your needs

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

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

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

Comprehensive I/O, plus full remote control

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

K4 KEY FEATURES

- Optimized for ease of use
- Modular, upgradeable design
- 7" color screen with touch and mouse control
- ATU with 10:1+ range, 3 antenna jacks
- Up to 5 receive antenna sources
- Full remote control via Ethernet

The K4 interfaces seamlessly with the KPA500 and KPA1500 amplifiers

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

ELECRAFT®

For complete features and specifications visit elecraft.com • 831-763-4211

Up Front

Associated with ARRL

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

An Edible AL-80B

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

Who Knew Butterflies Used Ham Lingo?

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

The Love of CW

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

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

FOR THE THRILL OF THE HUNT.

We're for every corner of the earth. So much so it's led to revolutionizing the ham radio industry as the leader in software-defined radios (SDRs) design. Because when you're looking to connect with people and places that may or may not even be on the map, you better have the best partner in technology on the planet. Contest season is upon us, and it's time to prepare your station. To learn more about our boundary-pushing products, visit **FlexRadio.com**.

FlexRadio

Find Everywhere

GO. SEEK. FIND.

Enjoy clear "Noise Free" audio with.. ..a bhi DSP noise canceling product!

bhi

ParaPro EQ20 Audio DSP Range

- 10W amplified DSP unit with parametric equaliser
- Options with noise canceling and bluetooth on input
- Improved audio for those with hearing loss
- Two separate mono inputs or one stereo input
- Use with passive speakers or headphones
- Basic EQ20, (use with Dual In-Line, Compact In-Line or In-Line Module)
- DSP noise canceling versions EQ20-DSP, EQ20B-DSP (with added Bluetooth on input)

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

In-Line Module

NEDP1901-KBD

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

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

Dual In-Line

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

Compact In-Line

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

New

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

DESKTOP MKII

10W amplified DSP noise canceling speaker
- Simple controls
- 8 filter levels
- Separate line level and speaker level audio inputs
- 12V DC power
- Suitable for all radios incl' SDR, Elecraft and FlexRadio products

NES10-2MK4

- 5W DSP Noise Canceling Speaker - 8 filter levels
- Compact speaker for mobile or base station
- Three position switch for all functions
- Headphone socket
- Adjustable metal bracket

Check out our accessories, headphones and extension speakers

DX ENGINEERING
1-800-777-0703

www.bhi-ltd.com

GigaParts Technology Superstore
1-256-428-4644

VISA PayPal MasterCard

EA&O

Put A Spring In Your STEP

Stay Active On All The Bands

*Optional
CX-10G
10GHz Transverter

IC-905
2M / 70CM / 23CM / 13CM / 5CM

IC-705
HF / 6M / 2M / 70CM

ANALOG / DIGITAL

IC-7610
HF / 6M

ID-50A
2M / 70CM

IC-7300
HF / 6M

IC-7100
HF / 6M / 2M / 70CM

ID-52A
2M / 70CM

ID-5100AD
2M / 70CM

IC-V86
2M

IC-V3500
2M

ANALOG

IC-T10
2M / 70CM

For the love of **ham radio.**

www.icomamerica.com/amateur
insidesales@icomamerica.com

60th Anniversary

ICOM®

Correspondence

Letters from Our Members

Station Complications after Moving

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

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

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

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

I like to run digital modes using Ham Radio Deluxe (HRD) *DM-780* and *WSJT*, but when I operated, no signals were decoded. I bought a new computer with Windows 11, and all the sound card settings appeared to be set correctly. I sent a message to HRD support and was advised that Windows 11 has a configuration that automatically reduces or cuts the power to the USB ports to conserve energy. So, it can cause the rig control to disconnect from the radio, which causes the software to fail. I had to disable all the power options for all the USB ports on my computer, and I didn't have any more problems!

Michael Stansbery, WD8EBS
Pickerington, Ohio

A Treasured Memory

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

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

Andy Faber, AE6Y
Monte Sereno, California

Clear, Concise, and to the Point

The article titled "Lessons Learned from Drafting After-Action Reports" by Brian Haren, W8BYH, in the "Public Service" column of the December 2023 issue of *QST* is excellent and well worth the read. His recommendations are obviously from the real world and not just theory. He writes clearly, and the article is succinct without confusing statements and requires just two pages. He removes complexity without lowering the bar!

Denis Battrum, N5KX
Liberty, Missouri
Life Member

Leaving Code Behind Brought Enjoyment

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

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

Brent Seale, KK4NAW
Thayne, Wyoming

Send your letters 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.

DAYTON 2024 HAMVENTION®

Expanding Our Community

Get Your Tickets Online NOW!
$26 in advance or $30 at the gate

May 17 - 19, 2024

- Exhibits & Flea Market
- Forums & Activities
- Networking & More!

hamvention.org

Meet us at Hamvention® for the 2024 ARRL National Convention

Program Highlights

- Special Exhibits and Guests
- Presentations and Forums
- ARRL Program Representatives
- ARRL Store. Get 2024 ARRL Field Day gear!

2024 ARRL Youth Rally at Hamvention®

Saturday, May 18

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

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

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

ARRL events

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

Get the full **2024 ARRL National Convention Program** at **www.arrl.org/expo**

TIMEWAVE TECHNOLOGY INC.

*NEW! ANC-4+

ANC-4+ Now Shipping!

- Ham Radio Outlet www.hamradio.com
- R&L Electronics www.randl.com
- Japan Communication www.jacom.com
- Radio Parts Japan www.radio-part.com

The familiar, rugged ANC-4 now with:

- External TX/RX control - great for QRP operation
- Continously Adjustable TX hang time
- Noise amp front end protection
- TX LED indicator
- SMT construction w/ gold-plated PCB
- Heavy steel laser-cut housing for precise tuning and mechanical stability

ANC-4+ Antenna Noise Canceller

Kill Noise before it reaches your receiver! Great for supressing power line noise, plasma TV noise & many other local electrical noises.

Navigator

The Premier Sound Card Modem!

See QST Short Takes Review - May 2014-P. 62

- Quiet - hear what others miss!
- Proven USB Sound Card built-in
- Precise FSK
- Genuine K1EL Winkeyer CW IC
- Complete - Six FTDI COM ports
- Universal Rig Control for every radio
- Works well with HRD, M110A, Fldigi, FT8 & many more software programs
- Front-Panel Audio & CW controls
- USB connected and powered
- Convenient - No annoying jumpers!

Customize your PK-232 installation with our complete line of upgrades, accessories and cables.

100,000 sold - All-time top selling data controller!

PK-232SC+

Multimode Data Controller*

- RTTY
- Packet
- Pactor
- CW
- PSK31 & all the Sound Card modes!

**Upgrade any PK-232 to the PK-232SC with New Lower Combo Pricing for SC & DSP Upgrade!*

- Single USB connection to computer
- USB Sound Card built-in
- 3-Way Rig Control built-in - logic level, RS-232 & USB!
- Computer isolated from radio
- Real FSK & AFSK
- keyboard CW - send and receive
- Dual Port - two radios at same time!

■ PK-96/100 USB Packet TNC

1200/9600 bps AX.25 Packet
Available with USB or RS-232 connection

■ HamLinkUSB™ USB-to-RS-232 Adapter

Proven FTDI Chip. 9 and 25 pins for all radios, TNCs, Rotor Controllers & more!

■ HamLinkUSB™ Rig Control+

C-IV, CAT, RTS (PTT, FSK or CW) for sound card software
Perfect for HRD owners with simple sound card adapters

Timewave Technology Inc.
360 Larpenteur Ave. W., Suite 100
St. Paul, MN 55113 USA

www.timewave.com
sales@timewave.com

651-489-5080

MFJ . . .the World Leader in Ham Radio Accessories!

MFJ-4416C *Super* Battery *Booster*

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, compensates for run down battery, wiring voltage drop, car off . . .

MFJ-4416C
$249.95

Keeps your transceiver at full power output, provides full performance, high efficiency, prevents output signal distortion and transceiver shutdown. Compensates for run-down battery, wiring voltage drop or when car is off. Provides up to 25 Amps peak with 90% efficiency. Selectable 9/10/11 Volts minimum input voltage prevents battery damage from over-discharging. RF sense turns MFJ-4416C off during receive to save power, increases efficiency and reduces noise. Adjustable 12 to 13.8 VDC output pass-through improves efficiency and lets transceiver run cooler. Has output over-voltage crowbar protection. *Anderson PowerPoles*(R) and high-current 5-way binding posts for DC input, regulated output. 7¾Wx4Hx2⅛D". **MFJ-4416BRC, $119.95.** Booster Remote Control.

Super Heavy Duty Battery Booster

MFJ-4418
$299.95

Super robust with heavy duty transistors, rectifier, improved switch-mode transformer, larger heatsink. Input and output EMI filters reduce noise to minimum. Rugged construction. *Power-Poles*™ and 5-way binding posts. MFJ software adjusts output voltage, measure load current, set minimum voltage level, over-current trip level, ignition control, more. External boost enable, remote input/output voltage sampling, remote controllable with MFJ-4416BRC.

RFI Filter for DC power

MFJ-1142
$99.95

Connects between rig and 12/ 24/50 VDC power supply/battery. Reduces RFI, hash, transients, motor noises, alternators, fuel pump whine, power windows, more! Binding posts/*PowerPoles*(R).

Digital Volt/Amp Meter

MFJ-4422
$59.95

Connect in-line. Displays 4.5-30 VDC and up to 30A simultaneously. .01-.1V resolution. Dual .28" red/blue LED digits. *Anderson PowerPoles*™. Reverse polarity protection. 3x2x1 inches.

RFI Ferrite Chokes

MFJ-700A4
$19.95

Suppress RFI. Snap and locks on DC power line, coax, wires. Effectively removes RFI and noise. Install end-to-end or loop multiple turns for more suppression. .275" hole dia. 4 in package.

PowerPole™ DC Outlet Box

MFJ-1104
$59.95

One fused 30 Amp input and 25, 10, 5 Amp fused outputs *with Anderson PowerPoles*™. Has open fuse indicator. Sturdy metal construction, 2¾Wx3¼Hx1½D inches.

MFJ Low Pass Filter

MFJ-704
$119.95

High attenuation above 40 MHz. 1.5kW, 1.8-30 MHz. SWR<1.3. Nine Chebyshev poles, *Teflon*(R) dielectric capacitors, high-Q inductors, ground plane shielding, RF tight.

Lightning Surge Protector

MFJ-270
$27.95

Protect your expensive equipment from lightning induced surges on 50 Ohm coax. Use for transceivers up to 400 Watts, 1000 MHz. **MFJ-272, $37.95.** 1.5 kW.

MFJ 30-Amp Power Supply

MFJ-4230MVP
$159.95

World's most compact 30A switching power supply. Volt/Amp meter. Adjust 4-16 VDC output. 120/240 VAC input. PowerPoles™, binding posts. 5Wx2½Hx6D", 3 lbs.

High-efficiency Loop Tuner

New!
MFJ-935C
$299.95

Instantly turn wire or coax into a small, high-efficiency multi-banded loop antenna. 150W, 5.3-30 MHz. Tripod/mast mount included. **MFJ-936C, $389.95.** Relative RF antenna current and Cross-needle SWR/Wattmeter. **MFJ-933C, $279.95.** Like MFJ-935C, no meter.

MFJ Field Strength Meter

MFJ-801
$49.95

Relative field-strength readings .1-500 MHz. Sensitivity control, 1¾ inch meter. 20-inch telescoping whip. Finger contact increases sensitivity.

Tuned Indoor Active Antenna

MFJ-1020C
$129.95

Rival outside wire antennas hundreds of feet long and pick up signals loud and clear all over the world. 0.3-40 MHz.

25-1300 MHz Discone Ant

MFJ-1868
$99.95

Receives 25-1300 MHz. Transmits 50-1300 MHz up to 200 Watts. Test various X-mitters on one coax. 50 ft. coax, stainless steel elements.

17-foot Telescopic Whip

MFJ-1979
$69.95

17-foot stainless steel whip collapses to 27". Full 1/4 Wave on 20/17 Meters, 30-160 Meter operation with loading coil. Fits any standard 3/8-24 threaded mount.

Telescopic Fiberglass Mast

MFJ-1906HD
$269.95

Super-strong heavy-duty mast with *QuickClamps*™. 38 ft. ext., 6 ft. collapsed. 2½" OD bottom, 1" OD top. .125" thick wall. Supports "*real*" weight.

Giant 2½ inch LED Clock

MFJ-117
$19.95
New Low Price!

Giant 2½ inch super bright LEDs -- see from across the street day or night. 12/24 switch, 110VAC, 9V battery backup.

MFJ 2-Position *Remote* Antenna Switch

MFJ-4712
$109.95

MFJ 2-position *remote* antenna switch uses a *single* coaxial feedline to feed two antennas, DC power and control signals. Remotely switch HF and/or VHF antennas. Covers 1.8 MHz to 150 MHz. Handles 1500W. Impedance is 50-75 Ohms. Compact 4Wx2⅝Hx1½D". *Outside Switch Box* is fully enclosed and weather protected. Three quality *Teflon*(R) SO-239 connectors for transmitter, antenna one and antenna two. Stainless steel 1½" tall bracket with a U-bolt for masts up to 1½ in. O.D. *Inside biastee* control is 2¼Wx2½Hx1¼ in. Use 12 VDC or 110 VAC with MFJ-1312D, $19.95.

MFJ Artificial RF Ground

MFJ-931
$159.95

By tuning out ground wire reactance RF hot spots disappear and your rig is at actual earth ground. Improve signals by resonating a wire into a tuned counterpoise.

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759
Phone: (662) 323-5869 • Tech Help: (662) 323-0549 • FAX: (662) 323-6551 8-4:30 CST, Mon.-Fri.

W1AW Schedule

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

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

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

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

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

Code bulletins are sent at 18 WPM.

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

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

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

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

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

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

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

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

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

KENWOOD

3rd IMDR 110 dB*

RMDR 122 dB*

BDR 150 dB*

Performance Exceeding Expectations.

The most happy and sublime encounters happen in the worst circumstances and under the harshest conditions.

There are enthusiasts who know this all too well because of their love of HF radio.

Results born of certainty and not circumstance. Delivered through impeccable performance. This is our offering to you.

"The Kenwood TS-890S has the highest RMDR of any radio I have ever measured."
- Rob Sherwood - NC0B - December 2018

HF/50MHz TRANSCEIVER
TS-890S

Top-class receiving performance

3 kinds of dynamic range make for top-class performance.

- Third order intermodulation Dynamic Range (3rd IMDR) 110dB*
- Reciprocal Mixing Dynamic Range (RMDR) 122dB*
- Blocking Dynamic Range (BDR) 150dB*

*Values are measured examples. (2kHz spacing:14.1 MHz, CW, BW 500 Hz, Pre Amp OFF)

- Full Down Conversion RX
- High Carrier to Noise Ratio 1st LO
- H-mode mixer

4 kinds of built-in roofing filters

500Hz / 2.7kHz / 6kHz / 15kHz (270Hz Option)

7 inch Color TFT Display

- Roofing frequency sampling band scope
- Band scope auto-scroll mode
- Multi-information display including filter scope

Clean and tough 100W output

Built-in high-speed automatic antenna tuner

32-bit floating-point DSP for RX / TX and Bandscope

*: 2 kHz spacing measurement standard - Receiver frequency 14.2 MHz, MODE CW, BW 500 Hz, PRE AMP OFF

Customer Support: (310) 639-4200

www.kenwood.com/usa

JQA-1205 091
ISO9001 Registered
JVCKENWOOD Corporation

ADS#16221

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

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

Kosta Kropivny, PhD, VA7KL

Building a **J**-pole antenna that performs well on the VHF and UHF bands can be challenging. The monoband collinear **J**-pole, or super **J**-pole, is an improvement of a regular **J**-pole. It combines two λ/2 radiating sections with a collinear phasing stub between them. However, if tuned on UHF, this antenna won't resonate on VHF unless you make the **J** element ¾ λ instead of ¼ λ. Also, you can't get a 50 Ω impedance on both bands when feeding the antenna from the bottom end.

Igor Goncharenko, DL2KQ, proposed a wire antenna at **http://dl2kq.de/ant/3-85.htm** (check your browser for Russian translation) that uses a ⅜ λ radiating element on UHF and consists of two ⅝ λ elements separated by a λ/4 phasing stub and a ¾ λ **J** element. DL2KQ proved that an impedance of 50 Ω on both bands can be achieved by bending the **J**-element wire along its length. On VHF, this antenna works as a slightly shortened **J**-pole with the inductance of the phasing stub in the middle. On UHF, it works as a super **J**-pole with a ¾ λ **J** element. On both bands, this wire antenna radiates at low angles. However, it's narrowbanded, so it must be tuned to the desired UHF and VHF band segments.

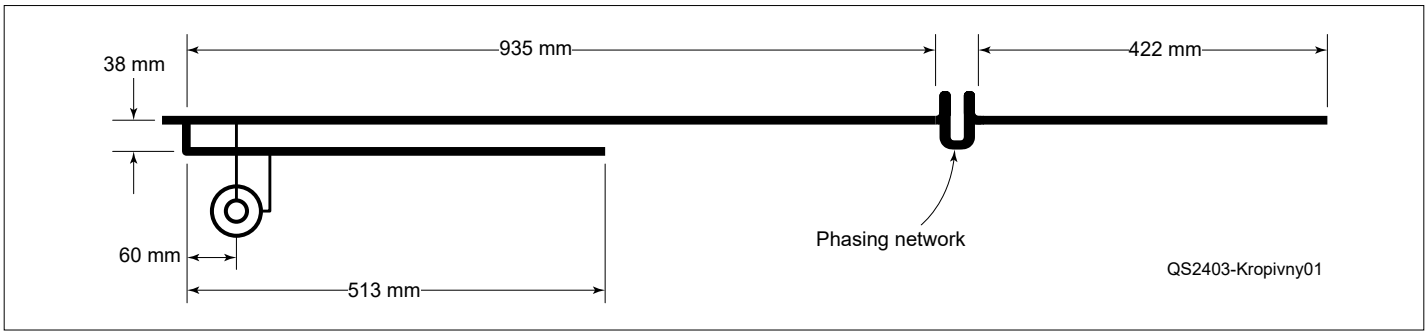


Figure 1 — Dimensions of the saxophone antenna. This drawing is not to scale.

Figure 2 — Phasing stub components.

Figure 3 — The assembled phasing stub.

Parts and Construction

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

The elements are made from a type-L copper pipe with an inner diameter of ½ inch and an outer diameter of ⅝ inch. You'll need a hot torch, flux, and solder, and you should solder the junctions outdoors or in a well-ventilated area. The RF N-type connector ground is soldered directly to the **J** element (as shown in the lead photo). Components for the phasing stub are given in Table 1 and are shown in Figure 2. The assembled phasing stub is shown in Figure 3. The dimensions are optimized for 146 and 446 MHz. The exact shape of the phasing stub is not very important, but its overall length must be 320 millimeters. This should work correctly when using the pipe fittings specified. The length of the phasing stub mainly affects the UHF resonant frequency. The VHF resonance is mainly controlled by the positioning of the feed point and minor bending of the **J**-element tip. I call this a saxophone antenna, as I think the phasing stub resembles part of a saxophone.

Table 1 — Copper Water Pipe with an Internal Diameter of ½ Inch and an External Diameter of ⅝ Inch

Quantity	Description	Lowe's Part Number
1	½-inch × 10-foot copper pipe	#LH04010
2	½-inch caps	#W 07007L
1	½-inch tee	#W 04006L
3	½-inch, 90-degree elbows	#W 01622L
6	½-inch, 90-degree female elbows	#W 01652L
2	½-inch, 45-degree elbows	#W 03326L
1	Female N-type connector	

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

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

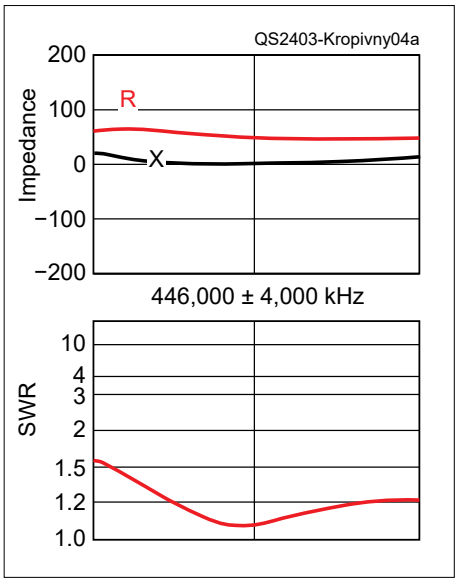


Figure 5 — UHF measurements.

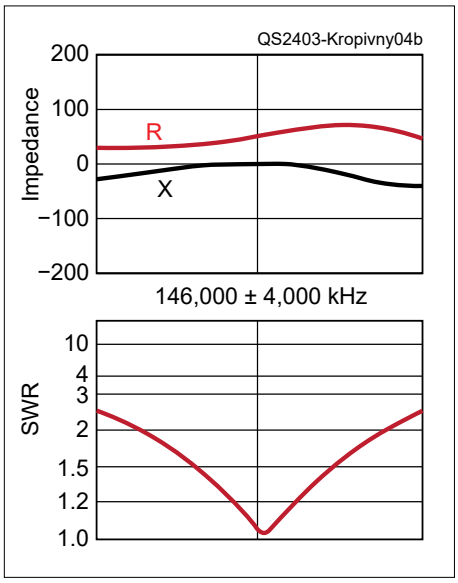


Figure 6 — VHF measurements.

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

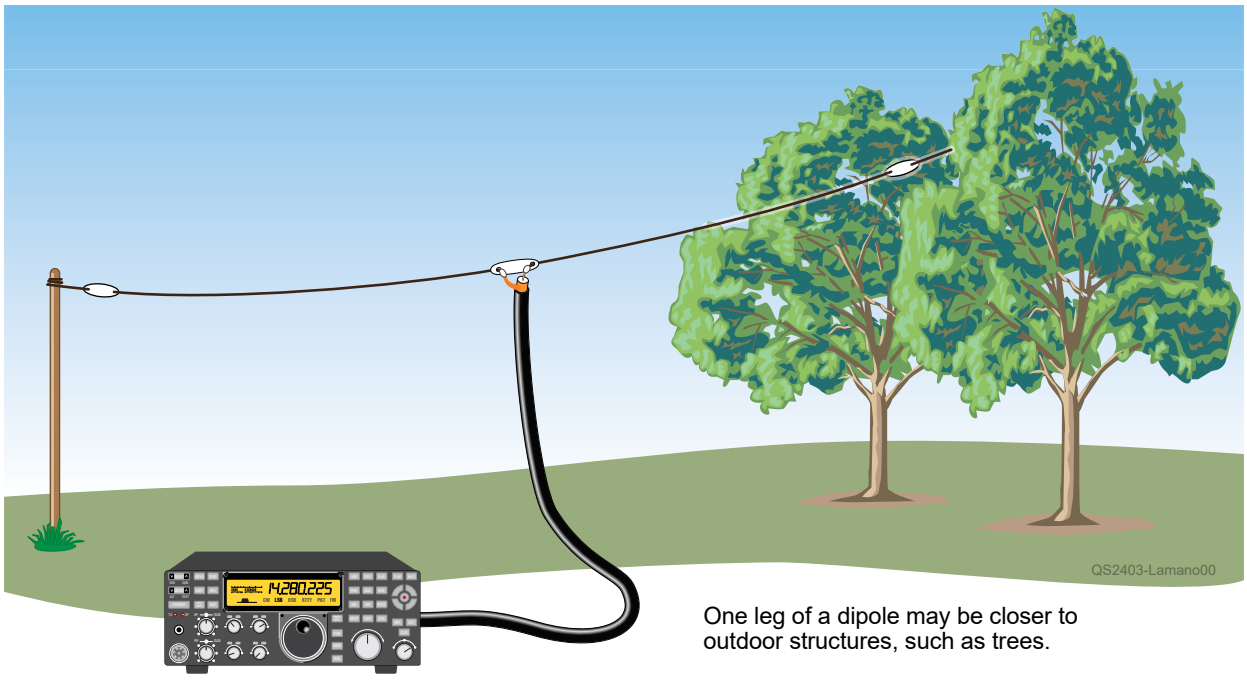
Conclusion

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

All photos provided by the author.

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

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



One leg of a dipole may be closer to outdoor structures, such as trees.

Common-Mode Current and Common-Mode Chokes

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

Larry Lamano, WAØQZY

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

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

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

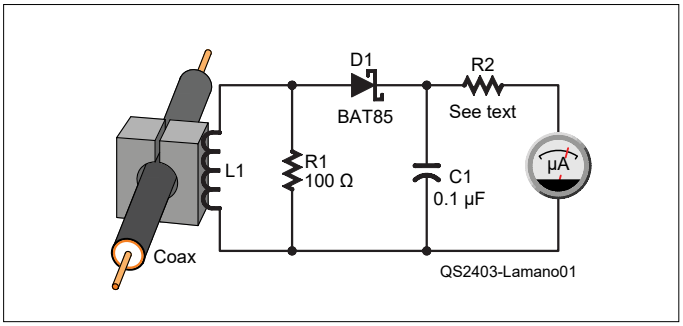


Figure 1 — A CM current meter. The clamp-on ferrite has 10 turns of small wire (L1) wound through it. When clamped on the coax, it becomes a high-ratio current transformer. The CM current reads on the meter after being rectified by D1. R2 sets the meter's sensitivity.

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

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

Measuring CM Current

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

Constructing an Effective CM Choke

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

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

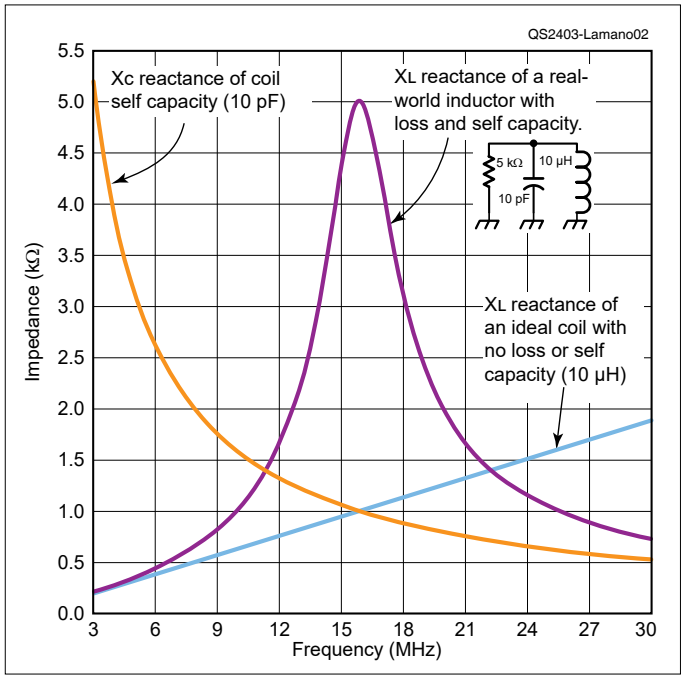


Figure 2 — A pure inductor of 10 µH would have the impedance depicted by the blue line. However, a real inductor could have 10 pF of self capacity, as shown by the orange curve. These are in parallel, and there is loss in the coil represented by the 5K resistor in parallel. The purple curve shows the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

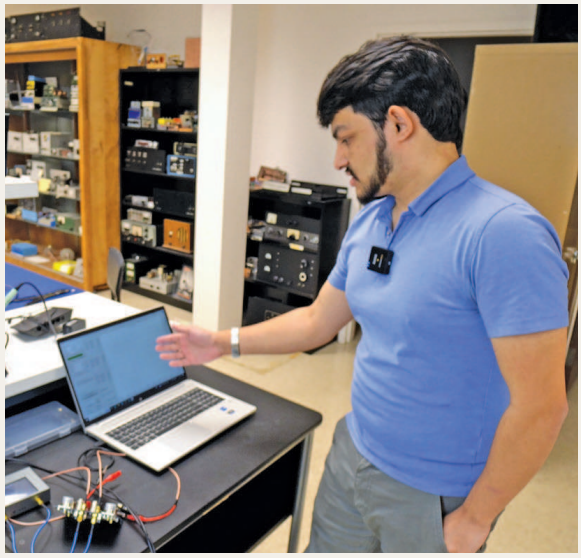
At that frequency, the currents through the inductance and the capacitance cancel, leaving only the resistive losses. Above the SRF, more current will flow through the coil's self capacitance and lower the overall impedance, as shown in Figure 2. That means that on 160 meters, a good choke with many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

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

Click Here for the Bonus Video!

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

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



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

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

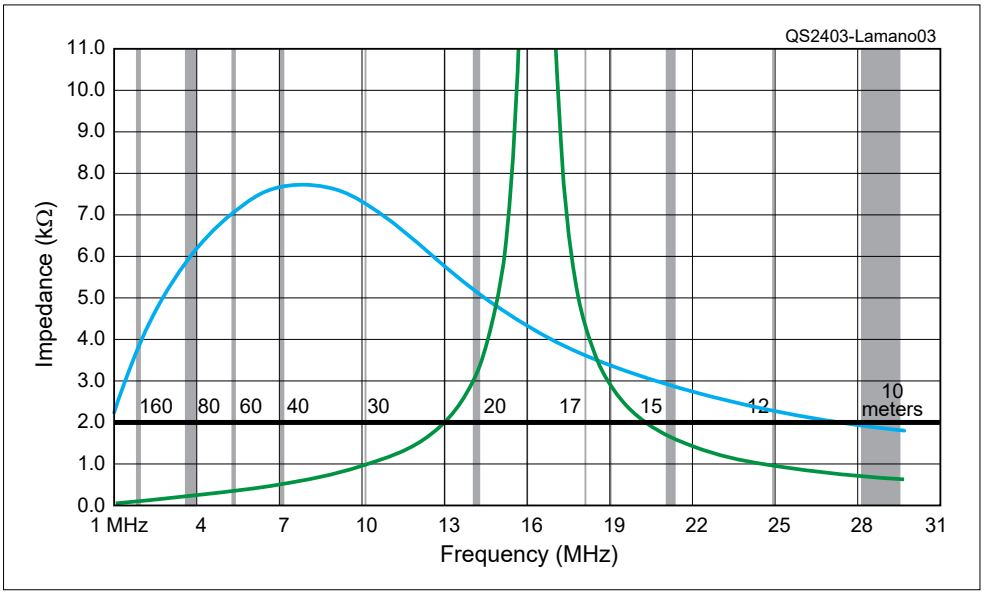


Figure 3 — The total impedance of an air-wound (green curve) and a ferrite toroid-wound (blue curve) choke balun. The black line at 2000 Ω shows the target impedance for effective CM current choking. The vertical gray bars show the limits of the amateur bands.

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

The green curve in Figure 3 represents the measured choking impedance of a scramble-wound air core choke, and the horizontal line represents our target impedance of 2000 Ω. This reactive choke consists of six turns of LMR-240 coax with a diameter of approximately 6 inches. The choking impedance declines rapidly on either side of resonance. The high-frequency performance worsens the closer the turns are to each other, as this increases the interwinding capacitance. It's clear that it isn't only an inductor, but a parallel resonant circuit with a narrow bandwidth. At 2000 Ω, this choke would be adequate only on the 20- and 17-meter bands. Reactive chokes can work well as single-band or sometimes as adjacent-band chokes, but they are inductive below resonance and capacitive above resonance. As such, they can increase CM current if — at some frequencies — their impedance is of opposite polarity to what is seen looking back down the coax. A document discusses this concept further at **www.arrl.org/qst-in-depth**. If you desire a wideband choke, resistance is needed because resistance is independent of frequency. In practice, this means passing the coax through a lossy ferrite core instead of an air core. The most common ferrite mixes for the HF bands are types 31 and 43. Their resistances allow chokes to have much broader frequency ranges. The blue curve in Figure 3 shows the same coax used in the previous measurements, but passed through a Fair-Rite 2631626202 core, and with the turns spread apart to lower the interwinding capacitance. The peak impedance is less than that of the reactive chokes, but there is a much wider band (160 – 12 meters) where the impedance is more than 2000 Ω. Even at 10 meters, the impedance may be acceptable.

See *QST* in Depth for More!

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

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

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

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

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

Check antenna VSWR before going on the air.

Mark Persons, WØMH

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

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

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

The Build

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

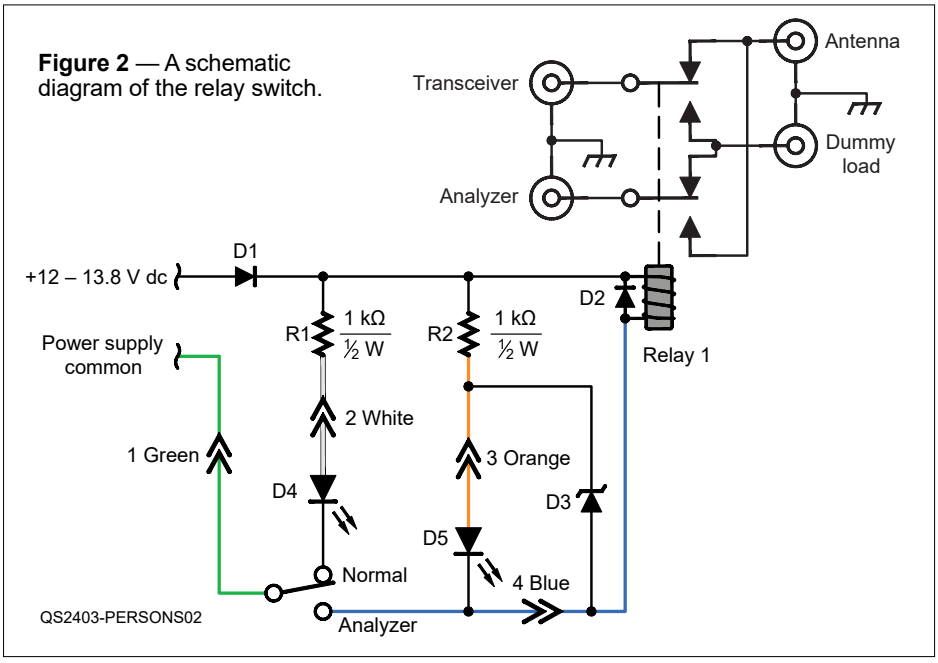


Figure 2 — A schematic diagram of the relay switch.

VSWR. Yes, I soldered it to the relay parts. The relay has its own smaller wires that were intended for 60 Hz. The braided wire parallels them and conveniently goes to the SO-239 connectors, and it's flexible enough to not affect relay operation. The project is intended for 160 through 10 meters, but it will work up to 6 meters, which is the highest frequency I would recommend (see Table 1). See Table 2 for a parts list for this project build.

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

Point-to-point control and status wiring is on a solder terminal strip. The logic connectors I used were Cinch Jones P-306-CCT and S-306-CCT from my junk box. You can use almost any connector that has at least four conductors. The 12 V dc power comes from the station power supply, and less than 0.25 A of current is required. It should be fused accordingly at the station's 12 V power distribution block. In Figure 2, you'll see that D1 is a steering diode to prevent problems if the power is connected backward. The schematic also shows logic wire colors and terminals on connectors.

Table 1 — Isolation and Matching

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

Table 2 — Parts List

Schematic Part	Schematic Signifier(s)
1N4004 diodes	D1, D2
3.3 V, 1 W Zener diode, 1N4728	D3
Green LED	D4
Red LED, LTL-4213-FL	D5
1 kΩ, ½ W resistors	R1, R2
Additional Parts	
Single-pole-double-throw rotary switch with knob	
SO-239 chassis mount connectors	
Four-pin logic connector and mating connector	
Hammond 1411L aluminum utility box, 5 × 4 × 3 inches, DigiKey	
Tyco Electronics PRD-11DY0-12 double-pole-double-throw 12 V dc relay, DigiKey	

Operating and Troubleshooting

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

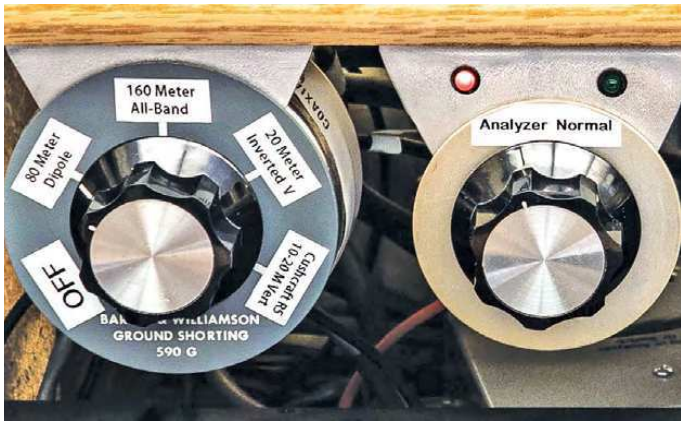


Figure 3 — The switch for my radio and antenna analyzer.

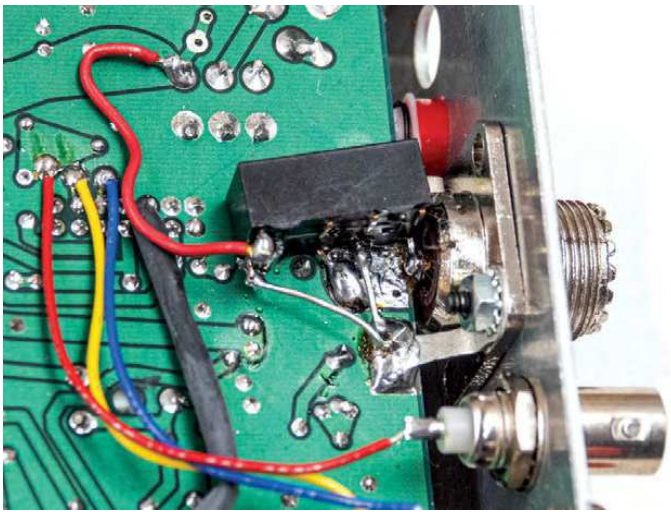


Figure 4 — The protection relay I added to my antenna analyzer.

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

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

In Summary

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

All photos by the author.

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

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

My Introduction to Parks on the Air

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

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

Jim Peterson, K6EI

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

Preparing to Activate a Park

Having never participated in POTA before, my first step was to create an account on the POTA website at **https://pota.app/#/signup**. After I made an account, I looked up the park reference code for Point Cabrillo Light Station State Historic Park (K-3536) and scheduled my operation at **https://pota.app/#/activations**. By publicizing the dates, bands, and mode that I planned to use, the POTA website made it possible for other hams to become aware of the activation and prepare to contact me.

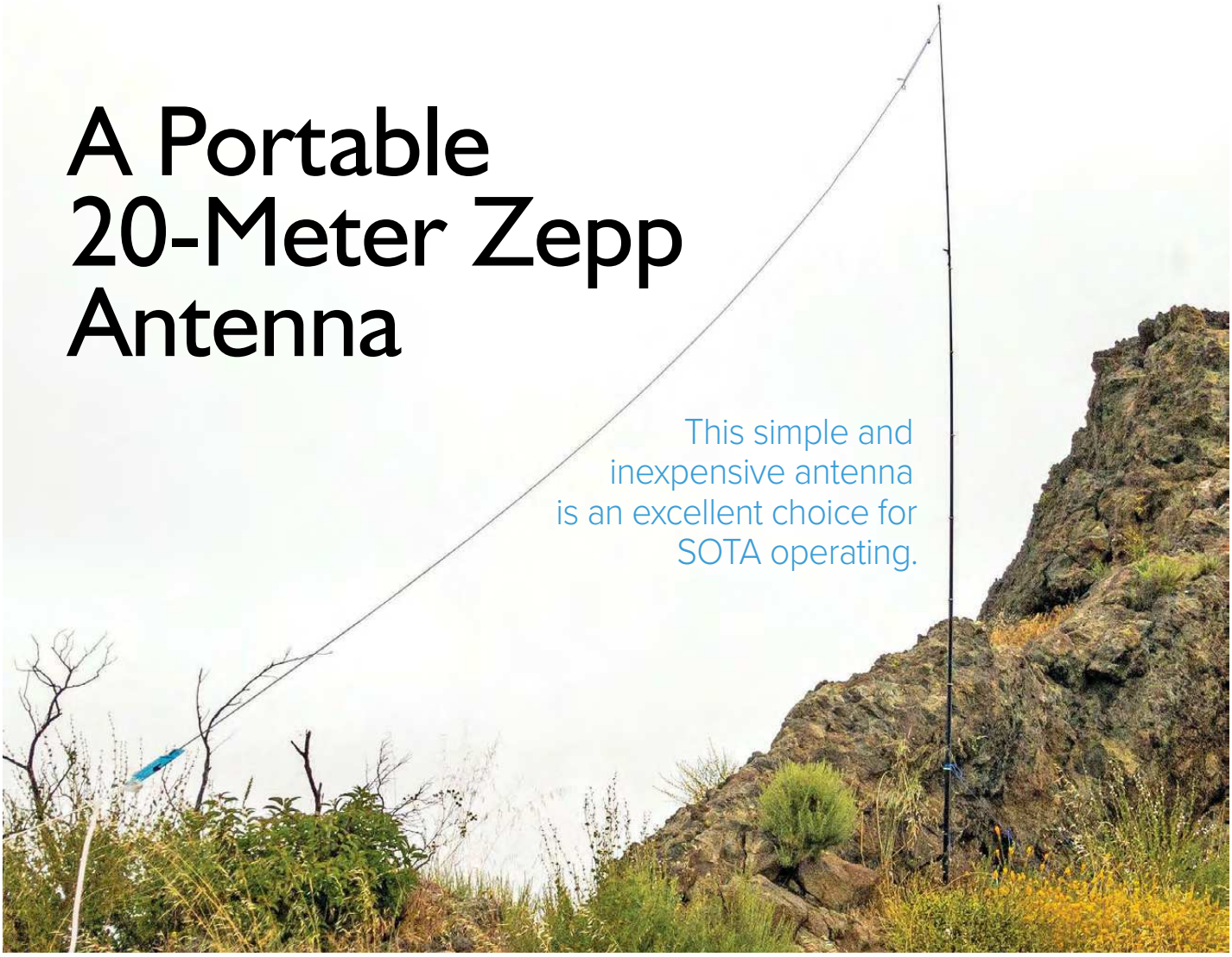
Amateur radio was going to be my secondary priority, so I decided to pack an Elecraft KX3 transceiver to use on the HF bands whenever we weren't hiking or exploring the local towns. I also chose to limit my operation to FT8.

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

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

A Portable 20-Meter Zepp Antenna

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



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

Charlie Richards, KN6CX

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

How to Build It

The materials you'll need to build a Zepp antenna are shown in Table 1. My antenna's wire and transmission line dimensions for the CW portion of 20 meters are shown in Figure 1. These dimensions resulted in a standing wave ratio (SWR) of less than 1.2:1 in the CW portion of the band and less than 1.5:1 across the entire band. You may want to start with a 33-foot-long antenna wire so you can trim it to achieve the best SWR over your chosen frequency range.

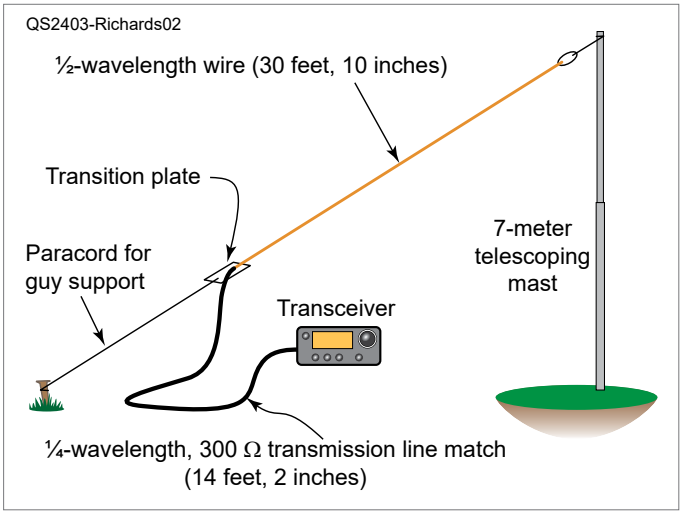


Figure 1 — The portable Zepp's structure and components.

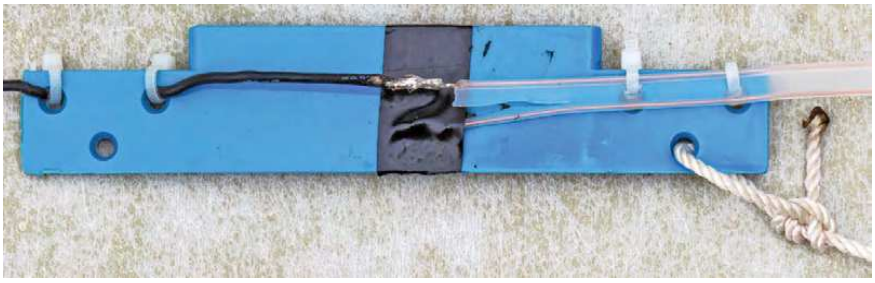


Figure 2 — Transition plate details. Note the open end of the 300 Ω transmission line.

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

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

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

How It's Set Up, and How It Performs

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

To set it up, extend the mast and use stainless-steel adjustable pipe clamps (available at any hardware store) at the mast section joints to keep the mast from collapsing. Secure the transition plate to something close to your operating position. Finally, tie the cord that is attached to the transition plate to the top of the mast. Guy wires, spaced roughly 120 degrees apart, can be tied to the mast at about chest height and secured to tent stakes, rocks, bushes, or anything else available. If a pipe or other mast support is available, the guy lines may be unnecessary. The mast can then be erected and secured, with the antenna wire pulled taut. The mast flexibility prevents excessive stress on the antenna wire.

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

All photos provided by the author.

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

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

Pascal Villeneuve, VA2PV, va2pv@arrl.org

Product Review

PreppComm MMX Multiband Morse Code Transceiver

Reviewed by Paul Danzer, N1II
n1ii@arrl.net

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

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

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

Bottom Line

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

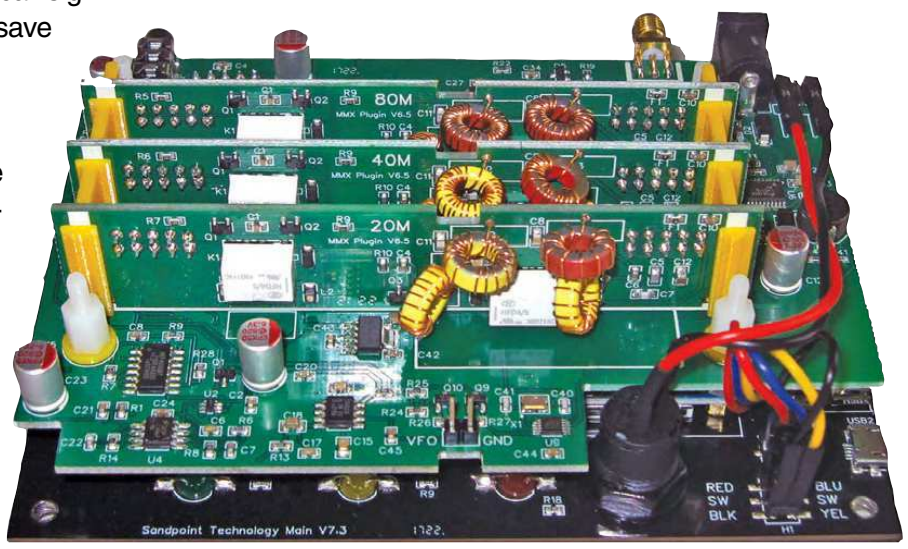
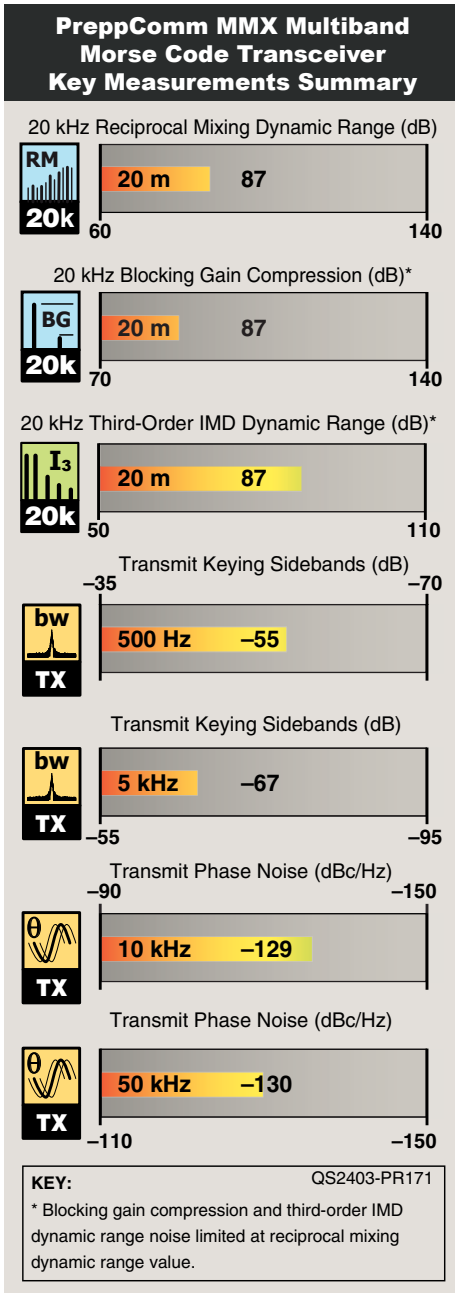


Figure 1 — Internal view of the PreppComm MMX, showing the three band modules (80, 40, and 20 meters).

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

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: receive, 2.45 – 5.6 MHz, 4.9 – 10.22 MHz, 9.8 – 20.9 MHz; transmit, 3.5 – 4.0 MHz, 7 – 7.3 MHz, 14 – 14.35 MHz.	As specified.
Power requirement: 12 – 16 V dc; transmit, 380 – 430 mA; receive, 80 – 120 mA.	At 13.8 V dc: transmit, 408 mA; receive, 112 mA (no signal, max. volume, backlight on), 72 mA (backlight off).
Modes of operation: CW, transmit and receive. AM and SSB, receive only.	As specified.
Receiver	**Receiver Dynamic Testing**
CW sensitivity: noise floor (MDS), better than –118 dBm / 0.03 µV.	–119.1 dBm / 0.28 µV.
Blocking gain compression dynamic range: Not specified.	Noise limited at RMDR value.
Reciprocal mixing dynamic range (RMDR): Not specified.	14 MHz, 20 kHz offset: 87 dB.
Two-tone, third-order IMD dynamic range.	Noise limited at RMDR value.
Transmitter	**Transmitter Dynamic Testing**
Power output: 80 m 2 W, 40 m 3 W, 20 m 1.5 W @ 13.8 V dc.	At 13.8 V dc, 80 m 2.3 W, 40 m 4.7 W, 20 m 1.4 W.
Spurious and harmonic suppression: Not specified.	All bands >53 dBc; meets the FCC limits for spurious emissions.
CW keyer range: up to 60 WPM.	As specified.
CW keying characteristics: Not specified.	See Figures A and B.
Transmit phase noise: Not specified.	See Figure C.
Size (height, width, depth): 1.3 (without lid) or 2.25 (with lid) x 5.2 x 3.8 inches.	
Weight: 11 ounces with lid.	



What's in the Package?

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

There is no obvious instruction material in the carton, but there is a USB-terminated keyboard, slightly smaller than most standard keyboards. Included in the keyboard box is an information sheet that lists two websites. The first one (**www.preppcomm.com/pages/document-library**) brings up the MMX Product Data Sheet, the MMX Morse Code Transceiver Quick Start Guide, and the MMX Morse Code Transceiver Reference Manual. The second link (**www.youtube.com/@preppcomm**) brings up a set of instructional videos. There are a total of eight instructional videos plus a number of user-contributed videos.

Making Connections

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

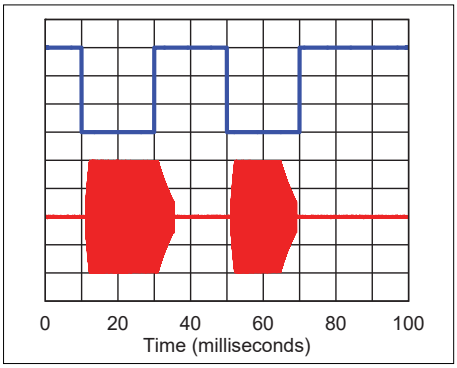


Figure A — CW keying waveform for the MMX showing the first two dits using external keying. Equivalent keying speed is 60 WPM. The upper trace is the key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 2 W output on the 14 MHz band. The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

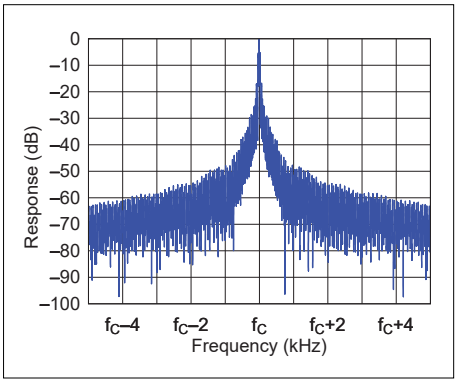


Figure B — Spectral display of the PreppComm MMX transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 2 W PEP output on the 14 MHz band,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

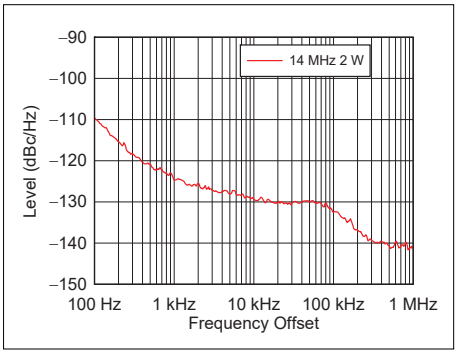


Figure C — Spectral display of the PreppComm MMX transmitter output during phase-noise testing. Power output is 2 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows phase noise 100 Hz to 1 MHz from the carrier. The reference level is –90 dBc/Hz, and the vertical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

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

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

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

Make the Unit Yours

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

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

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

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

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

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

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

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

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

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

It's Almost Time to Get on the Air

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

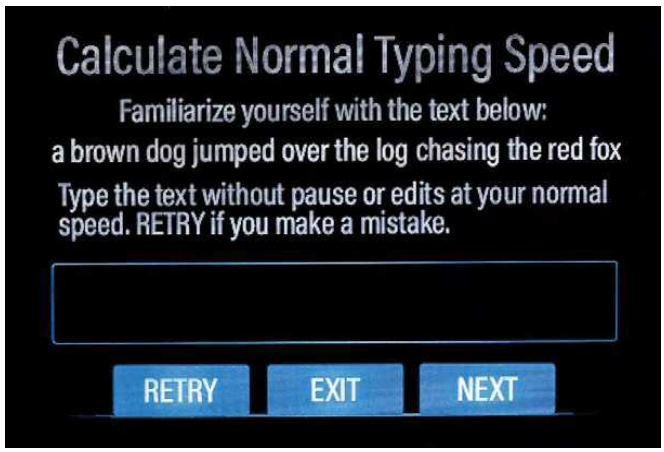


Figure 3 — The PreppComm MMX output code speed is set to the limit, found as a result of this typing speed measurement.

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

Transmitter Commands

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

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

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

Receiver Commands

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

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

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

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

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

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

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

With Your Home Rig

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

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

A Few Other Notes

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

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

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

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

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

On-the-Air Testing

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

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

Lab Notes: PreppComm MMX Multiband Morse Code Transceiver

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

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

Most of the on-the-air testing was spent learning how to effectively use the automatic call sign recognition and the built-in programming language. Although I needed quite a bit of time to learn the system and the programming language, the results can be summed up very quickly — it was fun!

Conclusion

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

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

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

Icom AH-730 Automatic Antenna Tuner

Reviewed by Mark Wilson, K1RO
k1ro@arrl.net

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

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

New and Improved

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

Bottom Line

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

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

Table 2
Icom AH-730 Automatic Antenna Tuner

Manufacturer's Specifications	
Frequency range	1.8 – 54 MHz (>23-foot antenna)
Maximum input power	150 W PEP, 100 W continuous
Tuning power required	5 – 15 W
Tuning time	Average 2 – 3 seconds, maximum 15 seconds
Power supply requirement	13.8 V dc ±15%, <0.7 A (supplied by radio through control cable)
Tuning accuracy	Less than 2:1 VSWR except with antennas ½ λ or a multiple of ½ λ long
Number of tuned memories	45
Dimensions (height, width, depth)	3.1 × 9.1 × 13.4 inches
Weight	5.5 pounds
Compatible antennas	Long wire and vertical whip antennas

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

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

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

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

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

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

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

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

Using the AH-730

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

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

There are no indicators or controls on the AH-730. When it's plugged into the **TUNER** socket, the radio's internal tuner is disabled. Press and hold the front-panel **TUNER** button for a second or two to start tuning. When the standing wave ratio (SWR) is reduced to 2:1 or less, **TUNE** shows on the display and the antenna system is ready to use. Although it's always a good idea to make adjustments on a clear frequency, radiated power during the short tuning process is less than 300 mW, minimizing potential interference with other operators.

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

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

On the Air

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

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

Table 3
Icom AH-730 Resistive Load and Loss Testing

VSWR/Impedance	160 M	80 M	40 M	20 M	10 M	6 M
10:1/5 Ω loss (%)	21%	29%	43%	47%	83%	NT
Tuned SWR	1.1	1.2	1.3	1.2	1.1	
8:1/6.25 Ω loss (%)	11%	18%	32%	32%	68%	NT
Tuned SWR	1.1	1.2	1.3	1.2	1.2	
4:1/12.5 Ω loss (%)	7%	11%	20%	25%	64%	NT
Tuned SWR	1.1	1.2	1.3	1.3	1.1	
2:1/25 Ω loss (%)	3%	5%	13%	19%	45%	NT
Tuned SWR	1.1	1.2	1.2	1.1	1.3	
1:1/50 Ω bypass loss (%)	0%	0%	2%	4%	4%	5%
Bypass VSWR	1.2	1.2	1.2	1.1	1.1	1.9
2:1/100 Ω loss (%)	6%	4%	11%	12%	44%	62%
Tuned SWR	1.1	1.2	1.2	1.2	1.3	1.6
4:1/200 Ω loss (%)	7%	6%	10%	17%	67%	69%
Tuned SWR	1.1	1.2	1.2	1.1	1.1	1.4
8:1/400 Ω loss (%)	4%	7%	11%	20%	69%	84%
Tuned SWR	1.1	1.2	1.2	1.2	1.2	1.3
10:1/500 Ω loss (%)	6%	8%	12%	22%	75%	89%
Tuned SWR	1.1	1.2	1.1	1.2	1.2	1.3

NT = No tuning solution found
All loss percentages accounted for % of reflected power at tuned SWR.

Lab Notes: Icom AH-730 Automatic Antenna Tuner

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

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

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

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

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

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

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

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

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

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

All loss percentages accounted for % of reflected power at tuned SWR.
*Loss of the antenna simulator box on 160 – 40 meters.

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

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

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

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

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

Final Thoughts

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

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

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

Reviewed by John Leonardelli, VE3IPS
jleonardelli@arrl.net

I have been searching for a lightweight HF multiband antenna that I can easily carry during air travel and fit into the side pocket of my backpack for portable use. After conducting some research, I came across the JNCRadio M-104 multiband antenna kit. It consists of a base-loaded vertical antenna with band coils for 40, 20, 15, and 10 meters, a base unit using the PL-259 format connector, a counterpoise ring terminal (for adding your own counterpoise), and a 3.94-foot (1.2-meter) telescopic whip. The power rating of 50 W PEP is perfect for my portable operations. Additionally, it includes a six-sided coupler to connect the whip directly to the antenna base without a coil. The assembly process is straightforward, with all components easily screwing together. I ordered mine from **www.chelegance.com**, and it arrived within 7 days with UPS shipping.

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

Bottom Line

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

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

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

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

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

Portability and On-the-Air Operations

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

Because I rented a car, I was able to use a Diamond K400 mount that I had packed (don't forget the Allen key) along with the M-104 antenna for HF operations. I also brought a cigarette lighter cord for the radio, ensuring I was fully prepared. On a beautiful day, I drove down to the waterfront district of Boston to visit the USS *Constitution* and the Christopher Columbus Waterfront Park. I had also packed a small clamp bracket that I made using an SO-239 connector and a counterpoise wire for use at the park. I typically use either #26 Silky wire or a 33-foot rubberized test lead wire.

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

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

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

Manufacturer's Specifications (not tested by the ARRL Lab)	
Maximum SSB power input	50 W
Maximum digital power input	20 W
Band coverage	40, 20, 15, and 10 meters
Antenna impedance	50 Ω
Antenna connector	PL-259
Minimum antenna length	55.12 inches
Package dimensions	7.09 × 4.33 × 1.18 inches
Weight	11 ounces

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

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

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

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

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

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

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

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

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

Conclusion

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

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

See *QST* in Depth for More!

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

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

Dave Casler, KEØOG, askdave@arrl.org

Ask Dave

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

Key Operating Practices

Balun Coax and Line Loss

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

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

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

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

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

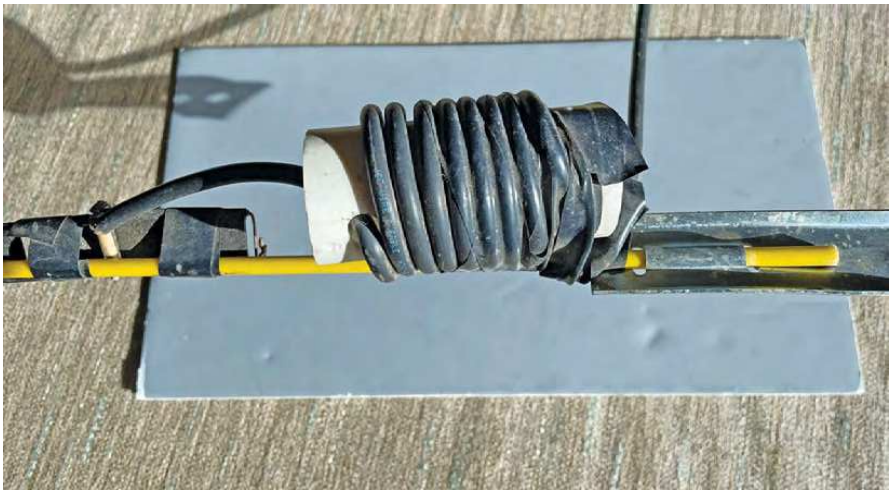


Figure 1 — An "ugly balun" for a **J**-pole made by wrapping several turns of coax around a short length of plastic pipe. On 2 meters, this provides enough inductance to keep common-mode current from coming down the coax. This coax coil does not affect what is inside the coax except to add length to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

Contacting the International Space Station

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

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

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

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

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

Sorting Out Repeaters

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

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

Each repeater has input and output frequencies, often called the "frequency pair," assigned by your state's frequency coordinator. The frequency coordinator has only so many pairs to assign, so one of the coordinator's jobs is to keep repeaters with the same pair geographically separated. Sometimes, this is impossible, so repeaters on the same pair will have different CTCSS codes so you don't go into the wrong one. The frequency pair and CTCSS code combination makes each repeater unique, so if you can make a contact using that information, you can be sure of which repeater you are using. If it is a linked system, the person you talk with may be coming into the system from an entirely different repeater.

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

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

Strays

QST Congratulates...

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

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

Hints & Hacks

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

Fix a Floppy D-104 Head

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

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

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

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

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

Drake L-4B Vernier Drive Replacement

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

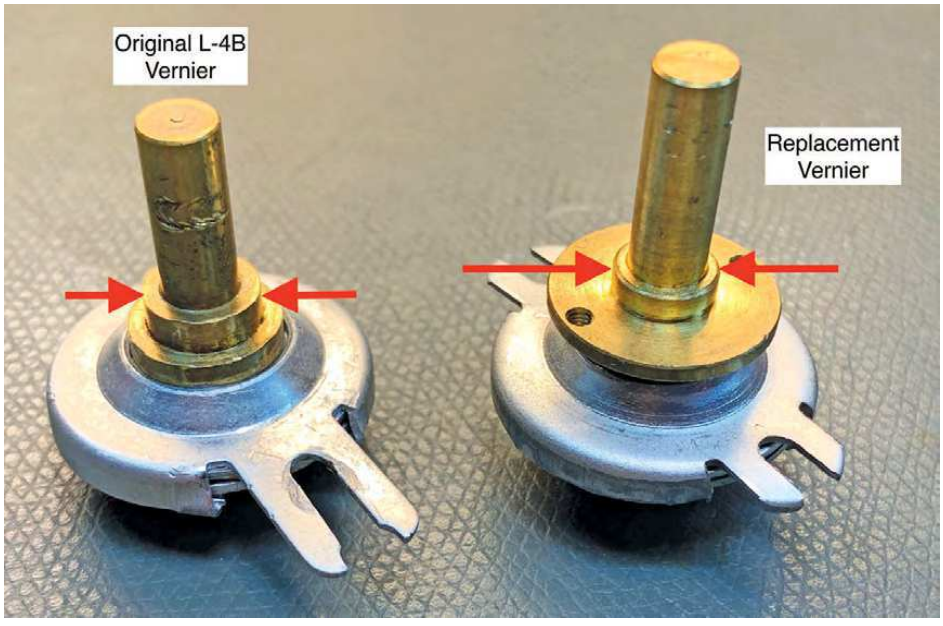


Figure 3 — The old vernier control is on the left, and the new vernier control is on the right. There is a clear difference between their sizes. [Dino Papas, KLØS, photo]

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

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

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

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

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

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

Cat5e Cable for Audio Runs

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

I chose one pair for each desired audio channel. When you remove the jacket, you will see that there are four color-coded pairs: green, blue, orange, and brown. Each solid color has a corresponding partially white partner (see Figure 6). I used the partially white wire as the ground in each audio channel, and I used the colored conductor for the audio signal.

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

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

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

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

Technical Correspondence

Back Feeding Dangers; Ultraviolet Degradation of PVC

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

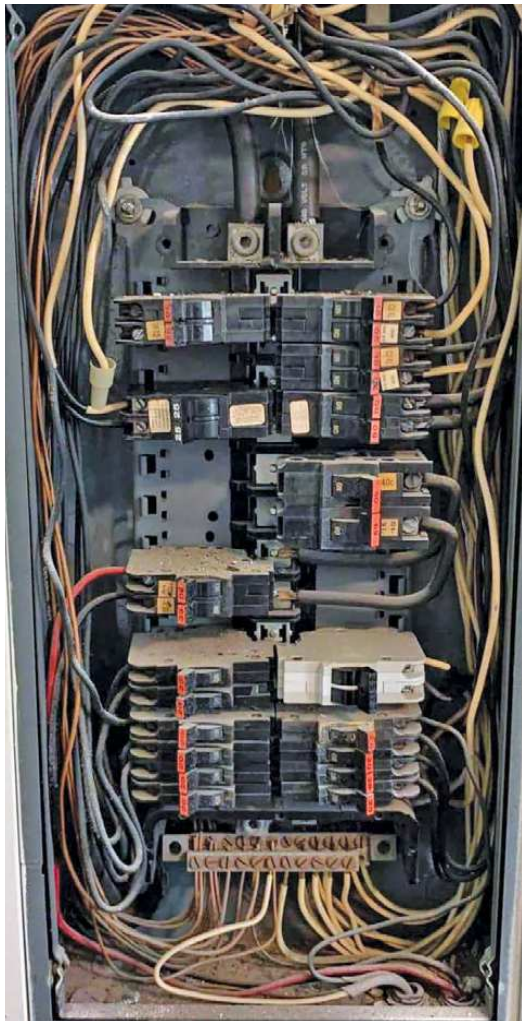


Figure 1 — An example of a split bus panel. These panels contain two separate sets of bus bars. [**www.waypointinspection.com**]

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

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

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

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

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

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

PVC Degradation with UV Exposure

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

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

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

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

Some plumbing PVC (generally beige, not to be confused with CPVC) is rated as UV-resistant. Gray electrical conduit PVC has Schedule 40 dimensions, and the fittings are fully interchangeable (not in drain-waste-vent types, which are a lighter weight and smaller size). In plumbing, gray PVC pipes and fittings may not be technically rated and stenciled as UV-resistant, but they seem to work fine outdoors. Plumbing PVC also comes in (generally gray) Schedule 80 threaded fittings, such as adapters, nipples, and threaded-one-end nipples.

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

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

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

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

An American Ham in TF Land

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

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

James Kooistra, KB8VUC

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

Planning and Preparations

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

As it turns out, upgrading to the General license 15 years ago put me in a great position to operate in a European country! As the United States has agreed to the European Conference of Postal and Telecommunications Administrations (CEPT) Electronic Communications Committee (ECC) Recommendation T/R 61-01, my US General license is equivalent to a CEPT Novice license under ECC Recommendation (05)06. Because there are some variations among CEPT countries, I highly recommend looking at the excellently detailed "Countries with CEPT License" PDF provided by the German Amateur Radio Club (see **https://files.darc.de/index.php/s/CKT38kZP6miK7xf**). Another resource of great help was **www.ira.is/english**, which includes a detailed list of local repeaters, the European Automatic Packet Reporting System (APRS) frequency, and contact information. Armed with this information, I was ready to operate as TF/KB8VUC.

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

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

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

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

Experiencing a New Society and Culture

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

Meeting the IRA

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

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

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

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

All photos by the author.

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

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

2022 Youth DX Adventure Trip

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

Brennan Long, K6BFL

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

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

Meet the Team

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

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

Operation Situations

After a short teaching period with the team leaders, Candace, TJ, and I felt like station veterans and started working people by the hundreds. Initially, internet service at the station was spotty, so FT8 was limited, but we were still able to operate SSB and CW. I was the only youth operator who knew CW, so I focused on that while Candace and TJ operated SSB. We operated well into the night and had several hours of more than 200 contacts per hour. Our team was lucky to have access to the expertise of the team leaders for the week. Geoff, Uli, and the other team leaders gave us tips on how to be stronger operators. At one point, I was struggling with a large CW pileup, and Geoff kindly gave

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

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

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

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

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

YDXA: A Brief History

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

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

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

Feedback

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

Cultivating a Diverse Ham Community

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

Will Hascall, KC9OKM

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

Maintain a Welcoming Environment

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

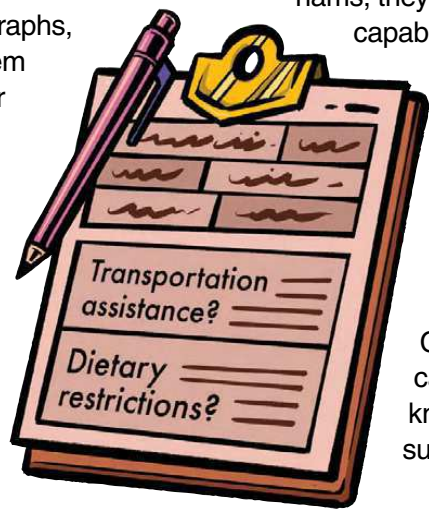
Having consistent messaging is key. If your club claims to be diverse, it must be reflected throughout their communications. Some members may not desire to be put in the spotlight, but they do want to be included. In your messaging — photographs, articles, and testimonials — show them being radio active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

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

Making your promotional material more accessible can increase your chances of reaching a wider audience. For example, you may believe that your organization's website or social media presence is already widely readable, but they may be inaccessible to people with disabilities. Consider following suggestions from organizations like WebAIM (**https://webaim.org**) that offer tips and training for promoting accessible web design. You might not need to print brochures in braille or large print, but it's a good idea to provide materials that are uncluttered and easily read by text-to-speech devices. You can also provide electronic copies of materials, such as agendas, meeting minutes, and brochures, upon request.

Get to Know One Another

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

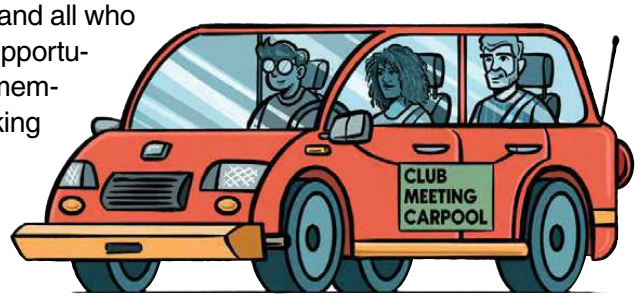


Club meetings, hamfests, and conventions can be great places for members to get to know each other. However, if you can't drive, suffer from social anxiety, are neurodivergent,

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

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

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



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

Adapt to Everyone's Needs

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

If your club normally meets at a location that's not near a bus line, or outside the average cab rate range, consider relocating or providing alternative methods for attending. You might consider using internet conferencing tools like Zoom and Google Meet, the telephone, or the local repeater. Recording meetings is also a useful tool for those who can't attend. If you know of members who want to attend meetings but don't, find out why and see if they can be accommodated.

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

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

Looking Ahead

Most hams are helpful, generous, and kindhearted people. However, we need to be constantly evaluating our efforts with recruitment and retention, and provide the necessary means for as many people as possible. This may mean that we need to change the way we've done things in the past.

Diversity makes us all stronger, more resilient, and much more interesting as a group. If your club or organization's recruitment methods aren't working, try something different; diversify your methods and adapt to the way the world is now.

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

Illustrations by Kevin Sterjo.

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

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

Remembering the Cold War through Parks on the Air

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

Andrea Borgnino, IWØHK

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

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

Antennas Atop a Mountain of Rubble

The first Berlin location I chose was a park located 1 kilometer away from the headquarters of Rundfunk Berlin-Brandenburg, the public radio-television of Berlin and Brandenburg. Teufelsberg, or Devil's Mountain, is a hill created from the rubble that resulted from bombings during World War II. Today, it's completely covered with splendid oak trees within Grunewald Forest (POTA reference DA-0218).

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

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

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

An Airport Laden with History

I made my second POTA activation at another symbol of the Cold War — directly on the runway of the former Tempelhof Airport. Among fog and frost, I was able to transmit low-power CW using the same QMX transceiver. This airport, situated in the southern part of the central Tempelhof-Schöneberg district in Berlin, was operational from 1923 to 2008. It's particularly famous for hosting the base of the Berlin Airlift during the Cold War when the United States and their allies in Western Europe transported food and other necessities by plane to West Berlin, which was being blocked by the Soviet Union.

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

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

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

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

The Joys of POTA

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

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

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

All photos by the author.

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

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

Getting the Most Out of PSK Reporter

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

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

Ira Brodsky, KC9TC

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

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

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

PSK Reporter's Capabilities

PSK Reporter was created to automatically collect reception reports of digital transmissions and to make them available almost immediately to amateur radio operators and shortwave listeners. This became much easier with the introduction of second-generation digital modes, such as PSK31, that employ internet-connected PCs using software and sound cards to encode and decode data for transmission and reception (first-generation digital modes such as radioteletype [RTTY] and amateur teleprinting over radio were introduced before the web existed and required special hardware).

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

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

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

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

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

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

The PSK Reporter map (see Figure 1) is automatically refreshed every 5 minutes (you can manually refresh the map; however, if done too often, it will ask you to "Moderate your requests" and impose a 5-minute wait). Each call sign is updated every 20 minutes or sooner if the station changes band or mode. The site also feeds data to DX clusters that report spots of active DX stations.

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

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

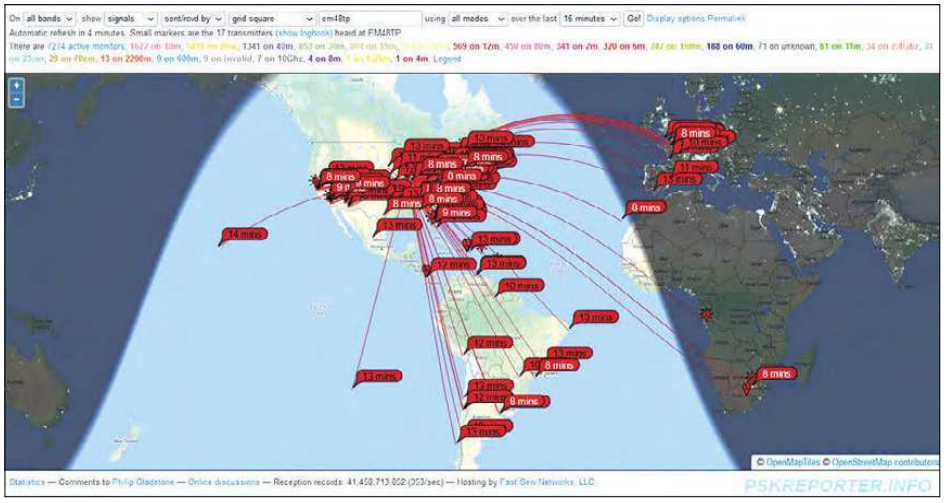


Figure 1 — PSK Reporter map display showing signals sent and heard by a nearby station within the last 15 minutes. Stations sharing the same six-character grid locator are within the same rectangular area, roughly 3 by 4 miles, in the continental US. [Ira Brodsky, KC9TC, photo]

Tips for Using PSK Reporter

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

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

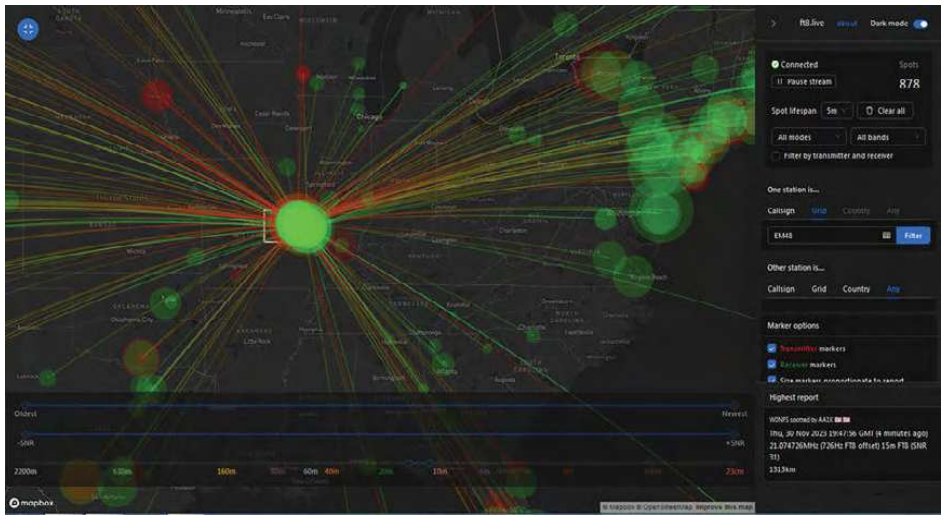


Figure 2 — FT8 Live map display (in optional dark mode) showing signals sent and heard in grid locator EM48 on the 15-meter band over the last 5 minutes. Note the sliders at the bottom of the map for controlling the age, SNR, and frequency band of the spots. [Ira Brodsky, KC9TC, photo]

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

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

To find the best frequencies and times to reach a DXpedition, enter the station's call sign in the search box and select **ALL MODES** (or the specific mode of interest) in the dropdown menu to the right of the search box. Click on **SHOW LOGBOOK** beneath the search box to download a searchable ADIF file for the last 24 hours or 7 days. You can also zoom into your location on the map to see when other stations in your area spotted the DXpedition and the modes and frequencies.

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

Related Tools and Websites

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

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

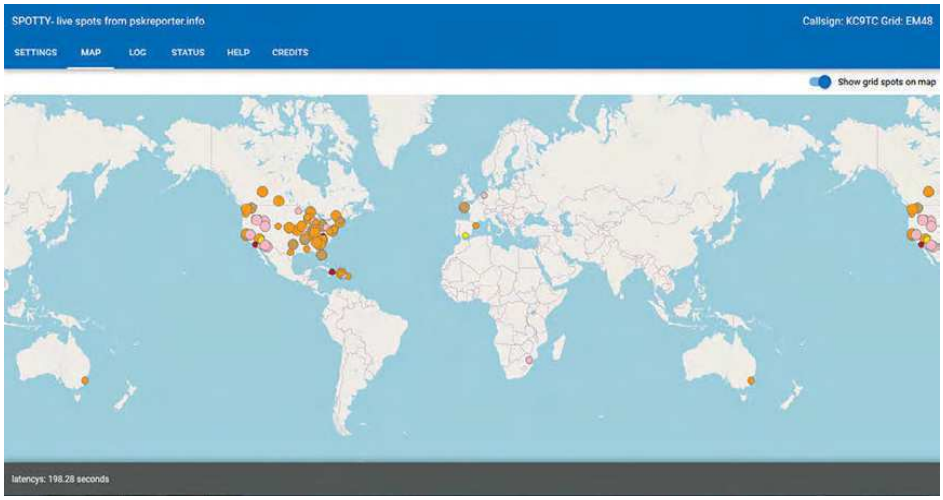


Figure 3 — Map display at Spotty showing stations heard in grid locator EM48 within 60 seconds. New markers automatically appear as markers older than 60 seconds drop off the map. [Ira Brodsky, KC9TC, photo]

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

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

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

For Website Developers

You can access a live feed of PSK Reporter spots using the protocol discussed at **http://mqtt.pskreporter.info**. This can be done with an MQTT client program such as the MQTT Explorer application available for Windows, Mac, Linux, and Ubuntu platforms. Users are encouraged to narrow down the feed to the items of interest (such as mode, frequency, band, and so forth) using the provided topic filters because the full feed is bandwidth intensive.

For Application Developers

To enable your application to submit spots, download the software development kit (SDK) at **https://pskreporter.info/pskreporter.zip**. The SDK contains a document describing the PSK Reporter API (also available at **https://pskreporter.info/PSKReporter.pdf**) and a dynamic link library for integration with Windows applications (Windows 2000 and above). Programs such as *fldigi*, *MSHV*, and *JTDX* have implemented the spot submission protocol, and their code is available under the General Public License version 3. A description of the protocol can be found at **https://pskreporter.info/pskdev**.

Conclusion

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

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

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

ARRL Responds to FCC Proposals

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

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

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

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

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

The bands addressed in this rulemaking are as follows:

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

ARRL Is New Publisher of Gordon West, WB6NOA

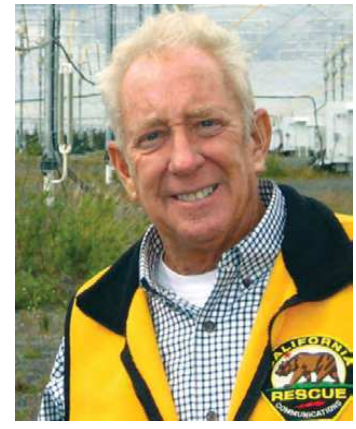
ARRL is the new publisher of the *Amateur Radio License Preparation* books and related resources authored by Gordon West, WB6NOA. Gordon West's popular books, classes, and audio courses have been a mainstay of amateur radio licensing for more than 40 years. Generations of hams have learned from Gordon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

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

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

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

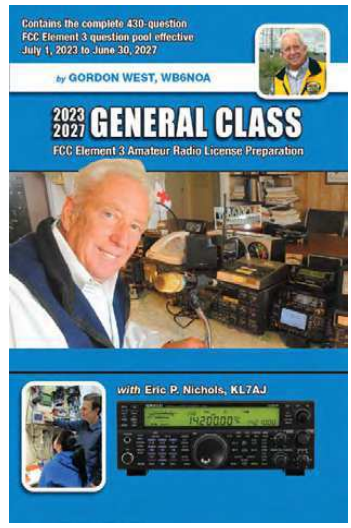
The books, including future editions, will continue to be authored by Gordon



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

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

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



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

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

2024 Orlando HamCation® Awards

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

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

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

This year's Gordon West Ambassador of the Year Award winners are Fred, AB1OC, and Anita Kemmerer, AB1QB. The Kemmerers hold Amateur Extra-class licenses and are active in the Nashua Area Radio Society (NARS) to promote amateur radio instruction, youth outreach, and science, technology, engineering, and math (STEM) education. Together, they've created and helped grow Ham Bootcamp, a program encouraging hams to learn new skills. They assist with NARS's training and licensing events, along with Tech Night, which complements club meetings. Their participation in STEM activities includes high-altitude balloon launches, foxhunts, and ARISS contacts.

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

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

ARRL Kids Day a Success in Nebraska

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

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

Parents were impressed with Kids Day. One said,

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

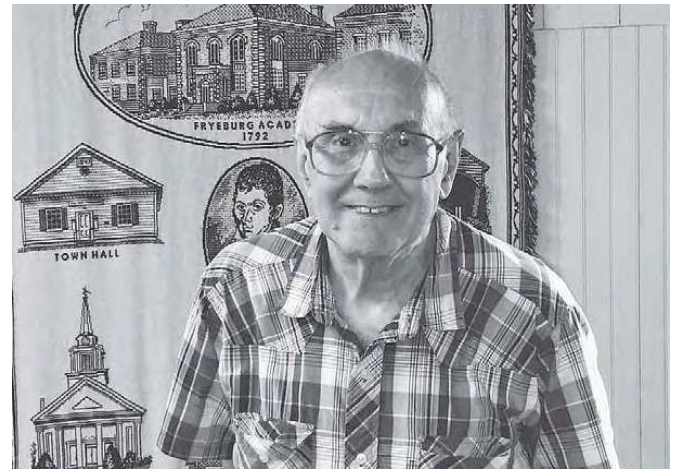
The final highlight of the day came as each child received their certificate of completion. Africa, Asia, Europe, and North America were all represented as the country of birth or the original nationality of the youth participants, and they talked with amateurs as far away as England and Canada.

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

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

Marty Engstrom, N1ARY, Silent Key

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



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

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

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

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

According to those who knew him, Engstrom frequently served his community through amateur radio. After a major ice storm in 1998, hams in Oxford County, Maine, banded together to form an emergency communications group. "Marty's low-key approach to various situations, even the more stressful ones, helped the group stay focused. His wealth of knowledge of transmitters and antennas was a tremendous benefit to the less-experienced hams," said Wayne Strout, N1YIS. "Marty actively worked as a member of our group with drills and training for both the Community Emergency Response Team and Amateur Radio Emergency Service."

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

Rick Palm, K1CE, k1ce@arrl.net

Public Service

Responding to an Unexpected Dust Storm

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

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

A Perfect Storm

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

A combination of the dry conditions, newly tilled topsoil, a low-lying segment of the road, and gusting winds created a wind tunnel, and visibility was nearly nonexistent. It didn't take long before 72 vehicles crashed into one another. Eight people lost their lives, and 37 people were injured.

Calling in Support

Not having a coordinated response was the first obstacle to overcome. KD9LON's Cybersecurity & Infrastructure Security Agency AUXCOMM training kicked in. He noted that many Emergency Medical Services (EMS) clinicians and firefighters were doing an excellent job aiding injured and trapped motorists, but he wasn't sure which agencies were helping and where along the accident perimeter help was being rendered. Even determining the accident perimeter was a challenge due to visibility and communication issues. Securing the accident scene, delivering medical aid, and establishing a unified command were the priorities, as per Incident Command System protocol.

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

Assess, Adapt, and Overcome

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

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

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

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

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

Aftermath

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

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

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

Wrap-Up

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

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

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

All photos provided by Dan Hough, KD9LON.

Field Organization Reports

December 2023

Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program can be found at **www.arrl.org/public-service-honor-roll**.

616
W9RY

470
N9VC

450
AD8CM

400
WA3EZN

345
W7EES

324
WA7PTM

270
WM5N

245
N2LC

240
KT2D

206
W9GRG

205
AC8NP

200
W9EEU

199
W5WMC

188
KV8Z

183
KO4KUS

175
W0PZD
N8SY

170
KC8WH
KE8ANW

K8AMH
WO2H

156
WM2C

155
KD8UUB
KE5YTA

150
W2PAX
W8DJG
N1ILZ

140
NØDMP
WA4VGZ
WB9QPM

135
AI9F
AG9G
KC9FXE
KE8RS

130
WA3QLW
K8MDA
N2JBA
KW1U
N1UMJ
WZØC

128
KT5EM

126
ACØKQ

125
KB9IME
KT5SR

123
K1CFI

122
WV5Q

120
KY2D
WA1URS
K9LGU
WB9WKO
WC4FSU
W4CMH
K7OED
KA9QWC
KF5OMH
K1HEJ
NA7G
N7IE

119
N2DW

115
N3GE

110
KA9MZJ
AD4DO
KM4WHO
KR4PI
KF5IOU
NW3X
KDØHHN
K1UAF
W1INC
N1IQI
W1RVY

108
KC8T

105
K5ANP

102
N7UWX

100
W1KX
NX9K
KZ8Q
WB4RJW
KB8GUN
KA5AZK
N1LAH
KC1KVY
W1TCD

99
KC1HHO

98
W8IM
KG5NNA

97
WB8SIQ

96
K4NWX
KT4WX

94
KFØBPN

93
WB8YYS
W2OOD

92
KB1NMO
K1XFC

91
W2ARP

90
N4NOA
KB9GO
KC9UC
KF7GC
N8MRS
W8GSR
KL7RF
K8KRA
KB8HJJ
W8MAL
N8OD
AB9ZA
W1FEA

89
KG5AOP
KB5PGY

88
KBØDTI

87
NT1N

85
KB1TCE
W7MIN

84
K4FHR
N1PZP

82
KB4OLY

81
NØET

80
AE2EY
KR4ST
KA8BJA
AJ7B

79
W4PXE
N1CVO

78
W7PAT

77
N2TSO

76
W5XX

75
K5OB

74
W3ZR

73
K1STM

70
K6RAU

The following stations qualified for PSHR in previous months, but were not acknowledged in this column yet. (Nov. 2023) W9RY 296, WB9QPM 140, AI9F 135, KA9MZJ 110. (Oct. 2023) W4CMH, KR4PI 140, W2PAX 130, K4FHR 85, KR4ST 80, W2ARP 76. (Aug. 2023) W9EEU 248, KA9QWC 120, AB9ZA 90, W9BGJ 78. (July 2023) W9BGJ 78.

Section Traffic Manager Reports

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

Section Emergency Coordinator Reports

The following Section Emergency Coordinators reported: AR, CT, ENY, EPA, GA, KY, MDC, MI, MO, ND, NFL, NLI, NNJ, NNY, NV, OK, SCV, SNJ, STX, TN, VA, WMA, WPA, WWA, WY.

Brass Pounders League

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

NX9K 1,932, KY2D 1,757, W2AH 1,560, WB9WKO 946, KW1U 832, WA3QLW 771, K8ED 642, N9CK 620, N9VC, W2PAX 548, AG9G 509, KB9GO 507.

Contest Corral March 2024

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

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

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

Bob Raymond, WA1Z, bobraymondwa1z@gmail.com

The 2023 IARU HF World Championship Results

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

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

Full Results Online

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

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

2023 IARU Special Station Scores

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

IARU Headquarters Stations

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

IARU Administrative Council Stations

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

IARU R1

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

IARU R2

PT2ADM	37,630
YS1MS	35,409
VE3YV	*4,288*

IARU R3

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

Top Ten — US and Canada

Single Operator, Mixed Mode, High Power

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

Single Operator, Mixed Mode, Low Power

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

Single Operator, Mixed Mode, QRP

W3PAX	7,700
NØLMQ	4,202
VA3IIF	1,632

Single Operator, Phone Only, High Power

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

Single Operator, Phone Only, Low Power

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

Single Operator, Phone Only, QRP

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

Single Operator, CW Only, High Power

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

Single Operator, CW Only, Low Power

K7SV	1,108,306
K1VUT	785,325
K9ZO	695,266
VE3TM	693,744
N7VM	577,273
W7YAQ	536,112
W1QK	442,636
WJ9B	373,296
K5MR	354,078
WB4TDH	308,176

Single Operator, CW Only, QRP

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

Single Operator Unlimited, Mixed Mode, High Power

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

Single Operator Unlimited, Mixed Mode, Low Power

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

Single Operator Unlimited, Mixed Mode, QRP

K8ZT	27,097

Single Operator Unlimited, Phone Only, High Power

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

Single Operator Unlimited, Phone Only, Low Power

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

Single Operator Unlimited, Phone Only, QRP

VE3BFU	1,920

Single Operator Unlimited, CW Only, High Power

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

Single Operator Unlimited, CW Only, Low Power

N2YO	1,050,448
N4AO (WC4E, op)	652,462
W3KB	620,100
WA1FCN	507,232
K7TQ	502,803
N9NC	487,648
KG9X	457,760
N2GA	453,492
WY7M	358,980
KØAD	358,956

Single Operator Unlimited, CW Only, QRP

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

Multioperator, Single Transmitter, High Power

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

Multioperator, Two Transmitter, Low Power

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

Top Ten — Worldwide

Single Operator, Mixed Mode, High Power

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

Single Operator, Mixed Mode, Low Power

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

Single Operator, Mixed Mode, QRP

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

Single Operator, Phone Only, High Power

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

Single Operator, Phone Only, Low Power

CT2HOV	584,463
PGØØT	584,259
YO7SR	523,525
MIØI	466,992
SN7T	274,866
DM5B (DG6IMR, op)	261,660
OK6AB	241,242
YO6GUU	200,200
DM2BR	194,296
DL6MRM	180,400

Single Operator, Phone Only, QRP

ES6RW	307,338
YO9FNP	194,950
IZ4AIF	84,125
HB9EGA	80,949
PY6GOE	45,551
MI7DGO	44,400
SP5LCT	43,452
PY2PPZ	27,477
HA1TI	26,322
BG6VBM	19,467

Single Operator, CW Only, High Power

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

Single Operator, CW Only, Low Power

4Z4AK	1,873,800
DL3JAN	1,245,312
LA2AB (LA7MFA, op)	1,154,860
K7SV	1,108,306
M5W	986,040
OM7K (OM7RU, op)	930,602
MI5I (GIØRQK, op)	846,183
K1VUT	785,325
HA7UI	780,966
JI1RXQ	742,980

Single Operator, CW Only, QRP

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

Single Operator Unlimited, Mixed Mode, High Power

OH1F (OH1TM, op)	4,341,216
ED8M (EA8DIG, op)	4,135,400
YU5R (YT2AAA, op)	3,061,016
RM5F	2,925,738
KM3T (@KC1XX)	2,915,689
YT9X (YTØC, op)	2,579,910
K4RO	2,360,271
YL7X (YL2LY, op)	2,260,244
II8K	2,207,428
HA6P	2,200,436

Single Operator Unlimited, Mixed Mode, Low Power

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

Single Operator Unlimited, Mixed Mode, QRP

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

Single Operator Unlimited, Phone Only, High Power

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

Single Operator Unlimited, Phone Only, Low Power

TA3NE	837,216
SP3H	759,528
M1T (MØKYB, op)	440,977
R9RA	439,425
UA9R	426,351
SV3RPQ	410,304
SO7E	316,998
8S8S (SM5XSH, op)	313,789
K3PA	302,445
F8ADY	265,073

Single Operator Unlimited, Phone Only, QRP

YO8WW	316,784
HA5BGG	65,436
CT2GSN	39,101
UZ7M (UT9MZ, op)	34,532
MM7BWK	13,804
YO5DSG	6,815
PU5ALE	3,456
VE3BFU	1,920
YO4LUP	1,292
YO8KNN (YO8OLY, op)	288

Single Operator Unlimited, CW Only, High Power

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

Single Operator Unlimited, CW Only, Low Power

ES7A (ES7GM, op)	3,049,920
UN4Q (UA4Z, op)	1,897,764
EC3A	1,602,640
SP2R	1,405,833
N2YO	1,050,448
EE3O (EA3O, op)	1,027,788
RW9DX	1,018,000
OM7LW	1,014,006
UA3RBR	906,865
RA9AP	896,694

Single Operator Unlimited, CW Only, QRP

HG6O (HA6OA, op)	773,738
JA6GCE	372,376
DM7AA	341,829
HG6C (HA6IAM, op)	280,731
HG3C (HA3HX, op)	216,240
W1FJ	173,799
UR2Y (USØYW, op)	152,928
YT5YTT	120,640
9A/S51Z	85,436
N4IJ	80,464

Multioperator, Single Transmitter, High Power

RM9A	7,342,026
UP2L	7,046,720
RU1A	6,698,928
PX2A	4,395,207
UA4S	4,294,634
HG6N	3,669,574
ZF5T	3,491,152
II2S	3,425,237
K5TR	3,226,744
RT4G	3,094,236

Multioperator, Two Transmitter, Low Power

HG7T	3,439,952
I44W	3,312,960
I43C	3,257,882
I49D	3,123,456
I47L	3,089,093
I42M	3,070,710
I47M	2,965,550
I44C	2,891,980
I46Q	2,828,035
I47V	2,827,257

Regional Leaders

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

West Coast Region

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

N9RV	3,031,796	SO-MIX-HP
K7NT	936,616	SO-MIX-HP
W1PR	73,656	SO-MIX-HP
KX7M	23,329	SO-MIX-HP
N7XCZ	13,908	SO-MIX-HP
WA7BNM	88,690	SO-MIX-LP
K7LR	43,290	SO-MIX-LP
K6RAD	36,437	SO-MIX-LP
WA8ZNC	29,568	SO-MIX-LP
N6AJS	10,752	SO-MIX-LP
W7WA	350,592	SO-PH-HP
AC7GL	43,120	SO-PH-HP
AI6LY	20,068	SO-PH-HP
NC6R	11,128	SO-PH-HP
K6DAV	6,055	SO-PH-HP
N6OKU	47,450	SO-PH-LP
K7HKR	24,080	SO-PH-LP
W1DGL	11,656	SO-PH-LP
VA6AGR	7,326	SO-PH-LP
NX7W (N7FLT, op)		
	6,992	SO-PH-LP
W6QU (W8QZA, op)		
	15,180	SO-PH-QRP
W6YX (N7MH, op)		
	1,529,331	SO-CW-HP
N6TV	1,431,872	SO-CW-HP
K6NA	1,244,680	SO-CW-HP
NI6W	499,872	SO-CW-HP
AJ6V	358,203	SO-CW-HP
N7VM	577,273	SO-CW-LP
W7YAQ	536,112	SO-CW-LP
WJ9B	373,296	SO-CW-LP
VE6BBP	217,536	SO-CW-LP
W6ZL	69,408	SO-CW-LP
N6HI	1,116	SO-CW-QRP
NK6A	142,236	SOU-MIX-HP
N6WT	125,248	SOU-MIX-HP
K6KR	119,040	SOU-MIX-HP
N7RVD	85,351	SOU-MIX-HP
NQ7R	75,938	SOU-MIX-HP
VE6TL	200,703	SOU-MIX-LP
KW6AA	165,998	SOU-MIX-LP
WN6W	57,494	SOU-MIX-LP
AD7XG	19,278	SOU-MIX-LP
KN6VVQ	18,585	SOU-MIX-LP
KE6GFI	61,320	SOU-PH-HP
N7GCO	56,700	SOU-PH-HP
W7ZZ	30,855	SOU-PH-HP
K0NG	25,668	SOU-PH-HP
K6DW	17,952	SOU-PH-HP
WZ8T	41,749	SOU-PH-LP
K7JKM	3,776	SOU-PH-LP
VE6CLG	1,160	SOU-PH-LP
N6AJR	1	SOU-PH-LP
W7RN (WD6T, op)		
	2,004,912	SOU-CW-HP
N7AT (K8IA, op)		
	892,234	SOU-CW-HP
VE7LWW	806,080	SOU-CW-HP
KA6BIM	761,280	SOU-CW-HP
K7QA	594,384	SOU-CW-HP
K7TQ	502,803	SOU-CW-LP
AA2IL	267,960	SOU-CW-LP
W7VO	150,216	SOU-CW-LP
K6WSC	64,314	SOU-CW-LP
WA0WWW	47,357	SOU-CW-LP
WQ6X	37,471	SOU-CW-QRP
K2GMY	100	SOU-CW-QRP
ND7K	2,283,175	MSHP
N7DX	1,778,334	MSHP
NX6T	1,116,744	MSHP
N6WM	923,544	MSHP
KT7E	645,392	MSHP

Midwest Region

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

VE5CPU	20,020	SO-MIX-HP
VE5SF	263,538	SO-MIX-LP
K0EA	237,159	SO-MIX-LP
AI6O	150,280	SO-MIX-LP
KA0PQW	95,586	SO-MIX-LP
AF5CC	92,803	SO-MIX-LP
N0LMQ	4,202	SO-MIX-QRP
W0CN	171,112	SO-PH-HP
K9MWM	79,054	SO-PH-HP
KD0JLE	50,854	SO-PH-HP
WX0Z	34,476	SO-PH-HP
VE4SG	6,253	SO-PH-HP
K5DHY	98,210	SO-PH-LP
KI0R	18,172	SO-PH-LP
NW5Q	17,212	SO-PH-LP
KF0HCN	16,072	SO-PH-LP
AF5MN	14,484	SO-PH-LP
WW0WB	2,726	SO-PH-QRP
WX0B (AD5Q, op)		
	2,153,288	SO-CW-HP
N5AW	231,261	SO-CW-HP
K0FX	165,846	SO-CW-HP
W4IFI	141,373	SO-CW-HP
N3BB	112,728	SO-CW-HP
K5MR	354,078	SO-CW-LP
KD2KW	148,248	SO-CW-LP
N0AX	141,588	SO-CW-LP
N5XE	59,004	SO-CW-LP
NN5T	43,200	SO-CW-LP
N5OBC	70	SO-CW-QRP
K0MD	384,375	SOU-MIX-HP
KV0I	219,950	SOU-MIX-HP
K0BJ	209,095	SOU-MIX-HP
W5GCX	23,750	SOU-MIX-HP
NT5SM	20,374	SOU-MIX-HP
W7CXX	433,380	SOU-MIX-LP
WB5N	153,258	SOU-MIX-LP
K5TXM	14,175	SOU-MIX-LP
N5DTT	10,150	SOU-MIX-LP
VE5UO	3,588	SOU-MIX-LP
W0PMO	104,386	SOU-PH-HP
K0TRL	32,697	SOU-PH-HP
AB5KM	9,396	SOU-PH-HP
WD5ENH	1,938	SOU-PH-HP
W5RIR	1,460	SOU-PH-HP
K3PA	302,445	SOU-PH-LP
KI5MM	127,182	SOU-PH-LP
N7MZW	28,584	SOU-PH-LP
K0TJT	3,348	SOU-PH-LP
W5IOH	2,064	SOU-PH-LP
N5RZ	1,014,189	SOU-CW-HP
N5OT	404,716	SOU-CW-HP
N0AT	359,992	SOU-CW-HP
N5TJ	344,908	SOU-CW-HP
W0VX	284,768	SOU-CW-HP
WY7M	358,980	SOU-CW-LP
K0AD	358,956	SOU-CW-LP
KG5U	342,384	SOU-CW-LP
K0TG	191,513	SOU-CW-LP
AD1C	145,152	SOU-CW-LP
KJ5T	37,674	SOU-CW-QRP
AH7RF/W5	1	SOU-CW-QRP
K5TR	3,226,744	MSHP
K0RF	2,918,720	MSHP
N0MA	578,493	MSHP
W7SU	1,330	MSHP

Central Region

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

VE3AT	3,091,968	SO-MIX-HP
VE3TAZ	110,630	SO-MIX-HP
KE8E	2,616	SO-MIX-HP
VE3KOT	221,361	SO-MIX-LP
VE3NFN	121,368	SO-MIX-LP
N7ZZ	110,448	SO-MIX-LP
K8WU	26,268	SO-MIX-LP
W8FSM	17,670	SO-MIX-LP
VA3IIF	1,632	SO-MIX-QRP
KB8O	288,259	SO-PH-HP
KV8P	66,960	SO-PH-HP
VA3ZNQ	65,100	SO-PH-HP
KE8NBC	29,546	SO-PH-HP
VA3CQG	13,570	SO-PH-HP
VA3KRT	62,040	SO-PH-LP
VE3RVZ	52,287	SO-PH-LP
W8LYO	45,600	SO-PH-LP
KE8VGU	45,580	SO-PH-LP
VE3GJP	32,040	SO-PH-LP
VE3JM	2,831,633	SO-CW-HP
NA8V	2,050,800	SO-CW-HP
W9RE	1,064,217	SO-CW-HP
K8GL	222,789	SO-CW-HP
K8MP	213,072	SO-CW-HP
K9ZO	695,266	SO-CW-LP
VE3TM	693,744	SO-CW-LP
W1NN	306,880	SO-CW-LP
KV8Q	247,572	SO-CW-LP
VE3MA	168,405	SO-CW-LP
VE3SIF	34,136	SO-CW-QRP
WS9V	7,252	SO-CW-QRP
K9OM	1,321,567	SOU-MIX-HP
XM3I	857,534	SOU-MIX-HP
VA3DF	648,945	SOU-MIX-HP
WT2P	416,608	SOU-MIX-HP
KW9A	370,980	SOU-MIX-HP
N8VV	323,420	SOU-MIX-LP
W9AV	256,875	SOU-MIX-LP
VA3OKG	110,776	SOU-MIX-LP
W8TB	100,092	SOU-MIX-LP
K9PG	74,847	SOU-MIX-LP
K8ZT	27,097	SOU-MIX-QRP
W9NZ	179,080	SOU-PH-HP
VA3LR	40,172	SOU-PH-HP
VA3PC	24,220	SOU-PH-HP
N9TCA	13,020	SOU-PH-HP
W8MQT	5,952	SOU-PH-HP
VA3IDD	176,176	SOU-PH-LP
VE3RGO	50,416	SOU-PH-LP
KD9GY	43,920	SOU-PH-LP
WA9YI	6,300	SOU-PH-LP
WS6K	2,987	SOU-PH-LP
VE3BFU	1,920	SOU-PH-QRP
K9NW	2,237,964	SOU-CW-HP
VE3NNT		
	1,549,575	SOU-CW-HP
WA8Y	758,625	SOU-CW-HP
WI9WI	745,998	SOU-CW-HP
VE3CT	693,357	SOU-CW-HP
KG9X	457,760	SOU-CW-LP
N8BJQ	274,464	SOU-CW-LP
WB8JUI	213,332	SOU-CW-LP
WT9U	204,800	SOU-CW-LP
KY0Q	168,980	SOU-CW-LP
KU4A	16,320	SOU-CW-QRP
AB8FJ	826	SOU-CW-QRP
K8AZ	2,874,586	MSHP
NV9L	2,026,976	MSHP
N4SS	1,532,640	MSHP
VA3YLR	25,200	MSHP
VE3VM	13,888	MSHP

Southeast Region

(Delta, Roanoke, and Southeastern Divisions)

NR3X	2,679,446	SO-MIX-HP
K4ZW	2,482,002	SO-MIX-HP
K0EJ	1,645,492	SO-MIX-HP
N4OX	861,840	SO-MIX-HP
AI4WW	58,656	SO-MIX-HP
N8II	386,880	SO-MIX-LP
N9NB	363,020	SO-MIX-LP
K5FUV	182,269	SO-MIX-LP
KX4UI	88,683	SO-MIX-LP
KB4CG	74,052	SO-MIX-LP
N4MM	178,128	SO-PH-HP
N5GF	103,752	SO-PH-HP
K4JC	59,290	SO-PH-HP
W2LAT	31,125	SO-PH-HP
K4QQG	28,576	SO-PH-HP
N2ESP	61,367	SO-PH-LP
KF7CG	58,473	SO-PH-LP
WA4JA	48,288	SO-PH-LP
W9TCV	28,712	SO-PH-LP
KV4ZY	23,030	SO-PH-LP
N4AF	2,101,112	SO-CW-HP
KZ5D	671,240	SO-CW-HP
WQ5L	294,560	SO-CW-HP
KQ4R	291,211	SO-CW-HP
NN4SS	132,712	SO-CW-HP
K7SV	1,108,306	SO-CW-LP
WB4TDH	308,176	SO-CW-LP
K3JT	225,872	SO-CW-LP
WA5SOG	206,790	SO-CW-LP
K4EJ	168,300	SO-CW-LP
K1WAT	22,632	SO-CW-QRP
K2EKM	10,944	SO-CW-QRP
AA4SD	2,280	SO-CW-QRP
KE4WKH	676	SO-CW-QRP
KJ4YM	572	SO-CW-QRP
K4RO	2,360,271	SOU-MIX-HP
N6AR	830,248	SOU-MIX-HP
K3IE	750,800	SOU-MIX-HP
WO4O	598,526	SOU-MIX-HP
N4IQ	461,600	SOU-MIX-HP
N4XL	823,686	SOU-MIX-LP
W4RN	366,540	SOU-MIX-LP
WN4AFP	310,954	SOU-MIX-LP
NK4O	210,180	SOU-MIX-LP
W6FB	202,240	SOU-MIX-LP
NA4DA	349,325	SOU-PH-HP
W4KW	173,880	SOU-PH-HP
W4SDX	69,969	SOU-PH-HP
KG2MM	58,509	SOU-PH-HP
N5GI	28,203	SOU-PH-HP
AJ4HP	80,630	SOU-PH-LP
NN4RB	39,648	SOU-PH-LP
K4SBZ	37,905	SOU-PH-LP
AA5NT	27,885	SOU-PH-LP
AI4DB	16,885	SOU-PH-LP
AD4EB	1,954,940	SOU-CW-HP
N4UU	1,095,024	SOU-CW-HP
W4NZ	970,632	SOU-CW-HP
KM5G	891,613	SOU-CW-HP
NR4M	532,922	SOU-CW-HP
N2YO	1,050,448	SOU-CW-LP
N4AO (WC4E, op)		
	652,462	SOU-CW-LP
WA1FCN	507,232	SOU-CW-LP
AD8J	337,824	SOU-CW-LP
K1GU	188,874	SOU-CW-LP
N4IJ	80,464	SOU-CW-QRP
K9AXT	4,756	SOU-CW-QRP
AD4ES	926,491	MSHP
K4OV	197,415	M2LP
NN4SA	74,675	M2LP
KN4JJA	2,470	M2LP

Northeast Region

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

KQ2M	3,209,088	SO-MIX-HP
N2NT (N2NC, op)		
	2,281,599	SO-MIX-HP
N2PP	1,054,489	SO-MIX-HP
W2XL	129,312	SO-MIX-HP
K3MD	77,562	SO-MIX-HP
KI2D	169,048	SO-MIX-LP
N1NQD	66,595	SO-MIX-LP
W3KN	48,934	SO-MIX-LP
KA2FIR	48,587	SO-MIX-LP
N1ET	34,808	SO-MIX-LP
W3PAX	7,700	SO-MIX-QRP
N1UR	1,858,335	SO-PH-HP
N2QV	1,380,016	SO-PH-HP
NG1M	464,750	SO-PH-HP
WA2GOT	37,315	SO-PH-HP
KC3RRF	12,626	SO-PH-HP
KS2G	88,884	SO-PH-LP
AB1F	88,361	SO-PH-LP
VE2HIT	63,535	SO-PH-LP
VE2IAA	36,991	SO-PH-LP
N2MTG	28,993	SO-PH-LP
K3RWN	450	SO-PH-QRP
W1KM	2,454,192	SO-CW-HP
K1IMI (N4CW, op)		
	512,325	SO-CW-HP
K3UL	445,704	SO-CW-HP
N2MF	387,834	SO-CW-HP
K1KI	352,428	SO-CW-HP
K1VUT	785,325	SO-CW-LP
W1QK	442,636	SO-CW-LP
K2NV	120,450	SO-CW-LP
W2QL	94,820	SO-CW-LP
N2EY	94,340	SO-CW-LP
K8CN	14,473	SO-CW-QRP
W7LG	10,980	SO-CW-QRP
KM3T (@KC1XX)		
	2,915,689	SOU-MIX-HP
W3UA	1,744,470	SOU-MIX-HP
W1GD	1,293,558	SOU-MIX-HP
K1AR	1,122,480	SOU-MIX-HP
K1JB	929,856	SOU-MIX-HP
WO1N	550,844	SOU-MIX-LP
NF3R	208,080	SOU-MIX-LP
W2RDS	108,966	SOU-MIX-LP
K2AL	81,046	SOU-MIX-LP
KI7WX	72,720	SOU-MIX-LP
W3LL	738,282	SOU-PH-HP
VE2NTT	684,199	SOU-PH-HP
W3FR	141,588	SOU-PH-HP
WA2DNI	111,940	SOU-PH-HP
N8IVN	83,284	SOU-PH-HP
W2NTV	91,188	SOU-PH-LP
KD2JOE	74,338	SOU-PH-LP
KC1OT	65,880	SOU-PH-LP
VE1FSM	57,204	SOU-PH-LP
KA2KON	40,502	SOU-PH-LP
K1LZ (NA1NA, op)		
	4,916,190	SOU-CW-HP
N3RS	2,681,503	SOU-CW-HP
AB3CX	2,052,500	SOU-CW-HP
N3AD	1,795,526	SOU-CW-HP
VE9AA	1,645,742	SOU-CW-HP
W3KB	620,100	SOU-CW-LP
N9NC	487,648	SOU-CW-LP
N2GA	453,492	SOU-CW-LP
K2LE	357,336	SOU-CW-LP
W1WBB	249,260	SOU-CW-LP
W1FJ	173,799	SOU-CW-QRP
KO1H	51,675	SOU-CW-QRP
K9RS	2,558,730	MSHP
K3AJ	1,296,126	MSHP
K3CCR	448,812	MSHP
W3ZGD	174,352	MSHP
K3JO	62,985	MSHP
W1FM	249,736	M2LP

The April 2024 ARRL Rookie Roundup — Phone

1800 UTC – 2359 UTC, Sunday, April 21

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

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

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

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

You can enter as a Rookie if:

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

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

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

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

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

Volunteer Monitor Program Report

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

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

- An advisory notice was issued to an operator in California for deliberate interference on 28.425 MHz, and to an operator in Kentucky for operation on DSB with a bandwidth of 14 kHz for the purpose of interfering with existing communications. The Kentucky operator, as well as an operator in Georgia using 3.965 MHz with a 10 kHz bandwidth, were advised that Section 97.307(a) of Commission rules states that no station shall occupy more bandwidth than necessary for the information rate and emission being transmitted. Both operators were informed that FCC forfeitures for such operation normally start at $7,000.

- An advisory notice was sent to an operator in Missouri for lengthy transmissions up to 45 minutes without identification, and the operator was reminded that Rule 97.119(a) requires station identification at the end of transmissions and every 10 minutes during transmissions.

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

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

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

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

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

Certificate of Code Proficiency Recipients

Sponsored by

www.i2rtf.com

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

September 2023

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

October 2023

Joseph P. Kononchik, KS1I	20

November 2023

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

December 2023

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

January 2024

George Wayne Moore, W8SUN	20

Congratulations to all of the recipients.

March 2024 W1AW Qualifying Runs

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

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

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

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

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

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

W1AW Qualifying Runs — March 2024
(All times are in Eastern Daylight Time. Blue indicates Eastern Standard Time.)

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

Mike Walters, W8ZY, mwalters@arrl.org

Club Station

Keeping Your Club Active with Special Events

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

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

Your Starting Point

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

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

When the event was over, we had contacted all 50 states and more than 130 counties. We created a report of our results and gave it to Lowell Historian Kevin Schindler, who said he had no idea we could contact so many seemingly unreachable places. Lowell Observatory staff were so pleased with our results, they invited us back to participate in their 10-year Pluto Discovery Countdown to its 100th anniversary. This event began in 2021 and will continue every February until 2030. Visit **www.nadxa.com/w7p_pluto_2030.html** for more information.

W7TB's special event celebrating the 100th anniversary of the Grand Canyon National Park was set up in the parking lot. This included putting the event banner onto a parked Peterbilt truck that belongs to club member Mickey Meredith, WW4MM.

The Planning Stage

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

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

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

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

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

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

Have your QSL cards made up before the event starts, and assign one or two members to handle the QSL requests. Per event, we usually spend about $50 for 500 cards. If it doesn't increase our mailing costs, we include flyers from the organization we're supporting with our QSL cards. These might share something about the event, the city, or the organization, and are supplied to us.

Post-Event Tasks

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

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

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

All photos by the author.

Write for "Club Station"

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

ARRL Special Service Clubs

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

New SSCs	
All Things ARA, W8ATR	Carroll, OH
Renewing SSCs	
Police Amateur Radio Team, WB1GOF	Westford, MA
Radio Amateurs of the Gorge, W7RAG	Mount Hood Parkdale, OR
Uniontown ARC, W3PIE	Uniontown, PA
Bellbrook ARC, W8DGN	Bellbrook, OH
South Bay ARA, KU6S	Fremont, CA
Falmouth ARA, K1RK	Falmouth, MA

Steve Goodgame, K5ATA, sgoodgame@arrl.org

Ham Media Playlist

YL Raisa — Spreading the Joy of Radio Around the Globe

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

A World of Inspiration

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

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

Videos with a Flair for Education

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

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

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

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

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

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

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

YouTube Content Motivation

Much of Raisa's reason for creating her YouTube channel was due to the realization that there are far fewer women on the air than men. Raisa focuses her efforts on helping other women understand the opportunities that are available to them in amateur radio; she is passionate about getting more women and girls interested and engaged in the hobby.

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

Community Enjoyment

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

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

Strays

QST Congratulates...

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

Bernie McClenny, W3UR, w3ur@arrl.org

How's DX?

FT#G — The Glorioso Islands

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

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

DXCC History

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

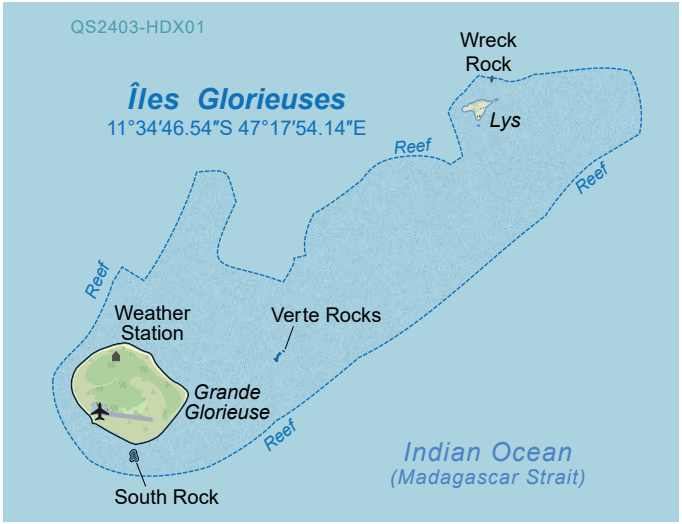
During the 1960s, 1970s, 1980s, and 1990s, there were as few as three and as many as seven Glorioso DXpeditions per decade. Most operations were conducted by radio technicians who happened to be hams, and they went on the air only in their spare time. Perhaps the most significant operation around this time was in April 1980 by a German DX team that included Ann Hannappel, DF3KX; Baldur Drobnica, DJ6SI; Gero, DJ3NG; Hans Hannappel, DK9KX, and Wilfried, DJ5RT. They used the call signs FRØACB, FRØACC, and FRØRX.

In 2005, the call sign prefix for all of the French Scattered Islands in the Indian Ocean, which include the Gloriosos, Tromelin, Juan de Nova, Europa, and Bassas da India, changed from FR to FT. The islands are under the authority of the French Southern and Antarctic Lands (TAAF).

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

Upcoming Glorioso DXpedition

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



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

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

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

DX News from Around the Globe

ZK3 — Tokelau

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

TY — Benin

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

H4Ø — Temotu Province

Rob Fanfant, N7QT; Paul Ewing, N6PSE; Scott Jasper, NE9U; Jay Slough, K4ZLE; Jay Lopes, AC7DC; Bruce Bern, K3NQ; Don DuBon, N6JRL, and David Flack, AH6HY, are heading to Lomlom, Temotu Province. They plan to be active as H4ØWA from February 22 to March 7. H4Ø currently ranks number 43 on Club Log's DXCC Most Wanted List. The H4ØWA team will "make a significant effort on the low bands during this activation." This effort will include running 1.5 kW on 80 and 160 meters, and they'll use CW, SSB, and FT8 via Fox and Hound. They will not use *MSHV*. For more details, check their website at **www.intrepid-dx.com/h40wa**.

JD1/M — Minami Torishima

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

Wrap-Up

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

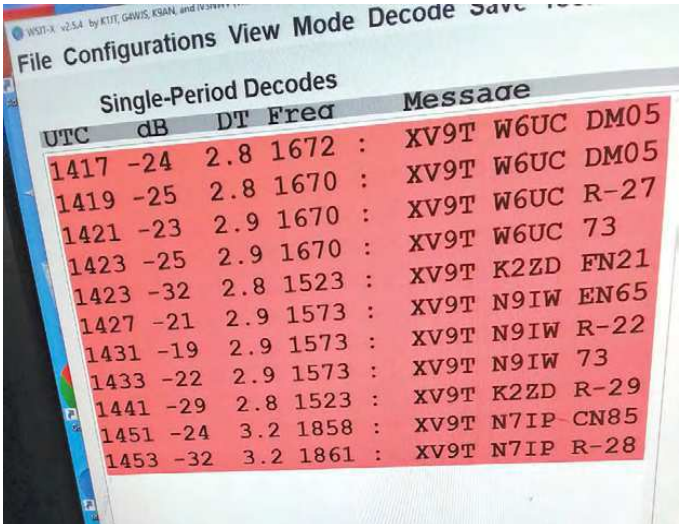
Jon Jones, NØJK, n0jk@arrl.org

Possible Best New Zealand Opening of Solar Cycle 25

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

XV9T 50 MHz EME Activity

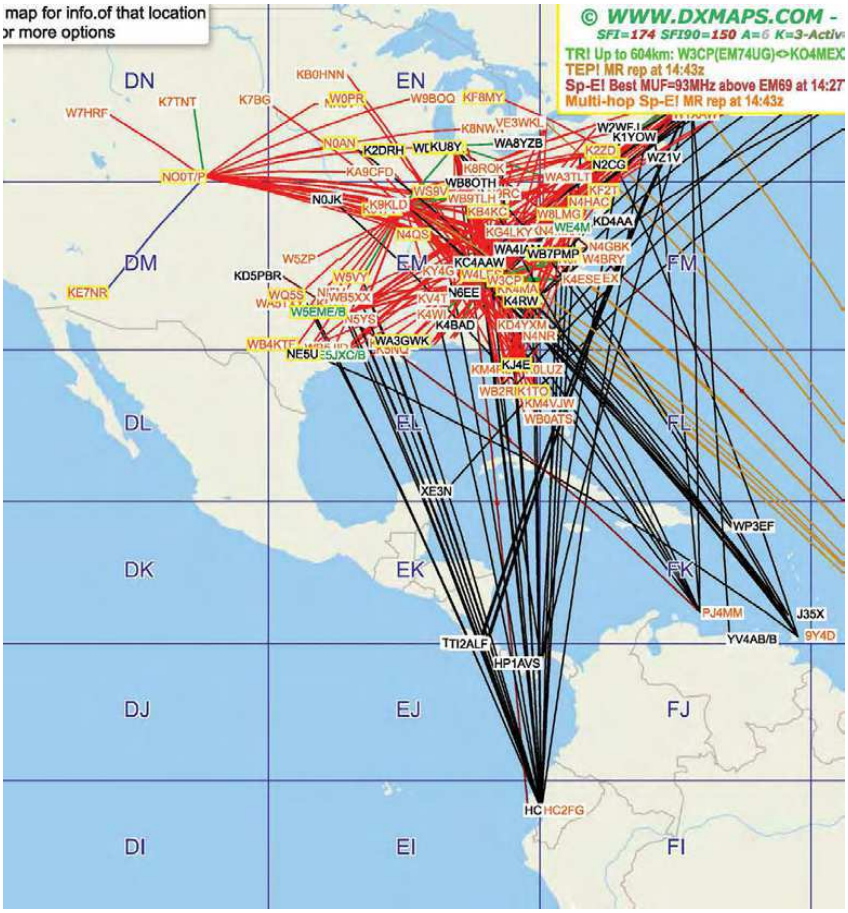
One of the most demanding modes in amateur radio is 6-meter Earth-Moon-Earth (EME). Eddy, XV9T, is now on 50 MHz EME from Vietnam and CQ zone 26. Eddy uses an eight-element LFA InnovAntennas Yagi up 11 meters with low-loss feed line. Even more notable is the fact that he is an almost totally blind amateur radio operator. However, Eddy has some limited central vision with the help of a 20X loupe, enabling him to use *WSJT* on FT8 and Q65. Tim Blank, NØTB, was instrumental in getting Eddy set up on EME, as he used *TeamViewer* to install *WSJT* on his computer. Eddy now uses a variation of *WSJT* known as *WSJT-Z*, which is a GNU-licensed clone of *WSJT-X*. It has a modified user interface and automated features. Eddy is usually operating during moonrise because there is local noise during moonset at his location. His station is on a hilltop with a negative horizon at –0.4 degrees. NØTB copied Eddy before his local moonrise. Eddy worked K2ZD, NØTB, N9IW, N7IP, W6UC, and others. W7GJ and KJ9I worked XV9T in 2010. K2ZD said XV9T was his 6-meter DXCC contact #225.



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

On the Bands

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



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

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

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

On December 18, NØLL decoded ZL7DX 10 times at around 2200 UTC. Larry was away from the radio at that time. He noted that ZL7DX worked NØPB (EM39) and NØLWF (EN10). NOØT (DM88) also copied ZL7DX and worked four New Zealand stations, as well as HC2FG. In the evening on December 18 and 19, there was a strong winter E_s opening for the midwest states. N7BHC (EL15) and other Texas stations were in strong. I, NØJK (EM28), logged XE2YWH (DL92) at 0250Z. There was also E_s to south Texas and Mexico on December 23, as NA5C and XE2X (EL06) were in to my location. There was a combination of F2 and E_s on December 24. PJ4MM (FK92) and HC1MD/2 (EI97) were in for me at 1420Z, followed by KK4MA (EM93) on E_s at 1433Z. KD2CYU said, "Santa brought us some DX," on December 24. He logged HP1AVS, various stations in Ireland, F4VPC, IW3IFJ, and VE1PZ. K3FR copied HP1AVS, and K3SWZ (FN22) worked ZL1RS at 2347Z. K5QE (EM31) reported making 40 6-meter contacts during the ARRL EME Contest.

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

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

Here and There

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

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

Convention and Hamfest Calendar

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

Abbreviations

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

Arizona (Phoenix) — Mar. 2 D F H Q R T V
7 AM – 11 AM. *Spr:* Arizona Red Cross Communications Club, Arizona ARC, Amateur Radio Council of Arizona. DeVry University, 2149 W. Dunlap Ave. *Tl:* 147.280 (162.2 Hz). *Adm:* $5. **www.k7arc.org**

Arizona (Tucson) — Apr. 6 D F H Q R T
6 AM – 11 AM. *Spr:* Radio Society of Tucson. Calvary Tucson Church, 8711 E. Speedway Blvd. *Tl:* 147.160 (141.3 Hz). *Adm:* Free. **www.k7rst.club/2023/10/tucson-spring-hamfest-saturday-april-6-2024**

Arkansas (Dardanelle) — Mar. 2 D F H Q R S T V
8 AM – 3 PM. *Spr:* Arkansas River Valley Amateur Radio Foundation. Dardanelle Community Center, 2059-2099 State Hwy. 22. *Tl:* 146.82 (131.8 Hz). *Adm:* $10. **www.arvarf.com**

Connecticut (Southington) — Apr. 7 D F H V
7 AM – noon. *Spr:* Southington ARA. Southington High School, 720 Pleasant St. *Tl:* 147.345 (151.4 Hz) and 444.200 (151.4 Hz). *Adm:* $7. Email: **k1hsn@cox.net**

ARRL SOUTHERN FLORIDA SECTION CONVENTION

March 16, Stuart, Florida
D F H Q R S T V
8 AM – 2 PM. *Spr:* Martin Co. ARA. Martin Co. Fairgrounds, 2616 SE. Dixie Hwy. *Tl:* 147.060 (107.2 Hz). *Adm:* Free. **www.stuarthamfest.com**

Illinois (Dixon) — Mar. 17 D F H V
7:30 AM. *Spr:* Sterling Rock Falls ARS. Sauk Valley Community College Gym, 173 IL Rte. 2. *Tl:* 146.850 (113.8 Hz). *Adm:* $8 Advance, $10 door. Email: **w9mepclub@hotmail.com**

Illinois (Godfrey) — Mar. 23 D F H S V
7 AM – noon. *Spr:* Lewis and Clark Radio Club. Lewis and Clark Community College, 5800 Godfrey Rd. *Tl:* 145.230 (79.7 Hz). *Adm:* $4 Advance, $5 door. **www.k9ham.org/hamfest**

Indiana (Brazil) — Mar. 30 F H R
8 AM – noon. *Spr:* Wabash Valley ARA, Inc. Clay Co. 4-H Fairgrounds, 6550 N. IN-59. *Tl:* 146.685 (151.4 Hz). *Adm:* $10. **www.w9uuu.org/hamfest/hamfest_2024.pdf**

Iowa (McClelland) — Mar. 2 D F H R
8 AM – noon. *Spr:* SW. Iowa ARC. McClelland Town Hall, 117 Main St. *Tl:* 442.225 (136.5 Hz). *Adm:* $5. **www.swiradio.org**

Michigan (Kalamazoo Township) — Mar. 9 D F H V
8 AM – noon. *Spr:* Southern Michigan ARS. Wings Event Center, 3600 Vanrick Dr. *Tl:* 147.000 (94.8 Hz). *Adm:* $8. **www.w8df.com/hamfest**

Minnesota (Buffalo) — Mar. 23 F H Q R V
8 AM – noon. *Spr:* Maple Grove Radio Club. Buffalo Civic Center, 1306 Co. Rd. 134. *Tl:* 147.000 (114.8 Hz). *Adm:* $10. Email: **k0ltc@k0ltc.org**

Missouri (Mount Vernon) — Mar. 23 D F H R S V
8 AM – 1 PM. *Spr:* Ozark ARS. The MARC, 822 W. Mt. Vernon Blvd. *Tl:* 146.970 (162.2 Hz). *Adm:* $10 Advance, $15 door. **www.w0oar.com**

New Hampshire (Hampton) — Apr. 6 F H R T V
8 AM – noon. *Spr:* Port City ARC. St. James Masonic Lodge, 77 Tide Mill Rd. *Tl:* 145.150 (127.3 Hz). *Adm:* $5. **www.w1wqm.org**

New Hampshire (Henniker) — Mar. 17 D F H R S V
8 AM – 2 PM. *Spr:* Contoocook Valley Radio Club. Henniker Community School Cafetorium, 51 Western Ave. *Tl:* 146.895 (100 Hz). *Adm:* $5. **www.k1bke.org**

ARRL ROANOKE DIVISION CONVENTION

April 6, Raleigh, North Carolina
D F H Q R S V
8 AM – 3 PM. *Spr:* Raleigh ARS. Jim Graham Building, 4285 Trinity Rd. *Tl:* 146.640. *Adm:* $11 Advance, $13 door. **www.rarsfest.org**

Ohio (Perrysburg) — Mar. 17 D F H R S V
8 AM – 2 PM. *Spr:* Toledo Mobile Radio Association. Owens Community College, 30335 Oregon Rd. *Tl:* 147.87 (103.5 Hz). *Adm:* $10. **www.w8hhf.org**

Pennsylvania (Elizabeth) — Apr. 7 D F H R V
8 AM – noon. *Spr:* Two Rivers ARC. Elizabeth VFD Bingo Hall, 101 S. 1st Ave. *Tl:* 147.12 (131.8 Hz). *Adm:* $5. **www.trarc.net**

Pennsylvania (Greensburg) — Mar. 9 D F H R T
8 AM – 1 PM. *Spr:* Westmoreland Emergency Amateur Radio Service. Greensburg Masonic Lodge, 349 Donohoe Rd. *Tl:* 147.180 (131.8 Hz). *Adm:* $5. **www.wc3ps.org**

South Carolina (Batesburg-Leesville) — Apr. 6 T
8 AM – 1 PM. *Spr:* Ridge ARC. Shealy's Bar-B-Que parking lot, 340 E. Columbia Ave. *Tl:* 147.255 (123.0 Hz). *Adm:* Free. **www.w4rrc.org**

Tennessee (Sevierville) — Mar. 16 D F H R S T
8 AM – 2 PM. *Spr:* Sevier Co. ARS. Sevier Co. Fairgrounds, 754 Old Knoxville Hwy. *Tl:* 146.940. *Adm:* $5. **www.seviercountyars.com**

Tennessee (Trenton) — Mar. 16 D F H R T V
8 AM – 2 PM. *Spr:* Area Wide ARA. National Guard Armory, 1460 Industrial Park Dr. *Tl:* 146.865 (127.3 Hz). *Adm:* $5. Email: **hcarc.na8x@gmail.com**

Texas (Irving) — Mar. 2 D F H R V
8 AM – 2 PM. *Spr:* Irving ARC. Betcha Bingo Hall, 2420 W. Irving Blvd. Ste. 125. *Tl:* 146.720 (110.9 Hz). *Adm:* $5. **www.irvingarc.org**

ARRL WEST TEXAS SECTION CONVENTION
March 16, Midland, Texas
D F H Q R S V
8 AM – 4 PM. *Spr:* Midland ARC. MLK Community Center, 2300 Butternut Ln. *Tl:* 147.300 (88.5 Hz). *Adm:* Free. **www.hamfest.w5qgg.org**

To All Event Sponsors

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

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

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

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

Write for *QST*

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

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

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

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

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

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

Strays

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

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

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

Special Event Stations

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

You can view all received Special Events at **www.arrl.org/special-event-stations**.

ARRL VEC Volunteer Examiner Honor Roll

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

If you are an ARRL VE, you can view your session stats online at **www.arrl.org/ve-session-counts**.
If you are not a VE, become one today! See **www.arrl.org/become-an-arrl-ve**.

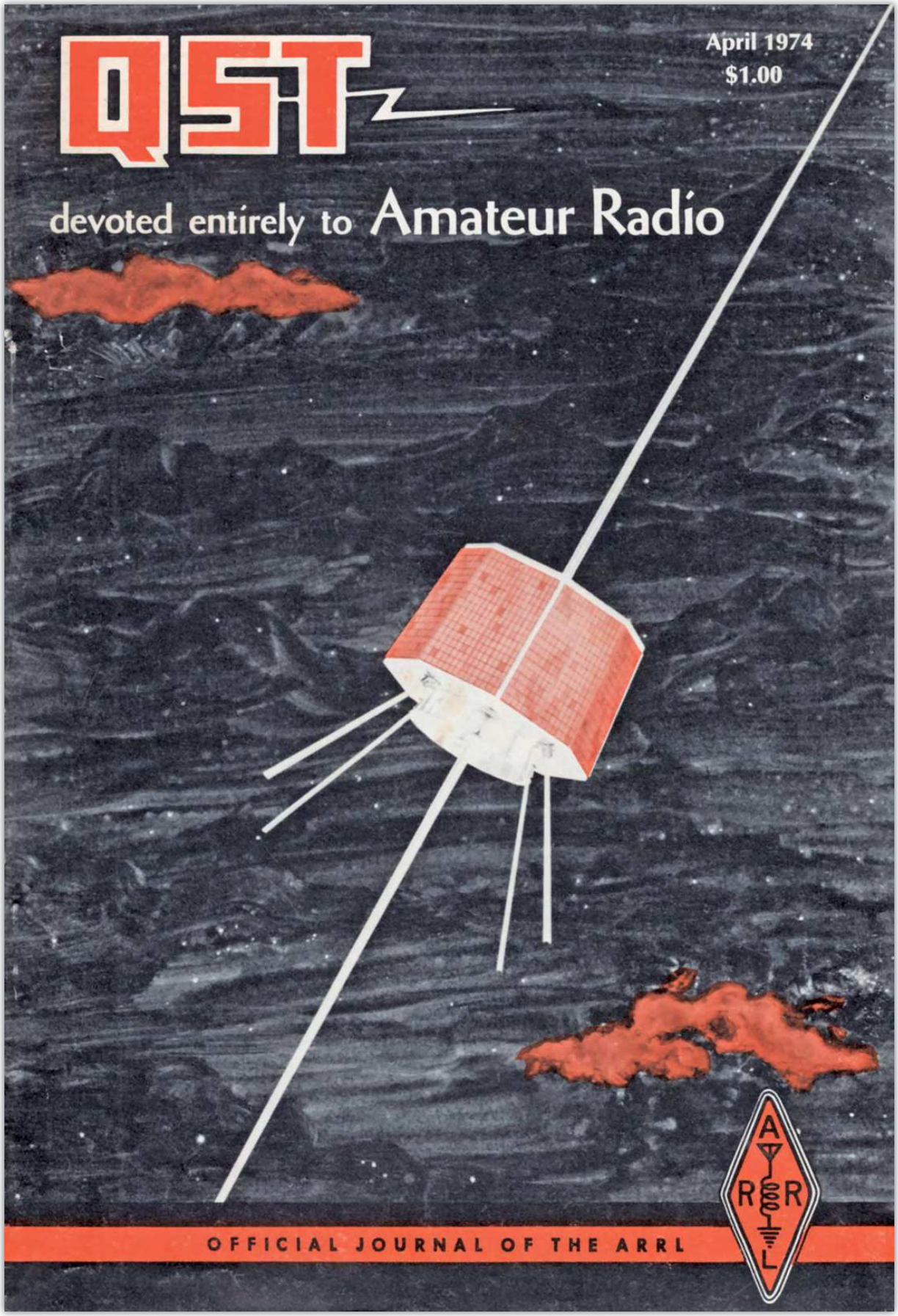
Volunteer Examiner	*Sessions*	*Accreditation Date*
Atlantic		
James McCloskey, NS3K	345	14-Nov-94
Jobst Vandrey, ACØLP	324	23-Jun-08
George Brechmann, N3HBT	310	01-Apr-91
Edward Genoino, WA2NDA	298	10-Jul-85
Cully Phillips, N3HTZ	223	01-Sep-91
Michael Harla, N2MHO	219	12-Apr-06
William Klepser, Jr., WB2AIV	215	09-Jun-99
Ralph Abbott, WA3ELQ	195	30-May-05
Robert Charles Worek, AG3U	189	26-Jul-06
Gary Reed, N2QEE	186	31-Mar-09
Central		
Ed Wagner, AB9FN	415	01-Jul-02
Allan Bukowski, N9ZD	352	01-Jun-92
Eldon Boehm, NK9U	338	21-Nov-86
Donald Hlinsky, N9IZU	331	01-Mar-91
Brian Eder, WB9UGX	305	01-Jan-92
Robert Begeman, W9KVK	292	01-Jun-92
Timothy Pechtold, AA9BV	280	01-Nov-92
James Rinehart, K9RU	264	01-Aug-91
Frederick Baguhn, W9GOC	260	16-May-02
David Pritchard, W9QL	254	12-Apr-01
Dakota		
Jeffrey Goodnuff, WØKF	343	17-Jun-03
John Schwarz, Jr., AEØAL	328	26-Oct-94
Shep Shepardson, NØNMZ	310	12-Mar-01
Douglas Nelson, AAØAW	249	01-May-90
Daniel Royer, KEØOR	245	01-Jul-91
Larry Larson, KRØK	229	16-Mar-09
James Rice, II, NØOA	227	04-Dec-00
Dennis Ackerman, KBØOQQ	221	15-Jul-96
Robert Tracy, NØTC	195	30-Jul-86
Karl Eriksen, WA2DEE	176	08-Jan-90
Delta		
Monvel T. Maskew, Jr., K9FQ	765	18-Jul-18
Loma Westmoreland, KU5J	738	31-Jan-21
Bryan McCammon, KI5HAV	413	03-Sep-20
John Waters, III, KC5FYA	310	14-Sep-21
Bobbie Williams, W1BEW	286	01-Jun-92
Joe Lowenthal, WA4OVO	286	25-May-06
Roger Gray, N5QS	275	01-Mar-93
Dawn Gray, N5QT	256	01-Mar-93
Terry Partigianoni, W5TMP	254	27-Nov-07
Rodney Webb, W4WRE	247	21-Mar-17
Robert White, AI4GI	225	18-Jul-05
Great Lakes		
*Charles Tyrrell, KE8PCB	1201	03-Sep-20
*David Potter, KE8OHG	1027	03-Jun-20
Earl Paazig, W8BR	664	16-Apr-02
Bruce Osmon, KE8LT	575	16-Nov-18
Charles Hall, W8HF	286	01-Jun-92
William Bogle, Jr., KE8FZY	270	08-Jul-20
Lance Harvala, AB8Y	254	06-Nov-19
Archie Mack, Sr., AF4EB	250	19-Aug-97
Stanley Arnett, II, AC8W	234	06-Sep-84
Chris Anderson, K8VJ	228	09-Feb-90

Volunteer Examiner	*Sessions*	*Accreditation Date*
Hudson		
Paul Maytan, AC2T	747	06-Sep-84
Alan Crosswell, N2YGK	511	26-Oct-94
Fritz Boigris, KB2O	496	26-Oct-84
Sid Markowitz, K2GG	448	27-Sep-94
John Kiernan, KE2UN	311	01-Jul-91
Walter Lesnowich, W2EE	295	06-Mar-08
Thomas Carrubba, KA2D	292	01-Sep-93
Robert Casino, N2GDY	283	03-Jun-08
Carlos Prior, KE2TT	261	01-Jun-90
Donald Younger, W2JEK	257	30-Jul-86
Midwest		
David Bartholomew, ABØTO	797	22-Mar-02
Kevin Naumann, NØWDG	700	17-Nov-02
Harry Steger, Jr., WØHMS	651	26-Aug-08
Roland Kramer, WØRL	554	21-Jun-01
Chris Hunt, NØYH	378	05-Aug-20
Kenneth Simila, KCØVMY	313	18-Feb-07
Ralph Waldren, NØOTS	299	03-Jan-20
John Mountain, Jr., KJØMTN	252	28-Sep-09
Edwin Berkel, AEØEB	245	06-Jan-15
Charles Wilmes, KWØK	220	28-Apr-09
New England		
**Paul Lux, K1PL	2042	25-Jan-85
*Bob Phinney, K5TEC	1652	20-Jan-14
Gregory Paul, KC1MND	547	03-Jun-20
Phillip Temples, K9HI	519	12-May-89
Robert Beaudet, W1YRC	409	01-Aug-90
Bruce Anderson, W1LUS	393	11-Feb-88
Barbara Irby, KC1KGS	358	05-Aug-19
William Poulin, WZ1L	341	01-Sep-91
Stefan Rodowicz, N1SR	315	20-Nov-84
James Mullen, KK1W	293	01-Mar-91
Don Wilson, K1IN	293	01-Apr-92
Northwestern		
Richard Morgan, KD7GIE	448	11-Aug-00
Scott Robinson, AG7T	438	01-Aug-91
Loren Hole, KK7M	381	06-Sep-84
John Clarke, AC7WW	369	20-Jan-03
S. Riley McLean, W7RIL	345	02-Sep-99
David Brooks, N7HT	326	10-Jun-87
Joseph Barry, K7SQ	305	21-Jun-95
Brandin Hess, WB1BR	296	24-Sep-15
Wayne Schuler, AI9Q	277	01-Sep-91
Erin Henrickson, ND7B	270	06-Jan-23
Pacific		
Brian Torr, N6IIY	881	06-Sep-00
Morris Jones, AD6ZH	568	27-Nov-01
Dieter Stussy, KD6LVW	458	27-Jan-94
Bill Nichols, NN7K	368	01-Sep-93
Larry Loomer, KI6LNB	364	03-Dec-08
Gordon Fuller, WB6OVH	363	06-Sep-84
Robert Perlman, W6BP	361	26-Aug-08
Jim Brunk, N6BHX	308	13-Jul-95
Dennis Simon, KB7UTV	294	10-Dec-13
Joseph Speroni, AHØA	290	20-Nov-84

Volunteer Examiner	*Sessions*	*Accreditation Date*
Roanoke		
Judy Friel, AC4RG	317	01-Feb-91
Alan Ronald Moeck, WA2RPX	264	27-Sep-94
David Snyder, W4SAR	253	01-May-93
Terry Sanner, WV8V	251	06-Sep-84
Larry Withrow, AF4HX	228	17-Dec-98
Henry Wyatt, II, K4YCR	211	28-Jan-98
David Poe, W8IW	210	13-Mar-07
Edwin Williams, KN4KL	209	01-Jan-92
John Kanode, N4MM	202	07-Jun-85
Thomas Lewis, W4SIS	194	14-Nov-97
Rocky Mountain		
Robert Vosper, KZ1B	507	09-Jul-10
Robert Hamilton, NØRN	425	19-May-87
Jeffrey Weinberg, WØQO	336	01-Apr-93
David Avery, NØHEQ	302	13-Jan-88
David Sharpe, KIØHG	259	02-Feb-98
Gary Zabriskie, N7ARE	249	20-Nov-84
Martin Soffran, NM5MS	240	21-Mar-94
Peter Brisbine, NM5PB	232	20-Jan-14
David Bratcher, AKØMR	201	23-Sep-08
Denis Campbell, AAØYX	185	02-Feb-96
Southeastern		
***Gary Pike, KA4KBX	7514	03-Sep-09
***Justin Pike, KJ4AXF	5780	12-Nov-12
***Collin Pike, KJ4AXB	5732	26-Apr-11
***Anna Pike, KD4PCU	4130	18-Aug-09
**Patrick Pike, KJ4AXD	2835	13-Oct-15
**Ryan Krenzischek, W4NTR	2077	04-Jan-13
John Reynolds, W4TXA	517	08-Jun-16
Robert Fauci, N1UVO	431	28-Mar-18
Pablo Soto, KP4SJ	399	01-May-92
Val Jacyno, AK4MM	388	08-Nov-11
Southwestern		
*Bill Martin, AIØD	1074	01-Nov-84
David Morrill, N7TWT	509	20-Jul-00
Richard Buck, KC7OCT	346	21-May-97
Donald Kramer, Sr., WA6UVW	339	08-May-98
Bruce Ziemienski, WA6BZ	321	25-Mar-02
Ali Hassan, AA6WC	288	01-Jun-90
Norman Pilawski, WT6Y	282	17-Feb-87
Frank Westphal, K6FW	274	06-Sep-84
Gary Hamman, K7GH	260	01-Aug-92
Dave Martin, AC7FF	257	04-Apr-14
West Gulf		
*Franz Laugermann, K3FL	1530	01-Dec-91
*Tanner Jones, W9TWJ	1235	31-Jul-07
Daniel Quigley, N7HQ	793	24-Apr-20
Gerald Grant, WB5R	530	04-Jan-85
Adolph Chris Koehler, K5VCR	523	29-Sep-95
John Paterson, Jr., KC5LAA	512	16-Mar-09
David Fanelli, KB5PGY	494	01-Oct-91
Wilbert Cannonier, KK5JJ	475	03-Nov-95
Janet Crenshaw, WB9ZPH	422	02-Oct-97
Michael Nault, W5OFT	414	06-Sep-01

Congratulations to David Potter, KE8OHG, from Prudenville, Michigan (Great Lakes Division), who is the latest VE to participate in 1,000 sessions!
*Denotes participation in over 1,000 sessions. **Denotes participation in over 2,000 sessions. ***Denotes participation in over 3,000 sessions.

A Look Back


QST
April 1974
$1.00
devoted entirely to Amateur Radio
OFFICIAL JOURNAL OF THE ARRL
ARRL

Monitoring an SSB Amplifier Chain for Linearity

BY WIN WAGENER,* W6VQD

ONE OF THE better means of monitoring the linearity of a chain of ssb linear amplifiers to establish the proper gain levels and avoid flat topping, is to observe a suitable triangular modulation pattern. This pattern is obtained when an rf sample from the antenna feed line is fed to the vertical plates of an SB-610 oscilloscope, and an early sample of the envelope of the low-level ssb signal is placed on the horizontal plates. See the block diagrams in Fig. 1.

The resulting patterns on the SB-610 oscilloscope appear as shown in Fig. 2. The formation of these patterns results from the application of two signals on the two axes, as shown in Fig. 3. The output rf is on the Y axis, or vertical plates, and the rectified envelope of an early sample of the ssb signal in the amplifier chain is on the X axis, or horizontal plates, of the scope. They combine on the X – Y coordinates as in Fig. 3, just as they do on the face of the CR tube in the monitor.

If the amplifier chain is linear, the rf amplitude in the antenna line should rise and fall exactly in step with the amplitude of the ssb signal applied to the first stage of the amplifier chain. Please note that the straight lines OA and OB are in no way related to the shape of the envelopes of the input and output signals. As long as the signals rise and fall together the lines OA and OB will be straight.

The instructions for the operation of the SB-610 say to put the rf output of the exciter in and out of two coaxial connectors (phono jacks marked "exciter") and the rf output of the power amplifier in and out of two coaxial connectors en route to the antenna (see Fig. 1A). This enables the SB-610 to sample the rf line from the PA to antenna, and sample the rf line from the exciter to the PA. The SB-610 rectifies the exciter rf to get an envelope signal, and this is applied to the horizontal plates through the internal horizontal amplifier. However, with this connection the SB-610 monitors only the linearity of the amplifier. If the exciter is putting out a nonlinear signal, or is flat-topping, the SB-610 can't show this, and you could be beguiled into thinking the linearity of your signal on-the-air was beautiful, because only the linearity of the PA is being monitored.

Corrective Measures

Now, if instead of taking the sample signal for the horizontal plates from the exciter output, one

* 12481 LaCresta Drive, Los Altos Hills, CA94022.

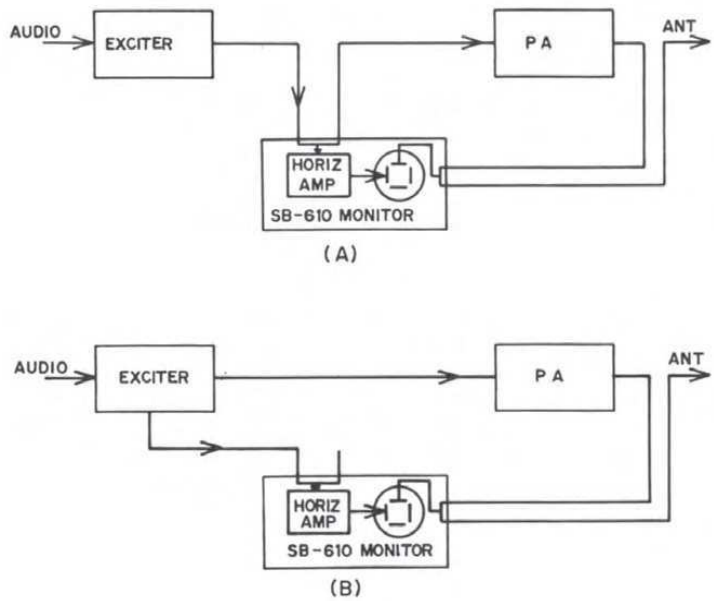


Fig. 1 — Block diagrams of monitoring connections for the SB-610 scope. Checking the linearity of the amplifier stage only is shown at A. Checking over several stages is shown at B.

were to take this sample from an early stage within the exciter, the pattern on the scope would show the combined linearity of all succeeding stages, including the PA. I chose to take the sample of the ssb signal at the intermediate frequency of my Swan 350 (see Fig. 1B). The envelope shape of the ssb signal at the i-f should be the same as the envelope shape at the final frequency, because the mixer only translates the desired signal to a different frequency. In the case of the Swan 350 I took a sample of the signal from the plate of the first amplifier tube following the crystal filter, and inserted it into an "exciter" jack of the SB-610, in order to go through the demodulator diode and horizontal amplifier of the SB-610.

At this moment my troubles with the SB-610 began. In order to get an adequate signal on the horizontal plates I had to run the built-in horizontal amplifier of the SB-610 wide open. I got a beautiful triangular pattern just like the one portrayed in Fig. 2A. I was very happy until one day I discovered that I got the same perfect pattern even if I removed the sampling line of my Swan from the "exciter" jack of the SB-610! It turns out that the stray rf pickup within the SB-610, from the antenna rf line to the vertical plates, was enough to give a suitable signal to the horizontal amplifier. Of course the pattern would be perfect, because the same rf envelope was applied to both the vertical and horizontal plates and the voltages to these plates would rise and fall together, because it was the same signal! Now the problem was to reduce the accidental stray coupling to the horizontal circuits to a negligible value.

The demodulator diode for the horizontal voltage is one of the two diodes built into a 6BN8 in the SB-610. The other diode in the 6BN8 is used as part of the clamper circuit to remove the cathode-ray spot when no signal is applied. To accomplish this the rf output of the final PA is fed to this diode. The two diodes are close together, as are the leads through the stem of the 6BN8. The cure was to take the horizontal-voltage demodulator circuit out of the 6BN8 and use a 1N55 diode, and to fully shield the rf portion of the horizontal-voltage circuit from the rf power of the PA output. When this was done the horizontal signal would drop to zero when the rf sampling line from the Swan 350 was removed from the SB-610. Thus now the horizontal signal resulted only from the desired low-level rf ssb signal in the Swan transceiver.

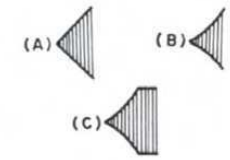


Fig. 2 — Single-sideband modulation patterns, showing perfect linearity, A, tolerable linearity, B, and bad flat-topping and splatter, C.

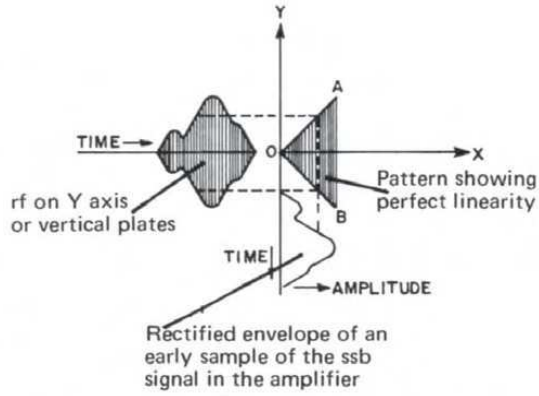


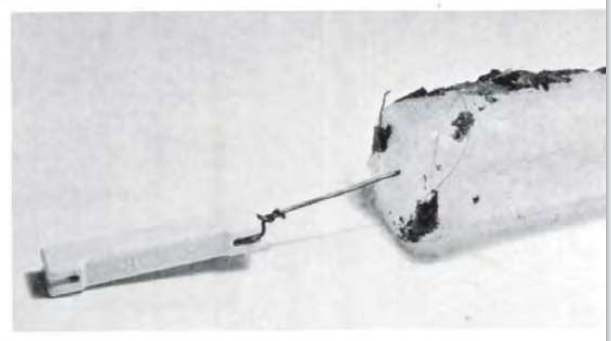
Fig. 3 — Applied rf and envelope voltages and resulting pattern on the axes of the SB-610 scope.

The sampling of the low-level i-f in the Swan followed the instructions of the SB-610 for sampling incoming receiver signals in the i-f line. I used a 3.2-pF capacitor connected to the output circuit of the first i-f tube after the crystal filter, and after the dc plate voltage of the tube was removed by the blocking capacitor. A shielded coax line carried this sample to the "exciter" jack of the SB-610. (Note: The sample is not applied to the vertical amplifier, as one would do to display received signals against a linear horizontal sweep.)

Results

In station operation it is a real satisfaction to monitor the linearity of all the important linear stages continually as one talks. It is also devastating to realize that one must be careful of the level of the audio, lest one flat-top momentarily on the peaks of one's voice. Any visible flat-topping, even momentarily, gives splatter outside the channel required for voice frequencies. The triangular modulation pattern allows one to see such momentary flat-topping. QST

Strays



Recently we showed what happened to W1FBY's antenna installation when an ice storm hit Connecticut. Bob saved one of the chunks of ice by keeping it in a freezer until we could take this photograph. It measured slightly over three inches in diameter! Anyone want to calculate the weight of the ice on an 80-meter dipole 135 feet long?

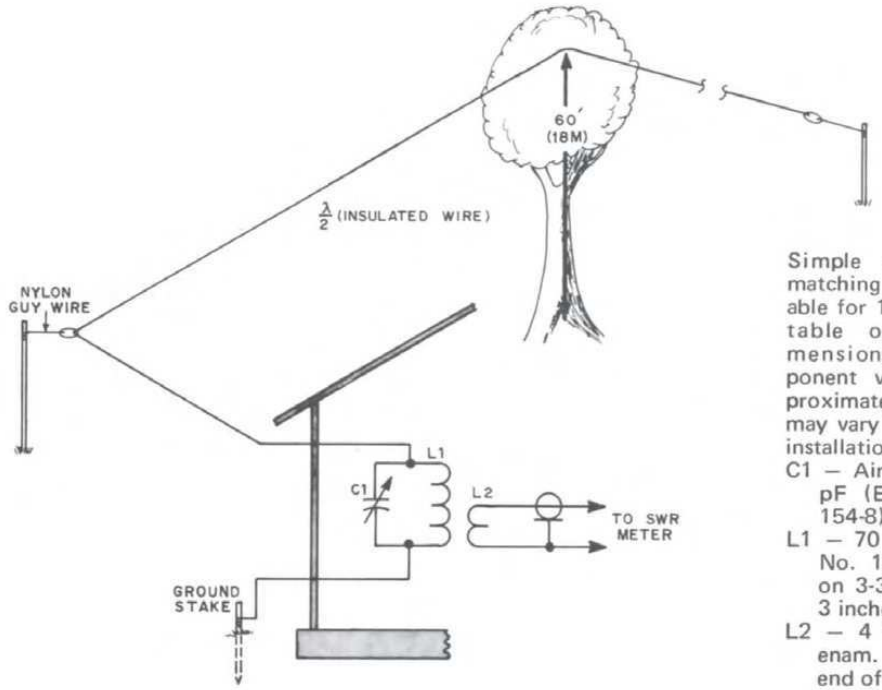
Hints and Kinks For the Experimenter

SOME ANTENNA IDEAS FOR 1.8-MHz PORTABLE OPERATION

Antennas for portable operation should be simple to erect and easy to adjust. The hf bands present few problems, but 160 and perhaps 80 meters require a bit more thought. A cottage was available to the writer, where the local operating competition was minimal, so this location was used during the last few ARRL 160-Meter Contests. Since frequent ice storms in the area made permanent antennas unadvisable, a Field Day approach to the problem evolved. Some of the more successful ideas may be of interest to amateurs in similar situations.

While a number of antennas were considered, the end-fed half-wave wire antenna had a number of desirable features. It can be bent into a variety of shapes and doesn't require a low-loss ground connection at the feed point. A single ground stake should suffice since a current node exists at the ends of a half-wave radiator. Other types of ground loss exist (unless an extensive radial system is used) but resistive losses at the feed point are minimized. Most of the useful radiation results from those parts of the antenna where the current distribution is the highest. In the half-wave case, this occurs in the middle third, which should be the highest part of the antenna. An inverted-V arrangement can be used, but if it is symmetrical about the center, be sure the apex angle is greater than 90 degrees. The outer thirds can then be run off in some convenient direction and folded back if necessary. In fact, one of them can act as a lead-in to the matching network. A half wavelength on 160 meters may seem like a lot of wire to get up in the air but remember, only the middle third (approximately 90 feet) has to be strung between the highest support points.

Before the contest, the writer spotted an assortment of plastic-coated hookup wire at the local outlet of Allied Radio Shack. There were five rolls of various gauges with 100 feet on each roll. The price (less than $4) was attractive. A roll of the heavier-gauge wire was used for the middle of the antenna where the current distribution is the highest, with the lighter-gauge wire spliced on each side. A line attached to an arrow was shot over some trees and then the wire was pulled through. The plastic coating on the wire eliminated the need for insulators. While existing structures can be used to support most of the antenna, one portable support is usually needed for the most convenient layout. Surplus MS-44 mast sections are handy for this purpose since they are practically self-supporting up to 25 feet.



Simple antenna and matching network suitable for 160-meter portable operation. Dimensions and component values are approximate only, and may vary with different installations.
C1 — Air variable, 150 pF (E. F. Johnson 154-8).
L1 — 70 μH, 28 turns No. 18 enam. wire on 3-3/4-inch form, 3 inches long.
L2 — 4 turns No. 18 enam. wire on cold end of L1

The matching network shown in the drawing can be constructed easily from junk-box parts. With a receiver and the antenna connected, C1 is peaked up for maximum signal strength. Only slight adjustment with the transmitter on should be necessary to get the SWR to a minimum.

Although the height of the antenna might be considered low, the performance of this one was very satisfactory. Signal reports were superior to those with previous antennas used. But perhaps best of all, the entire system can be dismantled in a few minutes and the wire rolled up on a short piece of board for next time. – *W1YNC*

A BACKYARD 160-METER VERTICAL

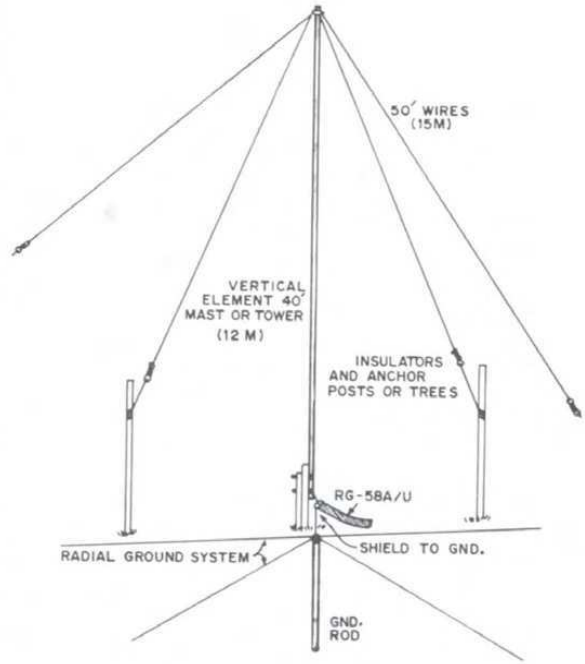
The 160-meter band was the favorite one at my QTH this winter. The same could be said for many other amateurs and the simple antenna described here may be of interest.

Some of the old timers will tell the newcomer to 160 meters that the best antenna for local and DX work is the vertical. Since a full-size vertical would be very large, the question is finding a type that will fit into a closely packed residential area.

As a starter, I took an old 40-foot (12.2 meter) telescoping mast and insulated it from the ground. (This can be done by setting it on top of a large soft-drink bottle, or clamping it to a wooden post.) The antenna was fed at the base with RG-58A/U 52-ohm coaxial cable. The shield was wired to a radial system and a ground rod. A hint for the radials – buy some aluminum clothesline and cut a number of slits in your yard with a flat spade. Next, push the wire into the slits and tamp the grass back together. If there are any swampy parts of the yard, these seem to make the best ground areas.

Rather than using a loading network at the base of the antenna, I constructed a capacitive hat to load it at the top instead. The top hat was made from four fifty-foot (15.2-meter) pieces of wire strung out from the top of the mast in guy-wire fashion. They are connected electrically to the top, and stretched until they are as close to a 90-degree angle with respect to the mast as is possible.

The system described works well with a 40-foot mast but other lengths could be used instead. However, the top hat may have to be adjusted in order to bring the system to resonance. While my vertical occupies very little space, it seems to perform as well as do many "full-size" antennas on 160 meters. – *Mike Mussler, WB8JJA*

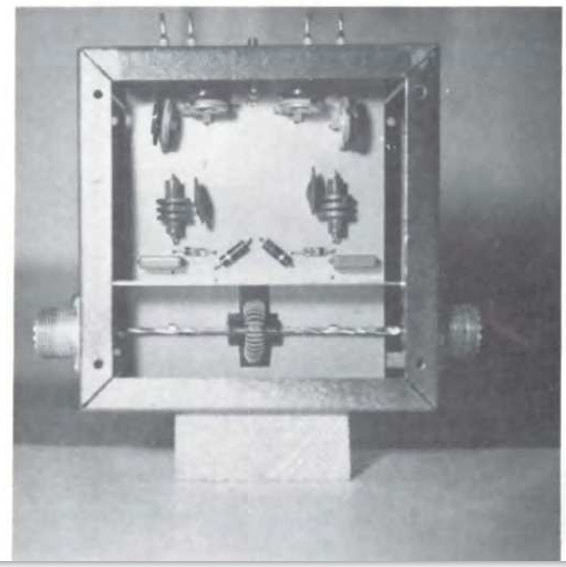


A space saving vertical for 160 meters. While not always possible, it is desirable to have the wires for the top hat run off at right angles to the mast.

IN-LINE POWER-METER MODIFICATIONS

I built the in-line rf power meter described in the December, 1969, issue of *QST* It does everything claimed for it and I have liked it so well that I have recommended it to others. To me, it is more useful as a tuning indicator than as a power meter and for this purpose I have made a slight modification to take care of this need. This means the addition of an external potentiometer to control the sensitivity of the indicating meter.

The photo of the bridge shows a modification in the construction which I believe is worth considering. This should be helpful to others who plan to build one. You will note that the RG-8/U which supports the toroid coil, L1, is cut to run from J1 to J2 and this in turn supports the printed circuit board by virtue of soldered contacts to C1 and C2 lugs. An aluminum L bracket is no longer required. Two solder lugs are mounted under the retaining screws of each coax connector and the two free ends are soldered to the ground foil which does establish a good ground. I do have some doubts that copper foil can carry heavy currents such as may be encountered at 2 kW and a high SWR. This construction eliminates any doubts that may exist. Instead of the flashing copper shield I used aluminum to get away from possible electrolysis effects. – *T C. Galbreath, W2AXX*



April 1974

Celebrating Our Legacy

My Radio Journey from Burma to the United States

My parents were born in Burma (now Myanmar), and during World War II, they had to evacuate to India, where I was born in 1943, and we returned to Burma in 1946.

I learned to solder and dismantle electronic gear, studied schematics, and helped my father, who got licensed in 1938, replace oil-filled capacitors on RCA AR-88 receivers. He had a Collins R-107 receiver, an RCA ET-4336 transmitter, and a few other pieces. There weren't any radio shops to buy gear, so everything was homebrewed and made with parts salvaged from the war surplus stock.

When I was 11, I became fascinated with Morse code and told my father I wanted to get my license. When I was 12, I took the test and passed rather easily. It was one of the happiest days of my life. Because I was living with my father, we had to share the station call sign XZ2KN.

All of our antennas were homebrewed for 10, 15, and 20 meters. We designed and built a four-element beam with a 44-foot boom and made a lot of contacts. We enjoyed hosting visiting hams, including King Hussein of Jordan, JY1, and US Senator Barry Goldwater, then K7UGA.

As the military and government were in turmoil, on January 10, 1968, we were informed that amateur radio was banned. With no prospects in sight, I decided to go to the United States. I arrived in Springfield, Illinois, in 1974 and found a ham who helped me get ready for the amateur radio test again, which led to me getting my first US call sign, WB9TTN.

Gurbux Singh, W6BUX
Chatsworth, California

A Long, Great Trip

My mentor and cousin, Dudley Field, K2DFZ (SK), got me interested in ham radio when I was 12. I got my Novice license in 1956 as KN2TRS and built a Heathkit AR-3 receiver, a Q-multiplier circuit, and a Heathkit AT-1. A year later, I got my Technician license with the call sign WA2AIC. Then I acquired a National NC-88, which I still have.

Eric Dodge's, WA2AIC, National NC-88 (left), and the 1957 edition of *The ARRL Handbook* rests on top of it.

I took a hiatus from ham radio during college. Dudley encouraged me to get back into it, and I did, starting with handheld radios and repeaters. In the 1990s, I got my General license and became serious about HF again. Finally, I got my Extra-class license and now run a Kenwood TS-590 through two off-center-fed dipoles at right angles.

I continue to learn from Winlink, phase-shift keying, FT8, and activities with local emergency operations centers with my club, Eastern Shore Amateur Radio Club, K4BW.

After Dudley's passing, I made sure his license was reissued to his granddaughter. What a long, great trip it has been.

Eric Dodge, WA2AIC
Onancock, Virginia

Two Wires

My time in ham radio started with two wires. As a kid, I regularly played with wires, batteries, buzzers, and telegraph keys. One Christmas, my folks gave me an electronics project kit. I jumped right in, building crystal radios, code practice oscillators, and all sorts of things.

One project, a one-tube regenerative shortwave radio, refused to work. I set it up with a wire out the window and a ground wire to our steam radiator. I took it apart and put it together again and again with no results. You had to connect two wires to a separate tickler coil that slid in and out of the main coil. I finally read the fine print in the manual and realized that connecting them one way would cause the desired oscillation, and the other way would prevent it. I reversed the wires, connected the batteries, and heard some squeals and then a human voice!

Within a year, I became KN1VHO. I worked in radio broadcasting for 26 years, followed by 18 years in broadcast equipment manufacturing, and got the new call sign W1TAG. In 59 years, I've done all sorts of stuff, from LF to VHF operating. Now, my greatest interest is working CW and helping others find satisfaction in that part of the hobby — and it all started with getting two wires connected the right way!

John Andrews, W1TAG
Holden, Massachusetts

Send reminiscences of your early days in radio to **celebrate@arrl.org**. Submissions selected for publication will be edited for space and clarity. Material published in "Celebrating Our Legacy" may also appear in other ARRL media. The publishers of *QST* assume no responsibility for statements made in this column.

George Misic, KE8RN, ke8rn@comcast.net

Classic Radio

Switching Sidebands without Frequency Shift in the ’50s and ’60s

Most SSB products of the 1950s and 1960s that allowed you to select the sideband shift had the carrier oscillator on the opposite side of the narrow passband filter and shifted the variable frequency oscillator (VFO) approximately the same amount to keep the operating frequency nearly unchanged. Collins Radio, Hallicrafters, Swan Electronics, and others used this practical method.

The amount that the VFO was shifted changed a small degree as the frequency of the VFO changed, so the correction is only exact at one frequency. This technique is accurate enough for most practical purposes, so the frequency correction is good enough for most operators. Some amateur radio equipment used a technique that had zero frequency shift when switching from the upper sideband (USB) to the lower sideband (LSB). The three methods that I know of to achieve zero frequency shift when changing sidebands are detailed below.

This advertisement for Eldico Electronics appeared in the March 1957 issue of *QST*.

Phasing SSB Generation

One method used to attain no frequency shift when changing sidebands was inherently part of the first popular method of generating an SSB signal. The phasing method of SSB generation employed the cancellation of one sideband and the reinforcement of the other to generate the signal. Because no filtering was used, there wasn’t any movement of the carrier oscillator to switch sidebands, and because no internal frequencies were shifted, no com-

pensation was required. Thus, exciters that employed the phasing method of SSB generation didn't involve frequency shift; to switch sidebands, they simply changed the phase of one of the internal signals used in the cancellation of the unwanted sideband.

Amateur products that employed the phasing method of SSB generation included all the transmitters built by Central Electronics, including the 10A, 10B, 20A, 100V, and 200V; Central Electronics never used sharp filters for sideband selection in any of their products. Similarly, all of the transmitters made by Lakeshore Industries employed the phasing method of SSB generation, so none of their products had any frequency shift when changing sidebands. Eldico Electronics started with phasing SSB generation in 1951 with their SSB Junior exciter for 75-meter SSB, which was sold wired and aligned or as a kit. Eldico continued with kits until 1955, when they switched to crystal-lattice filter SSB generation with the appropriately named SSB-100F. They stopped marketing new equipment after the 1958 S-119 SSB station, which was mostly a knockoff of the Collins Radio S-Line. Heathkit also used this method in their 1959 SB-10 SSB adapter for the TX-1 Apache AM/CW transmitter kit.

Two-Frequency Shifted Bandwidth Filters

Another method, which was used by Drake on their transceivers and transmitters (such as the TR-3 and TR-4), used two crystal-lattice filters for SSB generation — one for LSB and one for USB — so the carrier oscillator always stayed on the same frequency and, as a result, there was no frequency shift when changing sidebands. The Drake 4-line transmitters used the same method to select the desired LSB or USB. Like the TR-3 and TR-4, the T-4 family of transmitters employed two crystal-lattice filters with center frequencies, perhaps a bit less than 3.0 kHz apart, so one would shear off the upper and the other the lower sideband. This was a simple method to get a selectable sideband; the only issue was that it required two closely spaced crystal-lattice filters, which weren't inexpensive and could be hard to find with the center frequencies so closely spaced.

> "The phasing method of SSB generation employed the cancellation of one sideband and the reinforcement of the other to generate the signal. Because no filtering was used, there wasn't any movement of the carrier oscillator to switch sidebands, and because no internal frequencies were shifted, no compensation was required."

SBE IF Conversion Method

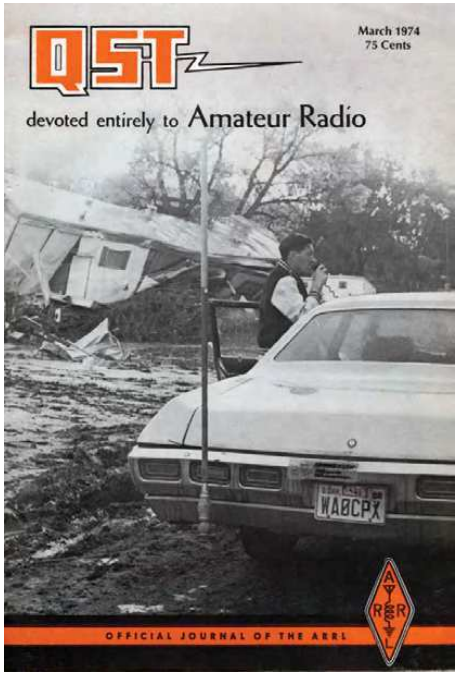
The LSB and USB selection method used by SideBand Engineers (SBE) founder Faust Gonsett was brilliant. This brings us to the third and final method that I know of — absolutely zero frequency shift between LSB and USB selection. This method was used by SBE on the SB-33 and SB-34 largely solid-state SSB transceivers. The SBE method always generated a USB signal at the first intermediate frequency (IF) of 455 kHz using a Collins Radio mechanical filter for SSB generation. A second IF of five times the carrier frequency was used; this was achieved by using an injection frequency of four times the carrier frequency to make a USB signal at the second IF, and an injection frequency of six times the carrier frequency to generate an LSB signal at five times the carrier frequency. Thus, when generating a USB signal, the 455 kHz USB signal was added to a signal at about 1820 kHz to make a 2275 kHz USB signal. For LSB generation, a frequency of six times the carrier, or about 2730 kHz, was used to subtract the 455 kHz IF to again give a second IF of 2275 kHz with the inversion of the sideband that always occurred when subtracting the IF, as compared to adding the first IF, giving absolutely no frequency shift between USB and LSB.

This was a neat and clever solution to the typical frequency shift caused by moving the IF carrier frequency to the opposite side of the filter. The 2275 kHz IF helped improve possible image rejection at 20 and 15 meters by using a somewhat higher IF than 455 kHz. These frequencies are approximate, because the actual carrier frequency was set to be at the bottom edge of the 455 kHz mechanical filter, or at about 453.5 kHz. But using either the fourth or sixth harmonic of the oscillator to make exactly five times the low IF still worked to give absolutely no carrier or frequency shift.

100, 50, and 25 Years Ago

March 1924

- With the devil on one shoulder and a police officer holding his hand off the key, the cover shows a ham wrestling with whether or not to call a station just before the end of "quiet hours."
- The case for developing radio waves below 200 meters for amateur use is discussed in "Editorials: The Short Waves."
- Methods used in designing r.f. amplifiers and uses of regeneration in r.f. amplifiers, among other items, for a successful shortwave r.f. amplifier are discussed in "Radio Frequency Amplification" by Stuart Ballantine.
- S. Kruse, 1OA, explains the difference between good and bad series condensers in "Antenna Series Condensers---Good and Bad."
- An update on the MacMillan Expedition is reported in "MacMillan Expedition Nears Arctic Daybreak" by K.B. Warner, 1BHW.
- Radio amateurs can be helpful in locating radio interference caused by power lines. Perry O. Briggs, 1BGF, explains why you should cooperate with power companies in "Cornering That Buzzing Interference."
- In "The Amateur Builder," H.F. Mason, 1ID, gives some "Hints on Building Receiving Sets."



March 1974

- The cover shows WAØCPX at the scene of destruction caused by a killer tornado. Continuing the theme, "Amateur Radio Public Service: Become Involved" by Bill Mann, WA1FCM, points out that disasters are not everyday occurrences, yet public-service activities are performed daily, and discusses some ways to participate.
- "It Seems to Us…Auto Patch" discusses the problems of auto-patch abuse on 2-meter repeaters, and reminds us that a landline patch is one of the most valuable tools a repeater system can have for emergency communications effectiveness. Abuse can result only in withdrawal of the privilege.
- Ben Vester, K3BC, describes the interesting properties of his half-square antenna, including different antennas he tried that didn't work as well in "The Half Square Antenna."
- Headaches associated with converting membership records to an automatic data processing system are addressed in "Woes of Babysitting a Computer" by John Nelson, W1GNC.
- Speaking at the ARRL Midwest Division Convention, A. Prose Walker, W4BW, Chief of the Amateur & Citizens Radio Division of FCC, discusses the established methods by which any change in our frequency allocation picture might be made. See the details in "Spectrum Allocations for the Amateur Service."

March 1999

- The cover features Jim Andera, KØNK, and pack dog Tobie getting on the air from the great outdoors. In the related story, Jim presents an introduction to the trials and tribulations of operating "polar bear portable" in "Hamming From an Igloo."
- David Sumner, K1ZZ, discusses putting forth positive experiences to encourage and welcome newcomers in "It Seems to Us…The Radio Amateur is Friendly."
- The mystique behind the devotion to a single radio manufacturer is explained in "The Collins Collectors Association" by George Maier, K1GXT.
- A refreshing story of two ham radio families during their three-year "cultural exchange program" is told in "Kurashiki-Pasadena — DX Fun for the Entire Family!" by Mitsu Sakamoto, JA4FVE.
- Steve Hageman shares some ideas on developing PIC-based projects for yourself in "PIC Development on a Shoestring."
- Why do competitors spend entire weekends in front of their radios? To increase operating skill, chase awards, compete on multiple fronts, and have tons of fun! David Jones, KK7GW, shows how in "Contest Fun for Everyone."
- Bernie McClenny, W3UR, reports on his UAE visit as a team member to operate the CQ World Wide CW DX Contest in "How's DX?: The United Arab Emirates."

Silent Keys

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

v•WB1ATK **Eichacker**, Richard F., Rockport, ME
WJ1M **Meo**, Joseph, Southport, CT
•K1PIL **Roberts**, Nelson "Sparky" C., Southwick, MA
♦K1QPN **Moore**, Donald E., Bloomfield, CT
v•KD1RM **Foisy**, Gerard F., Cumberland, RI
W1SJL **Iannuccillo**, Emilio D., Bristol, RI
vN1SZZ **Purcell**, Larry T., Ledyard, CT
W1VPI **Brazeal**, Earl H., Jr., Woodstock, CT
•K2AVS **Sturm**, John G., Buffalo, NY
♦W2CC **Popkin**, David B., Englewood, NJ
♦AE2EE **Baumgarte**, Dennis R., Batavia, NY
KC2HCY **Meyer**, Ned G., Ocean, NJ
N2HEP **Crudele**, Alfred D., Jr., New Windsor, NY
vWA2HKN **Herrick**, Alfred A., Woodbury, NY
WB2HYX **Herrick**, Sydell, Woodbury, NY
•WB2IJH **Hackett**, Frederick R., Pavilion, NY
N2IYY **Tarantula**, Robert R., Ronks, PA
♦N2LND **Barbato**, John L., Spencer, MA
WA2OCN **Sepesi**, Peter G., Bridgewater, NJ
NU2R **Diepeveen**, Neal, Sarasota, FL
N2SCX **Kozma**, Robert P., Rome, NY
♦K2SLZ **Bean**, Roger D., East Aurora, NY
•KA2ZKM **Meyer**, Marion, New Gloucester, ME
v•K2ZLF **Meyer**, Joseph C., New Gloucester, ME
vN3EDD **Mumper**, John Martin, Saint Leonard, MD
KD3GZ **Brook**, Derek J., Elmira, NY
vWB3HTK **Newman**, Walter W., Oreland, PA
vK3JAW **Hoeflich**, Philip, Seven Valleys, PA
KB3JDW **Batz**, Charles E., Westminster, MD
v•KD3LE **Long**, George M., Bellwood, PA
vKB3RAN **Hardy**, David Brooke, Lusby, MD
K3RON **Rubin**, Ronald L., Rydal, PA
•K3RTU **Smith**, James S., Aston, PA
•KA3VWH **Finestone**, Stephen C., Wellsboro, PA
•K3ZO **Laun**, Alfred A., Temple Hills, MD
vKD4BXF **Spanyer**, Carl H., Jr., Harvest, AL
KJ4CFT **O'Brien**, John, Calhoun, GA
v•WA4CRL **Johnson**, George H., Fredericksburg, VA
KG4HPO **Wentworth**, Michael L., DeBary, FL
vW4JPW **Thomas**, William C., Jr., Columbus, GA
KB4KA **Cox**, Terry A., Fairfield Bay, AR
KE4KKI **Stewart**, James W., Greeneville, TN
vKM4MEX **Waters**, Haran N., Mount Olive, NC
v♦WB4N **Jackson**, Barry, Maysville, KY
•WB4OMN **Naylor**, John T., Clinton, NC
vKI4OXX **Krueger**, Michael H., Northport, AL
N4PGS **Faust**, Gregory H., Charlottesville, VA
v♦NQ4Q **Willmuth**, John C., Berlin, MD
KI4QAC **Green**, Carl E., Alabaster, AL
AC4QJ **Van Der Bijl**, Otto R.P., Prosser, WA
v♦K4QLM **Puig**, Wilfred, Cocoa, FL
vKE4RGR **Allen**, Phillip S., Columbia, SC
W4RJA **Antolick**, Richard J., The Villages, FL
N4SM **Jones**, Thomas M., Clyde, NC
vW4WJH **Jaquish**, Michael P., Athens, TN
vN4WMY **Tigges**, Michael B., Radcliff, KY
KD4Y **Connellan**, Herbert D., Jr., Greenville, AL
WA5EIY **King**, Donald R., Fort Worth, TX
vN5GDO **Oliver**, Gary D., Athens, TX
♦K5HTZ **DeMajo**, John, Chesterfield, VA
K5IHK **Green**, Jerry, Magnolia, TX
♦W5IR **Rees**, Joseph Harrison, Metairie, LA
KI5IRS **Gray**, Mary L., Gun Barrel City, TX
N5LD **Fortinberry**, George K., Kentwood, LA
KC5LUA **Cagle**, Don, Bixby, OK
WB5MMS **Randall**, Rosalie, Kemp, TX
v♦KB5MY **Hammill**, Daniel L., San Diego, CA
♦•N5NVP **Bookter**, James J., Leesville, LA
KD5OEV **Johnson**, Ellen J., Waco, TX
K5POU **Plumlee**, David L., Independence, MO
WB5QFM **Taylor**, Charles R., Shreveport, LA
K5RCD **Davis**, Randall C., Floresville, TX
vKF5SK **Speed**, William E., Malakoff, TX
KE5UPK **Bookter**, Irma L., Leesville, LA
KB5VAI **Calhoun**, Heath, Clinton, MS
vWB5VDC **Fielder**, Wavelen Wayne, Beaumont, TX
AD5VO **Sellmeyer**, J.S., Allen, TX
K5YJB **Kuykendall**, Roger, Flowery Branch, GA
vKF5ZXG **Harrison**, James W., III, Lago Vista, TX
KF6BGR **Arterberry**, Martha K., Waterville, ME
v♦K6ERU **Laffin**, Ray W., Pleasanton, CA
♦WA6EUT **Whalan**, Michael R., Ridgecrest, CA
WH6FTU **Braun**, Sylvia J., Laupahoehoe, HI
vKI6FWO **Hutchinson**, Warren, Woodland Hills, CA
vN6IID **Chandler**, Paul L., Highland, CA
v♦N6IN **Ichikawa**, Gordon R., Owego, NY
vKE6LEY **Hess**, Kenneth G., Alameda, CA
vK6LJS **Thompson**, Melvin Clark, Los Alamos, NM
N6NQQ **Hammond**, Brian, San Diego, CA
vN6PR **Maraffio**, William R., Ammon, ID
•KI6ZX **Fulmer**, Patrick D., Yuba City, CA
NZ7A **Loudon**, Roger G., Yakima, WA
N7AFM **Van Zee**, James C., Phoenix, AZ
vKB7AIH **Harris**, Edwin D., Eugene, OR
WA7EDI **Cripps**, Lorraine, Phoenix, AZ
KB7EKB **Suber**, Ivy D., Klamath Falls, OR
vK7GCO **Glanzer**, Kenneth W., Bridgewater, SD
KA7HHG **Bigelow**, Arthur, Prineville, OR
WA7LDB **Byrd**, Lynda, Weiser, ID
vW7LFB **Grundstrom**, Roger, Hot Springs, SD
KI7NAE **Forstein**, Thomas J., Bow, WA
vWA7PBI **Kimmel**, Gene G., Yakima, WA
N7SIP **Nielson**, Anthony G., Herriman, UT
♦N7TT **Gohndrone**, John, La Center, WA
v•KB7UOG **Sargent**, Harold W., Sr., American Fork, UT
•N7WVQ **Dunlap**, Samuel J., Medford, OR
vKD8AMR **McElroy**, David, Dearborn Heights, MI
WA8DTU **Urschel**, Donald R., Franklin, OH
vWB8DXC **Filby**, James W., Mentor, OH
vWB8GWK **Green**, Dalbert E., Adrian, MI
vKC8HEF **Newsome**, Gary A., Homer, MI
W8IJ **Barrows**, David O., Camp Hill, PA
•WD8KOU **Ferguson**, Forester W., Sr., Lebanon, OH
•N8LXQ **Dooley**, James P., Stevensville, MI
KA8MEG **Wysong**, Jerry F., Richmond, IN
WV8RC **Cummings**, James R., Charleston, WV
KD8TAF **Anderson**, David G., New Paris, OH
KA8YIW **Ebert**, Donald, Saline, MI
W8ZRZ **Heringhaus**, Donald R., Ottawa, OH
vK9AQX **Ferris**, Joseph R., Marco Island, FL
KC9ET **Ovrid**, Virginia K., Iron River, MI
vW9EXP **Day**, Theodore A., Richmond Hill, GA
K9FTJ **Stallsworth**, Robert L., Tuscola, IL
N9HHL **Korner**, Gregory C., Brookville, IN
N9JRJ **Szymanowski**, James E., Richmond, IN
vKD9KB **Gross**, George L., Quincy, IL
WA9MTY **Mills**, Patricia A., Martinsville, IN
v•N9ND **Eccles**, Dale, Clearwater, FL
N9RH **Hoops**, Robert, Greensburg, IN
K9TUD **Loomer-Oliver**, Mary A., Cameron, WI
W9YEA **Howell**, Roy L., Bedford, IN
vKØARY **Quayle**, Bruce B., Jr., Imperial, MO
WWØB **Biggs**, Rex H., Joplin, MO
WDØD **De Wolf**, Danny E., North Platte, NE
WØDED **Dedmon**, Timothy M., Alamo, TX
vKCØFIC **Hoepner**, Edward K., Colorado Springs, CO
KØHE **Atwood**, Rick, Bellevue, NE
NØJRM **Ford**, Susan J., Springfield, MO
•NØNOQ **Simpson**, William F., Scott City, KS
vKØSTZ **Medina**, Ruben L., San Luis, CO
vABØXE **Howard**, Stephen F., South Saint Paul, MN
VE3CM **Cowan**, Jim, Woodslee, ON, Canada
VA3GEG **Geduld**, Geoffrey E., Ottawa, ON, Canada
VE3RSI **Sacerty**, J. Robert, Sarnia, ON, Canada
VE6GY **Green**, Ernest W., Foothills, AB, Canada
VA7DLJ **Johnson**, David L., Metchosin, BC, Canada
LZ1PZ **Mihaylov**, Hristofor "Fori" A., Veliko Tarnovo, Bulgaria

♦ 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.

HAM RADIO OUTLET®

WWW.HAMRADIO.COM

Family owned and operated since 1971

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-905 | *VHF/UHF/SHF All Mode Portable*

• GPS-Controlled Oscillator for Ultimate Frequency Stability • Separate Controller & RF Unit Configuration • Industry First 144 MHz to Microwave Transceiver • Wideband 50 MHz Span Real-time Spectrum Scope • Full D-STAR Functions

IC-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-5100 AD

VHF/UHF Dual Band Digital Transceiver

• Analog FM/D-Star DV Mode • SD Card Slot for Voice & Data Storage • 50W Output on VHF/UHF Bands • Integrated GPS Receiver • AM Airband Dualwatch

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

ID-50A | *VHF/UHF D-STAR Portable*

• High Visible LCD with Backlight Function • Find Nearby Repeaters with the Built-In GPS • Easy D-STAR Settings for Beginners • Voice Recorder Function • Share Pictures in DV Mode

IC-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

5 Ways to Shop!

- **RETAIL LOCATIONS – Store hours 10:00AM - 5:30PM - Closed Sunday**
- **PHONE – Toll-free phone hours 9:30AM - 5:30PM**
- **FAX – All store locations**
- **ONLINE – WWW.HAMRADIO.COM**
- **MAIL – All store locations**

ICOM®

FOLLOW HRO ON SOCIAL MEDIA

twitter.com/HamRadioOutlet
facebook.com/HROHamRadioOutlet
instagram.com/HamRadioOutlet
youtube.com/HamRadioOutlet

HAM RADIO OUTLET®

WWW.HAMRADIO.COM

March is Yaesu Month at HRO!

FTDX101MP | *200W HF/50MHz Transceiver*

• Hybrid SDR Configuration • Unparalleled 70 dB Max. Attenuation VC-Tune • New Generation Scope Display 3DSS • ABI (Active Band Indicator) & MPVD (Multi-Purpose VFO Outer Dial) • PC Remote Control Software to Expand the Operating Range • Includes External Power With Matching Front Speaker

FTDX10 | *HF/50MHz 100 W SDR Transceiver*

• Narrow Band and Direct Sampling SDR • Down Conversion, 9MHz IF Roofing Filters Produce Excellent Shape Factor • 5" Full-Color Touch Panel w/3D Spectrum Stream • High Speed Auto Antenna Tuner • Microphone Amplifier w/3-Stage Parametric Equalizer • Remote Operation w/optional LAN Unit (SCU-LAN10)

FT-991A | *HF/VHF/UHF All ModeTransceiver*

Real-time Spectrum Scope with Automatic Scope Control • Multi-color waterfall display • State of the art 32-bit Digital Signal Processing System • 3kHz Roofing Filter for enhanced performance • 3.5 Inch Full Color TFT USB Capable • Internal Automatic Antenna Tuner • High Accuracy TCXO

FTDX101D | *HF + 6M Transceiver*

• Narrow Band SDR & Direct Sampling SDR • Crystal Roofing Filters Phenomenal Multi-Signal Receiving Characteristics • Unparalleled - 70dB Maximum Attenuation VC-Tune • 15 Separate (HAM 10 + GEN 5) Powerful Band Pass Filters • New Generation Scope Displays 3-Dimensional Spectrum Stream

FT-710 Aess | *HF/50MHz 100W SDR Transceiver*

• Unmatched SDR Receiving Performance • Band Pass Filters Dedicated for the Amateur Bands • High Res 4.3-inch TFT Color Touch Display • AESS: Acoustic Enhanced Speaker System with SP-40 For High-Fidelity Audio • Built-in High Speed Auto Antenna Tuner

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-500DR | *C4FM/FM 144/430MHz Dual Band Xcvr*

• Front Firing Acoustically Enhanced Speaker System • True Dual Band Operation, C4FM/C4FM Digital D-D Dual Receive • 2.4" High-Resolution Full-Color Touch Panel Display • Built-in High Precision GPS Receiver • Wireless Operation Capability with Optional Bluetooth® Headset

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*

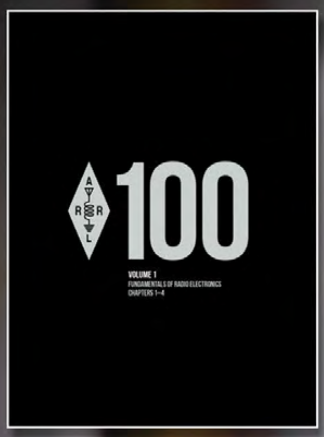
• All New User Operating Interface-E2O-III (Easy to Operate-III) • Robust Speaker Delivers 3W of Clear, Crisp Receive Audio • Detachable Front Panel Can Be Mounted in Multiple Positions • Supports Optional Bluetooth® Wireless Operation Using the SSM-BT10 or a Commercially Available Bluetooth® Headset

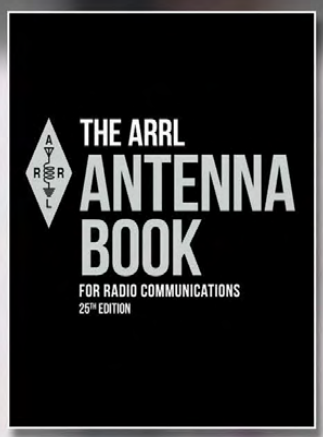
5 Ways to Shop!

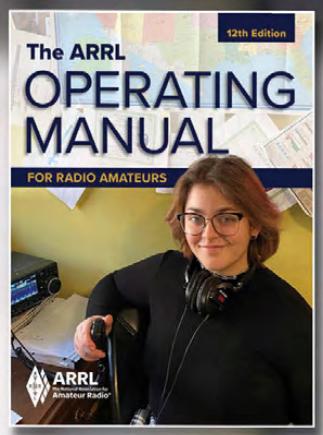
- RETAIL LOCATIONS – Store hours 10:00AM - 5:30PM - Closed Sunday
- PHONE – Toll-free phone hours 9:30AM - 5:30PM
- ONLINE – WWW.HAMRADIO.COM
- FAX – All store locations
- MAIL – All store locations

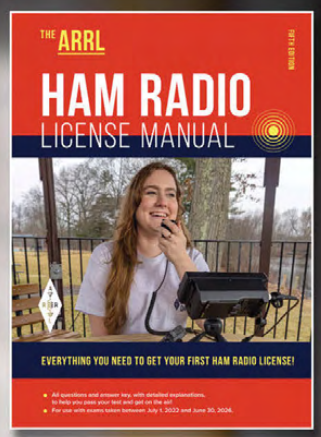
YAESU The radio

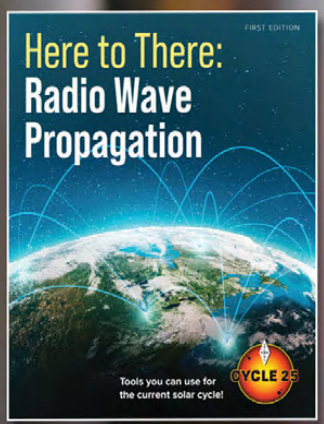
ANAHEIM, CA (800) 854-6046	PORTLAND, OR (800) 765-4267	PHOENIX, AZ (800) 559-7388	MILWAUKEE, WI (800) 558-0411	WOODBRIDGE, VA (800) 444-4799	WINTER SPRINGS, FL (800) 327-1917
SACRAMENTO, CA (877) 892-1745	DENVER, CO (800) 444-9476	PLANO, TX (877) 455-8750	NEW CASTLE, DE (800) 644-4476	SALEM, NH (800) 444-0047	ATLANTA, GA (800) 444-7927





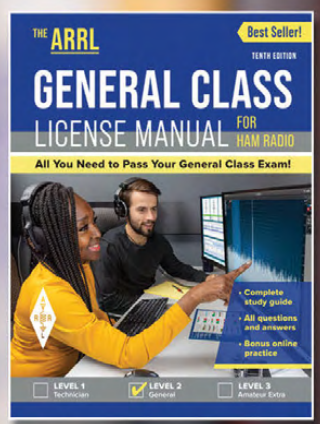


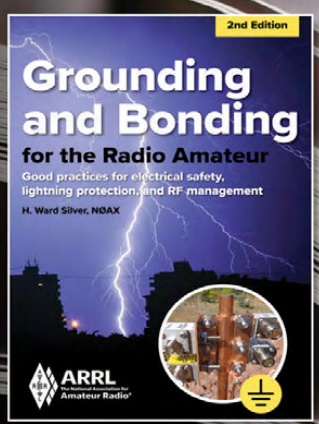




Stay in the Know

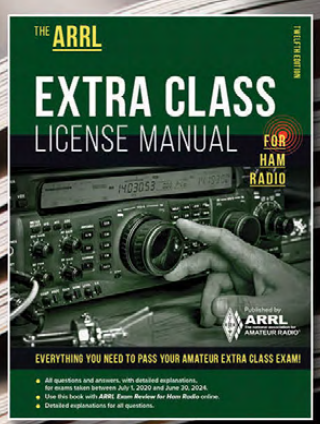
ARRL Publications and Journals





www.arrl.org/shop

ARRL The National Association for Amateur Radio®



MFJ Reach for the Sky Mister!

Get that antenna up where it belongs, high in the sky with MFJ's heavy-duty Telescopic Masts and accessories. We have all you need for temporary, portable or permanent antenna installations.

18' Telescopic Mast/Tripod

MFJ-1919EX, $199.95.

Put your antennas up high anywhere with this super-strong* 18 foot telescoping fiberglass mast and MFJ-1919 heavy duty steel tripod. *QuickClamps™ lower mast to 5 feet. Mast has thick 1/8 in. wall, .75" top, 1.5" bottom dia. 15 lbs. Steel tripod has braced triangle base, non-skid feet, mast lock.

9.5' Telescopic Mast/Tripod

MFJ-1918EX, $129.95.

MFJ-1918 *tripod with 9.5 ft. telescoping fiberglass mast*. 3.8 feet collapsed. 6.5 lbs.

Tripods Only

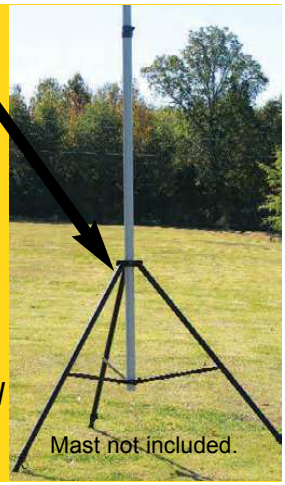
MFJ-1921, $219.95.

Giant tripod base spreads to 8'! Supports massive masts/ antennas. Adjustable length non-skid legs accommodates uneven ground surfaces. Optional foot anchors. 14 lbs.

MFJ-1919, $129.95.

Large tripod spreads to 4.8 ft. Support 100 lbs. 7.8', 9.75 lbs.

MFJ-1918, $84.95, *Small tripod* base spreads to 2.75 ft. Support 66 lbs. 6.75 lbs.



Light Duty Lightweight Fiberglass Masts

Portable, telescoping high-strength fiberglass masts extend way up into the sky! Just pull out sections and lock.

Choose Lightweight-Light-Duty or Super-Strong Thick-Wall models -- 10 to 50 feet long. Each collapses to an easy-to-carry size for true 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, $319.95 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, $239.95/MFJ-1908H, $289.95, 41' ext., 7.75-ft. collapsed, six 7.75-ft. sect., 16 lbs. 2" bottom, 3/4" top OD.

Mast Accessories

MFJ-1900, $99.95. Mount clamps mast to mounting pipe.
MFJ-13, $84.95. 5 Military 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,** *fiber-glass*; **MFJ-2840X, $19.95,** *aluminum*.

Left: *Stainless Steel Hose Clamps* recommended for permanent installations. Fiberglass is slotted.

Right: UV protected Military grade *Quick-Clamps*.Guy 2 levels when fully extended.

80-6 Meter Telescopic Antenna

3.8 foot fiberglass mast telescopes to a 31' self-supporting *high performance* 80-6 Meter antenna in minutes! 1/4 wave performance on 40M, 1/2 wave on 20M. High-Q air wound loading coil. Use antenna tuner for 30/20/15/12/10/6. 600 Watts SSB/CW. Temporary, portable or permanent ant-enna for home, RV, field day, DXpedition. Includes four 12 foot radials. Current balun reduces feedline radiation and pattern distortion. **MFJ-2982, $179.95.** 80-6M. **MFJ-2980, $139.95.** 40-6M.

MFJ "*HamStick*" *Isolated* Dipole

MFJ-347, $29.95. Build your own 80-6 Meter *mini*-dipole using two HF mobile whips! MFJ-347 *isolates* dipole elements. Lets you use a balun to give a *true balanced dipole.* Prevents pattern distortion, noise pickup and RFI radiation from RF on coax shield. Solid aluminum. Use masts up to 1¼" OD.

3/8-24 Hamstick Mount. MFJ-342T, $19.95. Mount 3/8-24 HF/VHF hamsticks vertically or horizontally on masts to 1 inch. Built-in SO239.

MFJ Balcony Mount

Mount *multiple* HF/VHF hamsticks, verticals, dipoles vertically or horizontally on your balcony. High-strength aircraft aluminum extends out 14 inches. Two U-bolts mount to 1½ inches diameter railing/fence post.

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 inchesOD.

Portable Mast Supports

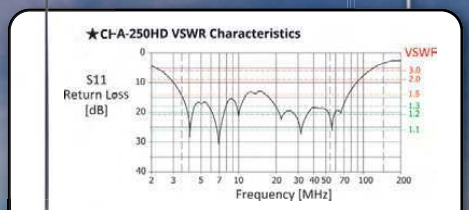
MFJ-1912, $129.95. Just drive your car or truck tire over the stainless steel base of the mount. You're ready for virtually any antenna. Fits up to 2.25" masts.

MFJ-1914, $139.95. Stainless steel antenna mast mount includes four heavy duty galvanized ground stakes to hold your antenna up safely in the field. Use up to 2.25" masts.

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759
Phone: (662) 323-5869 • **Tech Help:** (662) 323-0549 • **FAX:** (662) 323-6551 8-4:30 CST, Mon.-Fri.

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!

❼

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

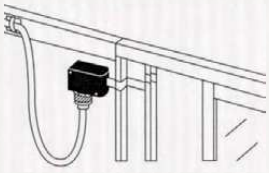
❸ COMET GP-6 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA
Wavelength: 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 5 • Max Pwr: 200W • Length: 10'2"• Weight: 3lbs. 8ozs. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

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!
www.natcommgroup.com | 800-962-2611

COMET®

MFJ POTA helpers

80-10 Meters with single EFHW antenna, no tuner needed!

MFJ-1982MP, $99.95

- **Get on the air** 80-10 Meters with a single wire *EFHW* and one center or end support. Fast, easy set-up/take-down for portable use.
- **End-Fed Half-Waves** (EFHW) resonate on halfwave fundamental frequency and even harmonics. 80-10 Meters -- no traps, stubs, resonators. Broad-band matching transformer gives you low SWR! No tuner usually needed.
- **No long counterpoise**, radials or feedline required
- **Nearly invisible,** no-tangle black *Teflon* insulated radiator wire.
- **Weather** and U/V resistant. Easy storage and transport.

MFJ-1982MP, $99.95. *300 Watts* Restricted space, 80-10M. 132 ft.
MFJ-1984MP, $89.95. *300 Watts* Restricted space, 40-10M. 66 feet.
MFJ-1982HP, $129.95. *800 Watts*, high power, 80-10 Meters. 132 feet.
MFJ-1984HP, $109.95. *800 Watts*, high power, 40-10 Meters. 66 feet.
MFJ-1982LP, $89.95. *30 Watts* QRP, 80-10 Meters. 132 feet.
MFJ-1984LP, $79.95. *30 Watts* QRP, 40-10 Meters. 66 feet.

G5RV Antenna

MFJ-1778, $89.95. 80-10 Meters G5RV is 102 foot wide copper wire, 32.5 feet ladder line center to SO-239.

Premium stainless steel telescopic whips

-- Build collapsible dipoles, mobiles, portable and base antennas. Great for traveling. Rigidly collared at the base, stronger than plated brass, resists rust/corrosion. 16.9/12/10/8/4.5' models available.

MFJ-1979, $69.95. *Most popular!* 16.9' ext., 27" collapsed. 10 sect. 20-6M.

MFJ-1936T, $49.95. Ground rod, 3/8-24 mount, 17' whip, counterpoise.

Continuously tuneable Portable 60-6M Antenna

MFJ-1898, $149.95. Get 60/40/30/20/17/15/12/10/6-Meters in one portable *continuously tuneable* antenna!!! Great for POTA, SOTA, DXPeditions or just in your backyard. Collapses to 1.25x11.5 inches in two sections. Fully extended it's a whopping 103 inches! Easy to tune. Tuning section base unscrews to reveal a nifty tuning chart (like a ruler). Handles 125 Watts PEP SSB. Quick and painless band changing.

HF Hamstick Portable Antennas

MFJ-16XXT, $22.95-$29.95. Monoband portable hamsticks make POTA fun & easy! Small, lightweight, efficient, and easy-to-use. Dual center and distributed loading lets you radiate efficiently -- get more power out for working DX and ragchewing. Ruggedly constructed. Heavy duty 4'-3/8" diameter fiberglass rod, .125" diameter PH-17-7 stainless steel whip, chrome plated brass fittings give years of dependability. Adjust whip for lowest SWR. Allen wrench, tuning/matching instructions. 250W. PEP. 7' fully extended, collapses to 4' for easy storage. 6/10/12/15/20/30/40/60/75M. 3/8 x 24 mount.

MFJ-347, $29.95. Mounts 2 of your favorite hamsticks to make a dipole. Use masts up to 1.25" OD. Isolated dipole elements.

18 foot Telescopic Mast with Tripod

MFJ-1919EX, $199.95. 18' telescoping fiberglass mast with heavy duty steel tripod. Mast collapses to 5'. Thick 1/8" wall, .75" top, 1.5" bottom. 15 lbs. Braced triangle, non-skid feet.

MFJ-1918EX, $129.95. Tripod, 9.5' telescoping fiberglass mast. 3.8' collapsed. 6½ lbs.

Tripods Only

MFJ-1921, $219.95, *Giant tripod* base spreads to 8'! Supports massive antennas. Adjustable non-skid legs. 14 lbs.

MFJ-1905, $44.95. *Optional* foot anchors,

MFJ-1919, $129.95, Base spreads 4.8'. Supports 100 lbs. 7.8 ft, 9.75 lbs.

MFJ-1918, $84.95, Base spreads 2.75'. Support 66 lbs. 6.75 lbs.

Telescopic Fiberglass Masts

Pull out sections and lock to extend your antenna way to the sky. Lightweight, Light-Duty or Super-Strong Thick-Wall models, 25-43'. Each collapses for easy-to-carry size for true portablilty.

MFJ-1910, $119.95. 33', light duty, has top tie ring for wires.

MFJ-1915, $159.95. 25 feet, for heavier duty use.

MFJ-1917, $209.95. 43 feet, heavier duty use, has top tie ring for wires.

MFJ RFI Isolator

MFJ-915, $49.95. Prevents unwanted RFI from traveling on your coax shield into your expensive transceiver and other electronic equipment. Prevents painful RF "bites" and erratic operation. 1.5 kW. 1.8-30 MHz.

MFJ 4:1 Balun

MFJ-918, $49.95. True 1:1 current balun/center insulator. High-permeability ferrite beads on RG-303 *Teflon*(R) coax. 2" dia.x6" long. 14 gauge 7-strand copper wire. 1.5 kW 1.8-30 MHz.

MFJ POTA Antenna Tuners

MFJ-939, $199.95. Automatic Tuner, 200W Digital/SSB/CW. 20,000 memories, super fast automatic tuning. Includes interface cable, 2-year warranty. Compact 6½Wx2⅞Hx8⅜D".

MFJ-945E, $189.95. 160-6M Manual antenna tuner. Lighted Cross-Needle SWR/Wattmeter, Lamp/ Bypass switches. 300 Watts. Compact 8Wx2Hx6D inches.

MFJ 30 Amp Power Supply

MFJ-4230MVP, $159.95.

Ham radio's *best seller* is just 5Wx2½H x6D inches, and just 3 pounds. Perfect for home, POTA or for power for your "*Go-Box*". 25A continuous, 30A surge at 13.8 VDC. Adjusts 4-16 VDC. 120/240 VAC at 47-63 Hz -- worldwide! V/A Meter switch. 75% efficiency, low ripple/noise, <100 mV. Over-voltage/current protections.

HF/VHF SWR Analyzer

MFJ-259D, $349.95. World's best selling analyzer covers 280 KHz to 230 MHz, has LCD that reads SWR and impedance or SWR bargraph, SWR and Impedance analog meters, signal generator, frequency counter.

MFJ-281, $19.95. *ClearTone*™ **Communication speaker**, 3" speaker 8W, 8 Ohms, 6' cord, 3.5 mm mono.

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759
Phone: (662) 323-5869 • **Tech Help:** (662) 323-0549 • **FAX:** (662) 323-6551 8-4:30 CST, Mon.-Fri.

MFJ ANTENNAS

MFJ Wire Antennas

G5RV -- *Most popular antenna in the world!*

Operate 80-10 or 40-10M with tuner. 14 gauge, 7-strand copper antenna wire. 1.5kW. 32.5' ladder line matching section with SO-239 for coax.
MFJ-1778, $89.95. 80-10M. 102 feet long.
MFJ-1778M, $79.95. 40-10M. 52 feet long.

End Fed Half Waves

Operate 80-10 or 40-10M with one support/no tuner.

80-10 Meters, 132 feet:
MFJ-1982HP, $129.95. 800 Watts.
MFJ-1982MP, $99.95. 300 Watts.
MFJ-1982LP, $89.95. 30 Watts.

40-10 Meters, 66 feet:
MFJ-1984HP, $109.95. 800 Watts.
MFJ-1984MP, $89.95. 300 Watts.
MFJ-1984LP, $79.95. 30 Watts.

Off Center Fed Dipoles

Lightweight, virtually invisible. Gives you directivity and gain (*see MFJ website*).
MFJ-2012, $109.95, 40/20/10/6 Meters, 1500 Watts. 67 ft.
MFJ-2010, $89.95. 40/20/10/6 Meters, 300 Watts. 67 ft.
MFJ-2014, $139.95. 75/40 Meters, 1500 Watts. 122 ft.
MFJ-2016, $169.95. 160/75/40 Meters, 1500 Watts. 240 ft.
MFJ-2013, $109.95. 60/30 Meters, 300 Watts. 86 ft.

Dual Band 80/40 or 40/20 Dipoles, 1.5 kW

MFJ-17758, $129.95. 80/40 Meters, 95 feet long, ultra-efficient end-loading on 80 Meters. No tuner needed. Super-strong center insulator, built-in SO239, hanghole.
MFJ-17754, $89.95. 40/20M, 42 ft.

MFJ All Band Doublet

MFJ-1777, $129.95.102 foot, 160-6 Meters with tuner/balun. *Extremely low feedline loss*. Super strong fiberglass center insulator provides stress relief for included 100 feet ladder line. *Ceramic* end insulators. 1500 Watts SSB/CW/Digital.

MFJ 1.5 kW Dipoles

7-strand, 14-ga. copper wire.*Ceramic* insulators. Center insulator with SO-239
MFJ-1779C, $59.95. 20-6M, 35 feet.
MFJ-1779B, $79.95. 80-40M,135 feet.
MFJ-1779A, $99.95. 160M, 265 feet.

20M Extended Double Zepp

MFJ-1742, $124.95. See web for gain. 90 ft. long, 100 ft. ladder line. 7-strand, 14-ga. wire. 80-10M with tuner/balun. 1500 Watts SSB/CW/Digital.

80M End-Fed Zepp

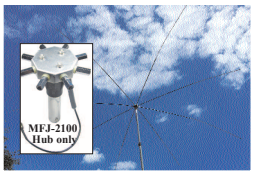
MFJ-1748, $124.95. 125 feet long, 100 foot ladder line included. 7-strand, 14-ga. wire. Use tuner/balun. 1500 Watts SSB/CW/Digital.

MFJ Vertical Mounted Antennas

MFJ 6-Band Cobweb Antenna

MFJ-1836H, $319.95. Six-bands: 20/17/15/12/10/6 Meters, 1.5 kW. *Perfect for restricted space*. Nearly invisible. 9x9x1/2 feet, 8 lbs. Outstand-ing performance! Horizontally polarized gives less noise, more gain over verticals. Omni-directional. No radials needed! Works great at low heights. Low SWR.
MFJ-1836, $299.95. Like MFJ-1836H, but 300 Watts.

MFJ *4-Band* Dipole Octopus Antenna



***Octopus** antenna hub turns hamsticks into four balanced* HF/VHF/UHF *dipoles!* Rotate for maximum signal, minimum QRM/noise. Mount low for local NVIS, high for DX. Perfect for portable, limited space, HOAs, camping, ARES. Balun. No tuner needed.
MFJ-2104, $299.95. Includes 8 hamsticks for 75/40/20/15 M.
MFJ-2100, $129.95. Hub only. Use eight hamsticks.

MFJ Multi-Band Verticals, no radials needed!

Low angle radiation lets you easily work far-away, rare DX!
Efficient end loading gives maximum radiated power.
1500 Watts SSB/CW/Digital. Low SWR. Omni-directional. No radials or antenna tuner needed.
Low profiles blend into any surroundings. Mount them anywhere ground level, roof tops, apartments, houses, small lots.
Efficient high-Q coils. High power air-wound choke balun.
Built-to-last. Solid fiberglass rod, aircraft aluminum tubing.

5 models: Choose your bands 80-2 Meters
MFJ-1796, $369.95. 6 bands: 40/20/15/10/6/2M, 12 feet.
MFJ-1797, $399.95. 7 bands:40/30/20/17/15/12/10M. 23 ft.
MFJ-1797LP, $369.95. Like MFJ-1797, but only 9 feet tall. Narrower bandwidth on 40 Meters.
MFJ-1799, $599.95.10 bands: 80/40/30/20/17/15/12/10/6/2M. 20 ft.
MFJ-1799X, $549.95. Like MFJ-1799, but less 80M.

MFJ 43-foot Vertical, 160-6 Meter

MFJ-2990,$469.95. High performance 43 foot vertical operates 160-6 Meters, 1500 Watts SSB/CW/Digital. 2 square feet wind load. Self-supporting, no guy wires needed. 6063 aircraft aluminum tubing, bottom section 2" OD, .120" wall thickness. 20 lbs. Requires antenna tuner, ground/counterpoise.

BigStick ™ Vertical

MFJ-2286, $149.95. 7-55 MHz, *full 1/4 wave* 20-6M, 40M coil. 17 ft. extended, 28" collapsed. 2 lbs. 1 KW. Mount, radial kit included.

BigEAR ™ Dipole

MFJ-2289, $249.95. 7-55 MHz. *Full-size* 20-6 Meter dipole, 40M air loading coil. Two 17 ft. telescopic whips, 28" collapsed.

MFJ-915, $49.95 RFI Isolator

Prevents unwanted RF from traveling on your coax shield into your expensive transceiver. Prevents painful RF "bites" and erratic operation. 1.5 kW. 1.8-30 MHz.

MFJ-918, $49.95 4:1 Balun

True 1:1 current balun/center insulator. High-permeability ferrite beads on RG-303 *Teflon*(R) coax. 2" dia.x6" long. 14 gauge 7-strand copper wire. 1.5 kW 1.8-30 MHz.

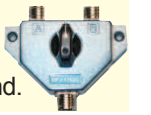
MFJ-913, $49.95, 300W MFJ-919, $84.95, 1.5 kW

True 4:1 current baluns/antenna center insulators transform 200 ohms to 50 ohms, 1.8-30 MHz. Transmission line transformer, low permeability ferrite cores, SO-239, stainless steel hardware with direct 14 gauge stranded copper wire to antenna.

Lightning surge protectors

MFJ-270, $27.95. 400W.
MFJ-272, $37.95. 1500W.
Gas discharge tube shunts 5000 amps peak.< 0.1 dB loss. 1 GHz. SO-239s.

2-Position Antenna Switch



MFJ-1702C, $69.95.
2-position antenna switch, lightning surge protection, center ground.

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759
Phone: (662) 323-5869 • **Tech Help:** (662) 323-0549 • **FAX:** (662) 323-6551 8-4:30 CST, Mon.-Fri.

MFJ *Low-Noise Receiving* Loops

Work DX and ragchew even through horrendous noise!

Pull weak signals out of static crashes, atmospheric, man-made and power line noise!

Clearly hear signals 50 KHz to 30 MHz you never knew existed. Power line noise and static just disappears.

MFJ-1886 drastically reduces noise and interference by receiving the magnetic field and rejecting the electric field. Rotate MFJ-1886 receiving loop to totally eliminate interfering signals or greatly peak desired signal.

Excellent antenna and preamplifier balance gives deep null.

State-of-the-art push-pull Gali MMICs preamp gives you high dynamic range, low IMD and 25 dB of low noise gain.

Gives excellent strong and weak signal performance without overload.

Fully protected preamplifier -- magnetically coupled voltages up to 40V and capacitively coupled voltages up to 20V will not damage preamplifier.

Output is protected from transmission line surges induced by distant lightning.

Use anywhere, inside or outside. RF signal and power goes through your 50 Ohm coax.

Ruggedly built to withstand extreme weather. 1-inch OD diameter 6061 aluminum tubing. 36-inch diameter. 2½lbs. SO-239. Use masts up to 1¾ inches.

MFJ-1886, $329.95. Includes receive loop and MFJ-4116 bias-tee to power MFJ-1886 through coax.

MFJ-1886TR, $369.95. Includes MFJ-1886 and MFJ-4113TR Bias-Tee/Transmit/Receive switch. MFJ-4113TR powers MFJ-1886 through coax and switches between transmitting antenna and receiving loop. For radios with only one antenna connector.

MFJ-4116, $44.95. Bias-Tee provides RF signal and power through coax transmission line. Send up to 1A DC up to 50 Volts.

MFJ-4113TR, $119.95. Bias-Tee with built-in Transmit/Receive switch. Switches between transmitting and receiving antenna. For radios with only one antenna connector. Provides RF signal and power through coax.

Multi-coupler/Bias-Tee

New! **MFJ-1888MC, $249.95.** Connect four receivers to one antenna. Receivers are fully isolated. Each receiver port has 1-12 dB adjustable gain. IP3 is +15 dB. 2dB noise figure. Built-in Bias-Tee powers receiving loop through coax. SO-239s. Use 12 VDC or 110 VAC with MFJ-1312D, $19.95. RF tight, 7¼Wx1¾Hx5D inches.

Super High Dynamic Range High Gain Receiving Loop

New! **MFJ-1888, $499.95.** 32 dB gain from 50 KHz to 30 MHz. 20 dB gain at 80 MHz. IP3 is + 30 dB, 1 dB compression point is 23 dB, noise figure is 1.7 dB. Built-in BCB input filters to reduce overloading. Includes MFJ-1888MC remote multi-coupler. Can be used with MFJ-4113TR Bias-Tee/T/R switch and/or MFJ-4116 bias tee. 36-inch diameter. 2½ lbs. SO-239. Use masts up to 1¾ inches.

Antenna Rotator

Perfect for MFJ-1886/1786/1788 loop, VHF/UHF, small HF beams, TV, FM antennas.

AR-500
$199.95

Weather-proof one piece cast aluminum housing with precision all metal gears, steel thrust bearings and automatic braking. Includes rotator, controller, remote control, clamps, hardware. Memories for 12 directions! Digitally displays position. 110/220 VAC.

Wipe out RFI

Wipe out RFI, noise, interference from any direction at any frequency with a 60 dB notch before it gets into your receiver!

MFJ-1026
$259.95

Eliminate power line noise, fluorescent lamps, light dimmers, computers, TVs, lightning, motors, industrial processes.

Null out QRM on rare DX and work him! Null out local ham or AM station to prevent receiver overload. Works on SSB, AM, CW, FM, digital BCB to lower VHF. Plugs between antenna and transceiver. 12VDC, 110VAC with MFJ-1312D, $19.95.

MFJ *Super High-Q™ Transmitting Loop* Antennas

MFJ-1786
$659.95

MFJ 36-inch diameter transmitting loop antenna lets you operate 10-30 MHz continuously including WARC bands!

Ideal for limited space, HOA.

Work DX with low angle radiation and local close-in contacts with high angle radiation when mounted vertically. 150 watts.

Super easy-to-use! MFJ remote control auto tunes to your desired band. Fast/slow tune buttons, Cross-Needle SWR/Watt-meter lets you quickly tune to your exact frequency. No control cable needed.

***World's** most efficient small loop antenna has all welded construction, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter aluminum radiator for highest efficiency.*

Every capacitor plate is welded for extremely low loss and polished to prevent high voltage arcing. Nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor gives smooth precision tuning. Heavy-duty ABS plastic housing has ultraviolet inhibitor.

Cover 40-15 Meters. MFJ-1788, $719.95. Like MFJ-1786 but covers 40-15 Meters continuous. Includes remote control.

Portable Loop

MFJ-1780, $429.95. *Box fan loop with carrying handle, 24x24x 5¾".* 20-10 Meters continuous, 150 Watts. Fast/slow tune remote control. Highly efficient all-welded construction.

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759
Phone: (662) 323-5869 • **Tech Help:** (662) 323-0549 • **FAX:** (662) 323-6551 8-4:30 CST, Mon.-Fri.

MFJ If Pigs Could Fly . . .

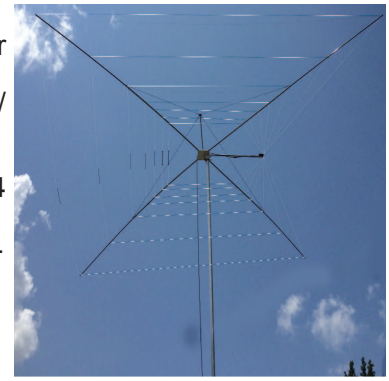
If pigs could fly . . . I think we wouldn't go outside very much. I also think our antennas would not survive those Pig Flying Roosters. Thank goodness pigs are not flying and we do not have to worry about such a thing. In a world of Covid and Killer Hornets, we certainly do not need any flying pigs. Now, flying cobwebs, flying Octopus, flying G5RVs, OCFDs, dipoles, beams, yagis, loops and masts?

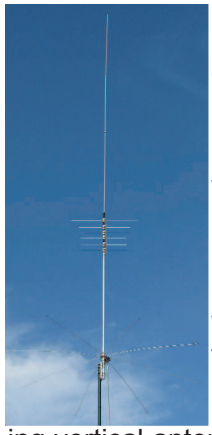
Yes one of each please.

MFJ-2100, $129.95.
Want a super versatile antenna system? This Octopus hub lets you place four bands, two hamsticks each. Picture 75/40/20/10 Meters or any other combination you wish.
One feedline, tough aircraft aluminum construction.
MFJ-2104, $299.95. 75/40/20/15M hamsticks, hub combination.
MFJ-2104X, $299.95. Octopus hub and your choice of four pair of MFJ hamsticks.

MFJ-1838, $489.95.
The Cobweb Antenna for restricted spaces covers 8-bands: 40/30/20/17/15/12/10/6 Meters. Super strong large diameter fiberglass, heavy duty 14 gauge stranded hard copper wire. 1500 Watts. 12 feet 23 lbs.

MFJ-1836H, $319.95.
20-6 Meters, 1500W.





MFJ-1797, $399.95.
SkyMaster 40-10 Meter vertical covers all of your favorite bands: 40/30/20/17/15/12/10 Meters. Handles 1000 Watts PEP. Just 7.5 lbs, 23.5 feet tall.
MFJ-1797LP, $369.95.
Like MFJ-1797 less the 14.5' whip, less efficient, narrow bandwidth on 40M. Weighs 6 lbs., only 9 feet tall for super low profile.
MFJ-2982, $179.95. The FeatherLite is a self-supporting vertical antenna that sets up in minutes, collapses to 3.8 feet for easy storage. Perfect for RVs, vacations, field day. 80-6M, includes mount, balun, wire and telescopic mast.
MFJ-2980, $139.95. 40-6 Meters.

MFJ-2389, $399.95.
Compact Vertical Antenna covers 80/40/20/15/10/6/2 Meters and UHF. Weighs less than 6 lbs. and just 8.5 feet tall. Built-in ground radial system, no fooling with counterpoise wires. SWR is 1.5:1 or less, handles 200 Watts. 1/4 wave on HF, 80-6 Meters, 1/2 wave on 2-Meters and a 5/8 wave on 440 MHz. *All in one antenna!*

MFJ-1886, $329.95.
Low-Noise Receive Loop lets you work DX and ragchew even through horrendous noise. Pull weak signals out of static crashes, atmospheric, man-made and power line noise. Clearly hear signals 50 KHz to 30 MHz.
MFJ-1888, $499.95. Like MFJ-1886 but includes MFJ-1888MC remote multi-coupler. Connect 4 receivers.

MFJ-1778, $89.95.
The famous G5RV antenna is 102 feet wide with 32.5 feet of ladder line terminating in an SO-239 connector. Operate all bands 160-10 Meters. Use **MFJ-915, $49.95,** RFI isolator for eliminating RF from traveling on long coax lines.
MFJ-1778M, $79.95.
Half-size G5RV Junior is 52 feet, covers 40-10M with tuner. 1500 Watts.

MFJ-1779 ABC, $99.95, $79.95, $59.95.

Single Band Dipole antennas have a custom injection molded UV-resistant center insulator with heavy duty 14-gauge hard copper wire. Models for 20-6M, 80-40M and 160M. Use horizontal, sloping or inverted vee.
MFJ-1779A, 265 ft.160M.
MFJ-1779B, 135 ft. 80/40.
MFJ1779C, 35 ft, 20-6M.

MFJ-2010, $89.95.

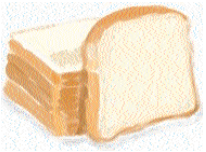
Off Center Fed Dipole delivers ham radios most interesting DX bands, 40/20/10/6M. Long leg is 44.6 ft., short is 22.3 ft. Perfect for low profile, portable, QRP, < 2 lbs.
MFJ-2012, $109.95. Like MFJ-2010 but legal limit.
MFJ-2013, $109.95. For 60/30 Meters, 300 Watts.
MFJ-2014, $139.95. For 75/40 Meters, legal limit.

Build your own!

MFJ-2774K, $99.95.
Deluxe dipole kit includes three multi-purpose center insulators, 100 feet of nylon rope, copper wire, two PL-259 connectors, two RG68 reducers, stainless steel screws and nuts and six ceramic insulators. Make G5RV, doublet or dipole antennas!

You want antennas? We've got antennas! You want parts to build antennas with? We've got parts! You want a pig that flies? We don't have that! Come fly with MFJ, send an antenna up and start receiving signals from all over the universe!!!

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759
Phone: (662) 323-5869 • **Tech Help:** (662) 323-0549 • **FAX:** (662) 323-6551 8-4:30 CST, Mon.-Fri.



"Best thing since sliced bread!"

More hams use MFJ analyzers than all others in the world!

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).*

Coax Calculator™ calculates coax line length in feet given degrees and vice versa for any frequency, velocity factor.

New! MFJ-269D **$449.95**

Measure SWR and loss of coax with *any* characteristic impedance (280 KHz to 230 MHz) from 10 to over 600 Ohms.

Measures inductance in uH and capacitance in pF at RF frequencies, 100 KHz to 230 MHz.

High contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

12-bit A/D converter gives much better accuracy and resolution than common 8-bits -- *MFJ-269D exclusive!*

Built-in frequency counter, battery saver, low battery warning, Ni-Mh/NiCd charge circuit. 4Wx2Dx6¾", 2 lbs. Use ten aA batteries or 110 VAC with MFJ-1312D, $19.95.

MFJ-269DPRO™ SWR Analyzer **MFJ-269DPro, $519.95.** Like MFJ-269D, but UHF range covers ***430 to 520 MHz***. For commercial work.

MFJ-259D . . . World's Most Popular Antenna Analyzer!

New!

MFJ-259D **$349.95** ***New and improved, now covers 280 KHz-230 MHz!***

***World** famous* MFJ-259D gives you a complete picture of your antenna's SWR and Complex Impedance.

MFJ-259D is a complete ham radio test station including frequency counter, RF signal generator, *SWR Analyzer™*, RF Resistance/Reactance Analyzer, Coax Analyzer, Capacitance/Inductance Meter and more!

Read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

Determine velocity factor, coax cable loss in dB, length of coax and distance to short/open.

Read SWR, return loss and reflection coefficient at any frequency simultaneously.

Read inductance (uH) and capacitance (pF) at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

Built-in frequency counter, Ni-MH/Ni-CD charger circuit, battery saver, low battery warning, smooth reduction drive tuning.

Super easy-to-use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR, Complex impedance displayed instantly!

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. Use 10 AA or Ni-Cad or Ni-MH batteries (not included) or 110 VAC with MFJ-1312D, $19.95. Rugged metal cabinet, 4x2x6¾". **MFJ-249D, $329.95.**

MFJ-249D does everything MFJ-259D does with digital display only.

1500 Watt *Legal Limit*

for Ameritron AL-1500/1200/82 amps

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! Ultra-fast automatic antenna tuning, back-lighted LCD and Cross-Needle SWR/Wattmeter. Highly efficient L-network, 12-1600 Ohms impedance matching, 20,000 *VirtualAntenna™* memories, audio SWR, multiple antenna connections. Made in USA!

MFJ-998 **$769.95**

MFJ-225 1.5-180 MHz *continuous* Two-Port Graphic Analyzer

Out in the field, the MFJ-225 is a compact completely *self-contained handheld graphing analyzer*. On the bench it becomes a full-fledged two-port (S21) desktop machine when teamed up with your PC. Using powerful IG-miniVNA freeware, you'll run de-tailed data analysis and print out stunning color-graphic plots to document your work! Built-in back-lighted *3-inch LCD graphic* display. Make fine adjustments using full-screen easy-to-view SWR bar-graph, capture vivid swept displays for SWR, impedance, re-turn loss, phase angle, more. DDS generator.

MFJ-225 **$399.95**

SWR Analyzer Accessories

A. MFJ-29D/MFJ-39D, $39.95. Carrying Pouch for MFJ-259D/269D.

B. MFJ-92AA10, $59.95. 10-Pk 2500 mAh Ni-MH Supercells.

C. MFJ-66C, $59.95. Dip coils, set of two covers 1.8-230 MHz.

D. MFJ-731, $134.95. Tunable Analyzer Filter, 1.8-30 MHz, for strong RF fields.

E. MFJ-917, $39.95. 1:1 Current balun for SWR Analyzers to test balanced line antennas, other loads.

F. MFJ-7737, $8.95. PL-259 to BNC Female.

G. MFJ-7727, $9.95. PL-259 to SMA Female.

H. MFJ-5510C, $19.95. 12VDC cigarette lighter adapter.

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759

Phone: (662) 323-5869 • Tech Help: (662) 323-0549 • FAX: (662) 323-6551 8-4:30 CST, Mon.-Fri.

Born in the U.S.A.!

Buy American! MFJ automatic tuners are built on American soil by American workers right here in Starkville, Mississippi USA.

MFJ *IntelliTuner*™ Automatic Tuners

The MFJ-998 Legal Limit IntelliTuner™ lets you tune any antenna automatically -- ultra fast and handles a full 1500 Watts SSB/CW and Digital!

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas, wire connection and 4:1 current balun for balanced lines.

MFJ-998
$769.95
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, 12-1600 ohm matching at 1500 Watts SSB/CW and digital, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, and *backlit* LCD. MFJ-998 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!* Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $29.95**. 13Wx4Hx15D". Radio interface cables. See ***www.mfjenterprises.com***

600 Watt MFJ Automatic Antenna Tuner

MFJ-994B, $419.95. Like MFJ-993B but handles 600 Watts SSB/ CW/Digital, matches 12-800 Ohms. 10,000 memories. Doesn't have LCD, antenna switch, balun, audio SWR meter. 10Wx2¾Hx9D inches.

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 . . .

300/150 Watt *Tuner*

300W (6-1600) 150W (6-3200 Ohms)

MFJ-993B
$329.95
Full Digital Power!

Automatically tunes unbalanced/balanced antennas, ultra fast and has 20,000 memories. Has antenna switch, efficient L-network, select 300 Watts (6-1600 Ohms or 150W 6-3200 Ohms. 1.8-30 MHz, 4:1 balun, backlit LCD.

300 Watt ...*Extra* Wide Range

SWR/Wattmeter, 10000 VA Memories

***Extra** wide matching range at less cost.* MFJ's *exclusive* dual power level: 300 Watts for 6-1600 Ohms; 150Watts for 6-3200 Ohms. Cross-Needle SWR/Wattmeter.

MFJ-991B
$309.95
Full Digital Power!

200 Watt ...Compact

Digital Meter, Ant Switch, Wide Range

MFJ-929
$279.95
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, $299.95. 200W.
MFJ-993BRT, $399.95. 300W.
MFJ-994BRT, $499.95. 600W.
MFJ-998BRT, $949.95. 1.5 kW.

G5RV Antennas

Cover 160-10 Meters with antenna tuner. 102 ft. long. Use as inverted vee or sloper, 160 Meters as Marconi. 1500 Watts. Superstrong fiberglass center/feedpoint insulators. *Glazed ceramic* end insulators.

MFJ-1778
$89.95

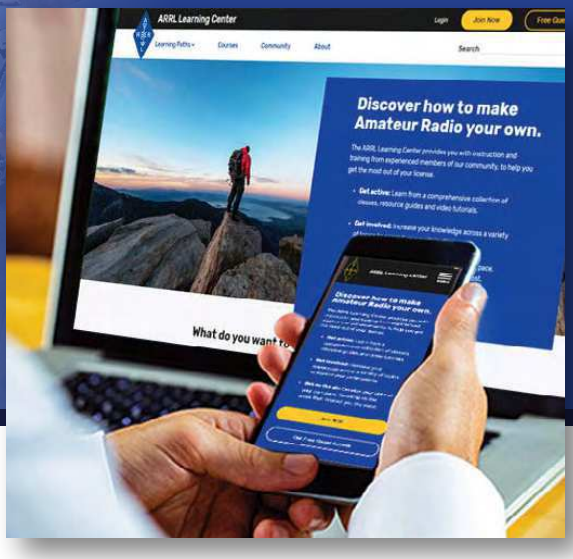
MFJ-1778M, $79.95. 52'. 40-10M.

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.

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759
Phone: (662) 323-5869 • **Tech Help:** (662) 323-0549 • **FAX:** (662) 323-6551 8-4:30 CST, Mon.-Fri.

ARRL Learning Center



Discover how to make Amateur Radio your own.

Online courses from the ARRL Learning Center provide ARRL members with additional instruction and training for getting on the air, emergency communications, and electronics and technology.

As one of ARRL's member benefits, this online learning environment is designed to help you get the most out of your license.

- **GET ACTIVE:** Take online courses, featuring activities and video tutorials created by ARRL approved experts.
- **GET INVOLVED:** Use course work and resources to improve your knowledge and skills.
- **GET ON THE AIR:** Put what you learn to work with help from the ARRL community.

Choose your own adventure!

Select the path that interests you most to get started.

The ARRL Learning Center organizes its course content around Learning Paths, making it easy to navigate and explore the field.

- On the Air
- Emergency Communications
- Electronics & Technology
- Education and Instruction

For more information visit **learn.arrl.org**

MFJ Antenna Tuners

New, Improved MFJ-989D 1500 Watt Legal Limit Antenna Tuner

World's most popular 1500W Legal Limit Tuner just got better -- *much better* -- gives you more for your money!

New, Improved MFJ-989D legal limit antenna tuner gives you beter efficiency, lower losses and a new true peak reading meter. It easily handles full 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New, dual 500 pF air variable capacitors give you twice the capacitance for more efficient operation on 160/80 Meters.

New, improved *AirCore*™ Roller Inductor gives you lower losses, higher Q and handles more power more efficiently.

New, *TrueActive*™ peak reading Cross-Needle SWR/Wattmeter lets you read true peak power on all modes.

MFJ-989D, $539.95

New, high voltage current balun lets you tune balanced lines at high power with no worries.

New, crank knob lets you reset your roller inductor quickly, smoothly and accurately.

New, larger 2-inch diameter capacitor knobs with easy-to-see dials make tuning much easier.

New, cabinet maintains components' high-Q. Generous air vents keep components cool.

12⅞Wx6Hx11⅝D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

MFJ-986 Two Knob *Differential-T*™

MFJ-986, $479.95

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning fooolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 kW PEP SSB amplifier input power (1.5 kW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun, 1.8 to 30 MHz. 15Wx4½Hx10¾D".

MFJ-962E compact kW Tuner

MFJ-962E, $399.95

A few more dollars steps you up to a kW tuner for an amp later. Handles 1.5 kW PEP/SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H. *AirCore*™ roller inductor, gear-driven turns counter, peak/avg lighted Cross-needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8 to 30 MHz. 10⅞Wx14½Hx10¾D".

MFJ-969 300W Roller Inductor Tuner

MFJ-969, $319.95

Superb, *AirCore*™ roller inductor. Covers 6 Meters through 160 Meters! 300 Watts PEP SSB. Active true peak reading lighted Cross-Needle SWR/WAttmeter, *QRM-Free PreTune*™ antenna switch, dummy load, 4:1 balun, Lexan front. 10½Wx3½Hx9½D".

MFJ-949E deluxe 300 Watt Tuner

MFJ-949E, $279.95

More hams use MFJ-949s than any other antenna tuner in the world! Handles 300 Watts, full 1.8-30 MHz coverage, custom inductor switch, 1000V tuning capacitors, full size peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. 10⅝Wx3½Hx7D". **MFJ-948, $259.95.** Econ-omy version of MFJ-949E, less dummy load.

MFJ-941E Super Value Tuner

MFJ-941E, $239.95

Most for your money! 300 Watts PEP, 1.8-30 MHz, lighted Cross-Needle SWR/Wattmeter, 8-position antenna switch, 4:1 balun, 1000 Volt capacitors, Lexan front panel. 10½Wx2½Hx7D". **MFJ-941EK, $209.95.** Tuner Kit -- *Build your own!*

MFJ-945E HF/6M mobile Tuner

MFJ-945E, $189.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8Wx2Hx6D". Lighted Cross-Needle SWR/Wattmeter, Lamp and Bypass switches. Covers 1.8-30 MHz and 6-Meters. 300 Watts PEP. **MFJ-20, $14.95**, mobile mount.

MFJ-971 portable/QRP Tuner

MFJ-971, $179.95

Tunes coax, balanced lines, random wire, 1.8-30 MHz. Cross-Needle Meter, SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ rigs. Tiny 6½Wx2½Hx6D".

MFJ-901B smallest Versa Tuner

MFJ-901B, $149.95

MFJ's smallest (5Wx2Hx6D") and most affordable wide range 200 Watt PEP Versa Tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902B Tiny Travel Tuner

MFJ-902B, $149.95

Tiny 4½Wx2¼Hx3D", full 150 Watts, 80-6 Meters, has tuner bypass switch for coax/random wire. **MFJ-904H, $199.95.** Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. 7¼Wx2¾Hx2¾D".

MFJ-16010 random wire Tuner

MFJ-16010, $109.95

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antennas. 1.8-30 MHz. 200 Watts PEP. Tiny 4Wx2Hx3D".

MFJ-9201 *QRPocket*™ Tuner

MFJ-9201, $79.95

80-10 Meters, 25 Watts. 12 position inductor, tune/bypass switch, wide-range T-network. BNCs. 4Wx2⅝Hx1½D".

MFJ-921/924 VHF/UHF Tuners

MFJ-921/924, $149.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8Wx2½Hx3D".

MFJ-931 Artificial RF Ground

MFJ-931, $159.95

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $299.95.** Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759

Phone: (662) 323-5869 • **Tech Help:** (662) 323-0549 • **FAX:** (662) 323-6551 8-4:30 CST, Mon.-Fri.

Ham Ads

Please contact the Advertising Department at 860-594-0255 or hamads@arrl.org for further information or to submit your ad.

QST Ham Ads on the Web
Updated Monthly!
www.arrl.org/ham-ad-listing

Club/Hamfests/Nets

CW INSTRUCTION via internet video conference classes. VISIT longislandcwclub.org

Emergency Ham Net. Forming a new group, free membership. Have fun and push the frontiers of digital radio. www.emergencyham.net

Friend of BILL W meets Thur on 14.316 @ 12:30 ET. Daily Meeting on QSO NET on 21.350 @ 11:30 Eastern Time. More info please visit HAAM Group website www.qsl.net/haam.

SOCIETY OF WIRELESS PIONEERS - Professional brass pounders on land, sea, and air from the time of spark to solid state preserved photos, stories, schematics, letters, cartoons, catalogs, books, and manuals to keep radio history alive. Website showcases **early ham stations**, naval communications history, SOS events, and more, all free. www.sowp.org

Property/Vacation/Rentals

A CARIBBEAN SAINT KITTS "V4" DX RENTAL. See V47JA on QRZ.com and email: W5JON@sbcglobal.net for Ham Discount information. John W5JON/V47JA

A DX Apartment available in VP9 with rigs and antennas. Email: ed@vp9ge.com for details.

Beautiful outdoor Idaho! Spacious low populated areas. Abundant recreation opportunities. Moderate four season climate. Thinking of buying or selling? Contact Ron Bishop, W7IM, Keller Williams Realty Boise. 208-870-6075. Ron@BoiseBargains.com

CAPE COD real estate for hams, buy or sell, John Strome, KC1MLR, ColdwellBanker associate, john.strome@nemoves.com, 508-527-0499

COLORADO CHALET with ham gear for weekly rental, www.lostcreekcabin.com. WØLSD, Buena Vista, CO.

Hams Looking to purchase or sell real estate in Connecticut? Please contact Licensed Ham and Realtor, Claude Cousins, Sr. N1QAE, Berkshire Hathaway Home Services, claudecous@gmail.com, 860-989-2113

KD7UIZ Helps buy/sell radio friendly properties anywhere in AZ. Pima Canyon Realty. Email - **DON@DONERNLE.COM**

MAINE year-round Ham Station. www.CottagebytheDam.com

Retiring to Florida? Looking for a resort-like, award winning 55+ active adult community with a vibrant, active Amateur Radio Club with three community repeaters? Contact WB-8ZNL, Doug Bennett, Realtor - Arista Realty Group, for more information. 317-418-4273

www.peidxlodge.com

Antique/Vintage/Classic

6 Meter legacy by K6EDX K6MIO. www.bobcooper.tv

ANTIQUE WIRELESS ASSOCIATION - the largest international organization for historic radio enthusiasts. Publishes the quarterly AWA Journal and annual AWA Review on all aspects of collecting and history of communications. AWA produces the famous annual AWA Convention and sponsors the world renowned Antique Wireless Museum. Only $35/year USA, $40/year elsewhere. Antique Wireless Association, PO Box 421, Bloomfield, NY 14469. Website: http://www.antiquewireless.org

AR88 Excellent condition with LM7 Frequency Meter. Spare tubes available. ericbforsyth@gmail.com

Awesome Technology & Stem Museum - www.cyberengineer.info

Six Decades of Amateur Radio www.kk4ww.com

Vintage Radio, Ham Radio and Military Radio Repair. www.mcveyelectronics.com 845-561-8383

WANTED PRE-1980 MICROCOMPUTERS for historical Museum www.kk4ww.com

QSLCards/Call Sign Novelties

Flaunt your call! www.**HAMFLAGS**.com

Get Top Quality Full Color UV Coated QSL Cards direct from the printer. Chester QSL Cards by Chester Press. Call 800-748-7089 for samples, email info@chesterpressinc.com or visit the chesterpressinc.com/QSL website.

www.QSLCONCEPT.com Custom designed QSL Cards. FREE Design, FREE Shipping, FREE Stock Photo.

General

RF CONNECTORS & GADGETS
Parts - Products - More
www.W5SWL.com.

#1 Amateur website for useful links and downloadable information: www.kb9at.com

Amateur and High-End Audio Equipment Repair. Email: seecumulus@gmail.com, AJ4UY, SMD Rework Services.

ATTENTION YAESU-FT 10218,000hrs, 30yrs, 800+ FT-102's Repaired. Have every part. AM-FM/board. $25/hr. Parts@cost. Relays lifetime warranty. 954-961-2034 NC4L www.w8kvk.com/nc4l

Build your own Yagi! - W5EES.COM

CALL SIGN T-SHIRTS, COFFEE MUGS AND CAPS! See my store KA7UNW at www.etsy.com/shop/KA7UNW or just Google KA7UNW

Custom LED Call Signs.
www.ledboothsign.com
408-315-4573 Phone

GAIN the EDGE with NARTE Certification – NARTE gives you the competitive edge with individual certification in Electromagnetic Compatibility, Electromagnetic Discharge Control and Telecommunications. Industry-recognized certification required or desired by more than 400 corporations nationwide. Call 1-800-89-NARTE or visit www.inarte.org. NARTE offers the premier EMC/EMI, ESD, Telecommunications and Wireless certification to professional technicians and engineers.

HAM KITS for sale at www.HecKits.com L/C Meter, SWR Bridge, ESR Meter, 2-Tone Gen, FET DIP Meter.

ISOTRON ANTENNAS FOR 160 - 6 METERS! Efficient, rugged and resonant. Please visit **WWW.ISOTRONANTENNAS.COM**. wd0eja@isotronantennas.com 719/687-0650.

KB6NU'S "NO NONSENSE" LICENSE STUDY GUIDES have helped 1000's get their first license and upgrade to General or Extra. They can help you, too. KB6NU.COM/STUDY-GUIDES/

MicroLog-By-WA0H .. Easy to use logging program .. Free download .. **www.wa0h.com**

PRINTED CIRCUIT BOARDS for projects shown in QST, QEX, HR, ARRL HB, 73 and more. Custom boards available. FAR Circuits, 18N640 Field Ct, Dundee, IL 60118; fax/phone 847-347-2432; www.farcircuits.net; mail@farcircuits.net

Radio Shack HTX-100 Repair. Free Estimates. KA1HVR -- www.HTX-100.com

RF SUPERSTORE
Connectors, Adapters, Antennas, Coaxial Cable and more!
High Quality, Low Cost, Ham Friendly
WWW.RFSUPERSTORE.COM

Rohn Tower, telescoping poles, tripods and antenna parts delivered to your door. **www.antennapartsoutlet.com**

Science Hall of Fame Dedicated to promoting Ham Radio in classrooms. www.SciHall.com AB5L

Soldering-desoldering-hand tools-ESD how can we help? **www.technimark-inc.com** and E-Bay store-ebay.com/str/technimarkinc

Start to read fast CW in your head! Begin to hear whole words sent in fast CW! Soon reading is easy! **https://www.hearcwwords.com**

Tactical Portable Accessories for Yaesu 450D, DX-10, 817ND, 857D, 897D, 891, 991A, ICOM 7300, 7200, 7000, 706/703 and 9700. W0MSN www.portablezero.com

Universal Aluminum push up towers. Same day shipping. www.antennapartsoutlet.com

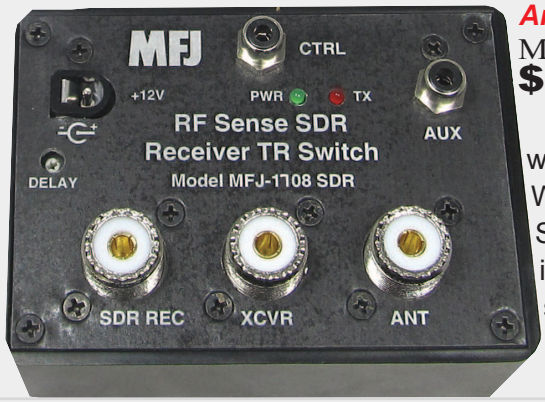
WANTED: Kenwood DK-520 Digital Adapter Kit. b52ewo54@gmail.com or 484.474.2167

Xcellent **Amateur** and **Monitor Logging** from **DXtreme!** Click **www.dxtreme.com**

New!

MFJ SDR T/R Protection Switch

Turn your SDR into a panadapter to see entire bands on frequency/waterfall displays . . .



An inexpensive wide-band SDR dongle receiver lets you see entire bands on frequency/waterfall computer displays!

MFJ-1708B-SDR
$139.95

If you want to know where the activity is, who's generating splatter, what's in the DX window, how wide your audio is or what frequencies are clear, it's all right there! While receiving on your transceiver, MFJ-1708B-SDR switches your SDR to your antenna showing the entire band. On transmit your SDR is switched out and grounded to protect your SDR. PTT and a fail-safe RF sense switches MFJ-1708B-SDR. For HF/VHF/UHF. Monitor multiple bands with multiple SDRs and a multi-coupler.

MFJ-1708B-SDRS, $139.95. SMA connector for your SDR.

New B series improvements . . .

The original MFJ-1708 series used one relay and wires to connect the SO-239s. The *new B-series* uses *four* relays and connectors on a *single* pc board. This gives you > 50 dB isolation at 300 MHz and > 68 dB at 50 MHz. SWR < 1.16:1 at 50 MHz and < 1.75:1 at 450 MHz at the transmit port. Mute output is a selectable short or open to ground. Use "boat anchors" or modern receivers or key a linear amplifier. Receiver input protection prevents overload from nearby high power signals and from receive to transmit. A hybrid splitter on SDR models reduces loading effect and gives > 15 dB isolation between the SDR REC and XCVR ports to reduce interference. The original MFJ-1708 series is still available.

MFJ Low Noise VLF/HF Receiving Loop

Pull weak signals out of static crashes, atmospheric, man-made and power line noise!

Hear signals 50 KHz to 30 MHz cleaner, quieter than ever before! Power line noise disappears. Rotate its figure 8 pattern and its extremely deep null to completely eliminate an interfering signal or greatly peak a desired one. Fully protected state-of-the-art Gali MMICs in push-pull gives you a preamp with extremely high dynamic range, low IMD and 25 dB of low noise gain. Excellent performance on strong and weak signals without overload. 36-inch dia. loop. 1-in. OD 6061 aluminum.

MFJ *wideband* SDR *Discone* Antenna

Receives 25-1300 MHz

MFJ ultra wide-band *Discone* Antenna receives 25-1300 MHz. Perfect for all band SDR reception. Covers 10, 6, 2 Meters, 220 and 440 MHz and 33/23 CM ham bands and everything in between. It is excellent for monitoring multiple bands simultaneously using multiple SDRs and a multi-coupler. Also test any transmitter 50-1300 MHz using a single discone and single coax. Handles 200W. Includes 50 feet coax, stainless steel elements and mounting hardware.

MFJ-1866, $79.95. Like MFJ-1868 but transmits 144-1290 MHz. Coax and mounting hardware not included.

Tuned Indoor SDR Active Antenna

Make your SDR receiver come alive with HF signals, .3-40 MHz, while rejecting interference with MFJ-1020C *tuneable* indoor active antenna! Gain control, telescoping whip.

MFJ-1020C
$129.95

Untuned Indoor SDR Active Antenna

MFJ-1022, $89.95. Hear weak, noisy VLF to UHF signals. Noise-less feedback gives excellent low noise reception. Handles strong signals.

Active OutdoorAntenna

MFJ-1024
$219.95

World Radio TV Handbook says "MFJ-1024 is a *first rate, easy-to-operate active antenna, quiet, excellent dynamic range, good gain, very low noise factor, broad frequency coverage, excellent choice . . .*"

Outdoor mounted 54-inch whip/preamp gives maximum signal and minimum noise. Covers .05-30 MHz.

Indoor unit: 20 dB attenuator, gain control, 2 receiver and 2 antenna switches.

HF SDR Preselector

Tuneable

MFJ-1040C
$149.95

MFJ-1040C lets you copy **weak**, noisy SDR signals from 1.8 to 54 MHz. Greatly tunes out and reject out-of-band interference. Up to 20 dB gain. Has gain control. Cascode FET/bipolar transistor gives low noise, high gain without overloading. Switches for 2 antennas and 2 receivers. SO-239s. Has 20 dB attenuator. Automatically bypasses when transmitting or use PTT. 6½Wx2½Hx4D inches.

MFJ LW/MW/SW SDR Preselector/Tuner

MFJ-956
$109.95

Highly rated series-tuned MFJ boosts your desired signals while greatly rejecting interference and preventing serious overload.

Greatly improves reception 0.15 to 30 MHz. Incredibly effective below 2 MHz.

Super easy to operate, select band and tune!

Bypass tuner and ground receiver switch positions.

Compact 2x3x4 inches. SO-239 connectors.

MFJ RF Sense Transmit/Receive Switch

MFJ-1708B
$139.95.

Switches your antenna from receiver to transmitter using a relay. Shorts your receiver to ground during transmit. Use RF sensing with adjustable delay or PTT line. Has selectable open/short mute.

Auto switch XCVR between 2 antennas

MFJ-1707B
$139.95.

Automatically switches separate transmit and receive antennas on transceivers with only one antenna port. *Example:* Efficient 75M dipole for XMIT and low noise MFJ loop for receive -- *no static crashes!*

MFJ Enterprises, Inc. 300 Industrial Pk Rd, Starkville, MS 39759
Phone: (662) 323-5869 • **Tech Help:** (662) 323-0549 • **FAX:** (662) 323-6551 8-4:30 CST, Mon.-Fri.

Advertising Department

Janet Rocco, W1JLR, Advertising Sales Manager
Toll Free: 800-243-7768
Fax: 860-594-4285
E-mail: ads@arrl.org
Web: www.arrl.org/ads

QST Index of Advertisers

Member Services Contact Information:

Toll Free: 888-277-5289
Fax: 860-594-0303
E-mail: circulation@arrl.org
Web: www.arrl.org

MFJ

Dealer/Catalog/Manuals
Visit: http://www.mfjenterprises.com
or call toll-free 800-647-1800

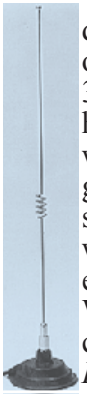
• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759
PH: (662) 323-5869 **Tech:** (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

VISA MasterCard DISCOVER AMERICAN EXPRESS PayPal

MFJ-281, $19.95. *Clearest speech you ever heard!* 3" speaker, 8W, 8 Ohms, 6' cord, 3.5 mm plug.

Best Sellers! Dual Band Mag Mount Ant



MFJ-1724B **$29.95** **MFJ-1724B** 2-Meter/440 MHz antenna is perfect for your dual band mobile or HT. Powerful 3½ inch magnet holds firm at highway speeds, rubber guard, 19" black stainless steel whip, low SWR, excellent gain, 300 Watts PEP, 12 feet coax with PL-259. *Free* BNC adapter.

MFJ-1729 **$49.95** **MFJ-1729** ***Power*Gain***™ Ham Radio's most powerful dual band antenna gives whopping gain on 440 MHz and 2-Meters! Low SWR. 27½" stainless steel *Slimline*™ radiator minimizes wind vibration for less SWR flutter for longer range, better readability. 12' coax, PL-259, Heavy duty magnet mount.

MFJ-1728B **$39.95** **MFJ-1728B** ***5/8 Wave 2/6 Meter Mobile*** Full 50-inch 5/8 Wave gives you maximum possible gain of *any* single element antenna on 2-Meters. On 6-Meter "magic band" you get a powerful signal with its high-performance low SWR *full* 1/4 Wave. 300 Watts PEP, heavy duty magnet, 12 feet coax, stainless steel radiator.

MFJ *Super-Strong* Magnet Mounts with Coax/PL-259

MFJ 5-inch Magnet

MFJ-335BS SO-239
MFJ-335BM NMO
MFJ-335BT 3/8 - 24 For HF sticks
$29.95 Each

Best Seller!
These jet-black ***5-inch*** *super strong* magnet mounts have 17' coaxial line terminated with PL-259 connectors. SO-239 (BS) or NMO (BM) for your VHF/UHF antennas or 3/8-24 threaded (BT) for your HF hamstick antennas with a 3/8-24 threaded connector.

MFJ 3-inch Magnet

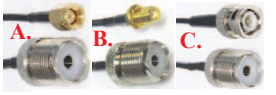
MFJ-333BS pictured
$19.95 Each

3-inch black magnet antenna mounts. 17 foot coax is terminated with PL-259 connector. Choose SO-239 (**BS**) or NMO (**BM**). For VHF/UHF lightweight antennas.

MFJ SMA/BNC Cables, $19.95

Release strain on your HT's antenna connector! 3 ft. flexible, mini coax with SO-239 connector.

A.MFJ-5612S SMA Male.
B.MFJ-5612SF SMA Female Wouxun/Baofeng.
C.MFJ-5612B BNC Male.

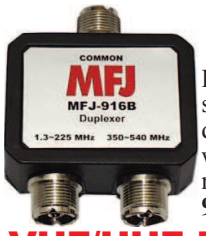


MFJ Triple 5" Magnets

$49.95 Each
MFJ-336S SO-239
MFJ-336M NMO
MFJ-336T 3/8x24

Three super-strong 5-Inch Magnets make up this MFJ *Goliath*™ Tri-Magnet Mount. 1/4" thick steel triangle base. 17' coax. Select SO-239, NMO, 3/8-24 antennas. **Caution:** once on, it's difficult to get off!

HF/VHF/UHF 200 Watt Duplexers



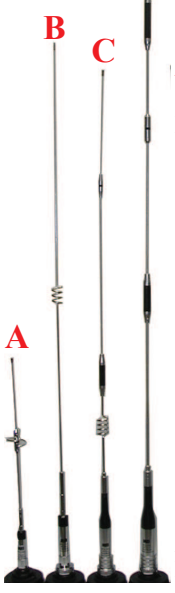
MFJ-916B **$44.95** **Use** separate HF/VHF and 440 MHz UHF antennas with single transceiver ***OR*** use two separate HF/VHF and 440 MHz UHF transceivers with a single HF/VHF/UHF antenna. Heavy-duty diecast enclosure houses low/high pass networks that separate/combine HF/VHF/UHF signals. Low loss SO-239s. 50 Ohm ports. **MFJ-916BC, $79.95** 3 ft. coax pigtails on 2-port side.

1.8-200 MHz SWR/Wattmeter

Compact 1.8-200 MHz SWR/Wattmeter has HUGE 3" *Cross-Needle* meter. Read forward/reflected power and SWR simultaneously. Perfect for mobile/portable. 30/300 Watt ranges. Built-in meter light. SO-239s. 3¼Wx3¼Hx3¼D". **MFJ-842, $79.95** covers 140-525 MHz, 15/150 Watts.

MFJ-822 1.8-200 MHz **$79.95** MFJ-842, 140-525

VHF/UHF Hi-Gain Antennas



A. MFJ-1402, $29.95. ***VHF/UHF RuffRiderJunior***™**.** Premium, short 16½" antenna fits in any garage on any auto. ¼ Wave on 2 Meters, ½ Wave, gain on 440 MHz. 100W. No foldover. B or C.

B. MFJ-1412, $39.95. ***VHF/UHF RuffRider High Power***™**.** Just 40" long handles full *200 Watts*. Great for high power mobile amp. ½ Wave, gain on 2 Meters, ⅝ Wave, great gain on 440 MHz. Black or chrome.

C. MFJ-1422, $59.95. ***VHF/UHF RuffRider High Gain***™**.** 41½ inch long antenna gives extra gain with little height increase. Handles 150 Watts. ½ wave with good gain on 2 Meters, ⅝ wave, excellent gain on 440 MHz. Black or chrome.

D. MFJ-1432, $69.95. ***VHF/UHF RuffRider Hyper Gain***™**.** 62½" brute gives whopping gain on ⅞ Wave 2-Meters, ⅝ Wave and a *MONSTER* gain on 440 MHz. MFJ will rock your ham radio world! 150 Watts. Use tri-magnet. Black or Chrome.

MFJ Mobile HF *Ham Sticks*

MFJ-1675T - 75 Meters
MFJ-1660T - 60 Meters
MFJ-1640T - 40 Meters
MFJ-1630T - 30 Meters
MFJ-1620T - 20 Meters
MFJ-1617T - 17 Meters
MFJ-1615T - 15 Meters
MFJ-1612T - 12 Meters
MFJ-1610T - 10 Meters
MFJ-1606T - 6 Meters
$21.95 Each 6-30 Meters
40-60 Meters, **$22.95**
75 Meters, **$29.95**

Each is ruggedly constructed. A heavy duty 4', ⅜ inch diameter fiberglass rod; a nearly indestructible .125 inch diameter PH-17-7 stainless steel whip and chrome plated brass fittings will give you years of service. It's sleek, low profile construction has low wind loading and its semi-rigid fiberglass eliminates the need for springs or guys.

Black anti-static jacket protects loading coil, blends with any vehicle. Stainless steel whip is adjustable for lowest SWR. Push it down to park in the garage or fully extend it for maximum efficiency during mobile operation.

Includes allen wrench and complete tuning and matching instructions. Handle 250 Watts PEP. Whips are 7 feet fully extended, and collapse to about 4 feet for easy storage. **Simply** screws into any 3/8 x 24 female mount for quick band-changing. Get them all for great band coverage!

3/8-24 Ham Stick Mounts

MFJ-343, $19.95. Tough 3/8-24 hard mount for permanent installation.

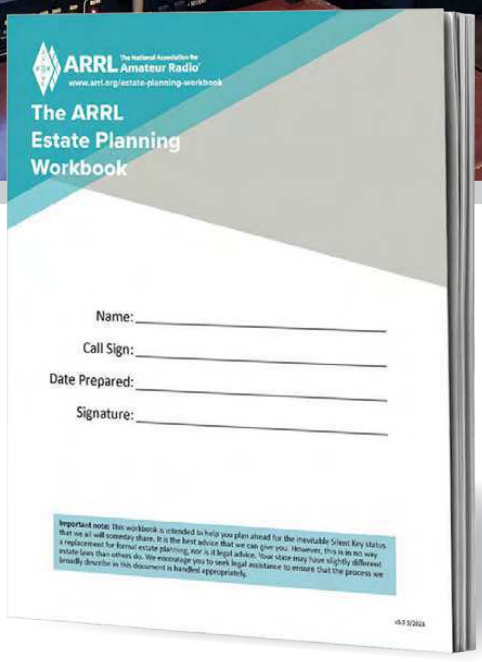
MFJ-342T, $19.95. 3/8-24 HF horizontal or vertical 1/4 or 1/2 inch pipe or mirror mount.

MFJ-344, $19.95. Like MFJ-342T, but horizontal pipe mount.

www.mfjenterprises.com

Your Station is an Asset

The ARRL Estate Planning Workbook is a resource to guide you. Planning in advance will help your family and friends. Use the workbook to help you create your plan.



- **Handle your station and its many assets**
- **Decide how you will leave your legacy**
- **Use part or all of your station to support the future of amateur radio**

Download the ARRL Estate Planning Workbook today at **www.arrl.org/estate-planning-workbook** or contact ARRL Development with questions about your plans.

Leave a Lasting Legacy

The ARRL Legacy Circle recognized the generosity of individuals who have planned support for ARRL through wills, trusts, life insurance gifts, and other planned giving opportunities. The ARRL Legacy Circle ensures that ARRL and amateur radio will continue to thrive for generations to come.

Contact the Development team for more information and learn how we can work with you and your advisors to create a meaningful and enduring legacy.

AMERICAN RADIO RELAY LEAGUE
LEGACY CIRCLE

www.arrl.org/arrl-legacy-circle | development@arrl.org

ARRL, 225 Main Street, Newington CT 06111-1400 USA

KENWOOD

Versatile and Flexible Radio Returns with a New Look and Soaring Functions That'll Thrill Amateur Radio Enthusiasts.

NEW TRIBANDER

TH-D75A

144 / 220 / 430 MHz TRIBANDER

Key Features

- **APRS® Protocol*1 compliant**
  To exchange GPS location data and messages in real-time.
- **D-STAR*2 with Simultaneous Reception on DV mode**
  Compatible for transferring voice and digital data over D-STAR networks.
- Reflector Terminal mode to access D-STAR Reflectors
- USB Type-C for Data Transfer and Charging
- Built-in Digipeater (a digital repeater) station to transmit received data
- Built-in GPS unit
- Easy-to-read Transflective Color TFT Display
- Call Sign Readout
- Tough & Robust – meets IP54/55 Standards
- Wide-band and multi-mode reception
- Built-in IF Filter for comfortable reception (SSB/CW)
- DSP-based Voice Processing and Reputable KENWOOD Custom Tuned Sound Quality
- Bluetooth®, microSD/SDHC Memory Card Slot for flexible link with a PC

*1: APRS® (The Automatic Packet Reporting System) is a registered trademark of TAPR (Tucson Amateur Packet Radio Corp.)
*2: D-STAR is a digital radio protocol developed by JARL (Japan Amateur Radio League).

JVCKENWOOD USA Corporation

Customer Support/Distribution Customer Support:
(310) 639-4200 Fax: (310) 537-8235 **www.kenwood.com/usa**

ADS#31823